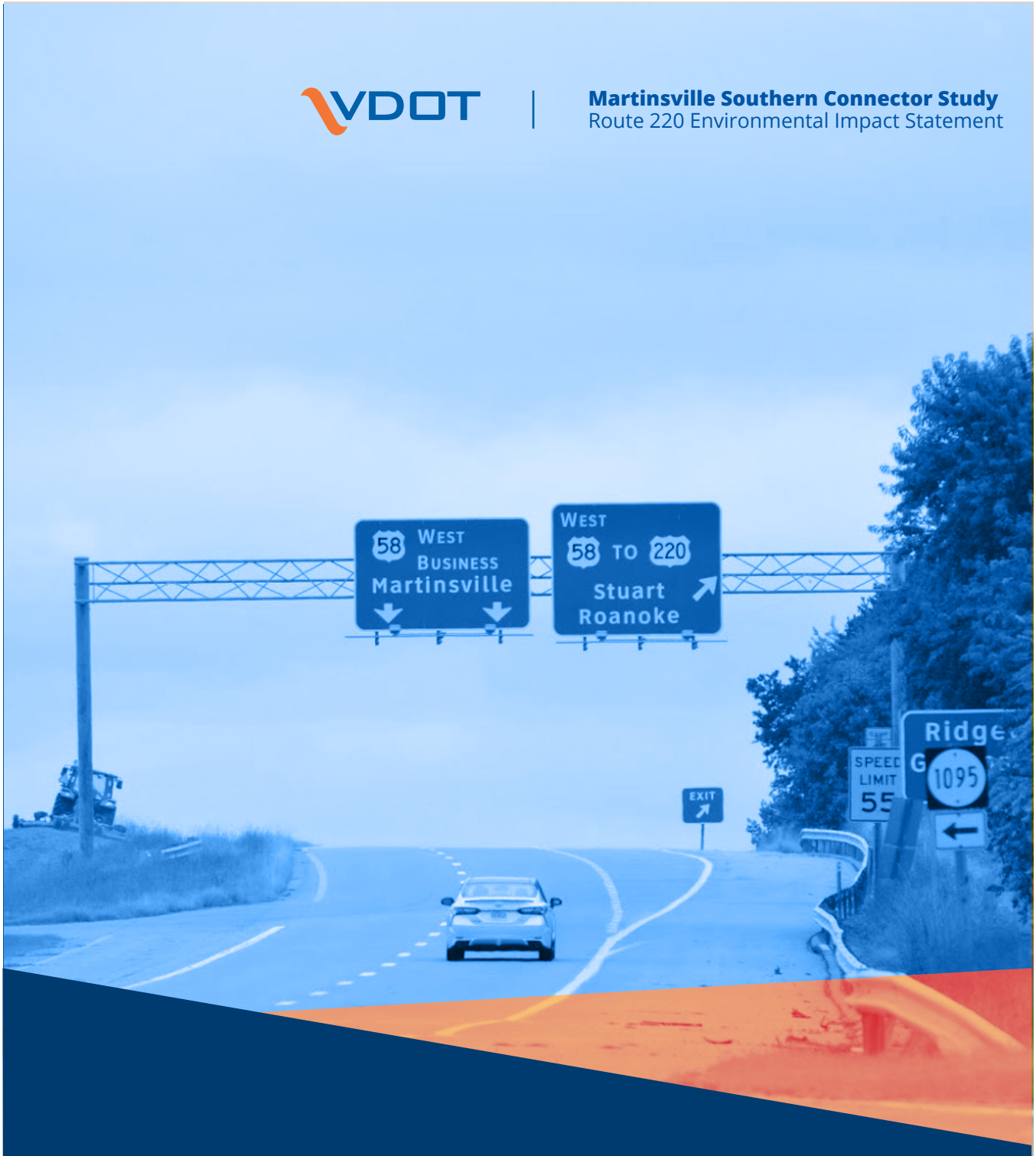
Martinsville Southern Connector Study
Route 220 Environmental Impact Statement



MARCH 2020

Indirect and Cumulative Effects Technical Report

State Project #: 0220-044-052, P101; UPC: 110916
Federal Project #: STP-044-2(059)

Prepared in Coordination With:

U.S. Department of Transportation
Federal Highway Administration

INDIRECT AND CUMULATIVE EFFECTS TECHNICAL REPORT

Martinsville Southern Connector Study

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March 2020

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ACS	American Community Survey
APE	Area of Potential Effects
BCE	Before Common Era
BMP	Best Management Practices
CBD	Central Business District
CCAT	Commonwealth Centre for Advanced Training
CCB	Center for Conservation Biology
CEDAR	Comprehensive Environmental Data and Reporting
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CLOMR	Conditional Letters of Map Revision
CWA	Clean Water Act
DOTs	Departments of Transportation
DRBA	Dan River Basin
E. coli	Escherichia coli
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
ESC	Virginia Erosion & Sediment Control
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FY	Fiscal Year
GIS	Geographic Information System
HHS	Health and Human Services
HUC	Hydrologic Unit Code
ICE	Indirect and Cumulative Effects
IPaC	Information for Planning and Conservation
LOD	Illustrative Planning Level Limits of Disturbance
LOMR	Letters of Map Revision
NCDOT	North Carolina Department of Transportation
NCHRP	National Cooperative Highway Research Program
NCNHP	North Carolina Natural Heritage Program
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NHDE	Natural Heritage Data Explorer
NHS	National Highway System
NHPA	National Historic Preservation Act
NLCD	National Land Cover Dataset
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places

NTHP	National Trust for the Historic Preservation
NWI	National Wetlands Inventory
OFD	One Federal Decision
SHPO	State Historic Preservation Officer
STIP	State Transportation Improvement Plan
SWM	Virginia Stormwater Management
SYIP	Six-year Improvement Program
TCE	trichloroethylene
TOYR	Time of Year Restrictions
TRB	Transportation Research Board
USC	United States Code
USEPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VAC	Virginia Administrative Code
VAFWIS	VDGIF's Fish and Wildlife Information Service
VCRIS	Virginia Cultural Resource Information System
VDCR	Virginia Department of Conservation and Recreation
VDCR-DNH	Virginia Department of Conservation and Recreation–Division of Natural Heritage
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDHR	Virginia Department of Historic Resources
VDOT	Virginia Department of Transportation
VEC	Virginia Employment Commission
Virginia	Commonwealth of Virginia
WCCPS	Weldon Cooper Center for Public Service
WERMS	Wildlife Environmental Review Map Service
WPPDC	West Piedmont Planning District Commission
WOUS	Waters of the United States

1. INTRODUCTION

The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA) as the Federal Lead Agency and in cooperation with the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA), have prepared a Draft Environmental Impact Statement (EIS) for the Martinsville Southern Connector Study – Route 220 EIS (Martinsville Southern Connector Study). This study evaluates potential transportation improvements along the U.S. Route 220 (Route 220) corridor between the North Carolina state line and U.S. Route 58 (Route 58) in Henry County near the City of Martinsville (Martinsville), Virginia.

The Draft EIS and supporting technical documentation have been prepared pursuant to the National Environmental Policy Act of 1969 (NEPA), codified in 42 United States Code §4321-4347, as amended, and in accordance with FHWA regulations, found in 23 Code of Federal Regulations (CFR) §771. As part of the Draft EIS, the environmental review process has been carried out following the conditions and understanding of the *NEPA and Clean Water Act (Section 404) Merged Process for Highway Projects in Virginia* (merged process)[1]. The Martinsville Southern Connector Study also follows the One Federal Decision (OFD) process, which was enacted by Executive Order (EO) 13807: *Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects* (82 FR 163)[2].

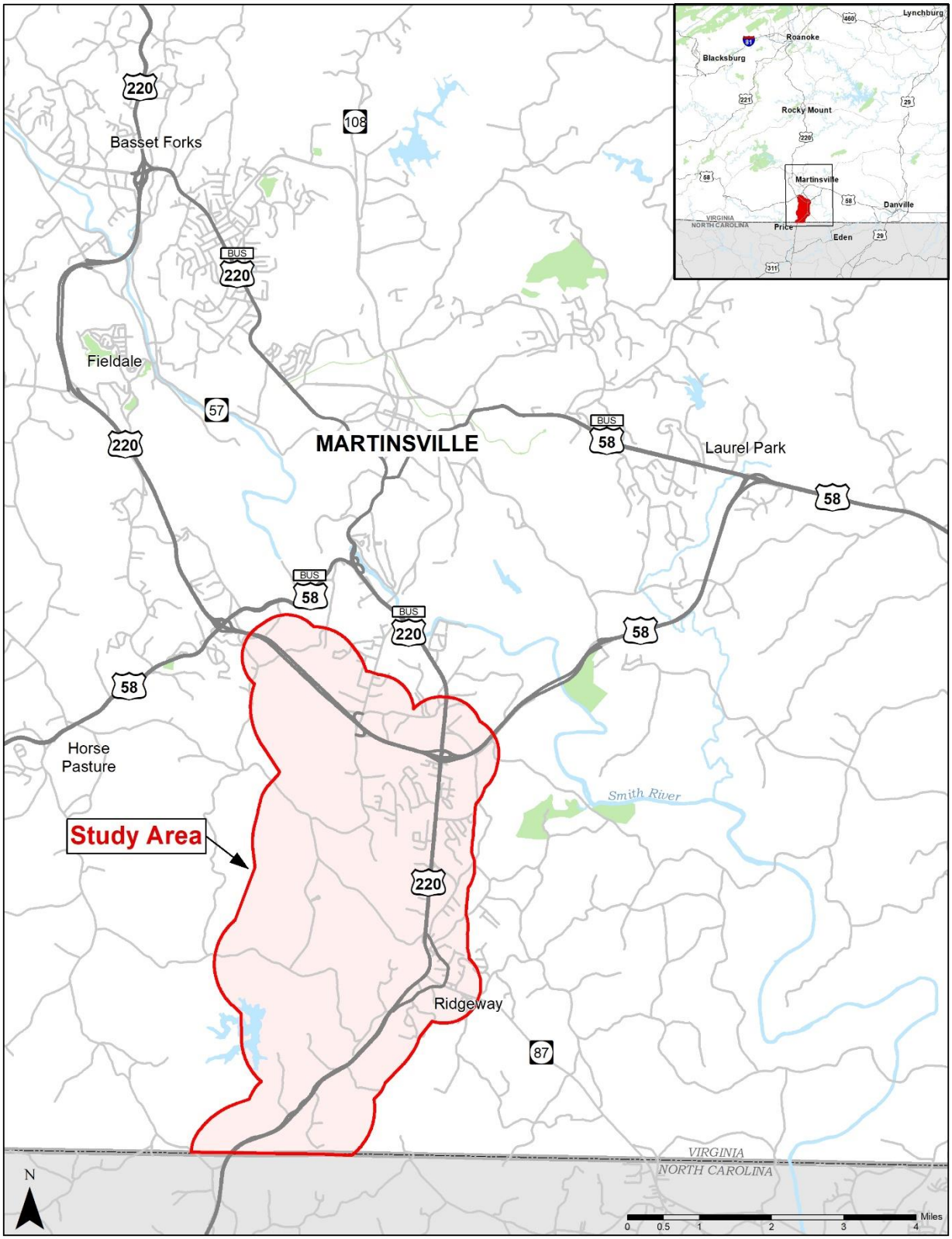
The study area for the Martinsville Southern Connector Study is located south of Martinsville in Henry County, Virginia (see **Figure 1-1**). Positioned on the southern border of Virginia, the study area is located approximately 60 miles southeast of the City of Roanoke (Roanoke) via Route 220, 30 miles west of the City of Danville via Route 58, and 40 miles north of the City of Greensboro (Greensboro) in North Carolina via Interstate 73 and Route 220.

The study area encompasses approximately seven miles of the Route 220 corridor, between the interchange of Route 220 with the William F. Stone Highway and the North Carolina state line. Within the study area, existing Route 220 consists of a four-lane roadway, with two travel lanes in each direction. The William F. Stone Highway is signed as Route 58 to the east of its interchange with Route 220; west of the interchange, Route 220 is collocated with Route 58, as both bypass Martinsville. For the purposes of consistency in this study, portions of the William F. Stone Highway east and west of the Route 220 interchange are herein referred to as Route 58. The study area also includes the interchange of Route 58 at Route 641 (Joseph Martin Highway), approximately 1.25 miles west of Route 220. Additionally, the study area encompasses the Town of Ridgeway (Ridgeway), where Route 220 connects with Route 87 (Morehead Avenue), approximately three miles south of Route 58.

[1]Established under a memorandum of understanding between VDOT, FHWA, USACE, EPA, and the U.S. Fish and Wildlife Service (USFWS), the merged process establishes a procedure for coordinated environmental review and development of documentation in Virginia that complies with the requirements of NEPA and provides sufficient information to support Federal regulatory decision-making, including FHWA approval or permits issued by other Federal agencies.

[2]The Martinsville Southern Connector Study is following the OFD process, subsequent to receiving OFD designation by FHWA. OFD requires that major infrastructure projects have a single permitting timetable for synchronized environmental reviews and authorizations: www.permits.performance.gov/permitting-projects/us-route-58220-bypass-north-carolina-state-line-limited-access-study.

Figure 1-1: Study Area



The study area boundary for the Martinsville Southern Connector Study has been developed to assist with data collection efforts and the evaluation of alternatives retained for evaluation. The study area covers 12,873 acres and generally encompasses a one-half-mile buffer around the portion of existing Route 220, between the North Carolina state line and Route 58, and each alternative carried forward for evaluation. The study area was used in various instances during preliminary research and to establish an understanding of the potentially affected natural, cultural, and social resources that may be impacted by the improvements evaluated in the Draft EIS.

The purpose of this ***Indirect and Cumulative Effects (ICE) Technical Report*** is to identify and assess the indirect and cumulative effects of the alternatives retained for evaluation in the Draft EIS. Information detailed in this report is intended to support discussions presented in the Draft EIS. This technical report first provides an overview of the study and a description of the methods that were used to assess indirect and cumulative effects. The indirect effects are then assessed in **Section 2**, followed by the assessment of cumulative effects in **Section 3**.

1.1 PURPOSE AND NEED

Working with FHWA and the Cooperating and Participating Agencies, the Purpose and Need for the study was concurred upon in November 2018. The purpose of the Martinsville Southern Connector Study is to enhance mobility for both local and regional traffic traveling along Route 220 between the North Carolina state line and Route 58 near Martinsville, Virginia.

The Martinsville Southern Connector Study addresses the following needs:

- **Accommodate Regional Traffic** – current inconsistencies in access, travel speeds, and corridor composition along Route 220 inhibit mobility and creates unsafe conditions considering the high volume of truck and personal vehicle traffic traveling through the corridor to origins and destinations north and south of the study area;
- **Accommodate Local Traffic** – numerous, uncontrolled access configurations along Route 220, combined with high through traffic movement, create traffic delays and contribute to high crash rates for travelers within the corridor accessing residences, commercial buildings, and schools; and
- **Address Geometric Deficiencies and Inconsistencies** – current geometric conditions along Route 220, such as lane widths, horizontal curves, and stopping sight distances, are below current design standards and vary along the length of the corridor, resulting in safety concerns for all users.

1.2 ALTERNATIVES CARRIED FORWARD FOR EVALUATION

1.2.1 Alternatives Retained

VDOT, in coordination with FHWA, the Cooperating and Participating Agencies, and the general public, initially considered a broad range of alignment options to address the established Purpose and Need of the Martinsville Southern Connector Study. A number of these alignment options were not carried forward based on their inability to meet the Purpose and Need. Other alignment options were developed into alternatives for evaluation, but were not retained based on anticipated impacts to private property. As part of the public involvement process during the development of the Draft EIS, additional alternatives were suggested for evaluation. These options were similar to the alignment options initially considered and were not carried forward for evaluation based on their inability to address the identified Purpose and Need for the study.

The alternatives carried forward for evaluation and retained for detailed study in the Draft EIS are listed below:

- No-Build Alternative;
- Alternative A – New access-controlled alignment west of existing Route 220 with a new interchange with Route 58 to the west of Route 641 (Joseph Martin Highway) and reconstruction of the existing Route 220 alignment for approximately 0.5 miles from the North Carolina state line;
- Alternative B – New access-controlled alignment west of existing Route 220 and west of Magna Vista High School with reconstruction of the Joseph Martin Highway interchange at Route 58 and reconstruction of the existing Route 220 alignment for approximately 0.5 miles from the North Carolina state line; and
- Alternative C – New access-controlled alignment west of existing Route 220 and east of Magna Vista High School with reconstruction of the Joseph Martin Highway interchange at Route 58 and reconstruction of the existing Route 220 alignment for approximately 0.5 miles from the North Carolina state line.

These alternatives are described in the sections that follow. Additional information is included in the Draft EIS and supporting ***Alternatives Analysis Technical Report*** (VDOT, 2020a), including the process used to identify and screen alignment options, alternatives carried forward, and alternatives retained for detailed study.

Based on the detailed study of the alternatives retained for evaluation, Alternative C has been identified in the Draft EIS as the Preferred Alternative.

1.2.1.1 No-Build Alternative

In accordance with the regulations for implementing NEPA [40 CFR §1502.14(d)], the No-Build Alternative has been included for evaluation as a basis for the comparison of future conditions and impacts. The No-Build Alternative would retain the Route 220 roadway and associated intersections and interchanges in their present configuration, allowing for routine maintenance and safety upgrades.

This alternative assumes no major improvements within the study area, except for previously committed projects that are currently programmed and funded in VDOT's *Six Year Improvement Plan (SYIP) for Fiscal Year (FY) 2020-2025* (VDOT, 2019) and Henry County's *Budget for FY 2019-2020* (Henry County, 2019). As these other projects are independent of the evaluated alternatives, they are not evaluated as part of the Draft EIS and supporting documentation.

1.2.1.2 Alternative A

Alternative A would consist of a new roadway alignment that is primarily to the west of existing Route 220. Under Alternative A, access would be controlled and provided at three new interchanges. It is assumed that interchanges would be provided at both ends of the facility and one would be located along the corridor. For the purposes of the analyses in the Draft EIS and supporting documentation, it is assumed this third interchange would occur at Route 687 (Soapstone Road). The reconstructed portion of Route 220, along with the new alignment, would incorporate full access control.

Beginning at the North Carolina state line, Alternative A would reconstruct Route 220 for approximately one mile, where it would shift eastward on a new alignment before turning to the north to cross over the Norfolk Southern railroad. The wide curve in this location would allow for an adequate turning radius to meet design standards for the arterial facility with a 60 mph design speed and minimize potential impacts to residents in the vicinity of J.B. Dalton Road. A new interchange to access a realigned existing Route 220 would be constructed near Route 689

(Reservoir Road) and Route 971 (J.B. Dalton Road). After crossing the railroad, the new alignment would parallel White House Road along its south side and then shift to the northwest crossing Patterson Branch. The alignment would then shift to the north, following a small ridge between Patterson Branch and a tributary to Marrowbone Creek, before crossing Marrowbone Creek east of Marrowbone Dam. The alignment would continue north and to the west of a large farm/open field, crossing tributaries of Marrowbone Creek. The alignment would shift eastward and cross over Route 688 (Lee Ford Camp Road), Stillhouse Run, and a floodplain. After crossing Stillhouse Run, the alignment would shift northward and continue for approximately one mile. The alignment would then continue north reaching Soapstone Road, where a new interchange would be provided, west of the intersection with Joseph Martin Highway. An interchange with Alternative A is proposed at Soapstone Road. The alignment would then turn to the northeast to cross three minor tributaries to Marrowbone Creek. The alignment continues in a northerly direction with a new interchange at Route 58, west of the interchange at Joseph Martin Highway.

1.2.1.3 Alternative B

Alternative B would consist of a new roadway alignment that is primarily to the west of existing Route 220. Under Alternative B, access would be controlled and provided at two new interchanges and a modified interchange at Route 58 and the Joseph Martin Highway. For the purpose of this study, it is assumed that new interchanges would be provided at the southern end of the facility and at Soapstone Road. If this alternative were to advance to a phase of more detailed design, the final interchange locations and configurations would be refined. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

Beginning at the North Carolina state line, Alternative B would reconstruct Route 220 for approximately one mile, where it would shift eastward before turning to the north to cross over the Norfolk Southern railroad. The wide horizontal curve in this location would allow for an adequate turning radius to meet design standards for the arterial facility with a 60 mph design speed, as well as minimize potential impacts to residents in the vicinity of J.B. Dalton Road. A new interchange to access a realigned existing Route 220 would be constructed near Reservoir Road and J.B. Dalton Road. After crossing the railroad, the new alignment would parallel White House Road along its south side and then shift to the northwest prior to crossing Patterson Branch. The alignment would then gradually shift from the northwest to the northeast and cross three tributaries to Marrowbone Creek. The alignment would continue in a northeasterly direction over Lee Ford Camp Road, where it would pass to the east of the Marrowbone Plantation, shifting northwest to cross Marrowbone Creek. After crossing Marrowbone Creek, Alternative B would continue to the northwest, crossing Magna Vista School Road south of Magna Vista High School, then paralleling Magna Vista School Road west of the high school up to a new interchange with Soapstone Road. The new interchange at Soapstone Road would require the relocation of a portion of Magna Vista School Road. From the Soapstone Road interchange, the alignment would continue to the northeast and cross two minor tributaries before shifting to the north. The alignment would then shift to the northeast to cross Little Marrowbone Creek and tie in with Joseph Martin Highway at its interchange with Route 58, requiring modifications to the existing interchange configuration to provide a more direct connection between Route 58 and the new roadway. The reconstructed portion of Route 220 at the southern end, along with the new alignment, would be an access-controlled facility.

1.2.1.4 Alternative C (Preferred Alternative)

Alternative C would consist of a new roadway alignment that is primarily to the west of existing Route 220. Alternative C was developed as a modification of the initially considered Alignment Option 4C based on agency comments, with the primary changes occurring north of Soapstone Road. Alignment Option 4C originally included an interchange between Joseph Martin Highway and Route 220; however, adequate spacing could not be provided to accommodate all movements. Therefore, the alignment was shifted to tie in at the location of the existing Joseph Martin Highway interchange. Under Alternative C, access would be controlled and provided at two new interchanges and a modified interchange at Route 220/Route 58 and Joseph Martin Highway. For the purposes of the analyses in the Draft EIS it is assumed that new interchanges would be provided at the southern end of the facility and at Soapstone Road. If this alternative were to advance to a phase of more detailed design, the final interchange locations and configuration would be refined. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

Beginning at the North Carolina state line, Alternative C would reconstruct Route 220 for approximately one mile, where it would shift eastward on a new alignment before turning to the north to cross over the Norfolk Southern railroad. The wide curve in this location would allow for an adequate turning radius to meet design standards for the arterial facility with a 60 mph design speed, and minimize potential impacts to residents in the vicinity of J.B. Dalton Road. A new interchange to access a realigned existing Route 220 would be constructed near Reservoir Road and J.B. Dalton Road. After crossing the railroad, the new alignment would continue northward for approximately 1.5 miles, crossing White House Road and a tributary to Marrowbone Creek. The alignment would then shift to the northeast to cross Lee Ford Camp Road. Alternative C would then shift northward and continue east of Magna Vista High School and Marrowbone Creek and parallel the Pace Airport to the east. After passing Pace airport, the alignment would shift to the northeast and cross Soapstone Road to the east of Marrowbone Creek. A new interchange with Alternative C would be constructed at Soapstone Road. North of Soapstone Road, the alignment would shift west and cross Joseph Martin Highway. The alignment would continue to the northwest and cross two tributaries before shifting to the north. The alignment would then shift to the northeast to cross Little Marrowbone Creek and tie in with Joseph Martin Highway at the existing interchange location with Route 58. This would require modifications to the existing interchange to provide a more direct connection between Route 58 and the new roadway.

1.2.2 Alternatives Not Retained

As part of the alternatives development process for the Draft EIS, the following alternatives were carried forward for evaluation, but have not been retained for detailed study in the Draft EIS, based on their anticipated impacts to private properties. However, these alternatives were evaluated to a sufficient level of detail to eliminate them from further consideration and detailed study in the Draft EIS. While this Technical Report does not include the analysis of Alternatives D and E, other technical reports, such as the ***Natural Resources Technical Report*** (VDOT, 2020d), were prepared prior to the elimination of alternatives and thus include the following two alternatives, which are summarized in the sections that follow.

- Alternative D – Reconstruct Route 220 as an access-controlled roadway, with a spur on new alignment north of Ridgeway and reconstruct the Joseph Martin interchange at Route 58; and
- Alternative E – Reconstruct Route 220 as an access-controlled roadway, consolidating access to interchanges at select locations.

These alternatives, as well as those previously described that have been retained for detailed analysis in the Draft EIS, are illustrated on **Figure 1-2**.

1.2.2.1 Alternative D

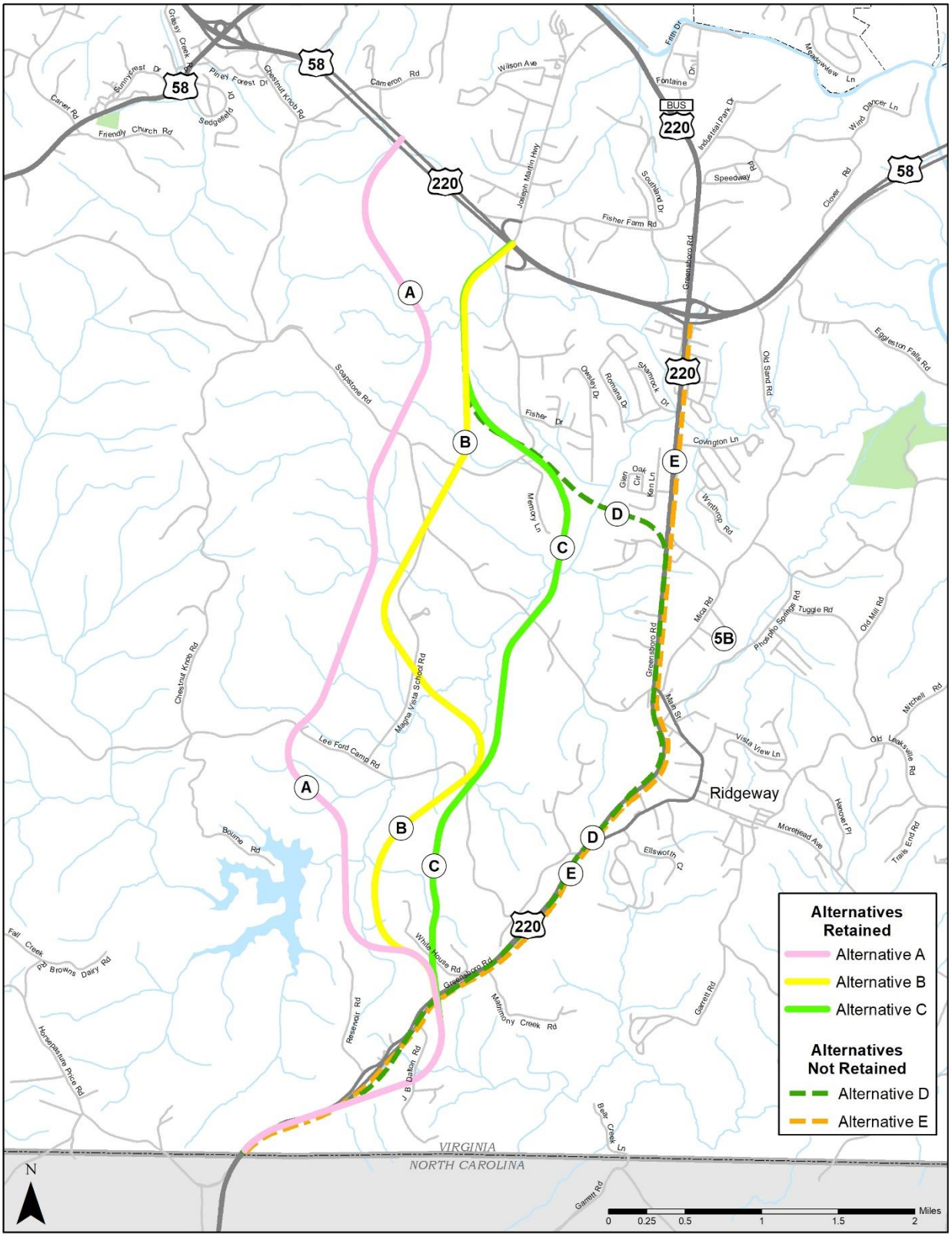
Alternative D would consist of reconstructing existing Route 220 as an access-controlled roadway for approximately 5.6 miles from the North Carolina state line where it would then divert to the west on a new access-controlled roadway just north of Water Plant Road. Under Alternative D, access would be controlled and provided at three new interchanges and a modified interchange at Route 58 and the Joseph Martin Highway. South of Water Plant Road, access to the new roadway would be made via frontage roads and new interchanges near Reservoir Road and at Morehead Avenue. A new structure providing access to Route 220 would be located at Lee Ford Camp Road/Church Street. At Water Plant Road an interchange is suggested where the new roadway branches from Route 220 to provide direct access between the new roadway and Route 220 to the north. From this interchange, the new alignment would proceed northwest, crossing Marrowbone Creek and then parallels a tributary of Marrowbone Creek to beyond Joseph Martin Highway. The alignment then shifts northward and follows the same alignments as Alternatives B and C just north of the Radial warehouse site to the tie-in location with Route 58. Modifications to the existing interchange at Route 58 and Joseph Martin Highway would be required with this alternative. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

1.2.2.2 Alternative E

Alternative E would consist of fully reconstructing existing Route 220 as an access-controlled roadway between the North Carolina state line and Route 58, removing all direct connections of existing driveways and side streets to Route 220.

Under Alternative E, access would be controlled and provided only at interchanges at various locations in the corridor. Existing residential and commercial driveways would be directed to frontage roads that parallel the roadway, ultimately connecting to Route 220 at interchanges. New interchanges to provide frontage road access to Route 220 are located at Reservoir Road and at Morehead Avenue. Structures over or under the new Route 220 roadway are included at Lee Ford Camp Road/Church Street and Soapstone Road/Main Street to provide east-west connectivity. The Route 220 interchange at Route 58 would be modified to provide direct access between the new roadway, Route 58, and Business Route 220 to the north.

Figure 1-2: Route 220 Alternative Alignment Map



1.3 METHODOLOGY

1.3.1 Regulatory Context

NEPA does not mention indirect or cumulative impacts; however, the Council on Environmental Quality (CEQ) regulations for implementing NEPA address Federal agency responsibilities applicable to indirect and cumulative considerations, analysis, and documentation (40 CFR §1508.25) in the content requirements for the environmental consequences section of an EIS (40 CFR §1502.16) (FHWA, 2014). In addition to CEQ's regulations, an indirect and cumulative effects assessment is conducted in accordance with the requirements and processes outlined in 23 CFR Part 771, FHWA Interim Guidance: Indirect and Cumulative Impacts in NEPA (2003), FHWA Position Paper on Secondary and Cumulative Impact Assessment (1992), FHWA's Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process (2014), the Transportation Research Board (TRB) National Cooperative Highway Research Program's (NCHRP) Report 466: *Desk Reference for Estimating the Indirect Effect of Proposed Transportation Projects* (TRB, 2002), NCHRP Project 25-25 Task 22: *Land Use Forecasting for Indirect Impacts Analysis* (TRB, 2007), NCHRP Project 25-25 Task 11: *Secondary/Indirect and Cumulative Effects Analysis* (TRB, 2006), as well as CEQ's Considering Cumulative Effects under the National Environmental Policy Act (1997) and Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (2005).

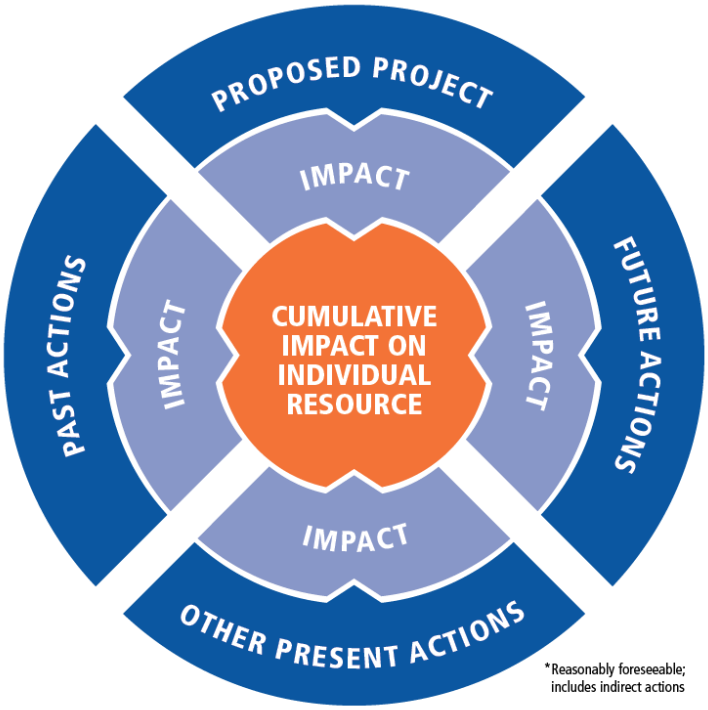
CEQ defines indirect effects as "…effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable" [40 CFR §1508.8(b)]. Indirect effects may include "growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" [40 CFR §1508.8(b)]. These related or induced actions are those that may or may not occur without the implementation of the evaluated Build Alternatives, as illustrated in **Figure 1-3**.

Figure 1-3: Direct vs. Indirect Environmental Impact

Source: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process, FHWA, 2019.

CEQ defines cumulative effects (or impacts) 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. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR §1508.7). Cumulative effects include the total of all impacts, direct and indirect, on a particular resource that have occurred, are occurring, and/or would likely occur as a result of any action or influence, including effects of a Federal activity (EPA, 1999), as illustrated in **Figure 1-4**.

Figure 1-4: Cumulative Impacts



Source: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process, (FHWA, 2019)

Because indirect and cumulative effects may be influenced by actions including those taken by others outside of the immediate study area, assumptions must be made to estimate the result of these actions. The CEQ regulations, cited above, state that the analysis must include all the indirect effects that are known and make a good faith effort to explain the impacts that are not known but which are reasonably foreseeable. NEPA does not define what constitutes reasonably foreseeable future actions. Court decisions on this topic indicate that indirect impact analyses should consider impacts that are sufficiently likely to occur (FHWA, 2019). CEQ has provided guidance on how to define reasonably foreseeable future actions based upon court opinions. CEQ makes it clear that actions that are probable should be considered while actions that are merely possible, conceptual, or speculative in nature are not reasonably foreseeable and need not be considered in the context of cumulative effects (CEQ, 1981; FHWA, 2019).

This direction on identifying reasonably foreseeable future actions is considered in both indirect and cumulative effects analyses described in the following sections. Specific methodologies on how these analyses were conducted are presented below. The Environmental Analysis Methodologies were prepared and distributed to the Cooperating and Participating Agencies in May 2018, revisions were made to address the agencies' comments, and the methodologies were concurred upon following the June 18, 2018 agency meeting.

1.3.2 Indirect Effects

This section presents the methodology used to analyze the potential indirect impacts related to the alternatives described in **Section 1.2**. The methodology followed for analyzing indirect effects is prescribed in the TRB's NCHRP Report 466, *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects* (TRB 2002).

In NCHRP Report 466, TRB states that indirect effects can occur in three broad categories:

1. Encroachment-Alteration Impacts – Alteration of the behavior and functioning of the affected environment caused by project encroachment (physical, biological, socioeconomics) on the environment;
2. Induced Growth Impacts – Project-influenced development effects (land use); and
3. Impacts Related to Induced Growth – Effects related to project-influenced development effects (impacts of the change of land use on the human and natural environment).

Transportation improvements often reduce time and cost of travel, as well as provide new or improved access to properties, enhancing the attractiveness of surrounding land to developers and consumers. Development of vacant land, or conversion of the built environment to more intensive uses, is often a consequence of highway projects. Through a review of other state department of transportation guidance, North Carolina Department of Transportation's (NCDOT) *Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina, Vol. II: Practitioners Handbook* (NCDOT 2001) was identified for its description of important characteristics that should be assessed to determine the potential for induced growth. Use of this guidance is referenced VDOT's *Indirect and Cumulative Effects Analysis: Consultant Guidance* and was concurred upon as a methodology for the study by USACE and EPA following the June 2018 agency meeting. Important characteristics for induced growth include existing land use conditions in the study area, increased accessibility that may result from new transportation improvements, local political and economic conditions, and the availability of other infrastructure and the rate of urbanization in the region (NCDOT, 2001).

The NCDOT guidance indicates that induced growth impacts are most often found up to one mile around a freeway interchange and two to five miles along major feeder roads. Two principal factors influencing the likelihood of induced growth noted are the extent and maturity of the existing transportation infrastructure and land availability. VDOT coordinated with the West Piedmont Planning District Commission (WPPDC) regarding the availability of maps or plans to be used to estimate the potential for growth in the study area. Since no future land use maps or plans were available, the WPPDC agreed that using the zoning maps to estimate the potential for growth was an appropriate methodology. Based upon the review of the zoning maps, and the maturity of the existing transportation infrastructure in the area, VDOT selected the two-mile increment for this study along major feeder roads. Along the two miles of the major feeder roads, 1,000 feet from the edge-of-pavement was included in the analysis. The 1,000-foot buffer was used because it represents a conservative estimate of the distance over which the influence of the Build Alternatives could be felt and is comparable to the areas of potential effect used for other impact assessments and resources. This area is identified as the induced growth study area.

To estimate the extent of induced development that may be associated with each Build Alternative, the amount of land available for development was mapped. For purposes of this study, land identified by the National Land Cover Database (NLCD) as forests, grasslands, and pastures are assumed to be the land available for development. The zoning designation was then identified for each mapped parcel and summarized by alternative.

Based on these principles, the indirect effects analysis focuses on the potential for ecological and socioeconomic impacts that could occur because of the proposed alternatives outside of the area of direct impact. The stepwise process TRB recommends in NCHRP Report 466 for assessing indirect effects has been used as the structure for this analysis, and consists of the following steps:

Step 1 Scoping

Step 2 Identify Study Area Direction and Goals

Step 3 Inventory Notable Features in the Study Area

Step 4 Identify Impact-Causing Activities of the Build Alternatives

Step 5 Identify Indirect Effects for Analysis

Step 6 Analyze Indirect Effects and Evaluate Analysis Results

Step 7 Assess Consequences and Develop Mitigation

To complete these steps, the required analyses rely on planning judgment. The NCHRP 25-25 program, Task 22, Forecasting Indirect Land Use Effects on Transportation Projects documents means of applying planning judgment to indirect and cumulative effects analysis (TRB, 2007). The direction provided in the TRB document is the basis for the indirect effects analysis presented in this Technical Report. Each of the steps for the indirect effects evaluation process is discussed in **Section 2** of this Technical Report.

1.3.3 Cumulative Effects

To document cumulative effects for this study, the analysis followed the five-part evaluation process outlined in Fritiofson v. Alexander, 772 F.2d 1225 (Fifth Cir. 1985), as described in FHWA's Guidance: *Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process* (FHWA, 2019).

1. What is the geographic area and temporal boundaries affected by the study?
2. What are the resources affected by the study?
3. What are the other past, present, and reasonably foreseeable actions that have impacted these resources?
4. What are those impacts?
5. What is the overall impact on these various resources from the accumulation of the actions?

Each of these parts of the cumulative effects evaluation process is discussed in **Section 3** of this Technical Report.

2. INDIRECT EFFECT ANALYSIS

2.1 STEP 1: SCOPING

The first step in the indirect effects analysis involves scoping activities and the identification of the ICE Study Areas. As part of this scoping effort, many local and regional planning documents were reviewed. These include each local government's comprehensive and/or capital improvement plans. The following is a summary of how each plan refers to the study.

- *County of Henry Comprehensive Plan 1995-2010* (Henry County, 1995) was developed to inform functional plans produced by the County's departments, identifying key policy challenges, and identifying opportunities to deliver public services more efficiently. The sections of the Plan which discuss natural and socioeconomic resources provided insight into the County's trends and priorities in the mid 1990's. The transportation section provided information regarding the County's highway improvement priorities at the time. Although the none of the Build Alternatives were included in this list of improvements, the Plan does identify Route 220 as one of the County's most important roadways and discusses a future project to widen Route 220 to four lanes from the Virginia-North Carolina Border to Greensboro.
- *City of Martinsville, Virginia 2009 Comprehensive Plan Update* (Martinsville City Planning Commission, 2009) was prepared as the third update to the City's central planning document (originally created in 1978). The goal of the document is to identify challenges facing Martinsville over the next twenty years and articulate responses. The Plan identifies Routes 220 and 58 as part of the National Highway System (NHS) and as federal primary routes that play important roles in Martinsville's trade and commerce. The Plan does not specifically mention the Martinsville Southern Connector Study. However, in its discussion of the 2008-2013 Six Year Improvement Program, the Plan identifies multiple municipal and county improvement priorities along Route 220 which complement the Connector Study's purpose and need. These improvements include: the installation of flashing signals, bridge improvements, and the construction of auxiliary lanes. The Plan states that these improvement priorities were developed to address capacity, the movement of goods, safety and roadway geometry, and land uses.
- *Martinsville-Henry County Area Transportation Study – 2020* (VDOT, 2003) was developed to evaluate the transportation system in Martinsville and Henry County and recommend transportation improvements that could satisfy existing and future transportation needs. Although the Study does not specifically mention the Martinsville Southern Connector Study, it does identify the construction of the Ridgeway bypass, a new four-lane divided limited access facility from the Route 220 bypass to Route 220 south of Ridgeway, including a Route 87 (Morehead Ave) connector.
- *2035 Rural Long-Range Transportation Plan* (WPPDC, 2011) is a document prepared by VDOT and the WPPDC to identify transportation needs in the portions of Franklin, Pittsylvania, Henry, and Patrick counties which lie outside of the Danville Metropolitan Planning Organization's jurisdiction. The Plan articulates several goals compatible with the Study's purpose and need, including: promoting efficient system management and providing a safe and secure transportation system. From a system-wide perspective, the Plan identifies Route 220 as the primary north-south corridor in the region. Although the Plan does not mention the Martinsville Southern Connector Study, it does identify several operational issues that could be addressed by the Alternatives Retained for Evaluation. Improvements to the intersection of Routes 220 and 87 in Ridgeway is a good example.

As part of the process, VDOT mailed scoping letters and questionnaires regarding indirect and cumulative effects on March 27, 2018 to the following Federal, state, and local agencies and organizations to obtain pertinent information and data developed, as well as to identify key issues regarding the potential environmental impacts for this study:

- Natural Resources Conservation Services
- US Forest Service
- National Park Service, Northeast Regional Office
- National Marine Fisheries Service
- U.S. Fish and Wildlife Service
- U.S. Department of the Interior Office of Environmental Policy and Compliance
- Federal Railroad Administration
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- US Coast Guard
- Federal Emergency Management Agency
- US Department of Housing and Urban Development
- Advisory Council on Historic Preservation
- Virginia Department of Conservation and Recreation
- Virginia Department of Game and Inland Fisheries
- Virginia Department of Historic Resources
- Virginia Department of Health
- Virginia Department of Environmental Quality
- Virginia Department of Forestry
- Virginia Department of Housing and Community Development
- Virginia National Guard
- Virginia Department of Mines, Minerals, and Energy
- Virginia Department of Emergency Management
- Virginia Department of Rail and Public Transportation
- Virginia Marine Resources Commission
- Henry County Administrative Office
- Henry County Department of Parks and Recreation
- Henry County Planning and Zoning Inspections
- West Piedmont Planning District Commission
- Martinsville
- Ridgeway
- North Carolina Department of Transportation

The survey questionnaires requested input on:

- changes in planned development;
- anticipated future population or land use assumptions that might occur because of any of the Build Alternatives;
- where transportation improvements within the study area rank among the County's specific transportation improvement needs;
- future mass transit options;
- input on potential positive and adverse indirect effects that transportation improvements would have; and
- any additional feedback beneficial to the development of the study.

Henry County's County Administrator indicated that the Commonwealth Crossing Business Centre would be constructed within the proposed study area and that any enhanced transportation developments would greatly benefit the new business park. Commonwealth Crossing Business Centre and anticipated impacts are discussed further in **Section 3** of this Technical Report. In addition, they stated that residential neighborhoods within the study area should be avoided.

Additional information on public involvement is provided in the **Draft EIS**.

2.2 STEP 2: IDENTIFY STUDY AREA DIRECTION AND GOALS

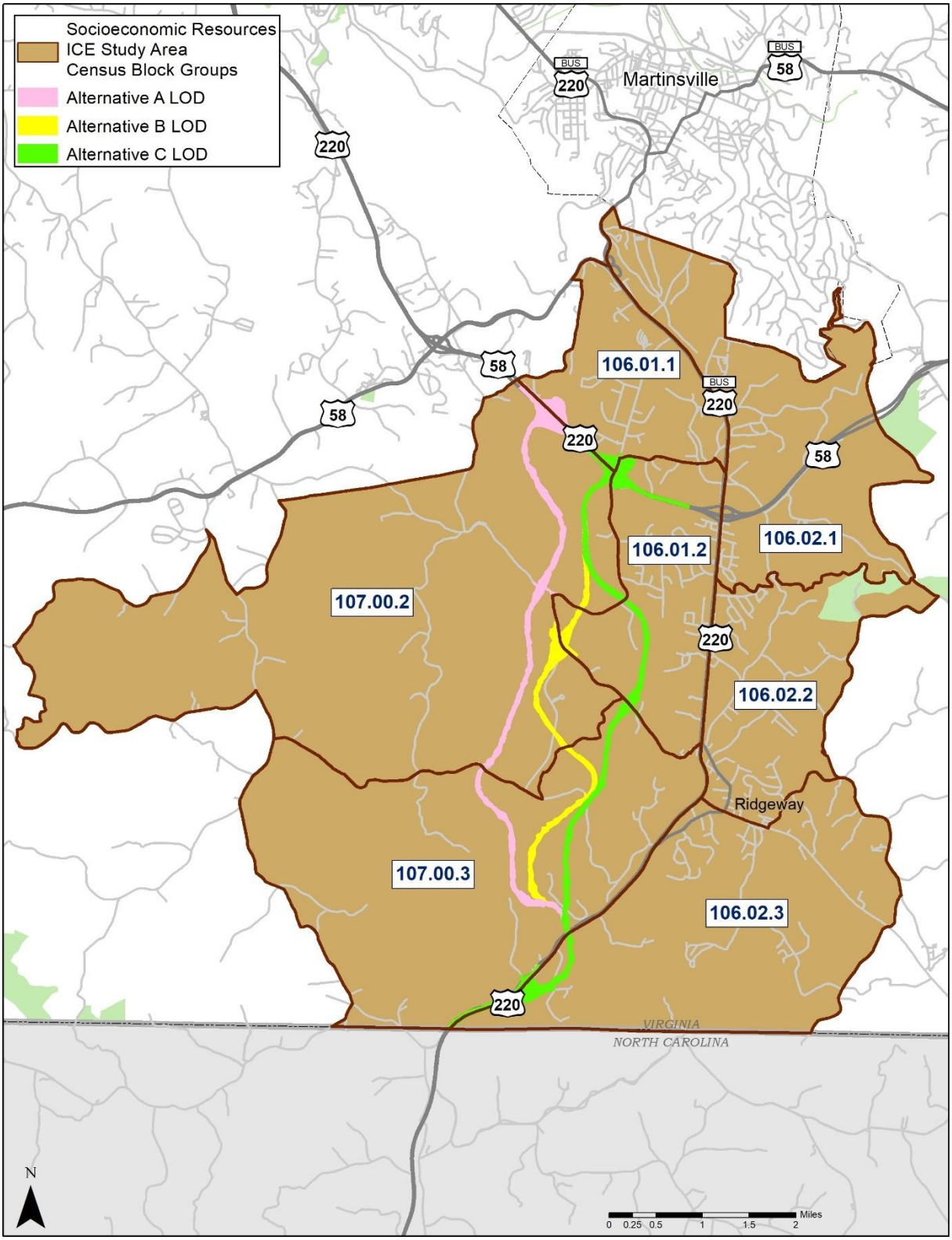
The goal of Step 2 is to establish the ICE analysis' general environmental and programmatic context.

2.2.1 Study Areas

Input from the scoping process, was used to inform the identification of resource-specific study areas for this indirect effects analysis. The method for establishing the ICE Study Areas was established in the Martinsville Southern Connector Study's Resource Identification and Impact Environmental Analysis Methodologies, which was approved on July 2018. In total, four study areas were developed as part of this indirect effects analysis: Socioeconomic Resources, Natural Resources, Historic Resources, and Induced Growth.

- **Socioeconomic Resources:** The ICE Socioeconomic Resources Study Area supports the analysis of indirect and cumulative effects on community facilities, parks, land use, and similar elements of the built environment. The ICE Socioeconomic Resources Study Area contains all the census block groups that overlap one or more of the alternatives retained for evaluation (see **Figure 2-1**). The reason census block group data is used is that it is the smallest geographical area for which population data can be obtained. Using census block groups is the most accurate way to determine the demographics of a population in an identified area. Seven block groups were identified using this criterion. Collectively they cover nearly 31,000 acres and contain 7,849 people.

Figure 2-1. ICE Socioeconomic Resources Study Area



- **Natural Resources:** The ICE Natural Resources Study Area supports the analysis of indirect and cumulative effects on natural areas, subwatersheds, wildlife, and similar elements of the natural environment. The ICE Natural Resources Study Area contains all the local subwatersheds (Hydrologic Unit Code (HUC) 12) that overlap one or more of the alternatives retained for evaluation (see **Figure 2-2**). The three local subwatersheds identified using this criterion are: Mulberry Creek-Smith River (HUC 030101030803), Marrowbone Creek (HUC 030101030802), and Matrimony Creek-Dan River (HUC 030101030505). Collectively they cover a little over 68,000 acres. Subwatersheds are used as the basic unit of the ICE Natural Resources Study area because many environmental processes either operate at the subwatershed scale (*e.g.* seasonal flooding) or are sensitive to subwatershed condition (*e.g.* water quality and habitat impairments).Whereas the ICE Socioeconomic Resources Study Area lies only within the Commonwealth of Virginia (Virginia), the ICE Natural Resources Study Area crosses into the state of North Carolina. Although none of the proposed improvements would take place in North Carolina, the ICE Natural Resources Study Area crosses the state line to capture the entirety of the Matrimony Creek-Dan River subwatershed.

- **Historic Resources:** This ICE Historic Resources Study Area supports the analysis of indirect effects to architectural and archaeological resources. Indirect effects such as altering the setting, feeling and association of archaeological and architectural historic properties are considered under Section 106 of the National Historic Preservation Act (NHPA). The types of indirect effects that are assessed for the ICE analysis would be changes to accessibility or visitation during or after construction. The boundary of the ICE Historic Resources Study Area is the Area of Potential Effects (APE) developed under the Section 106 process (see **Figure 2-3**). Within the APE, developed open spaces (including barren lands) occur in small patches clustered around the existing roadway system. Undeveloped open spaces, including grasslands and pastures, occur throughout the APE in a variety of patch sizes. The identification of historic resources in the ICE Historic Resources Study Area is limited to existing studies previously completed within the ICE Historic Resources Study Area and a desktop review of the Virginia Cultural Resource Information System (VCRIS) website.

- **Induced Growth:** The Induced Growth Study Area supports the consideration of indirect effects associated with changes in land use influenced by the potential improvement. The Induced Growth Study Area is a composite of three buffers. The first buffer captures land within one mile of the center of a proposed or existing interchange associated with the Build Alternatives. The second buffer captures land within 1,000 feet of the new roadway alignment. This buffer is included to present the frontage roads that would be constructed throughout most of the evaluated alignments. The third buffer captures land within 1,000 feet of feeder roads connected to proposed or existing interchanges associated with the Build Alternatives. These feeder roads extend up to two miles from the center of their associated interchanges. Figures illustrating the Induced Growth Study Areas for each of the Alternatives Retained for Evaluation can be found in **Section 2.6**.

Figure 2-2. ICE Natural Resources Study Area

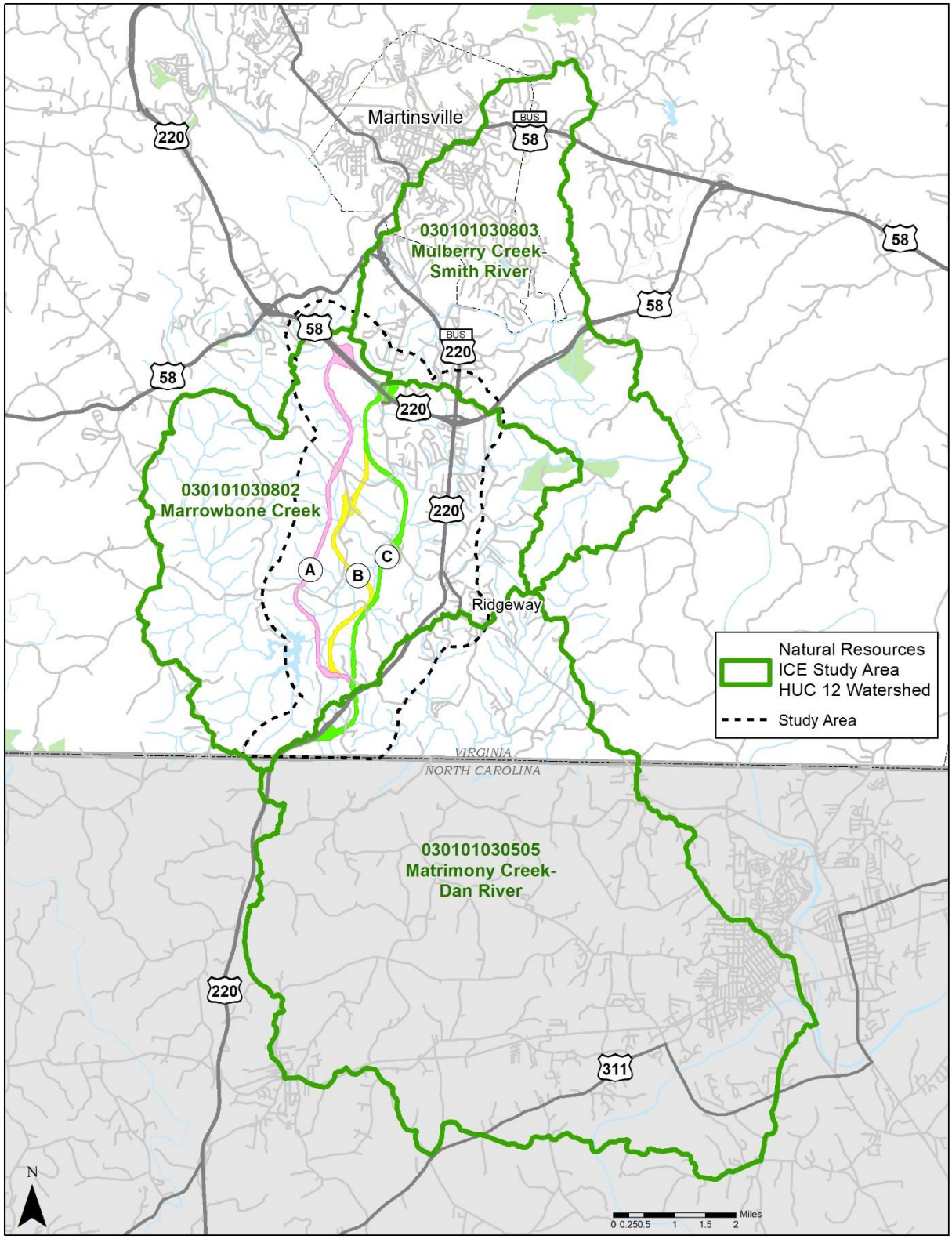
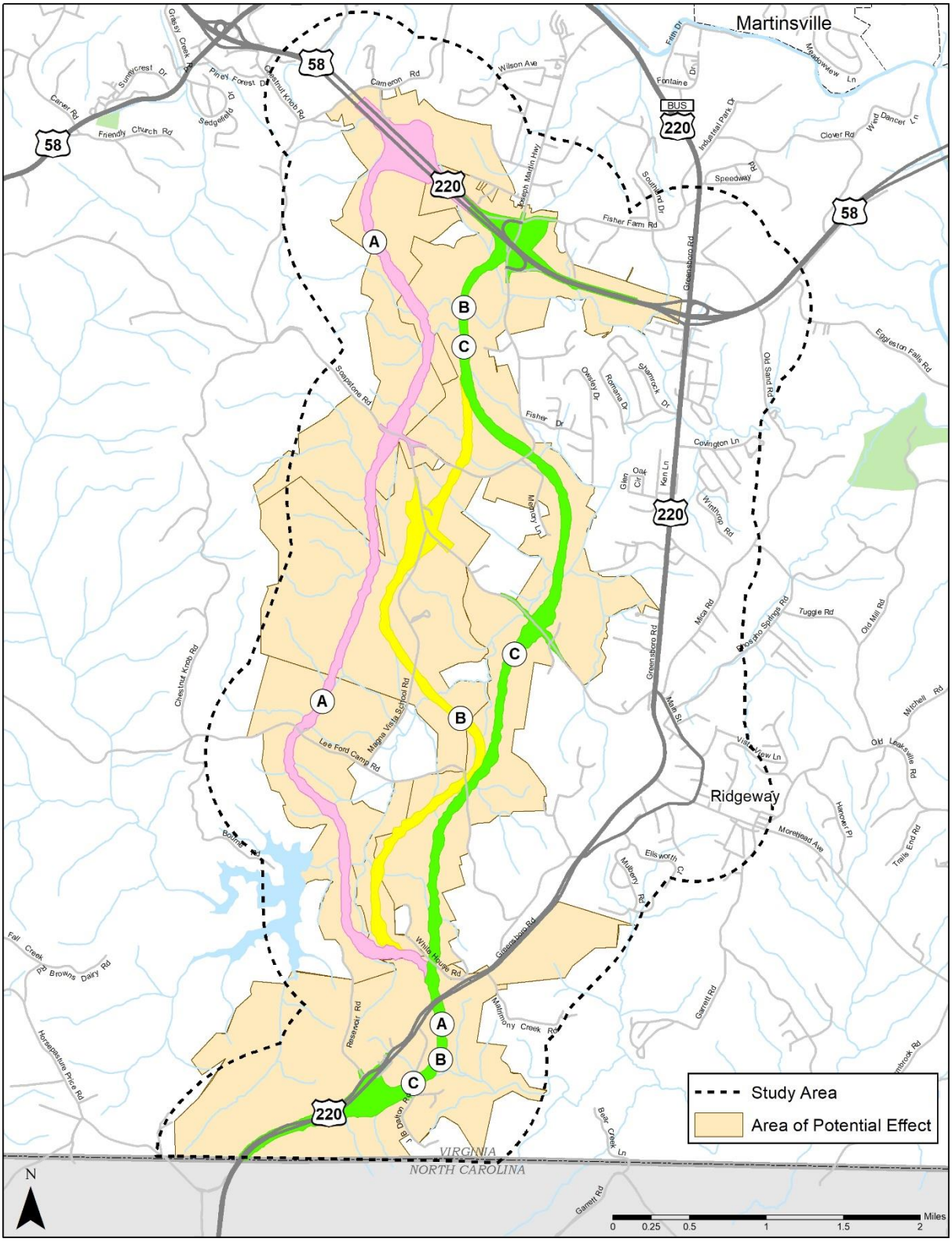


Figure 2-3. ICE Historic Resources Study Area



2.2.2 Direction and Goals

The way in which a highway project affects a community is driven by more than the project design. Evidence gathered from state departments of transportation around the country indicates that a project's impact is strongly influenced by a community's policies and history. Some important factors identified include: local land use policies, development incentives, availability of developable land, and the investment climate (TRB, 2002). To fully assess how a community might respond to a potential alternative, it is useful to develop a thorough knowledge of demographic, economic, and social trends. It is also important to understand the regional goals for consideration of potential indirect effects to the natural environment, and whether potential effects are in line with local goals as a determinant of impact significance and an indicator of effects that merit further analysis.

The following sections describe the existing and planned land use, population, employment, and economic development trends in the ICE Socioeconomic Resources Study Area to provide insight to the direction and goals associated with each of the existing corridors. In addition, environmental resource impact trends and protection goals within the ICE Natural Resources Study Area and ICE Historic Resources Study Area are discussed.

2.2.2.1 Historic Land Use

The lands contained within the Inner Piedmont have been settled by humans as early as 10,000 Before Common Era (BCE). Archaeological investigations at the Belmont Site near the Smith River show evidence of semi-permanent settlements and agriculture as early as 1000 BCE. By the Late Woodland Period, (approximately 800 to 1600 Common Era), agricultural practices were widespread and large fortified villages were established. The area's floodplains, kept fertile and clear by annual flooding, were probably the most heavily utilized (VDHR, 2009).

European settlement in Henry County is believed to begin in earnest in the mid-1700s, with first contact believed to occur sometime in the 1600s. The area's waterways served as both a conduit for the migration, and the nearby floodplains were the preferred settlement sites (VDHR, 2009). In the early 1750s, the Great Wagon Road, running from Pennsylvania through the Valley of Virginia, increased the rate of European settlement. With this increase in immigration came increased land conversion for agricultural production, most notably tobacco. In 1776, Henry County was formally created, with Martinsville founded as its county seat in 1791.

From the late 1700's through the 1820s, land was managed and owned predominately by plantation owners with large populations of African slaves (VDHR, 2009). The lives of the region's slave population are difficult to accurately portray. However, with some of the plantations housing over 100 slaves, it is reasonable to believe that their communities constitute a historically and culturally significant land use of their own.

Following the end of the Revolutionary War, road construction became more widespread. In 1816, the demand for infrastructure became great enough that Virginia's Board of Public Works was created (VDHR, 2009). With improvements in infrastructure came more mercantile and industrial development. For most of the 18th century, this development focused materially on the processing of tobacco and geographically on Martinsville. Through the Antebellum Period (1830-1860) and the Civil War, these two focal points fueled Henry County's continued prosperity and development.

Following the Civil War, the plantation system of land ownership was replaced by a network of smaller land owners and tenant farmers. Although this change did not diminish the overall rate of tobacco production, it did lead to a marked reduction in the value of the land associated with the plantations (VDHR, 2009).

The completion of the Danville & Western Division of the Southern Railway accelerated the process of industrialization. Bassett Furniture was the first large-scale (non-tobacco related) industry to capitalize on the presence of the railroads (VDHR, 2009). The growth of Bassett and other timber-related industries marked the beginning of the area's transition away from a singular economic reliance on tobacco production. From a land use perspective, this transition led to the clearing of forests for timber; the conversion of agricultural fields into industrial workshops; and the intensification of development in established commercial centers (i.e., Martinsville). This transition was strengthened further with the arrival of textile production in the early 20th Century.

Between 1920 and 1960, the growth of industry in Martinsville and the surrounding areas led to a massive increase in population. During this period, Martinsville's population increased from 4,000 to 18,800. Henry County's population doubled from 20,200 to over 43,000 (VDHR, 2009). With this significant increase in population came an equally sizeable increase in development. Whereas the previous era could be seen as an outgrowth of the plantation system, the new industrial development introduced new urban land uses to the area. Much of this development focused on Martinsville, which became Martinsville in 1928 (VDHR, 2009).

Between 1970 and 2010, due to competition from other countries, industry started leaving Martinsville and the surrounding areas. Textile and wood product manufacturers started downsizing and experiencing plant closures, resulting in substantial job losses (WPEDD, 2019). This downturn in employment slowed population growth in the County, to only ten percent growth over the 40-year period, and led to a 30-percent reduction in population in Martinsville over the same period (Weldon Cooper Center for Public Service 2019). Since this downturn, the region has tried to diversify its employment base and is trying to coordinate workforce training with economic development. In order to attract businesses, the City and County have invested in the creation an industrial park and a business center.

Review of Historic Mapping

Carefully documenting a location's history is an important phase in the development of any highway study. By reviewing historical records, study sponsors can gather information on sensitive resources and identify trends which may be affected by the proposed improvements. For the Martinsville Southern Connector Study, historic mapping played an important role in the completion of this review. The historic mapping used include a series of U.S. Geological Survey (USGS) topographic maps (starting from 1924) and Google Earth Pro™ aerial imagery (beginning in 1999).

The first reference included in the review of historic mapping is a topographic map published by the U.S. Geological Survey in 1924 (see **Figure A-1** in **Appendix A**). This map was produced during an important transitional moment in the area's history. Around this time, the effects of railroad and highway structure infrastructure were beginning to stimulate a massive expansion in the area's manufacturing capacity and population. Since this map was created in the early stage of this expansion, however, many of the features shown are associated with the area's pre-industrial economy and transportation infrastructure. Perhaps the most notable example of this is the absence of Route 220, which was constructed in 1926. Martinsville, Ridgeway, and Price all appear on the map, but Martinsville is not yet identified as a city. Most of the other notable socioeconomic resources are churches and schools. The Danville & Western Railway (completed in the 1890s) can be seen just west of Ridgeway. Many of the ICE Natural Resources Study Area's notable streams can be seen on the map, including the Smith River, Stillhouse Run, and Surry Martin Branch. Towns, roadways, and railways are shown along these streams as well as their tributaries. This development most likely had an adverse effect on water quality, streams, wetlands, and floodplains. Based on the location of the development along the stream valleys, it is likely that extensive vegetation removal occurred within the floodplains, wetlands were filled

and/or drained, streams were realigned and piped, and bridge supports were placed within the streambeds.

The next reference included in this review is a topographic map published the USGS in 1944 (see **Figure A-2** in **Appendix A**). At this point in the region's history, the growth associated with industrialization has nearly hit its peak. Around Martinsville, several new localities are identified, including Hensley, Koehler, Mt. Olivet, and Fontaine. In addition to these socioeconomic indication of growth, signs of natural resource extraction are also visible. Particularly in the area west of Route 220 (around Chestnut Knob and present-day Magna Vista High School), the map shows large areas that have been logged and converted to shrublands. This spike in tree removal and development, both along stream valleys and higher in the watersheds, likely worsened adverse effects to water quality, streams, wetlands, and floodplains. The conversion of landcover and expansion of impervious surface coverage presumably increased surface runoff, stream turbidity, and pollutant loading. Fill was likely added to wetlands and floodplains for additional development and/or to protect existing infrastructure. Some of the schools and chapels displayed in the 1924 map, including Norman School and Cedar Chapel, are still identified. Except for Route 220, Route 58, and Route 87, all the roads are mapped as having a dirt surface.

The third reference included in the historic mapping series is a topographic map of the Martinsville West quadrangle published by the USGS in 1965 (see **Figure A-3** in **Appendix A**). The map shows signs of a decrease in the rate of development in the region. Although the town of Koehler and the communities of Collinsville and Villa Heights are displayed in a manner that suggests they have become more established, some of the other communities such as Fieldale do not appear to have grown substantially. Additionally, many of the small localities shown in the 1944 mapping have disappeared, along with many of the community facilities (*e.g.*, churches and schools) previously shown. One example of this is around the northern and western edges of Chestnut Knob. This absence, however, may be more emblematic of the scale of the mapping effort rather than a change in the amount of small community facilities. In some areas, the forested cover shown in the 1965 mapping is less extensive than in the 1944 map. However, in many other areas, such as Chestnut Knob, the extent of forest cover has remained static or even increased. In terms of transportation infrastructure, the 1966 map shows significant expansion of the paved road network. Joseph Martin Highway and County Roads, 683, 684, and 781 all appear to be paved. The slower rate of land clearing and reforestation allowed to occur in some areas during this time period likely had a beneficial effect on water resources in the region. However, the expansion of urban development in some areas around Martinsville likely contributed to increased runoff and pollution entering the nearby waterways.

The final topographical map included in the historic mapping review is the Martinsville West quadrangle photorevised by the USGS in 1984 (see **Figure A-4** in **Appendix A**). Many of the areas shown as forested in 1965 are also shown as forested in 1984. This suggests that these forests were able to become more mature and better established. Notable exceptions to this trend are areas that were cleared for construction of the Route 220 bypass and associated development, such as the area north of the Route 220/Route 58 intersection. Wetlands and floodplains are still not shown on this mapping. However, based on the land use along stream valleys, it can be inferred that this time period had both beneficial and adverse effects on water resources in the area. The establishment of more mature forests likely improved stormwater attenuation in some areas, and riparian areas negatively affected by previous logging may have begun to improve. In areas cleared and developed as a result of the Route 220 bypass construction, surface runoff and pollutant loading likely increased. Some streams were probably piped, realigned, or otherwise altered. Fill material may have been placed in wetlands and floodplains.

Through its Google Earth Pro™ mapping platform, Google™ provides access to a collection of historic aerial imagery. In the Martinsville Area, the imagery library extends back to 1994. Unfortunately, these early images cover only a portion of the ICE Socioeconomic Resources Study Area. The first collection which covers the entirety of the area was collected in 1999 by the U.S. Geological Survey (see **Figure A-5** in **Appendix A**). Figures A-6 through A-9 are all derived from this 1999 dataset.

Figure A-6 in **Appendix A** shows the northernmost section of the ICE Socioeconomic Resources Study Area in 1999. The land use patterns shown are largely consistent with what exists today. One exception is the large wooded tract south of the Martinsville Speedway. Between 2002 and 2003, this parcel was cleared and then sold to the owners of the Speedway. Since then, no additional developments to the parcel have been made. While it appears that little development expansion has occurred in this area in the last twenty years, water resources in the area have likely been adversely affected by continued runoff and pollutant loading from yards and impervious surfaces as well as maintenance and construction activities. However, any improvements made to the area's stormwater management facilities may have provided beneficial effects to water quality.

Figure A-7 in **Appendix A** (from 1999) moves southward along Route 220, and includes Drewry Mason Elementary School, the Hopkins Lumber building, and many residential neighborhoods. In general, the land uses shown are consistent with what is seen today. One notable exception is the residential subdivision located on Joseph Martin Highway just south of Route 58. In the 1999 imagery the land has been cleared and a few homes appear to be present, but fewer homes than are present in the area today. The existing forests in the area that were able to continue maturing likely had a beneficial effect on water quality through improved stormwater attenuation and water quality treatment. However, many of the areas maintained as, or converted to, yards, agricultural fields, and impervious surfaces likely continue to contribute runoff and pollutants to nearby waters.

Figure A-8 in **Appendix A** (from 1999) focuses on Ridgeway and the area to the west. In general, the land uses shown are consistent with what is seen today. All the cleared areas shown in the image are still open today, and the extent of the residential and commercial areas matches what can be seen on recent aerial imagery. This lack of change in landcover has likely had minimal effects on water resources. Existing forests and natural areas that have continued to mature benefit water resources, but maintenance of existing fields, yards, and infrastructure may have adversely affected water quality.

Figure A-9 in **Appendix A** shows the southernmost region of the ICE Socioeconomic Resources Study Area in 1999. This image documents the forest cover that existed in 1999 on what has now become the Commonwealth Crossing Business Centre. This area located to the west of Route 220 and north of Route 692 (Horsepasture Price Road) was heavily forested through 2005. By 2006, the area to the west of Reservoir Road had been cleared of trees. In 2007, tree removal to the west of the initial parcel had been partially completed. By 2015, a large portion of the tract had been cleared completely. Beyond this change, however, the aerial imagery shows that land cover has been relatively static since 1999. The development associated with the Commonwealth Crossing Business Centre may have an adverse effect on water resources in the area by potentially filling wetlands and increasing runoff and pollutant loading. As described for Figures A-7 and A-8, the consistent land use for the remainder of this area may have contributed both beneficial and adverse effects on water resources.

2.2.2.2 Land Use Patterns and Local Plans

The following sections describe the local plans that guide the land use patterns and development within the ICE Socioeconomic Resources Study Area. The entire ICE Socioeconomic Resources Study Area falls within the jurisdiction of Henry County. With regard to regional planning, all of Henry County is located within the territory reviewed by the WPPDC. Additional information is available in the ***Socioeconomic and Land Use Technical Report*** (VDOT, 2020c). Transportation elements of the below plans that overlap with the ICE Study Areas are described under **Step 1**.

City of Martinsville, Virginia 2009 Comprehensive Plan Update

The land uses found within Martinsville can be divided into five general categories: residential, commercial, industrial, open space, and institutional. Of the five, residential land use is the most widespread. According to the City's 2009 Comprehensive Plan Update, single family homes are the most common form of housing (75.8 percent of the City's total inventory) (Martinsville City Planning Commission 2009). The remaining portion of the housing inventory is comprised of multi-family units. Residential developments can be found throughout the city but occur in the greatest concentrations in the areas that abut the City's northern and southern limits.

Commercial land use in Martinsville includes both public-facing retail establishments and professional offices. The Martinsville Central Business District (CBD) is the portion of the City with the highest concentration of commercial land use. Other important commercial districts include the Commonwealth Boulevard West (between Memorial Boulevard North and West Market Street) and Memorial Boulevard South (between Route 58 and Starling Ave). The development in these areas is predominately retail-focused.

Martinsville's industrial land uses are largely consolidated into three areas. The first is in the south-central portion of the City (along Rives Road) and is occupied by Nationwide Homes (a modular home builder). The second area is located on Hooker Street, on the City's northeast side. This site is occupied by Southern Finishing (a supplier of finishing materials) and the Hooker Furniture Corporation. The third is located on V C Drive (in the northwestern corner of Martinsville) and is occupied by multiple tenants.

Open space and institutional land uses are recognized by the City as separate land uses but occur near one another. In addition, both tend to be found near or within the residential areas located at the City's periphery. Some of the City's principal institutional land uses include Martinsville High School and Martinsville Hospital. Some of the City's principal open spaces include J. Frank Wilson Park, Southside Park, and Dr. Dana O. Baldwin Memorial Park.

County of Henry Comprehensive Plan 1995-2010

Henry County's most recent comprehensive planning document was adopted in June 1995. It was prepared as both a statement of overall policy and a guide for assessing governmental services and development proposals (Henry County, 1995). In addition to land use, the Plan's major considerations include: natural and historic resources; growth and development; and community facilities, services, and utilities.

The land use chapter of the Comprehensive Plan is divided into two sections. The first section reviews land use trends that were prevalent at the time the Plan was written and sets development guidelines for six growth areas. Of these six, only the Ridgeway Growth Area is located within the ICE Study Areas. The second section discusses ways to implement the proposed guidelines.

The Ridgeway Growth Area described in the County of Henry Comprehensive Plan includes Route 220 from Martinsville to the North Carolina-Virginia state line and Route 58 from Route 752

(Cameron Road) to just west of the Smith River. The land use trends identified in the first section of the Plan indicate early industrial development within Henry County along the Smith River. Based on the second section of the Plan, on the section of Route 220 that falls within the proposed limit of work, the Plan calls for the expansion of commercial land uses and the implementation of a Highway Corridor Overlay (Henry County Planning Commission, 1995). The Overlay would add to the underlying zoning requirements by establishing special access requirements, aesthetics controls for signage and lighting, and landscaping and setback requirements. Beyond Route 220 and its frontage, the plan recommends expanding residential land uses.

Since Henry County's Comprehensive Plan has not been updated recently, it is prudent to acknowledge that there are development priorities that are not included or acknowledged by the Ridgeway Growth Area and its Highway Corridor Overlay. In the absence of a recent update, the most reliable resource for new information are regional planning documents, such as the WPPDC's 2035 Rural Long-Range Transportation Plan (discussed below). Based on the recommendations include in the Long-Range Transportation Plan, the general tenets of the Highway Corridor Overlay remain a faithful articulation of the County's priorities and compatible with the purpose and need of this Study.

West Piedmont Planning District Commission 2035 Rural Long-Range Transportation Plan

According to the WPPDC's 2035 Rural Long-Range Transportation Plan, rural counties throughout WPPDC are working either to seek new economic growth and diversification or to balance growth while striving to preserve the rural character of the landscape (WPPDC, 2011). Most of the land in the region can be defined as agricultural, forested use, or rural residential, with more intensive land use in the towns and village centers, typically at the intersection of two roadways. Land use has been influenced primarily by the topography and locations of existing cities and towns as well as access to them. The extent of growth and the types of land use changes varies, and proximity to urban areas is often one of the key factors in this variability. Many of the rural counties are trying to direct any new growth towards existing towns, village centers, or service districts to provide services and to continue to address the needs of residents as well as maintain a general agricultural setting. As the population fluctuates, either through migration or shifting within the region, the needs of the communities (including education, health care, social services, employment, and transportation) shift and fluctuate as well. Land use and development changes that typically affect transportation in rural areas include school consolidation, loss or gain of a major employer, movement of younger sectors of the population to more urban areas, retirement community development, and growth of bedroom-community type developments for nearby urban areas.

2.2.2.3 Planning and Forecasting

Population Growth Trends

Since population projections at the County-level are not available from the U.S. Census Bureau, past and present population growth trends were identified using historic data and future projections prepared by the Weldon Cooper Center for Public Service's (WCCPS) Demographic Research Group. The WCCPS is a research institute within the University of Virginia system that prepares a wide range of public policy references and assessments for decision makers and the general public. The historic, present, and future populations it publishes are derived from the U.S. decennial census.

According to the WCCPS's Demographics Research Group, the population of Henry County (including Martinsville) has decreased approximately 3.7 percent from 70,554 residents in 1970 to 67,972 residents in 2010 (WCCPS 2019) (**Table 2-1**). Between 2010 and 2018, the population within Henry County dropped to 64,557, a five percent decrease. The population of Henry County

is projected to further decrease to 53,744 by 2040, which would result in a decrease of 24 percent over the 63–year period (WCCPS 2019). The population is expected to continue to decrease in both Henry County and Martinsville. Additional population data is available in the ***Socioeconomic and Land Use Technical Report*** (VDOT, 2020c).

Table 2-1: Population Trends and Forecast 1970, 2010, 2018, and 2040

Location	Estimated 1970 Population	Estimated 2010 Population	% Change (1970 to 2010)	Estimated 2018 Population	% Change (2010 to 2018)	Projected 2040 Population	% Change (1970 to 2040
Henry County	50,901	54,151	+6.4%	51,438	-5.0%	43,489	-14.6%
Martinsville	19,653	13,821	-29.7%	13,119	-5.1%	10,255	-47.8%
Total Henry County and Martinsville	**70,554**	**67,972**	**-3.7%**	**64,557**	**-5.0%**	**53,744**	**-23.8**

Source: The Weldon Cooper Center for Public Service, Demographics Research Group, Virginia Population Projections (2019). https://demographics.coopercenter.org/virginia-population-projections accessed 3/11/2019

Employment Trends

Information regarding employment, the size of local industries, commuting patterns, and similar economic statistics was collected primarily from the U.S. Census Bureau (2012-2016 ACS 5-Year Estimates) and community profiles published by the Virginia Employment Commission (VEC). It is important to note that U.S. Census and the VEC treat Henry County and Martinsville as separate statistical entities. As a result, unless stated otherwise, the statistics reported in this analysis for Henry County apply only to those areas that are beyond Martinsville's municipal boundary.

The single largest source of employment in Henry County is manufacturing (see **Table 2-2**). Based on the VEC's fourth quarter estimates for 2018, the local manufacturing sector employs approximately 24 percent (4,015 people) of the County's total workforce (VEC 2019a). Retail trade is the next largest, followed by administrative and support, waste management, health care, and social assistance. Across all industries, Henry County's ten largest employers are (VEC 2019b):

1. Henry County School Board
2. Cpfilms, Inc.
3. Monogram Management Services
4. GSI Solutions
5. Results Customer Solution
6. Hanesbrands Inc.
7. Springs Global Us Inc.
8. County of Henry
9. Patrick Henry Community College
10. Bassett Furniture Industries

The single largest source of employment in Martinsville is health care and social assistance (see **Table 2-3**). Based on the VEC's fourth quarter estimates for 2018, the local health care and social assistance sector employs approximately 23 percent (2,181 people) of the City's total workforce. Retail trade is the next largest, followed by administrative and support, waste management and manufacturing. Across all industries, Martinsville's largest employers are (VEC 2019c):

1. Danville Regional Medical
2. Martinsville City Schools
3. Piedmont Regional Community Service Board
4. Martinsville
5. Southern Finishing Company
6. Wal Mart
7. Kidd International Home C, Inc.
8. Faneuil, Inc.
9. Palm Harbor Homes, Inc.
10. Security Forces, Inc.

Table 2-2: Industry Employment Distribution in Henry County

Rank (Based on Number of Employees)	Industry Sector	North American Industry Classification System (NAICS) Sector Code	Number of Establishments	Number of Employees
1	Manufacturing	31-33	74	4,029
2	Retail Trade	44-45	168	2,135
3	Administrative and Support and Waste Management	56	67	1,437
4	Health Care and Social Assistance	62	488	1,365
5	Transportation and Warehousing	48-49	49	1,190
6	Accommodation and Food Services	72	61	956
7	Construction	23	78	651
8	Other Services (except Public Administration)	81	359	648
9	Public Administration	92	26	493
10	Wholesale Trade	42	43	483
Total (all industries)			**1,625**	**15,685**

Source: VEC, Quarterly Census of Employment and Wages (VEC 2019a).

Table 2-3: Industry Employment Distribution in Martinsville

Rank (Based on Number of Employees)	Industry Sector	North American Industry Classification System (NAICS) Sector Code	Number of Establishments	Number of Employees
1	Health Care and Social Assistance	62	379	2,181
2	Retail Trade	44-45	83	1,403
3	Administrative and Support and Waste Management	56	22	1,308
4	Manufacturing	31-33	15	862
5	Public Administration	92	29	753
6	Accommodation and Food Services	72	40	714
7	Other Services (except Public Administration)	81	209	477
8	Finance and Insurance	52	40	197
9	Transportation and Warehousing	48-49	12	177
10	Management Of Companies and Enterprise	55	10	107
Total (All Industries)			**969**	**9,385**

Source: VEC, Quarterly Census of Employment and Wages (VEC 2019a).

From 2008 to 2017, unemployment rates peaked in 2010 for Henry County and have been steadily declining since. In 2010, unemployment within Henry County peaked at nearly ten percent and declined to five percent by 2016. According to the Virginia Employment Commission, to be considered unemployed an individual must be over 16 years of age and not currently working but actively looking for work, and generally available to work. Employment in Henry County is expected to increase by over 4,400 positions between 2014 and 2024, representing a 6.3 percent increase in employment (VEC, 2019a).

As shown in the ***Socioeconomic and Land Use Technical Report*** (VDOT, 2020c), 26 percent of Henry County commuters both work and reside within Henry County, according to the VEC (VEC, 2019a). Martinsville is the destination for approximately 38 percent of Henry County's commuters. Another 13 and 11 percent of the residents commute to the City of Danville and Franklin County, respectively. The remaining 38 percent is comprised of residents who commute to areas such as Rockingham County, North Carolina, the City of Roanoke and other counties. **Table 2-4** presents American Community Survey (ACS) 5-year (2012-2016) labor force and employment data for both Henry County and Martinsville, compared to Virginia.

Table 2-4: 2016 Labor Force, Employment, and Unemployment

Location	Total Labor Force[1]	Labor Force Participation%[2]	Employment/ Population Ratio (%)	Unemployment Rate (%)
Virginia	6,653,111	66.2%	60.7%	3.8%
Henry County	42,868	53.1%	48.1%	5.0%
Martinsville	10,841	55.0%	49.5%	10.0
ICE Socioeconomic Study Area	6,401	55.3%	52.1%	3.2%

[1]Residents in labor force are persons 16 years of age or older; [2]Percentage of residents 16 years of age or older that are employed

Source: ACS 5-year 2012-2016

2.2.2.4 Land Use Trends

Recently, land use in the ICE Study Areas has been associated with a gradual decrease in the density of use (i.e., increased vacancies and decreased population size) within Martinsville and a gradual increase in the conversion of rural lands into suburban and commercial land uses. This trend is partially representative of national trends towards increased suburban sprawl and partially indicative of the loss of the major employers that drove Martinsville's growth during the early and mid-20th Century.

The local and regional planning documents referenced previously suggest that local, regional, and state agencies are actively pursuing opportunities to reverse the trend of disinvestment and create new economic opportunities for the area's residents. The continued development of the Patriot Centre at Beaver Creek and Commonwealth Crossing Business Centre are examples of these activities. From a land use perspective, these efforts could lead to both increased utilization of the area's urban centers and continued conversion of rural lands. Just as the growth of industry in the 20th century focused on the mobility provided by the railways

2.2.2.5 Natural Resources Trends and Goals

In contrast to the more heavily developed regions to the east, the Inner Piedmont contains relatively intact natural resources. Although the area's timber and furniture production in the 19th and 20th centuries led to the large-scale clearing of forested areas, the process of secondary succession has allowed many areas to regenerate. The presence of sensitive aquatic species,

like the Roanoke logperch (*Percina rex*), in many of the area's stream systems is a testament to the quality of the watersheds.

Current land use trends, as well as local and regional planning documents, indicate that lands within the ICE study area are gradually transitioning from rural lands into suburban and commercial lands. Natural resources within the ICE study area are protected from this development by laws and regulations such as the Clean Water Act of 1972 (CWA), the Virginia Erosion and Sediment Control Law, the Virginia Stormwater Management Act, the Virginia Water Resources and Wetlands Protection Program, the Endangered Species Act of 1973 (ESA), the Virginia Endangered Plant and Insect Species Act of 1979, floodplain management regulations, and local land disturbance regulations.

Given the aesthetic value of the area's natural resources, the principal goal for local and state governments is to establish a responsible balance between development and conservation (WPPDC, 2019a). From a practical standpoint, this translates to a need to work with potential investors and existing economic interests to avoid developing on or near sensitive sites. When all reasonable and feasible means for avoiding a direct discharge into a wetland, the focus shifts towards the consideration of minimization measures and, when all other avenues have been exhausted, the development of compensatory mitigation measures that comply with the 2008 Final Mitigation Rule. A good example of this sort of planning and coordination is the Regional Water Supply Plan produced by the WPPDC (WPPDC, 2019b).

2.3 STEP 3: INVENTORY NOTABLE FEATURES IN THE ICE STUDY AREAS

Notable resources for this study that were considered to be particularly relevant for the analysis of impacts from a transportation study include socioeconomics and land use (including communities, community facilities and parks, Environmental Justice (EJ), and economics); natural resources (including streams, wetlands, water quality, floodplains, wildlife habitat, and threatened and endangered species); and historic resources.

2.3.1 Socioeconomic Resources

2.3.1.1 Land Use

Land use patterns are regularly considered during the development of highway studies not only because they influence underlying traffic patterns, but also because changes to the highway system can themselves alter land use characteristics and therefore community activity. In urban areas, this feedback loop is buffered by the amount of development that is already present. Such that the amount of new development is limited by the existing development, decreasing the likelihood of considerable land use changes, for example from open space and rural nature to residential. In rural areas like the ICE Socioeconomic Resources Study Area, however, development is relatively sparse and therefore there is the potential for the proposed improvements to generate a more substantial effect, for example, undeveloped land being converted to developed land adjacent to a roadway, subsequently, modifying community activity. The first step in determining if an enhanced effect is likely to occur is to carefully document how land uses are currently distributed.

The land within the ICE Socioeconomic Resources Study Area is principally comprised of natural and agricultural areas (see **Figures 2-4** and **2-5**, and **Table 2-5**). Forests are by far the most widespread land cover, covering approximately 65 percent of the total area (57,288 acres). The forestlands are distributed relatively evenly across the ICE Socioeconomic Resources Study Area, with many large contiguous areas. Grasslands, pastures, and scrublands are the next most common land uses covering approximately 25 percent (22,174 acres) of the ICE Socioeconomic Resources Study Area.

Figure 2-4. ICE Socioeconomic Resources Study Area – Land Cover

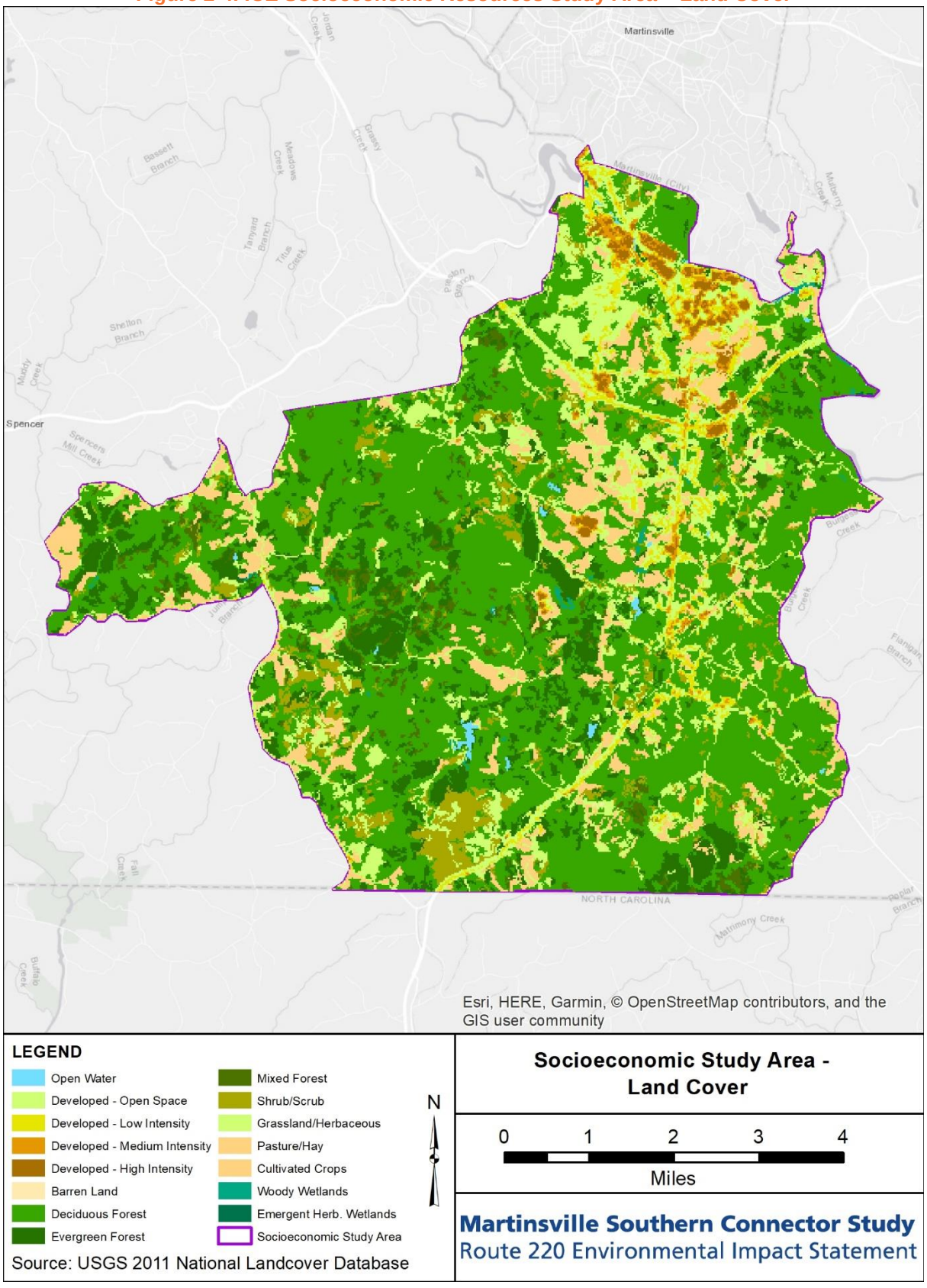
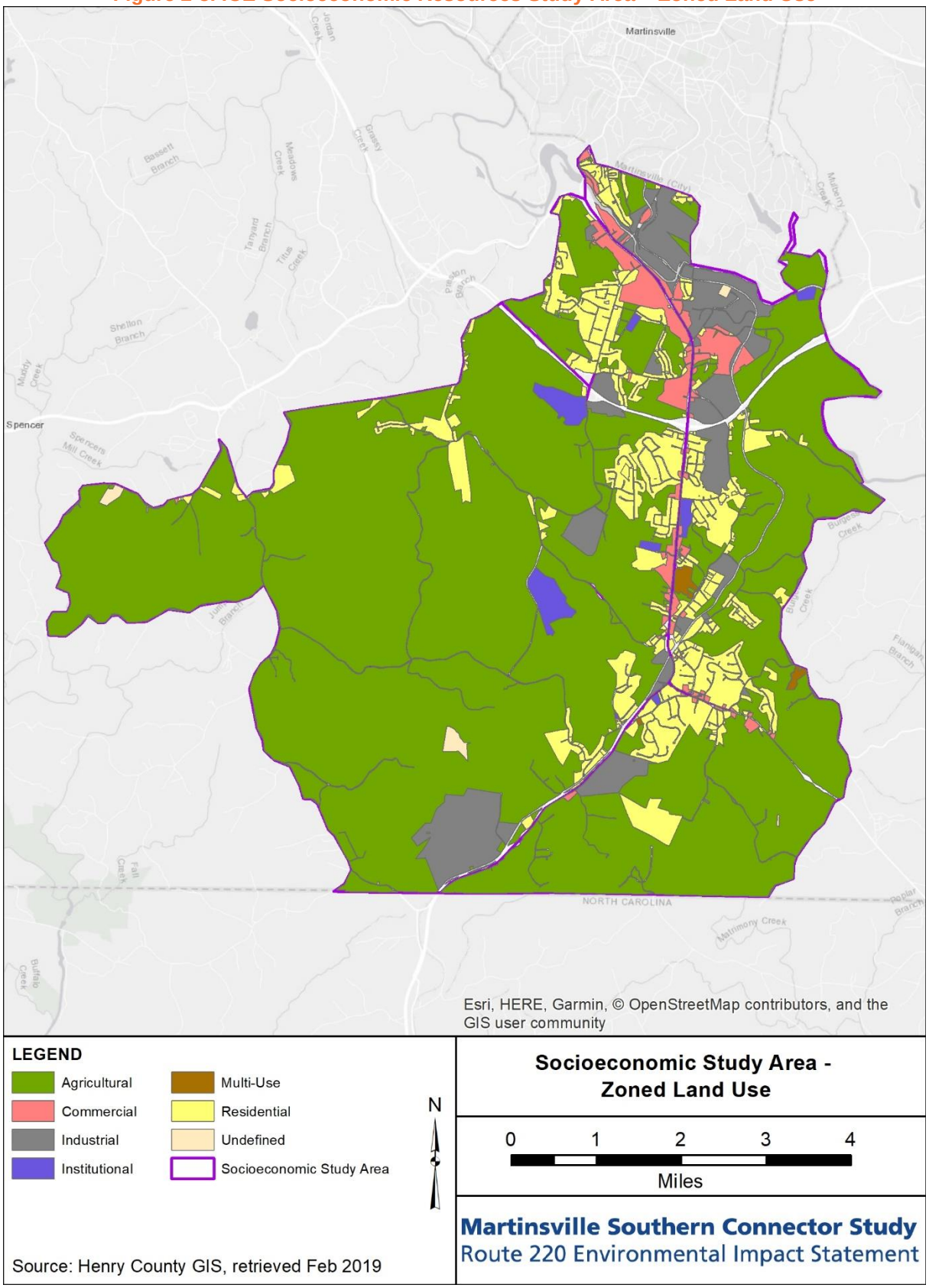


Figure 2-5. ICE Socioeconomic Resources Study Area – Zoned Land Use



These landcovers are also distributed evenly through the ICE Socioeconomic Resources Study Area but occur in smaller patches.

Table 2-5: Land Cover within the ICE Socioeconomic Resources Study Area

Land Cover	Land Use Acreage	% of ICE Socioeconomic Resources Study Area
11- Open Water	352	< 1%
21 – Developed, Open Space	4,377	5%
22 – Developed, Low Intensity	2,014	2%
23 – Developed, Medium Intensity	646	< 1%
24 – Developed High Intensity	385	< 1%
31 – Barren Land	30	< 1%
41 – Deciduous Forest	45,982	52%
42 – Evergreen Forest	9,447	11%
43 – Mixed Forest	1,859	2%
52 – Scrub	4,698	5%
71 - Grassland	7,727	9%
81 – Pasture	9,750	11%
82 - Cropland	73	< 1%
90 – Woody Wetlands	271	< 1%
95 – Herbaceous Wetlands	21	< 1%
TOTAL	**87,633**	**100.00%**

Source: USGS 2011 National Landcover Database

Developed areas account for approximately 9 percent of the total ICE Socioeconomic Resources Study Area (7,421 acres). Within this category, open space and low-intensity development is dominant, accounting for over 85 percent of all developed lands. The developed lands that are clustered abut Route 58, Route 220, and to a lesser degree Route 87. The largest consolidated area of development is located on Route 220 Business, north of Route 58. This area includes the Martinsville Speedway, the Martinsville Industrial Park, and a series of commercial properties (*e.g.*, grocery stores, restaurants, and retail stores).

2.3.1.1 Community Facilities, Parks, Recreational Facilities, Open Space

Community facilities in the ICE Socioeconomic Resources Study Area were identified through a review of data from local government, existing Geographic Information System (GIS) data, and field inventories. Through these methods 38 community facilities were identified. All of the facilities belong to one of the four following categories: educational facilities (i.e., schools and libraries), parks and recreation (*e.g.*, playgrounds, athletic fields, and public pools), places of worship and cemeteries. Overall, the ICE Socioeconomic Resources Study Area includes five educational facilities including three schools, one library, and one daycare facility; one public park; 29 places of worship, and three cemeteries. A complete list of these facilities is provided in **Appendix B**.

2.3.1.2 Environmental Justice

The ***Socioeconomic and Land Use Technical Report*** (VDOT, 2020c) provides a detailed description of the regulatory basis and methodology used for the EJ analysis of direct, indirect, and cumulative effects of the Build Alternatives on sensitive populations.

Minority Populations

For the purposes of this analysis a minority population is defined as: "*any readily identifiable group of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (e.g. migrant workers or tribal groups) who would be similarly affected by a USDOT/FHWA program, policy or activity*" (FHWA Order 6640.23A). Based on the CEQ's *Environmental Justice Guidance Under the National Environmental Policy Act*, a minority is determined to be present when: (a) the minority population of the affected area exceeds 50 percent of the total population, or (b) the minority population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographical analysis (CEQ, 1997).

For the purposes of this study, the unit of geographic analysis is the census block group, with boundaries defined by the U.S. Census Bureau, and the surrounding geographic areas in the reference study area are defined as the Henry County boundary. Therefore, the average minority population percentage of Henry County is used to determine the threshold for meaningfully greater minority population percentages within block groups in the ICE Socioeconomic Resources Study Area. **Table 2-6** identifies racial and ethnic characteristics within the ICE Socioeconomic Resources Study Area, as compared to Henry County and Virginia.

Table 2-6: ICE Socioeconomic Resources Study Area Racial and Ethnic Characteristics

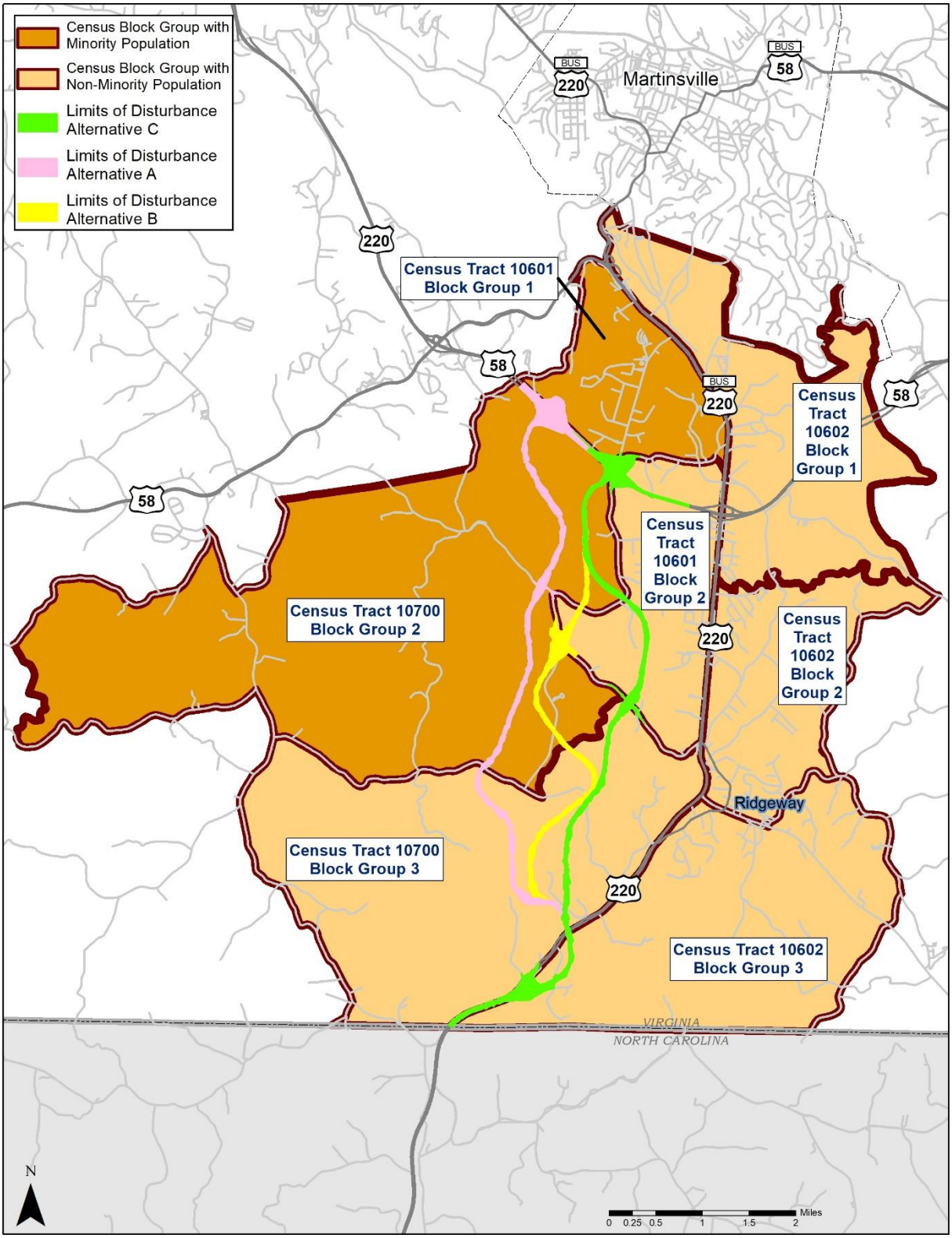
Census Tract	Census Block Group	Total Population	Total Block Group Minority Population[1]	
		No.	No.	%
Census Tract 106.01	Block Group 1	1,515	635	**42.00**
Census Tract 106.01	Block Group 2	1,287	179	13.91
Census Tract 106.02	Block Group 1	1,030	236	22.91
Census Tract 106.02	Block Group 2	1,592	346	21.73
Census Tract 106.02	Block Group 3	1,403	264	18.82
Census Tract 107	Block Group 2	612	269	**43.95**
Census Tract 107	Block Group 3	550	128	23.27
Henry County		54,151	17,209	31.78
Virginia		8,001,024	3,145,997	39.32

[1] Total minority population is the sum of all non-White races plus Hispanic or Latino - White; block groups with percentages of minority and/or Hispanic/Latino greater than the 31.78 percent threshold are bolded.

Source: U.S. Census Bureau, 2010 Decennial Census

Based upon the results of the 2010 Decennial Census, the minority population for each census block group would therefore be found to be meaningfully greater than the surrounding geographic areas in the reference study area if its minority population exceeds 31.78 percent. Based on this definition, a total of two out of eight Census block groups in the ICE Socioeconomic Resources Study Area have a minority population (see **Figure 2-6**).

Figure 2-6. Distribution of Minority Populations



Low-Income Populations

For the purposes of this analysis a low-income population is defined as: "*any readily identifiable group of low-income persons who live in geographic proximity, and, if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who will be similarly affected by a proposed FHWA program, policy, or activity*" (FHWA Order 6640.23A). The criteria used to determine if a population qualifies as low income is the 2018 Department of Health and Human Services (HHS) poverty threshold. If a census block group's median household income was determined to be at or below this threshold, it would be classified as low-income. According to the ACS 2012-2016 5-year estimates, the average household size in Henry County is 2.33 persons. Therefore, the poverty threshold for a three-person household was used.

The HHS 2018 Poverty Guidelines for the 48 Contiguous States and the District of Columbia identifies the poverty threshold as $20,780 for a family of three. **Table 2-7** identifies the median household income for each block group within the ICE Socioeconomic Resources Study Area, as well as Henry County, Martinsville, and Virginia to serve as a measure of comparison. None of the Census block groups within the ICE Socioeconomic Resources Study Area have a median household income below the HHS poverty threshold. Therefore, no low-income populations have been identified within the ICE Socioeconomic Resources Study Area and no further assessment of impacts to low income populations is required.

Table 2-7: ICE Socioeconomic Resources Study Area Median Household Income

Census Tract	Census Block Group	Median Household Income
Census Tract 106.01	Block Group 1	$26,597
Census Tract 106.01	Block Group 2	$47,171
Census Tract 106.02	Block Group 1	$28,967
Census Tract 106.02	Block Group 2	$45,906
Census Tract 106.02	Block Group 3	$43,995
Census Tract 107	Block Group 2	$43,125
Census Tract 107	Block Group 3	$38,056
Henry County		$34,992
Martinsville		$31,719
Virginia		$66,149

Source: 2012-2016 ACS 5-Year Estimates, Median Household Income in the Past 12 Months (in 2016 Inflation-Adjusted Dollars)

It should be noted that Drewry Mason Elementary School is listed as a Title I school. The purpose of Title I, as defined by the U.S. Department of Education, is to "*ensure that all children have a fair, equal, and significant opportunity to obtain a high-quality education and reach, at a minimum, proficiency on challenging State academic achievement standards and state academic assessments*." To be eligible to use Title I funds to upgrade the entire educational program in a Title I school, the school must serve a population where at least 40 percent of their students are considered low-income. The district which Drewry Mason Elementary services contains the entirety of the ICE Socioeconomic Resources Study Area south of Route 58. The Smith River forms the eastern boundary of the School's district, and the western boundary is roughly Horsepasture Price Road.

2.3.2 Natural Resources

2.3.2.1 Overview

The Martinsville Southern Connector Study is in a unique point between the Piedmont (which occupies much of central Virginia and North Carolina) and the Blue Ridge Mountains. As a result, the Martinsville Southern Connector ICE Natural Resources Study Area includes a variety of natural features that could be affected by the indirect and cumulative effects associated with the Build Alternatives. This section of the Technical Report is designed to support the consideration of these effects by providing background information on the ICE Natural Resources Study Area's principal natural resources.

The landcover within the ICE Natural Resources Study Area was assessed using the NLCD created by the U.S. Geological Survey (USGS). The NLCD was last compiled in 2011 and shows forests as the ICE Natural Resources Study Area's dominant land cover. The next most prominent landcovers are: developed open space, pastures, and grasslands. **Table 2-8** provides a summary of the land covers categories, and **Figure 2-7** shows their distribution.

Table 2-8: ICE Natural Resources Study Area Land Cover Summary

Land Cover Type	Total Area (acres)	% of ICE Natural Resources Study Area
11- Open Water	333	< 1%
21 – Developed, Open Space	5,960	9%
22 – Developed, Low Intensity	3,034	4%
23 – Developed, Medium Intensity	854	1%
24 – Developed High Intensity	492	< 1%
31 – Barren Land	52	< 1%
41 – Deciduous Forest	33,010	48%
42 – Evergreen Forest	6,113	9%
43 – Mixed Forest	1,627	2%
52 – Scrub	2,916	4%
71 - Grassland	5,221	8%
81 – Pasture	8,278	12%
82 - Cropland	62	< 1%
90 – Woody Wetlands	205	< 1%
95 – Herbaceous Wetlands	12	< 1%
Total	**68,169**	**100%**

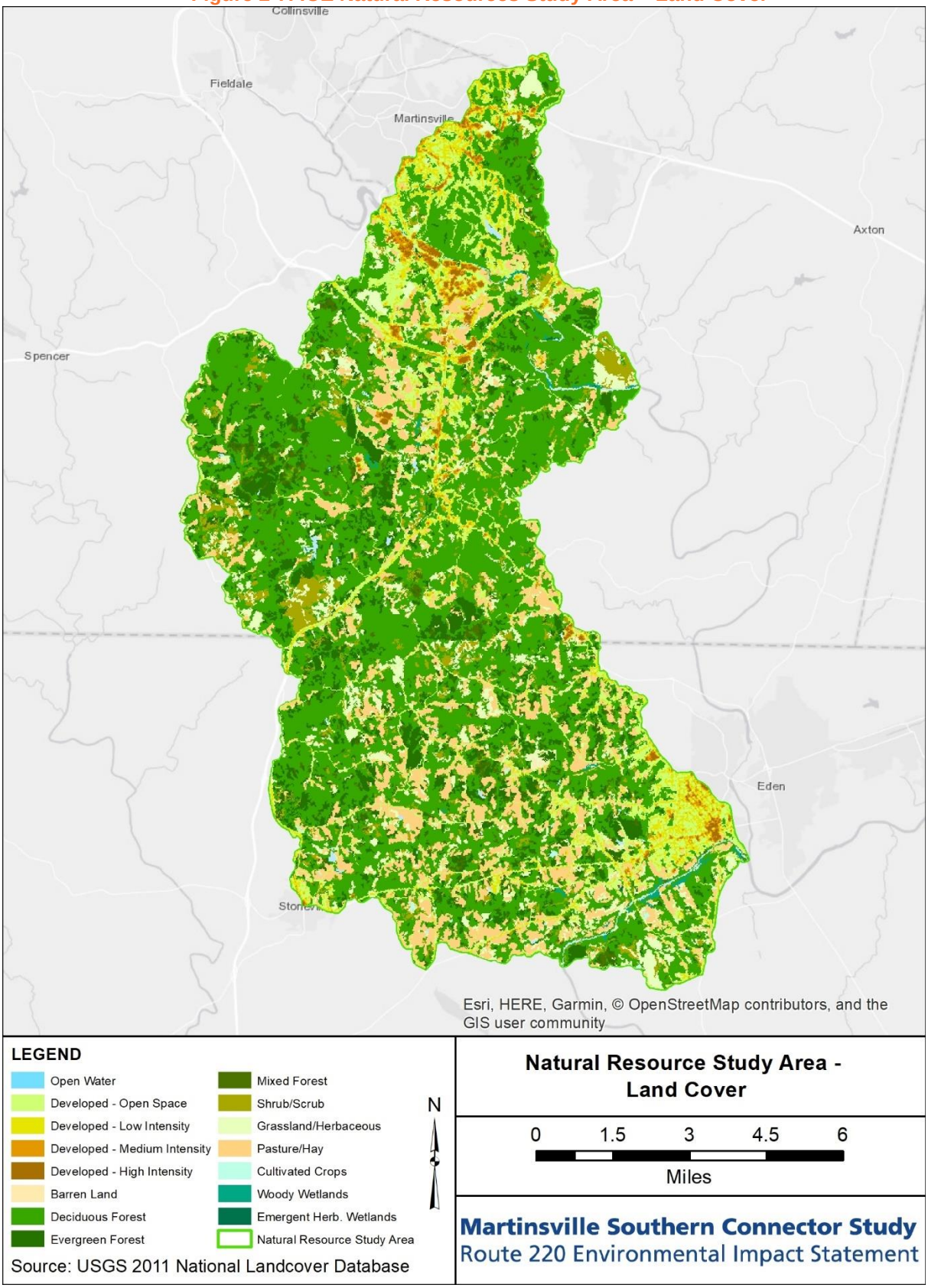
Source: National Land Cover Dataset

2.3.2.1 Water Quality

The ICE Natural Resources Study Area is in the Roanoke River Basin, an area that covers approximately 10,000 squares miles and roughly 15 percent of Virginia (NCDEQ, 2018). From its headwaters in the Blue Ridge Mountains, the Roanoke River flows southeastward, draining most of the Piedmont before it reaches the Albemarle Sound (NCDEQ, 2019). Forests/scrub are the most common landcover in the Basin, covering over 63 percent of the total area. Developed areas and agricultural land uses (cropland and pasture) are the next most common landcovers, comprising 15 percent and 13 percent of the total area, respectively (NCDEQ, 2019). The ICE Natural Resources Study Area is located in the portion of the Roanoke River Basin which drains to the Dan River.

Like the Roanoke River, the Dan River is sourced in Virginia's Blue Ridge Mountains. From there it flows eastward for approximately 200 miles until it terminates in the Kerr Reservoir. In total, the Dan River Basin includes 3,973 square miles and 11,213 linear miles of stream (PRTC, 2012).

Figure 2-7. ICE Natural Resources Study Area – Land Cover



Development in the Dan River Basin is sparse, accounting for only 5 percent of the total land cover. For example, the City of Danville is the only community in the Basin large enough to require a stormwater discharge permit from the National Pollutant Discharge Elimination System (NPDES). Despite the low levels of development, over 20 percent of the Dan River Basin's assessed waters are classified as impaired (PRTC, 2012). One of the principal sources of impairment is *Escherichia coli* (*E. coli)*, a bacterium found in the environment, foods, and intestines of people and animals. *E. coli* concentrations were found to exceed federal water quality standards in 55 percent of impaired waterways. The principal sources of *E. coli* in streams is fecal material from humans, livestock, and wildlife. Other metrics that have been commonly used to establish stream impairment in the Dan River Basin are: turbidity (i.e., the degree to which suspended soil particles and other solids decrease water's transparency), mercury levels, and poor benthic community condition (PRTC, 2012).

Within the ICE Natural Resources Study Area, the primary source of drinking water is the Beaver Creek Reservoir. The Reservoir is owned by Martinsville and has a capacity of 1.3 billion gallons (City of Martinsville, 2017). The Reservoir is fed by surface water flows, most notably Beaver Creek.

The groundwater networks present within the ICE Natural Resources Study Area are part of a system of aquifers known as the Piedmont and Blue Ridge Crystalline-Rock Aquifers. On a regional basis, groundwater testing conducted by the USGS throughout the Piedmont and Blue Ridge Crystalline-Rock Aquifers have found that "*inorganic constituents with human-health benchmarks were detected at high concentrations in about 5 percent of the sampling area and at moderate concentrations in about 12 percent of the sampling area. Manganese was the only constituent in this group that was detected at high concentrations. Arsenic, strontium, zinc, and uranium were detected at moderate concentrations.* [Volatile Organic Compounds] *were detected at moderate concentrations in 5 percent of the sampling area but were not detected at high concentrations. Compounds detected at moderate concentrations were the disinfection byproduct chloroform and the solvent trichloroethylene (TCE)… Pesticides were not detected at high or moderate concentrations in the sampling area*". The sampling program which produced these findings tested 60 public-supply wells. The closest of these wells is in Ferrum, Virginia (approximately 25 miles northwest of the ICE Natural Resources Study Area). Based on the EPA's Safe Drinking Water Information System, the last violation associated with these wells (operated by the Ferrum Water and Sewage Authority) occurred in 2005 and involved Total Fecal Coliform Rule.

2.3.2.2 Streams

The National Hydrography Dataset (NHD) was used to estimate the extent of the ICE Natural Resources Study Area's streams. Based on the resources shown within this dataset, the ICE Natural Resources Study Area contains approximately 317 miles of stream, including 20 named stream systems (see **Figure 2-8**). **Table 2-9** lists all the named streams, their mapped length, and sources of impairment. Impairment determinations were made by the Virginia Department of Environmental Quality (VDEQ) in 2016 (VDEQ 2016).

The Smith River is managed as a trout fishery by the Virginia Department of Game and Inland Fisheries (VDGIF). The USFWS has determined that the federally endangered Roanoke Logperch (*Percina rex*) may be located within the Smith River (Lahey and Angermeier, 2019). The VDGIF expands this known range to include Little Marrowbone Creek, Marrowbone Creek, and Matrimony Creek.

Figure 2-8. ICE Natural Resources Study Area – Streams

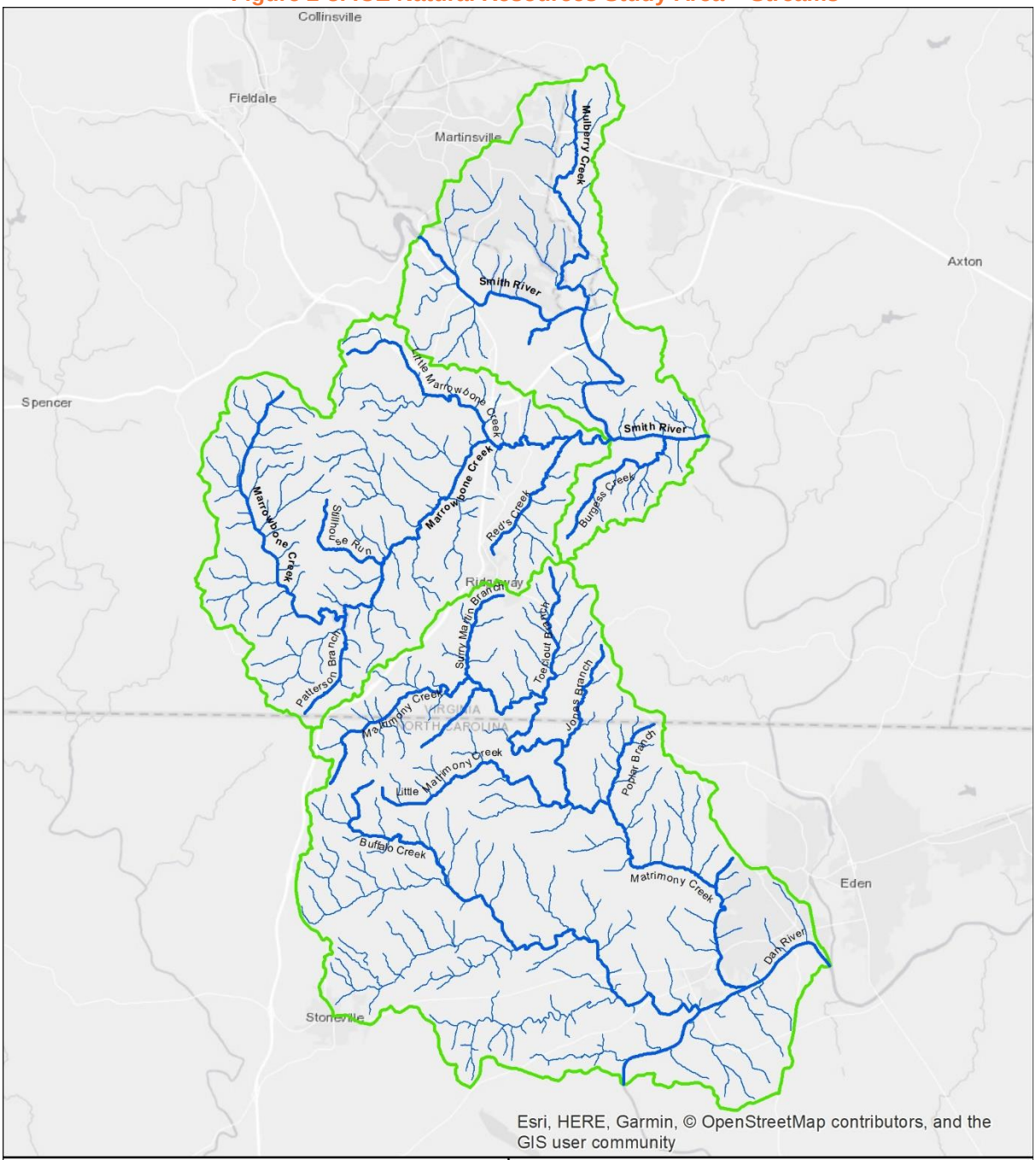


Table 2-9: Inventory of Named Streams

Stream Name	Length (ft)	Impairment(s)
Bear Branch	8,400	none listed
Boiling Springs Branch	3,365	none listed
Buffalo Creek	56,816	High levels of *E. coli*, Poor benthic community condition
Burgess Creek	16,690	none listed
Dan River	26,179	High levels of *E. coli*
Jones Branch	12,266	none listed
Little Marrowbone Creek	20,273	none listed
Little Matrimony Creek	24,376	none listed
Machine Branch	3,635	High levels of *E. coli*
Marrowbone Creek	76,183	High levels of *E. coli*
Matrimony Creek	86,805	none listed
Mulberry Creek	29,070	High levels of *E. coli*
Patterson Branch	11,203	none listed
Poplar Branch	9,633	High levels of *E. coli*
Red's Creek	14,507	none listed
Smith River	47,859	High levels of *E. coli*, Poor benthic community condition
Stillhouse Run	11,552	none listed
Surry Martin Branch	10,055	none listed
Toeclout Branch	14,226	none listed
Whetstone Creek	40	none listed

Source: National Hydrography Dataset

Based on NHD mapping, virtually all of the ICE Natural Resources Study Area's smaller un-named tributaries originate within the ICE Natural Resources Study Area and are therefore considered first-order streams. In forested settings, first order streams are typically narrow, heavily shaded, and relatively steep.

2.3.2.3 Wetlands

Although the wetlands described in the ***Natural Resources Technical Report*** (VDOT, 2020d) and the **Draft EIS** were delineated, National Wetlands Inventory (NWI) data was used to determine the presence of wetlands within the Natural Resources ICE Study Area per the methodologies agreed upon for the study. Although there are flaws and weaknesses to NWI, this data source is the best available wetland data for the Natural Resources ICE Study Area and is acceptable and appropriate for the size of the Natural Resources ICE Study Area.

The NWI contains records of 151 wetlands, which collectively cover approximately 281 acres within the ICE Natural Resources Study Area (see **Figure 2-9**). Approximately 57.4 percent (162 acres) are classified as freshwater forested or shrub-dominated habitats; 32.4 percent (91 acres) are classified as freshwater ponds; and 10.2 percent (29 acres) are classified as freshwater emergent habitats (see **Table 2-10**).

Figure 2-9. ICE Natural Resources Study Area – Wetlands

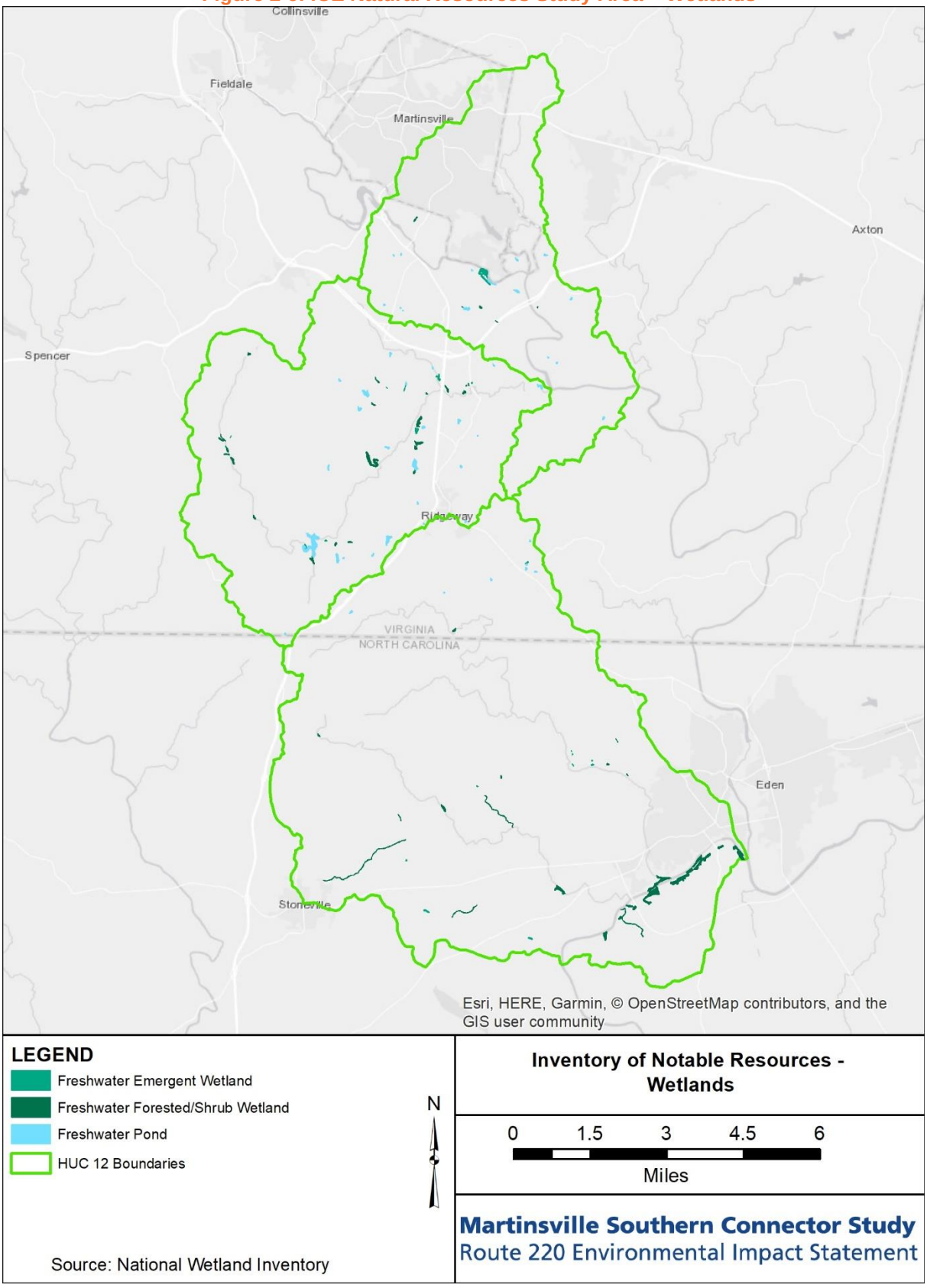


Table 2-10: Wetlands within the ICE Natural Resources Study Area

Wetland Type	Number of Sites	Total Area (acres)
Freshwater Emergent Wetland	35	29
Freshwater Forested/Shrub Wetland	68	162
Freshwater Pond	48	91
All	186	281

Source: National Wetland Inventory

2.3.2.4 Floodplains

The 100-year floodplains recognized by the Federal Emergency Management Agency (FEMA) occupy approximately 3,898 acres of land within the ICE Natural Resources Study Area (see **Figure 2-10**). This total acreage is distributed between 15 of the 20 named streams found within the ICE Natural Resources Study Area. The streams without floodplains include: Machine Branch, Bear Branch, Jones Branch, Little Matrimony Creek, and Poplar Branch.

Based on the 2011 NLCD, approximately 60 percent (2,330 acres) of the floodplains are forested. Grasslands, shrublands, and pastures are the next most common landcovers, collectively occupying approximately 23 percent (895 acres) of the ICE Natural Resources Study Area's floodplains. Open water and wetlands are the third most common landcover (9.5 percent or 366 acres), followed by developed spaces (7.6 percent or 296 acres).

2.3.2.5 Wildlife Habitat

In Henry County, the VDGIF's Fish and Wildlife Information Service (VAFWIS) identifies 386 potential resident animal species. To review the full list of species found within Henry County, see **Appendix C**. Due to frequent conversion for agricultural use, pristine floodplain forests tend to be rare within the Inner Piedmont. Those found within the ICE Natural Resources Study Area are likely to have been cleared numerous times for both timber and agriculture. The upland forests also have a history of being cleared but are generally considered to have a higher conservation value. The Virginia Natural Landscape Assessment, produced by the Virginia Department of Conservation and Recreation (VDCR), provides Ecological Core rankings for the State's forests. A rank of 1 is Outstanding, 2 is Very High, 3 is High, 4 is Moderate and 5 is General. According to the 2017 Assessment, the forests contained within ICE Natural Resources Study Area rank between 3 (high integrity) to 5 (general). **Figure 2-11** shows the location of the forest stands included in the 2017 Assessment and their ranking.

Figure 2-10. ICE Natural Resources Study Area – Floodplains

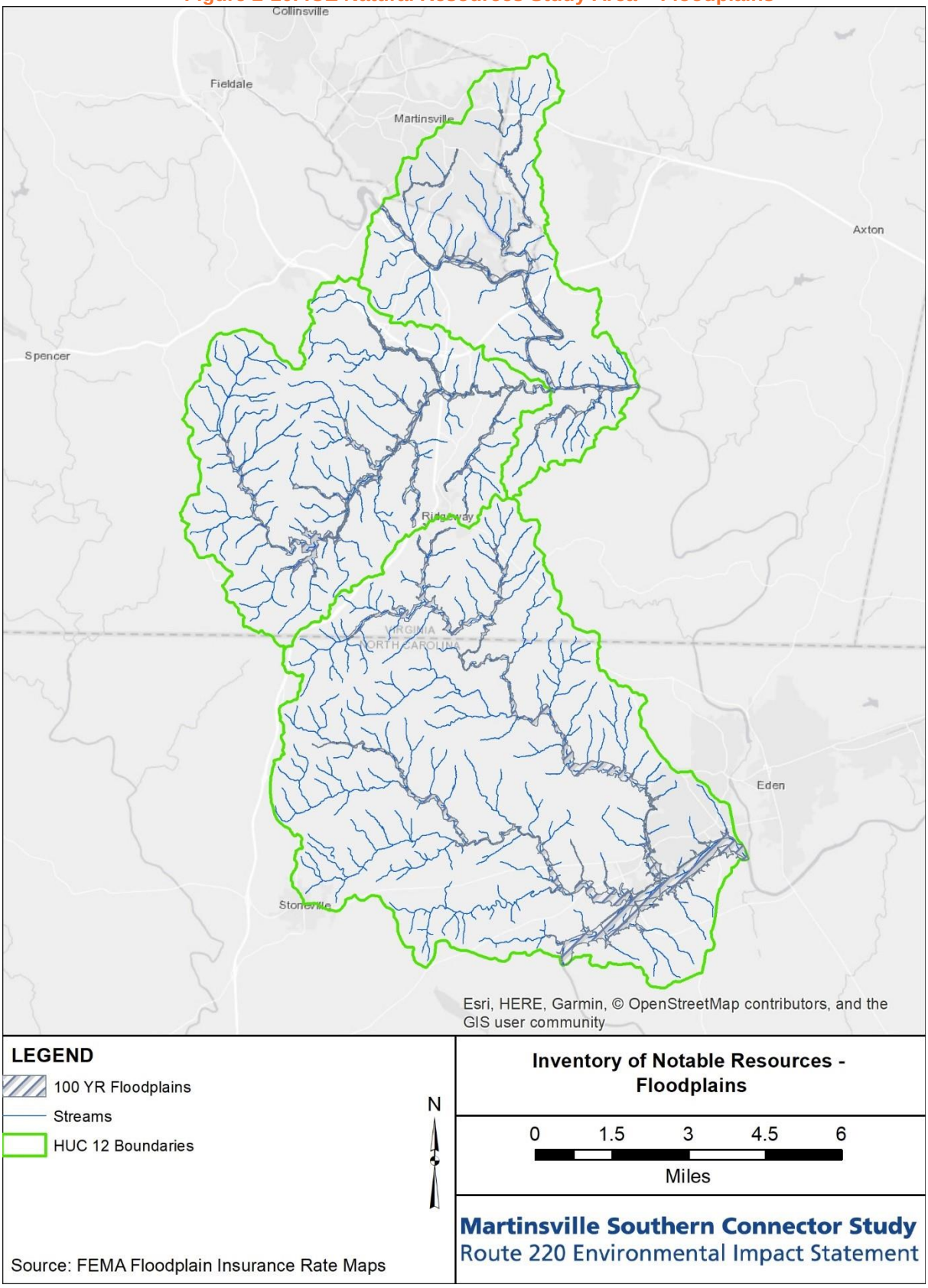
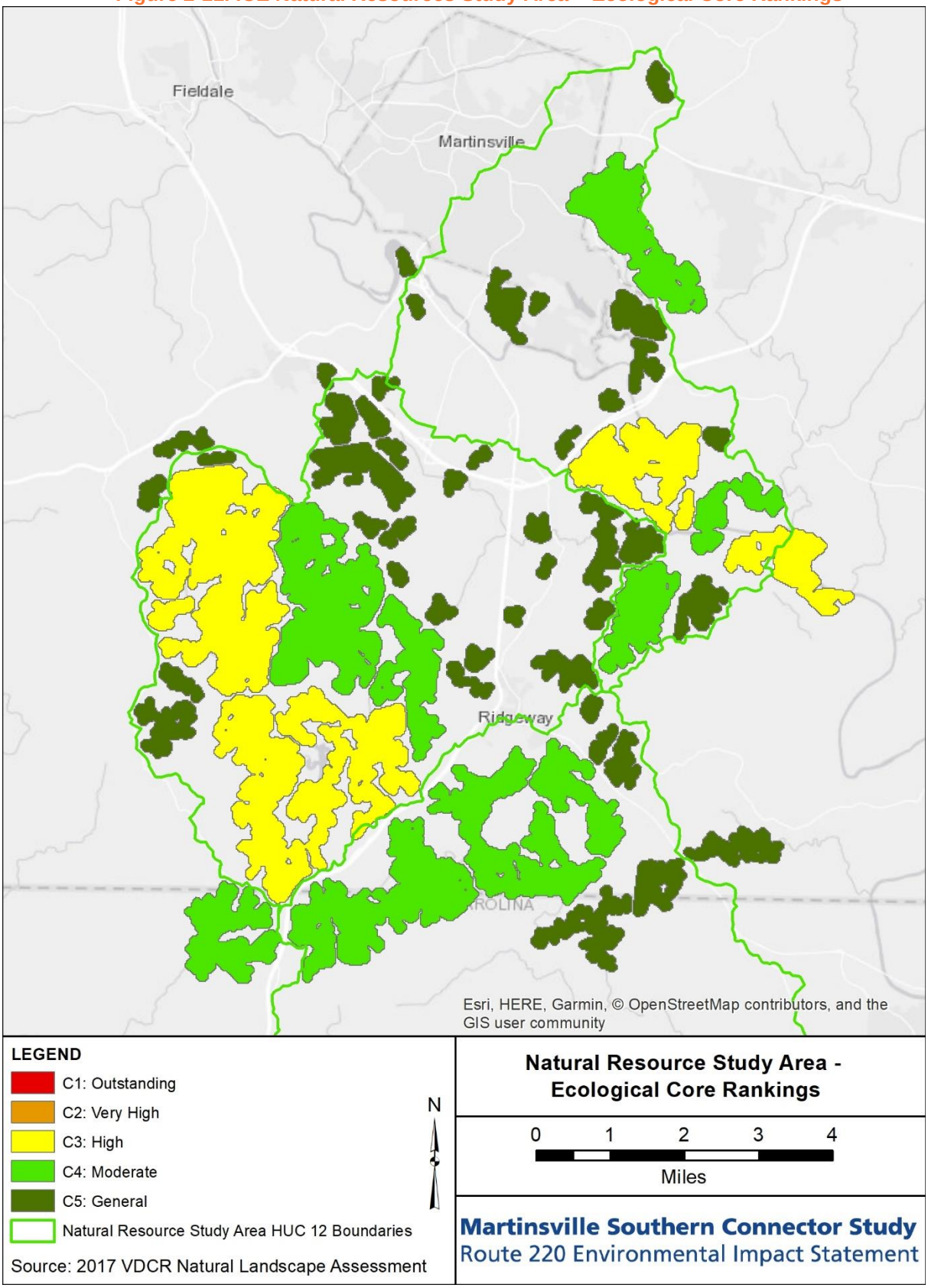


Figure 2-11. ICE Natural Resources Study Area – Ecological Core Rankings



Some notable examples of the ICE Natural Resources Study Area's terrestrial mammalian community include: the American black bear (*Ursus americanus*), bobcat (*Lynx rufus rufus*), northern river otter (*Lontra canadensis lataxina*), and the Carolina beaver (*Castor canadensis carolinensis*). The terrestrial reptile community consists predominately of snakes, such as the timber rattlesnake (*Crotalus horridus*), eastern kingsnake (*Lampropeltis getula*), and the northern rough greensnake (*Virginia valeriae valeriae*). In addition, the VAFWIS lists four turtles and a variety of lizards. The terrestrial amphibian community is comprised of three species of toad and two species of treefrog. The avian community shows the greatest diversity range, including: raptors like the Cooper's Hawk (*Accipiter cooperii*) and American kestrel (*Falco sparverius sparverius*); five different varieties of woodpeckers; five species of owls; and dozens of songbirds. The insect community, conversely, appears to be relatively small. Of the 20 species listed in the VAFWIS: 12 are butterflies or moths, five are ticks, and three are agricultural pests.

The grasslands recognized by the VDCR are associated with floodplains and rock outcrops. **Figure 2-7** illustrates the distribution of grasslands in the ICE Natural Resources Study Area. Rock outcroppings are unique habitats where the absence of topsoil makes it very difficult for woody plants and many grasses to grow. Due to their specialized ecological niche, the plant communities found at rock outcroppings are generally considered to be uncommon and, in some cases, rare. Given the prevalence of pasture within the ICE Natural Resources Study Area, it is likely that many of the upland grasslands and shrublands identified in the NLCD are agricultural fields that have been left fallow and are in the process of being recolonized by native plant life. These sorts of old field communities represent a distinct step in an ecological process known as secondary succession. Many forms of wildlife are likely to utilize the grasslands found within ICE Natural Resources Study Area. In alluvial settings, grasslands become an important food source for a wide range of herbivores as well as their associated predators. Migratory birds, such as green heron (*Butorides virescens*) and greater scaup (*Aythya marila*), are important seasonal residents. These species often use alluvial grasslands as cover and food sources during their migrations. In more upland settings, places where the tree canopy gives way to more open, grass and shrub-dominated communities can be very important to the vitality of wildlife. Some species, like white-tailed deer (*Odocoileus virginianus*) and wild turkey (*Meleagris gallopavo silvestris*), even thrive in these edge habitats.

The VDCR catalog recognizes five different wetland habitat types within the southern reaches of the Inner Piedmont. Two are classified as floodplain swamps and three are associated with upland seeps. The floodplain swamp classifications describe the plant species commonly found in the freshwater forested wetlands identified in **Section 2.3.2.1** that are located near streams and in floodplains. The upland seep classifications describe the plant species commonly found in the freshwater forested wetlands identified in **Section 2.3.2.1** that are located in upland locations. Some species, like the Carolina beaver (*Castor canadensis carolinensis*) and American mink (*Neovison vison mink*), will inherently be found moving between habitats. While others, like the Virginia opossum (*Didelphis virginiana*) and long-tailed weasel (*Mustela frenata noveboracensis*) may enter the Area's wetlands only when it is opportune. Some notable examples of Henry County's amphibian community includes: red-spotted newt (*Notophthalmus viridescens viridescens*), white-spotted slimy salamander (*Plethodon cylindraceus*), and wood frog (*Lithobates sylvaticus)*. Some of the waterfowl that can be found in alluvial wetlands include: king rail (*Rallus elegans*), green heron (*Butorides virescens*), greater scaup (*Aythya marila*), and great blue heron (*Ardea herodias herodias*).

The stream systems located in the ICE Natural Resources Study Area vary from small tributaries which may flow intermittently to perennial waterways of regional significance, such as the Smith and Dan Rivers. The wildlife community found in first-order streams, like many of the unnamed tributaries found within the ICE Natural Resources Study Area (see **Figure 2-8**), is usually

comprised of aquatic macroinvertebrates which can shred the coarse, organic matter, and the species which feed upon them. The named stream systems are generally large enough to have water present year-round and have higher concentrations of nutrients than the intermittent or ephemeral streams that feed into them. They also generally are less shaded, and therefore can support both the canopy tree species associated with the smaller streams and communities of herbaceous plants. These conditions allow the ICE Natural Resources Study Area's larger stream systems to support a greater diversity of wildlife. In total, the VAFWIS lists over 120 different aquatic species: 71 species of fish; 20 species of amphibians; 18 species of waterfowl; 11 species of shellfish and macro-invertebrates; and 3 aquatic reptiles. Some notable examples of the native fish community include: the Roanoke hogsucker (*Hypentelium roanokense*), brook trout (*Salvelinus fontinalis*), orangefin madtom (*Noturus gilberti*), and the Roanoke logperch (*Percina rex*).

2.3.2.6 Threatened and Endangered Species

Four datasets were used to identify rare, threatened, and endangered species that might be present with the ICE Natural Resources Study Area: the USFWS' Information for Planning and Conservation (IPaC) database; the VDGIF's VAFWIS, the VDCR's Department of Natural Heritage Database (VDCR-DNH), and the North Carolina Natural Heritage Program (NCNHP) Project Review database (see **Appendix D**). Species information was collected from all four datasets based on a variety of spatial queries, including: the ICE Natural Resources Study Area, Henry County, and Rockingham County, North Carolina. **Table 2-11** lists the threatened and endangered species contained within the four datasets. Following is a description of each of the threatened or endangered species:

The smooth coneflower (*Echinacea laevigata*) is classified as endangered by the USFWS and considered threatened within Virginia. In Virginia, its range is associated with the Upper Roanoke, Middle Roanoke, and Upper Dan Watersheds. The smooth coneflower is adapted to full sun environments with good drainage and high levels of calcium and magnesium (VDCR, 2019). The principal threat to the smooth coneflower is habitat loss and the presence of invasive competitors.

The Atlantic pigtoe (*Fusconaia masoni*) is a freshwater mussel that is classified as proposed threatened by the USFWS, threatened in Virginia, and endangered within North Carolina. Historically, this species ranged from the James and Chowan River basins in Virginia and the Roanoke, Tar, Neuse, Cape Fear, Pee Dee, and Catawba River basins in North Carolina. The species has been known to occur in the counties of Henry and Rockingham. The preferred habitat of the Atlantic pigtoe consists of coarse sand and gravel. Previously, the best populations were found in creeks and rivers with excellent water quality and silt-free substrates. Threats to this species include water quality issues caused by pollution and sedimentation as well as damming (USFWS, 2019).

The green floater (*Lasmigona subviridis*) is a freshwater mussel that is considered threatened within Virginia and is under consideration by the USFWS for classification as an endangered species. Historically the green floater was found throughout many of the Eastern United States' major river systems, including the Hudson, Susquehanna, and Potomac. The current populations, however, are much less widespread. The green floater usually occurs in streams and small rivers with low to medium gradients and slow pools (PDCNR, 2019). The principal threats to the green floater are habitat loss, water quality degradation (*e.g.*, increased turbidity and sewage discharge), the presence of invasive bivalves like the Asian clam (*Corbicula fluminea*), and agricultural runoff.

Table 2-11: Threatened and Endangered Species within the ICE Natural Resources Study Area

Species (Scientific Name)	Species (Common Name)	Status	Database			
			IPAC	VaFWIS (2 Mile Buffer)	VDCR-DNH	NCNHP
Echinacea laevigata	Smooth Coneflower	FE, ST (VA), SE (NC)	X			
Fusconaia masoni	Atlantic Pigtoe	FPE, ST (VA), SE (NC)	X			
Lasmigona subviridis	Green Floater	ST (VA), ST (NC)		X		X
Laterallus j jamaicensis	Eastern Black Rail	FPT				
Moxostoma ariommum	Bigeye Jumprock	ST (NC)				X
Myotis lucifugus	Little Brown Bat	SE (VA)		X		
Myotis septentionalis	Northern Long-eared Bat	FT, ST (VA), ST (NC)	X			
Noturus gilberti	Orangefin Madtom	ST (VA), SE (NC)		X		
Percina rex	Roanoke Logperch	FE, SE (VA), SE (NC)	X	X		X
Pleurobema collina	James Spinymussel	FE, SE (VA), SE (NC)	X			
Polemonium reptans var. reptans	Jacob's Ladder	ST (NC)				X
Tradescantia virginiana	Virginia Spiderwort	ST (NC)				X

FE = Federally Endangered; FT = Federally Threatened; FPE = Federally Proposed Endangered; FPT = Federally Proposed Threatened; SE = State Endangered; ST = State Threatened; VA = Virginia; NC = North Carolina

The eastern black rail (*Laterallus jamaicensis)* is a marsh bird that is classified as federally proposed threatened. Its historical range within the United States extended from Massachusetts down to Florida and west to states such as Colorado, Arkansas, New Mexico, and Wisconsin. Currently, the total number of recent occurrences is lower than historic averages. While most of the eastern half of the United States is considered potential habitat, many of the sites the black rail historically occupied now appear to be vacated. Suitable habitat includes marshes both tidally and non-tidally influenced, shrubby wetlands, wet sedge meadows, and other emergent-dominated wetlands. Threats to this species include alteration of plant communities by invasive species, human modifications, and sea-level rise as well as habitat fragmentation and fire suppression (USFWS, 2019).

The bigeye jumprock (*Moxostoma ariommum*) is a species of ray-finned fish classified as threatened in North Carolina. This species of fish is found only in the upper Roanoke River drainage in Virginia and North Carolina. The fish typically congregate in deep rock runs and heads of pools, usually among large rubble, boulders, and outcrops. The decline in wetlands combined with the quality of the habitat has led to the continuing decline of this species (NatureServe Explorer, 2019a).

The little brown bat (*Myotis lucifugus*) is a small to medium size bat that is listed as endangered in Virginia. Its historical range encompassed much of North America. However, this species is currently considered to be vulnerable or imperiled in many parts of its original distribution. In the winter, little brown bats roost in caves, mines, and abandoned tunnels. During the warmer months, the species will often use hollow trees and building attics for maternity roosts. Foraging habitat typically includes stream valleys and the margins of lakes and ponds adjacent to woodlands. Threats to the species include white-nose syndrome, a fungal disease which disrupts the bats' hibernation process and often leads to starvation, as well as collision with wind turbines and loss of suitable maternity roosts (NatureServe Explorer, 2019a).

The northern long-eared bat (*Myotis septentrionalis*) is a cave bat that is classified as threatened by both the USFWS and Virginia. The northern long-eared bat's historic range includes most of the Eastern United States. In the summer, northern long-eared bats can be found roosting in the cavities of living and dead trees. In the winter months, they hibernate in caves and mines. The decline in the northern long-eared bat populations is largely tied to the spread of white-nose syndrome (USFWS, 2015).

The orangefin madtom (*Noturus gilberti*) is a freshwater catfish that is considered threatened by Virginia and is under review by the USFWS. The orange madtom's native range is restricted to the Upper Roanoke Basin in Virginia and North Carolina. The species preferred habitat are large creeks with low amounts of sediment with moderate gradient. The madtom's prey are mostly the macro-invertebrates that occupy the same forested creeks (NatureServe Explorer, 2019a).

The Roanoke logperch (*Percina rex*) is a freshwater fish that is considered endangered by USFWS and Virginia. The species is believed to be restricted to portions of the Chowan and Roanoke River basins. Within the Dan River Basin, the Roanoke logperch is known to occupy the Smith River and Town Creek (USGS 2012). Its preferred habitat are medium-to-large warm streams with clear water and low gradient. Their preferred prey are aquatic macro-invertebrates. Some of the primary threats to the Roanoke logperch include agricultural runoff, the construction of dams and reservoirs, and watershed urbanization (USFWS, 2019).

The James spinymussel (*Pleurobema collina*) is a freshwater mussel that is classified as endangered by the USFWS and Virginia. The species' range includes the Upper James and Dan River Basins. The species preferred habitat includes free-flowing streams with a variety of flow regimes and low levels of silt. The principal threats to the James spinymussel are habitat loss, degradation (*e.g.*, increased turbidity and sewage discharge), the presence of invasive bivalves (*e.g.*, the Asiatic clam, *Corbicula fluminea*), and agricultural runoff (USFWS, 2019).

Jacob's Ladder (*Polemonium reptans var. reptans)* is a perennial wildflower classified as threatened in North Carolina. The loose flower clusters arise on separate stalks which are slender and somewhat weak. The flowers are typically cultivated in gardens. The flower prefers humus-rich soil and is classified as special value to bumble bees (Lady Bird Johnson Wildflower Center, 2019).

The Virginia spiderwort (*Tradescantia virginiana)* is a large but dainty perennial wildflower classified as threatened in North Carolina. The flowers open in the morning then close by mid-day, lasting only one day. The flower prefers humus-rich soil and is classified as special value to bumble bees (Lady Bird Johnson Wildflower Center, 2019).

2.3.3 Historic Resources

The NHPA [16 USC §470] defines a historic property as any "*prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP), including artifacts, records, and material remains related to such a property or*

resource." For the purposes of this analysis, historic properties are defined as archeological sites and architectural resources eligible for listing or listed in the NRHP.

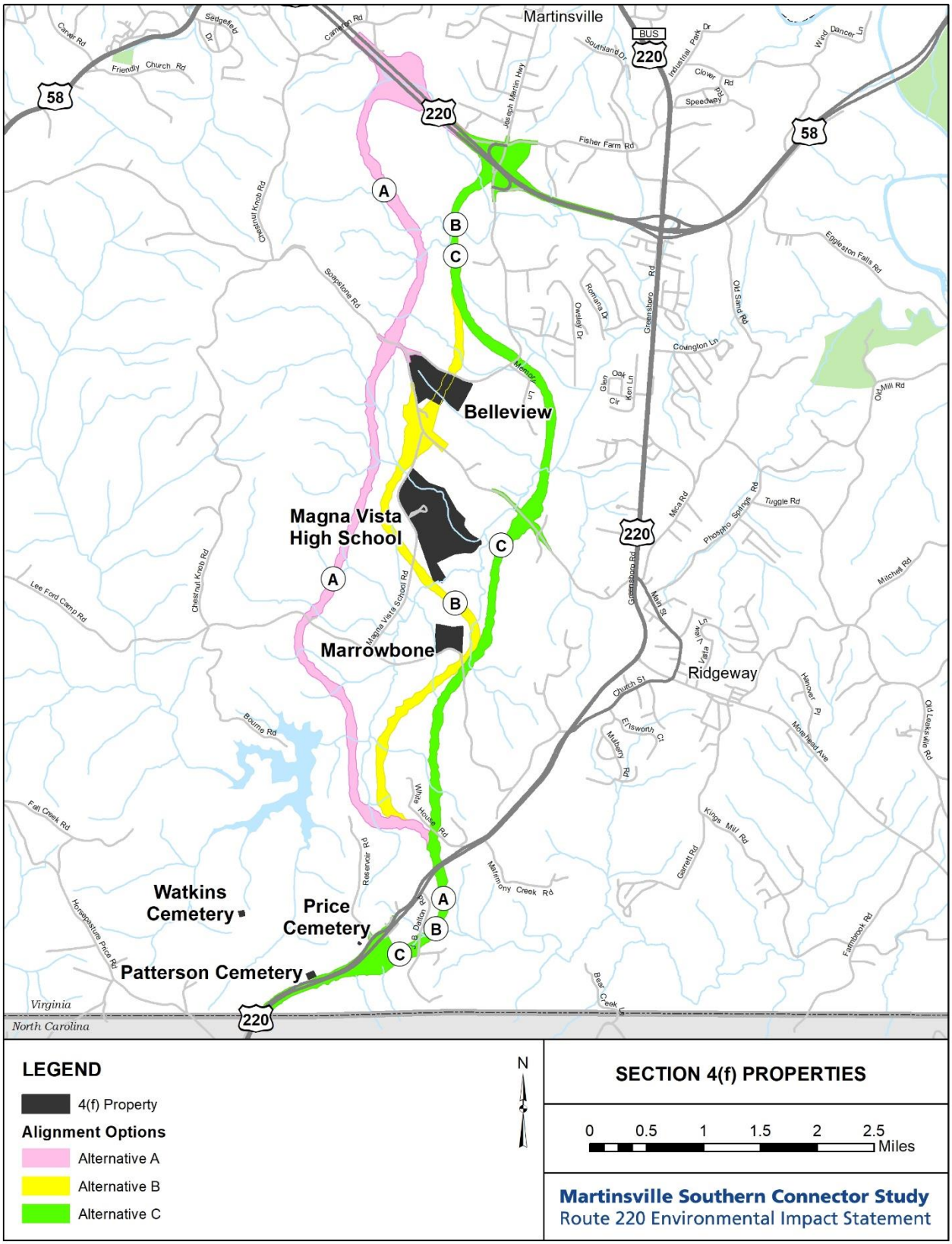
The results of field surveys and archival research undertaken for the purposes of identifying architectural historic properties within the direct and indirect effects APE for the three alternatives can be found in the **Architectural History Survey** (VDOT, 2020i). These results are preliminary and have not yet been coordinated with the State Historic Preservation Officer (SHPO). There are five architectural resources within the APE associated with the three alternatives either already listed on the NRHP or eligible for listing on the NRHP (see **Figure 2-12**). **Table 2-12** lists the five architectural historic properties identified to date and notes whether they are contained within the direct or indirect effects APE for each of the three build alternatives.

Table 2-12. Resources Listed in, Eligible for, or Recommended Eligible for Listing on the NRHP

VDHR Number	Resource	Property Address	Eligibility Recommendations	Alternative APE
044-0002	Belleview	3637 Joseph Martin Highway	NRHP Listed	A, B
044-0009	Marrowbone	1826 Lee Ford Camp	NRHP Eligible	B
044-5182	Patterson Cemetery	Unassigned	NRHP Eligible	A, B, C
044-5183	Price Cemetery	Reservoir Road	NRHP Eligible	A, B, C
044-5188	Watkins Cemetery	Browns Dairy Road	NRHP Eligible	A, B, C

As allowed under the Section 106 regulations [36 CFR Part 800.4(b)(2)] when alternatives under consideration consist of corridors of large land areas, VDOT may choose to defer completion of the additional survey and evaluation efforts needed to ensure identification of all archaeological sites eligible for the NRHP that might be affected by the Martinsville Southern Connector until after the selection of a Preferred Build Alternative. From the information contained in the report, **Phase I A Archaeological Survey** (VDOT, 2020h), that describes the archaeological sites presently known to be located within the Martinsville Southern Connector direct effects APE and assesses the potential of the APE to contain additional sites, VDOT has concluded that, in relation to their historic significance, any archaeological historic properties that might be affected by the Martinsville Southern Connector would meet the regulatory exception to the requirements of Section 4(f) approval: the sites would likely be important chiefly for the information they contain, which can be retrieved through date recovery, and would have minimal value for preservation in place [23 CFR 774.13(b)(1)]. These recommendations have not yet been coordinated with the SHPO.

Figure 2-12. Resources Listed in, Eligible for, or Recommended Eligible for Listing on the NRHP



2.4 STEP 4: IDENTIFY IMPACT-CAUSING ACTIVITIES OF THE BUILD ALTERNATIVES

The objective of this step is to identify direct impacts that could have indirect effects that may conflict with the regional directions and goals discussed in **Step 2** and/or impact the resources identified in **Step 3**. The NCHRP Report 466 includes groups of actions associated with transportation projects that are known to trigger indirect effects (TRB, 2002). Some examples of these impact-causing activities include alteration of drainage, channelization, noise and vibration, cut and fill, barriers, excavation, erosion and sediment control, landscaping, and alteration of travel time/cost. The estimated direct impacts due to impact-causing activities are summarized in **Table 2-13**. Comparing impact-causing activities to regional directions and goals and the resources in the ICE Study Areas enables the identification of resources that could be indirectly affected. The findings of this identification process are presented in **Step 5**.

Table 2-13: Direct Impacts of the Alternatives

Category	Element/Resource Assessed	Alternatives Retained for Detailed Evaluation		
		A	B	C (Preferred Alt.)
Relocations and Property Acquisitions	Residential Properties Impacted (no.)	50	119	**121**
	Residential Acres Impacted (ac.)	64	82	**85**
	Residential Relocations (no.)	17	26	**25**
	Industrial Properties Impacted (no.)	3	6	**6**
	Industrial Acres Impacted (ac.)	2	48	**48**
	Industrial Relocations (no.)	0	4	**3**
	Commercial Properties Impacted (no.)	0	0	**0**
	Other Potential Relocations (no.)†	1	1	**1**
Land Use	Conversion of Land (ac.)	574	584	**541**
	Prime Farmland and Farmland of Statewide Importance Converted (ac.)	264	346	**298**
Socioeconomics	Community Facilities Affected (no.)	1	3	**3**
	Relocations within Minority Census Block Groups (no.)	3	9	**9**
	Low Income Census Block Groups (no.)	0	0	**0**
Historic Properties	Resources Listed, Eligible, or Recommended Eligible‡ (no.)	4	5	**3**
Natural Resources	Streams (linear feet)	28,998	20,548	**21,882**
	Floodplain (ac.)	7.0	13.7	**7.5**
	Wetlands (ac.)	7.8	5.9	**3.7**
	Forest Clearing (ac.)	318	261	**224**
Air Quality	Violations of National Ambient Air Quality Standards (no.)	0	0	**0**
Noise	Existing (2018) Noise Receptors Affected (no.)	9	17	**11**
	Design Year (2040) Noise Receptors Affected (no.)	17	36	**26**
	Barrier Found Reasonable and Feasible (no.)	0	0	**0**
Hazardous Materials	Sites of Recognized Environmental Concern (no.)	5	8	**8**
Visual Quality	Viewsheds Impacted (no.)	30	100	**100**

Note: Shaded column denotes Preferred Alternative.
† Includes: Institutional and Cemeteries
‡ Number of Properties on or eligible for the National Register of Historic Places (NRHP)

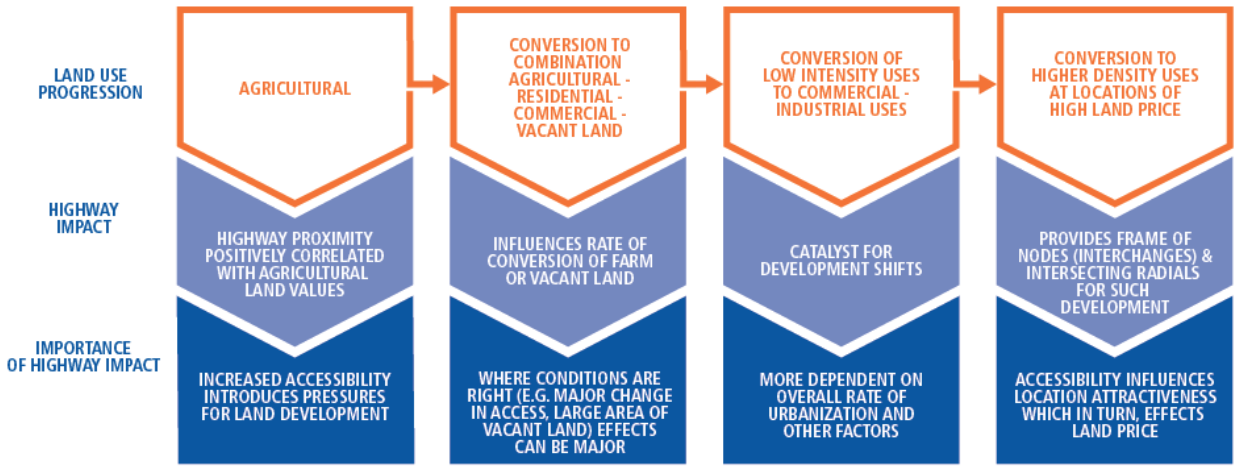
2.5 STEP 5: IDENTIFY INDIRECT EFFECTS FOR ANALYSIS

The objective of this step is to assess whether direct impacts identified above would cause indirect impacts. The indirect effects analysis focuses on the potential for socioeconomic and ecological impacts that could occur outside of the area of direct impact because of the alternatives. In NCHRP Report 466, TRB states that indirect effects can occur in three broad categories:

- Encroachment-Alteration Impacts – Alteration of the behavior and functioning of the affected environment caused by project encroachment (physical, biological, socioeconomics) on the environment;
- Induced Growth Impacts – Project-influenced development effects (land use); and,
- Impacts Related to Induced Growth – Effects related to project-influenced development effects (impacts of the change of land use on the human and natural environment).

Development of vacant land or conversion of the built environment to more intensive uses are often consequences of highway projects. NCDOT's *Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina, Vol. II: Practitioners Handbook* provides characteristics for induced growth as well as illustrates the different stages of development (see **Figure 2-13**) (NCDOT, 2001). These characteristics include existing land use conditions in the study area, increased accessibility that may result from new transportation improvements, local political and economic conditions, the availability of other infrastructure, and the rate of urbanization in the region. Induced growth impacts and the impacts to other resources related to induced growth are discussed together in the following sections.

Figure 2-13. Highway Investment on Typical Progress of Urbanization



When the term induced growth effects is used in this document, it is specifically referring to potential growth along feeder roads one mile from existing interchanges on all study corridors and a 1,000-foot buffer either side of the feeder roads along major feeder roads (as described in **Section 1.4**. As previously discussed in **Section 1.4**, the lands immediately surrounding Route 220 are dominated by residential development and some commercial development near Route 58, with development becoming less sparse to the south of Martinsville. Much of the land to the south of Martinsville has experienced either low density development or is currently undeveloped. Using these limits to identify the location of potential induced development and associated indirect effects is an attempt to identify where those indirect effects are most probable and could occur

because of the Build Alternatives. It does not mean that indirect effects from the Build Alternative would not occur elsewhere; rather it means that those effects are less reasonably foreseeable.

With regard to induced growth, transportation improvements often reduce time and cost of travel, as well as provide new or improved access to properties, enhancing the attractiveness of surrounding land to developers and consumers. The Build Alternatives would involve the construction of a new access controlled roadway alignment with access-controlled interchanges. As such, all the Alternatives have the potential to stimulate new land development at their access points. Figures depicting the land use within the Induced Growth Area for each Alternative are provided in **Section 2.6**.

2.5.1 Socioeconomic Resources

Alternatives A, B, and C have the potential to directly impact land use within the ICE Socioeconomic Resources Study Area through the acquisition of right of way (permanent and temporary), relocation or consolidation of access points, the creation of new interchanges, and the introduction of traffic to new areas. Potential indirect effects to land use resulting from these activities could include changes to land value, increased development pressure, community fragmentation, changes in commuting patterns, and the introduction of highway-related nuisances (*e.g.* traffic noise). The indirect impacts to community facilities, parks, recreational facilities, and open space, and EJ populations due to these direct impacts are closely related and are described together throughout the rest of the indirect effects analysis. Indirect impacts to community facilities, parks, recreational facilities, and open space, and EJ may include changes in land value, increased development pressure, altering access to communities and associated community facilities or services, the addition of highway-related nuisances, and changes to the demand for the services the facilities provide. Since indirect effects are possible, land use will be further discussed in **Step 6** in this analysis.

2.5.2 Natural Resources

2.5.2.1 Water Resources

Alternatives A, B, and C have the potential to directly impact water quality, streams, and wetlands within the ICE Natural Resources Study Area through the placement of fill into streams and wetlands, and removal of vegetation. Potential indirect effects resulting from construction could include increased runoff from the addition of impervious surface and the consequent discharge and changes to hydrologic regime. Additionally, indirect effects could include changes in wetland vegetation composition and water temperature could increase. Since indirect effects are possible, water quality will be further discussed in **Step 6** in this analysis.

2.5.2.2 Floodplains

Alternatives A, B, and C have the potential to directly impact the floodplains found within the ICE Natural Resources Study Area through the placement of fill into floodplains and clearing of vegetation. Potential indirect effects resulting from construction include alteration of drainage patterns and flood flows. Since indirect effects are possible, floodplains will be further discussed in **Step 6** in this analysis.

2.5.2.3 Wildlife Habitat

Alternatives A, B, and C have the potential to directly impact the wildlife habitat found within the ICE Natural Resources Study Area through the placement of fill and removal of vegetation. Potential indirect effects resulting from construction could include changes in regime (e.g., light, hydrology), changes in vegetative composition, increased pollution, increased road noise, and

introduction of invasive species on construction equipment. Since indirect effects are possible, wildlife habitat will be further discussed in **Step 6** in this analysis.

2.5.2.4 Threatened and Endangered Species

Alternatives A, B, and C are not anticipated to directly impact threatened or endangered species. However, construction of Build Alternatives A, B, or C could indirectly impact threatened or endangered species by altering landscape habitat. Such alterations include increased road noise, increased pollution, changes in vegetative composition, and alteration of animal foraging behavior. Since indirect effects are possible, threatened and endangered species will be further discussed in **Step 6** in this analysis.

2.5.3 Historic Resources

As discussed in **Section 2.2.1**, indirect effects such as altering the setting, feeling and association of archaeological and architectural historic properties are considered under Section 106 of the NHPA. The types of indirect effects that will be assessed for the ICE analysis would be changes to accessibility or visitation during or after construction. Since historic properties have been identified within the direct and indirect APEs for Alternatives A, B, and C, changes to accessibility or visitation during or after construction is possible. Since indirect effects are possible, historic resources will be discussed further in **Step 6** in this analysis.

2.6 STEP 6: ANALYZE INDIRECT EFFECTS

Using planning judgment, this step analyzes indirect and induced growth effects potentially resulting from each alternative. Each of the effects identified are considered either beneficial or adverse depending on whether they enhance or degrade the condition of the resource. In addition, effects can also be defined as either short or long-term. Short-term indirect effects are associated with actions which temporarily alter the function or characteristics of a resource. Long-term indirect effects are associated with action that have the potential to permanently alter the function or characteristics of a resource. The likelihood that long-term indirect effects would themselves become permanent conditions is strongly influenced by how the affected resources respond. For example, the abundance of forested areas within the ICE Natural Resources Study Area provides wildlife the opportunity to relocate and therefore avoid some of the potential indirect effects associated with generation of traffic noise and habitat conversion.

In some cases, effects are also classified as being minor. In the context of this analysis, a minor indirect effect is one that could locally enhance or degrade the condition of a resource but is not expected to have any measurable influence on the condition of the larger resource network or undermine the long-term stability of the resource. For example, indirect effects generated by the construction of a bridge over a 100-year floodplain would be considered minor as long as the bridge was designed to avoid obstructing the movement of floodwaters downstream.

2.6.1 No-Build Alternative

2.6.1.1 Encroachment Effects to Socioeconomic Resources

With continued use of existing Route 220 as the area's primary road for regional and freight traffic, additional truck and passenger car volumes are expected to occur. This increase in volume would adversely impact the ability of residents and commuters to access local businesses. Route 220 would continue to represent a physical barrier between the communities and community facilities due to the associated high percentage of truck traffic. As traffic volumes increase in the future, crossing Route 220 would become increasingly difficult and dangerous, continuing the community fragmentation of residences located on either side of the roadway. Additionally, the increased traffic volume would emphasize the fragmentation and further contribute to traffic delays. These

conditions would also continue to inhibit the movement of emergency vehicles traveling along Route 220. Since travel delay along the corridor would likely increase, access by residents to community facilities, such as Drewry Mason Elementary School, would be adversely impacted, also impacting minority and low income families that use these community facilities. However, since the operational repercussions of the No-Build Alternative are not localized, the No-Build Alternative would not result in disproportionate and adverse impacts to EJ populations.

The increase in truck and passenger vehicles on Route 220 could contribute to safety concerns to adjacent communities. Additional proximity impacts, such as traffic noise, are also expected as a result of the increased traffic along the existing roadway network. Refer to the ***Traffic and Transportation Technical Report*** (VDOT, 2020a), as well as the Purpose and Need chapter of the Draft EIS, for a more detailed discussion of traffic conditions within the ICE Socioeconomic Resources Study Area.

2.6.1.2 Encroachment Effects to Natural Resources

Water Resources

With continued use of Route 220 as the area's primary road for regional and freight traffic, pollutants associated with automotive travel would continue to enter nearby water bodies via surface runoff. These pollutants include vehicle exhaust, brake pad materials, fuel and oil spills/drippings, and hydraulic or other fluids. Many of the listed pollutants contain copper and nitrogen, which can impair water quality. In the absence of modern stormwater management system improvements that would be associated with construction of one of the Build Alternatives, existing indirect effects associated with untreated or poorly treated stormwater runoff would continue. Degradation of water resources adjacent to the roadway would continue additional truck and passenger car volumes are expected to occur. Existing development within the watersheds would continue to contribute to surface water impairments; however, no new impacts to natural resources are expected.

Floodplains

Under the No-Build Alternative, existing and planned developments would be anticipated to impact floodplains.

Wildlife Habitat

Under the No-Build Alternative, existing and planned developments would be anticipated to degrade wildlife habitat.

Threatened and Endangered Species

The No-Build Alternative is not anticipated to have any indirect effect on threatened and endangered species within the ICE Natural Resources Study Area.

2.6.1.3 Encroachment Effects to Historic Resources

As with socioeconomic resources, the increase in truck and passenger car volumes would adversely impact the ability of visitors to access the two historic properties located along Route 220. Additionally, proximity effects, such as increased traffic noise, could continue to affect historic properties along the existing roadway.

2.6.1.4 Induced Growth Effects

No induced growth is expected under the No-Build Alternative, as no new interchanges or access points would be constructed. While much of the area along Route 220 is already developed, planned and/or approved for development (such as the Commonwealth Crossing Business Centre), or is zoned to allow development, the increase in truck and passenger car volumes along Route 220, with no associated improvements, could affect the desirability of developing in this area. The increase in traffic volumes on Route 220 could reduce desirability for local residents through increased delays; however, the slower speeds of increased traffic could attract more customers to the local businesses. For more information, see the *County of Henry Comprehensive Plan 1995-2010* (Henry County, 1995).

2.6.2 Alternative A

2.6.2.1 Encroachment Effects on Socioeconomic Resources

The potential relocation of 17 residence, (three of which are in EJ block groups) and potential acquisition of 574 acres of right of way would result in properties that were previously not near a major roadway, now being immediately adjacent to the new alignment. Some of these adjacent property owners may choose to leave even though their property is not directly impacted by the alternative. These secondary relocations could indirectly degrade long-term community cohesion. This indirect effect would affect both EJ and non-EJ communities. Alternatively, replacement uses, such as commercial or industrial development, could occur in the new front row of properties, especially near the existing and evaluated interchanges. Additionally, the introduction of new access points and a new roadway could improve travel times for residents located near the new roadway, possibly making those areas more desirable in the long-term.

The construction of Alternative A would redirect regional traffic away from business located on existing Route 220 between Soapstone Road and Route 58. While this may have some adverse impact to local business, traffic modeling indicates that the majority of regional trips that travel through the length of the corridor do not stop. Therefore, redirecting regional traffic away from Route 220 would have limited adverse effect on local business. Alternatively, reduction of traffic, including trucks, could make the businesses along Route 220 more accessible and desirable to current and potential residents. Studies on the impact of bypasses on rural towns and communities, where a road or highway avoids a built-up area or town to let regional through traffic flow without local traffic interference, support the potential for such effects; however, these studies also indicate that the changes caused by bypasses in the rural environment are minimal (Rogers, Marshment, 2000; TRB, 2014).

During the consideration of possible indirect effects, it is important to note that this study does not address how existing Route 220 would be managed in the future. Decisions on how the road would be signed (business route or local road), the type of information that would be provided to drivers (information on businesses along the route), and the type of geometric changes that may be implemented along the existing corridor would have a great influence on how the potential indirect effects were realized.

2.6.2.2 Encroachment Effects on Natural Resources

Water Resources

Construction of Alternative A would require the clearing of approximately 325 acres of forests. This change in land cover would decrease the capacity of the affected watershed to sequester heavy rainfall through evapotranspiration. While the areas converted to roadway would remain unvegetated long-term, vegetation removal and amount of denuded ground surfaces are likely to be highest during construction.

Construction activities such as the use of heavy equipment and staging of materials may also contribute to increased soil compaction. Compacted soils have reduced rates of rainfall infiltration, thus contributing to increased surface runoff. Increased runoff from land-clearing and ground disturbance associated with construction has the potential to introduce additional sediment and nutrients into downstream waters. These added sediments and nutrients can affect the physical and chemical properties of receiving waters. For example, increased sediment loads can reduce water clarity, storage capacity, and quality of habitat in streams, ponds, and wetlands. Increased nutrient loads may lead to eutrophication (excessive richness of nutrients) in water bodies, which can result in low oxygen levels and the proliferation of harmful algae and bacteria. These effects related to construction are expected to be short-term, and proper use of stormwater management and erosion and sediment control measures can reduce the severity of these impacts.

Thermal pollution is also a potential indirect effect on water quality. The removal of 318 acres of forest could lead to more direct exposure of approximately 70 stream reach impacts, associated with Alternative A, to solar radiation. Additionally, common roadway materials absorb heat which can then be transferred to surface runoff flowing across the roadway. An increase in ambient water temperature or pollutants can impair valuable ecological functions by harming aquatic organisms as well as contribute to eutrophication.

Should the construction of the new roadway alignment require streams to be relocated, straightened, piped through culverts, or lined, the change in slope, number and extent of curves, and hydraulic roughness (frictional resistance) could affect the velocity of the water through, and downstream of, the directly-impacted sections. Stormwater drainage channels associated with construction and maintenance of the roadway would likely drain into existing streams. Due to high flow velocities often observed through pipes or within hardened channels, there is an increased risk of bed and bank erosion often present at, and/or downstream of, these drainage connections. Other indirect effects of adding hard structures along the stream channels can also include the limitation of the stream's natural ability to move laterally in response to changes within the watershed.

As discussed previously, the permanent removal of vegetation, compaction of soils, and addition of impervious surfaces within the watershed all increase stormwater runoff (VDEQ, 2019b). This runoff often drains into streams and rapidly increases the peak velocity and volume of flow within the channel, commonly referred to as flashiness. Greater velocities are likely to increase erosion along the stream bed and/or banks (VDEQ, 2019b). Erosion or downcutting along the stream bed, known as degradation, can cause a stream to become disconnected from its floodplain. The inability for the stream to access its floodplain often leads to an increased rate of stream bank erosion, which can impact valuable infrastructure. The clearing of trees and other vegetation in riparian buffers can worsen this risk, as roots provide structural stability to the banks, and above-ground growth provides surface roughness to reduce flow velocities. Stream channels that become deeply incised can also lower the surrounding water table, draining adjacent wetlands and altering the nearby vegetative composition (Rosgen, 1997.

Increased loads of runoff, nutrients, sediment, and chemical pollutants can have long-term effects on the physical, chemical, and biological processes in wetlands. Many wetland plants and animals are adapted to specific hydrologic conditions and could be extirpated if those conditions are altered severely. Alternative A would have the potential to generate additional indirect effects to the wetland areas in proximity to the new alignment through habitat conversion. In this case, habitat conversion refers to changes in the composition of a wetland's plant community that could occur because of changes in the availability of light. In areas where canopy cover would be removed, the increase in light would reduce the competitiveness of woody wetland species that are adapted to shady conditions and support the colonization of the site by more sun-tolerant species. In some cases, the new plant community may be comprised of native species. However,

the rapid alteration of environmental conditions brought on by deforestation can facilitate the introduction and expansion of invasive species. An increased presence of invasive species would in turn indirectly affect wetlands by disrupting the ecological process associated with specific native plant species. This change in the biological community, combined with an increased presence of road-sourced water pollutants, could cause wetlands outside of the illustrative planning level Limits of Disturbance (LOD) for Alternative A's to fail or be negatively altered.

The severity of adverse indirect effects generated by Alternative A on streams, wetlands, and overall water quality can be reduced and/or neutralized through the construction of stormwater management facilities and any mitigation measures determined to be warranted through the regulatory permitting process. In the southern section of Alternative A (from the Virginia-North Carolina state line to Reservoir Road), for example, the replacement of existing stormwater management facilities with facilities designed to meet more rigorous environmental requirements would reduce the severity of existing impairments caused by highway drainage. In the segment north of Reservoir Road, the construction of stormwater management, outside of aquatic habitats, would provide some of the lost sequestration capacity and therefore reduce the generation of related impairments. Mitigation measures, such as those described above, would not only help restore capacity, but would also help restore degraded natural areas. During more detailed phases of project development, the appropriate mitigation measures would be identified and designed.

Floodplains

Construction of Alternative A could potentially cause indirect effects due to the 7.0 acres of direct impact to 100-year floodplain. These indirect effects could include changing drainage patterns, water quality degradation, changes in flood flow levels, and associated effects on floral and faunal communities. Fill floodplains would also result in loss of floodplain functions. Floodplain encroachment could alter the hydrology of the floodplain that could indirectly result in more severe flooding in terms of flood height, duration, and erosion (FEMA, 2016). However, the implementation of adequately sized and properly-placed culverts, bridges, and stormwater Best Management Practices (BMPs) can reduce the severity of, or eliminate, indirect impacts to floodplains by allowing the controlled release and sufficient passage of stormwater.

Wildlife Habitat

The development of Alternative A could indirectly affect the ICE Natural Resources Study Area's wildlife habitat by altering vegetative structure and species composition, expanding highway usage, and altering hydrologic regimes. Alternative A would impact approximately 489 acres of wildlife habitat. The majority of these impacts would occur in the northern section of Alternative A (Reservoir Road to Route 58) where large contiguous blocks of forests would be cleared within the maintained right of way. This would lead to the creation of more open space and edge habitats. The creation of additional edge habitats could indirectly affect the ICE Natural Resources Study Area's forests by creating opportunities for invasive plants to spread, causing habitat conversion, and fragmenting habitats.

Clearing vegetation for the maintained right of way could allow invasive plants to spread into areas that area currently occupied by native species. Many invasive species thrive in disturbed areas where vegetation has been removed and soil exposed. This could result in the expansion of existing colonies (see **Section 2.3.2**) or the creation of new colonies created through the introduction of invasive species on construction equipment and vehicles. Over time, the increased presence of these colonies of invasive plants could alter the structure and functioning of otherwise unimpacted wildlife areas. A change in the composition of plant species can affect wildlife

movement by altering food supply, shelter, or travel corridors due to plant density in the understory.

In some cases, the change in environmental conditions experienced along new forest edges is substantial enough to cause habitat conversion. In the case of forested wetlands, for example, the removal of nearby canopy trees can change light conditions enough that the wetland's shade-tolerant woody plants are replaced with herbaceous plants more adapted to direct sunlight. In the case of the animal communities, habitat conversion at the edges of woodlands can increase the abundance of species which thrive at the margin between grasslands and forests. Examples of these species include white-tailed deer, rabbits, racoons, and opossums. However, other species that are better suited for forest-interior dwelling may not be able to persist. Over time, these effects could reduce the size and diversity of wildlife communities.

Habitat fragmentation occurs when disturbance events, like the construction of a highway or the clearing of land for agriculture, break large and contiguous natural areas into isolated patches. In this case, the construction of a roadway on new alignment fragments habitat by creating new barriers and hazards to animals attempting to reach resources on the other side of the road. Habitat fragmentation can have wide-ranging adverse effects on wildlife, including:

- reduced availability of food sources;
- difficulty finding mates;
- increased pressure from outside predators;
- the creation of physical barriers to movement and seasonal migration.

Another way the expansion of highway facilities has the potential to indirectly affect the ICE Natural Resources Study Area's wildlife habitat is by increasing the intensity and prevalence of roadway noise. Roadway noise can result in altered habitat utilization, strained communication, and heightened metabolic rates on wildlife, especially avian communities, indirectly causing wildlife abandonment of the area, increased predation, reduced foraging success, decreased breeding success, and decreased wildlife health. Such indirect effects could occur where the evaluated alignment is not utilizing the existing Route 220 corridor.

In addition to the immediate loss of habitat through direct impacts, these disturbances could indirectly affect the ICE Natural Resources Study Areas' wildlife habitats by altering surface-water hydrology. Impacts to streams could indirectly affect wildlife habitats by altering the chemical and physical characteristics of water following to downstream communities. Impacts to floodplains and wetlands, as well as an increase in impervious surface coverage, could reduce the ability of affected watershed to attenuate precipitations, and therefore exacerbate stream flashiness and other habitat impairments associated with soil erosion.

The severity of habitat impacts caused by altered hydrology can be reduced by the proper use of erosion and sediment control measures and stormwater management practices. The potential fragmentation of stream habitats directly impacted by the development of Alternative A could be avoided through the use of facilities and structures which preserve stream morphology and hydrologic connectivity. For example, bridges can be used in lieu of culverts or pipes across larger streams. Bridges may also provide areas for wildlife to safely cross beneath the roadway. In smaller streams, countersunk culverts could be used to preserve the structure of the impacted streambeds and therefore provide safe passage for some forms of wildlife.

Construction activities associated with the implementation of Alternative A could potentially result in temporary indirect effects to wildlife habitat. Increased noise, human activity, and dust caused by the operation of heavy machinery, installation of access roads, and staging of building materials could temporarily fragment habitat and displace wildlife. The severity of these effects could be reduced through proper location and minimization of staging areas and construction

access roads in valuable habitats. In addition, these effects on wildlife habitat would be temporary as construction activities at any one place are short-term in nature.

Threatened and Endangered Species

Impacts to threatened and endangered species for Alternative A would be similar to the impacts to wildlife habitat discussed in the preceding section, except that the characteristics of many threatened and endangered species tend to render them less resilient when faced with habitat loss/alteration or competition from invasive species.

In October 2019, the VDGIF VaFWIS database (three-mile search radius), the VDGIF Wildlife Environmental Review Map Service (WERMS) database, the USFWS IPaC database, the VDCR-DNH online searchable database and Natural Heritage Data Explorer (NHDE), VDOT's Comprehensive Environmental Data and Reporting (CEDAR) system, the Center for Conservation Biology (CCB) Mapping Portal, and the USFWS Virginia Field Office's Bald Eagle Map Tool were queried to identify threatened and endangered species that could potentially be affected by the Build Alternatives. The ICE Natural Resources Study Area contains six species listed as endangered, threatened, proposed endangered, or proposed threatened by the USFWS and 11 species listed as endangered or threatened by Virginia and/or North Carolina (see **Table 2-11**). The potential indirect effects from Alternative A's on these species are the same as those discussed for wildlife habitat.

For aquatic species listed as threatened or endangered, such as fish and mussels, common threats to their survival include changes in water quality, water turbidity, and stream substrate material. As discussed previously, Alternative A would have the potential to increase runoff. An increase in runoff can lead to additional sediment and pollutants being carried into streams as well as increasing flow velocities, turbidity, and erosion. Any existing habitat or populations of the protected aquatic species within the ICE Natural Resources Study Area could be adversely impacted by these indirect effects.

Bat species within the ICE Natural Resources Study Area for Alternative A could be indirectly affected by the clearing of trees; increase in traffic, noise, and lights; and construction of bridges. Bat species such as the northern long-eared bat and little brown bat often use trees that are hollow or have shaggy bark for roosting during part of the year (NatureServe Explorer, 2019b). Increased noise and light associated with motor vehicle traffic may also dissuade bats from roosting in the areas adjacent to the roadway. However, bats will also occasionally roost beneath bridges for part of the year (NatureServe Explorer, 2019b). Construction of new bridges may provide additional roosting habitat for protected bat species.

The loggerhead shrike is a protected predatory bird species. The shrike prefers open fields and grasslands to forage (NatureServe Explorer, 2019c). Conversion of forests to open areas for roadway construction may provide suitable foraging habitat if the vegetation is not regularly maintained. Conversion of existing grasslands or open fields to roadways could potentially have adverse effects on the loggerhead shrike by reducing the area of suitable foraging habitat.

Protected plant species, such as the smooth coneflower, often require very specific conditions in order to survive. Changes in sunlight exposure, grazing pressure, vegetative competition, and soil moisture can impact the coneflower. The coneflower prefers areas with at least partial exposure to sunlight and is occasionally found along roadsides due to the break in the tree canopy (NatureServe Explorer, 2019d). Construction of a road on new alignment could potentially create or improve conditions suitable for the smooth coneflower by reducing the amount of tree cover and reducing the vegetative competition. However, it may indirectly have adverse effects to any existing habitat or populations through alteration of wildlife movement and grazing pressure, changes in surface hydrology, and invasive species colonization.

Should any improvements from the Martinsville Southern Connector Study advance to detailed design, refinements would avoid and minimize impacts to habitats associated with rare, threatened, and endangered species as well as the overall limit of disturbance.

2.6.2.3 Encroachment Effects on Historic Resources

Four architectural historic properties are located within the direct or indirect effects APE for Alternative A. During construction, access to historic properties could be temporarily impacted by temporary road closures, detours, and loss of parking, potentially affecting visitation. However, any change in access or parking would be mitigated through appropriate construction signage to allow for detours or alternative parking areas. These construction effects would be short-term and therefore minor. Based upon the direct and/or indirect effects, Alternative A would have the potential to adversely affect one historic resource and/or impact their NRHP eligibility.

2.6.2.4 Induced Growth Effects

Induced growth could occur with the implementation of Alternative A because it would introduce a new roadway, shift regional traffic, and create new access points. To estimate the potential for induced growth, land available for development (identified by NLCD as forests, grasslands, and pastures) was identified (see **Figure 2-14**). The zoning designation was then identified for each mapped parcel. The total acres available for development within each zoned land use are summarized in **Table 2-14**.

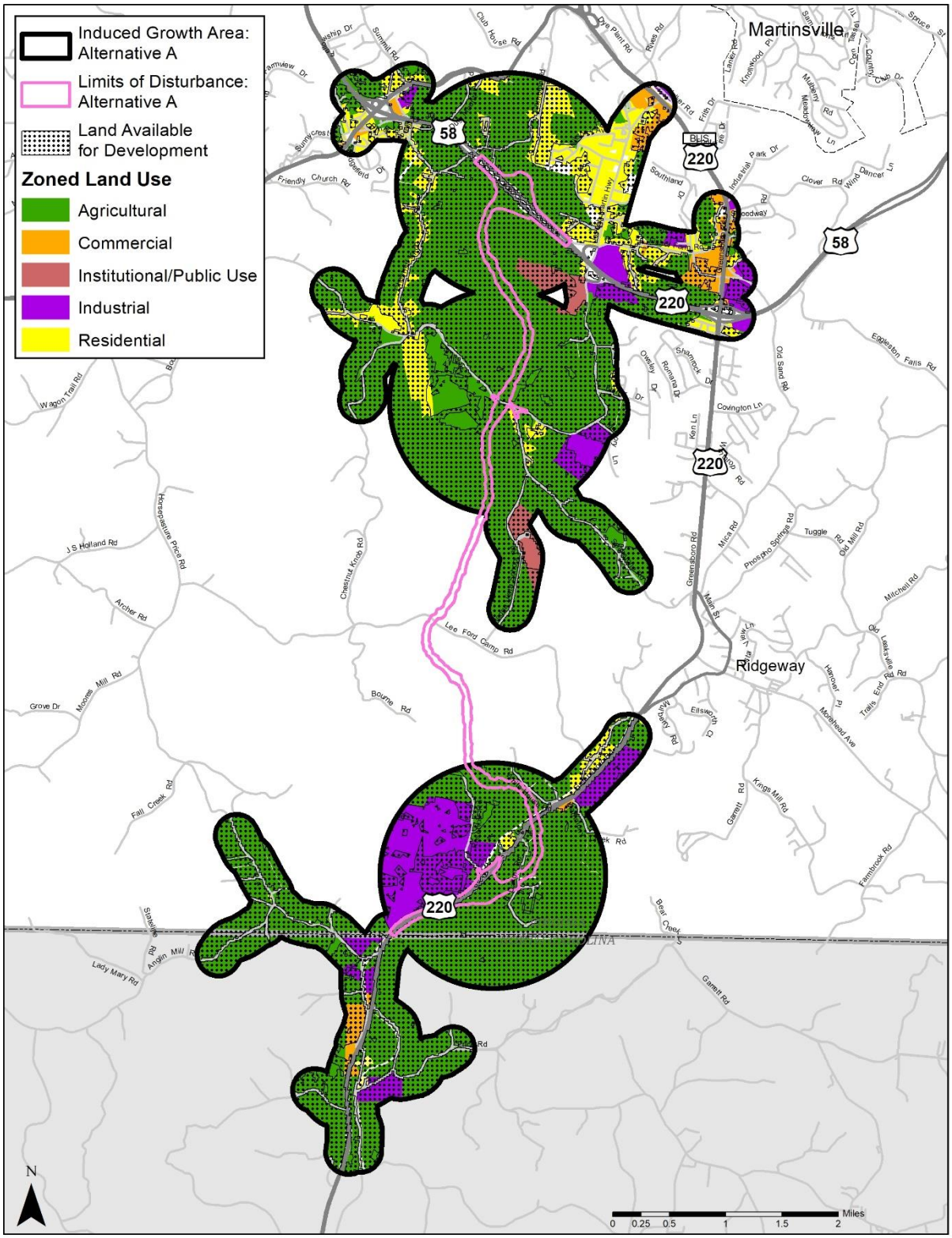
Table 2-14: Zoned Land Use in Land Available for Development within Induced Growth Area

Zoned Land Use	Land Available for Development within Induced Growth Area					
	Alt. A		Alt. B		Alt. C (Preferred)	
	Acres	%	Acres	%	Acres	%
Agricultural	6,550	84%	6,130	82%	5,723	79%
Commercial	115	1%	191	3%	258	4%
Institutional/Public Use	110	1%	177	2%	190	3%
Industrial	460	6%	520	7%	494	7%
Residential	554	7%	435	6%	554	8%
Total Land Available for Development within the Induced Growth Area for Each Alternative	**7,789**		**7,453**		**7,218**	

Note: Shaded columns denote Preferred Alternative.

Based on this methodology, approximately 7,800 acres are available for development within the induced growth area. Approximately 84 percent (6,550 acres) are zoned for agricultural, one percent (115 acres) are zoned for commercial, one percent (110 acres) are zoned for institutional/public use, six percent (460 acres) are zoned for industrial, and seven percent (554 acres) are zoned for residential land use. The potential for development would be greatest in areas proximate to other developed areas, especially for those areas that already have utilities available. The extent, intensity, and character of the new development is unclear at this time; many factors that operate beyond the scope of this study (*e.g.* local development policies and incentives, favorable economic conditions, and ease of financing) would influence development outcomes. However, considering the existing land cover, it is reasonable to conclude that any induced growth that does occur would likely involve the clearing of land rather than infill or redevelopment. Additionally, since limited growth has occurred over the last ten to 20 years, rapid growth in the area is not anticipated. Should new development occur, the tax base would increase and would serve as funding for the increased demand on existing community facilities.

Figure 2-14. Alternative A Induced Growth Area – Zoned Land Use



Although approximately one-third of the Induced Growth Study Area for Alternative A is located within EJ census block groups, the effect to the existing housing stock should be minimal since 554 acres of land available for development are zoned for residential. These parcels, as well as the 6,550 acres of agricultural land, would likely be developed prior to the redevelopment of existing housing stock.

The lands within the Induced Growth Area of Alternative A are covered by two local planning documents: the *Henry County Comprehensive Plan* and the *Rockingham County Land Use Plan* (HCPC, 1995; Rockingham County, 2006). Neither of these documents identify the Martinsville Southern Connector as a future project. However, both identify the Route 220 corridor as an area where growth is expected and desired. Throughout the entirety of the LOD for Alternative A, Henry County Comprehensive Plan calls for the expansion of commercial land uses (see **Section 2.2.2.2**) (Henry County, 1995). In the Rockingham County Land Use Plan, Route 220 and the lands adjacent to it are identified as an urban transition area linking Ridgeway with Stoneville, North Carolina. The Plan defines urban transition areas as "*Lands where local government plans to accommodate moderate to high density development during the following twenty-year period and where necessary public services will likely be provided to accommodate growth and economic development*" (Rockingham County 2006). Based on these two recommendations, any induced growth caused by the development of Alternative A should be compatible with local land use priorities and projections.

Induced growth could have both beneficial and adverse effects on the ICE Socioeconomic Resources Study Area's economic resources. The potential conversion of rural lands around the evaluated interchanges could create opportunities for businesses which require ready access to the highway system and exposure to regional traffic. This development would, in turn, create employment opportunities and generally increase the local demand for labor. At the Commonwealth Crossing Business Centre, for example, the construction of the proposed Reservoir Road Interchange could make bringing heavy trucks in and out of the site safer and faster. This change could indirectly affect the ICE Socioeconomic Resources Study Area's economic resources by making the Centre more attractive to potential tenants.

There is also the possibility that commercial development around the new interchanges and the rerouting of regional traffic could reduce the viability of the commercial properties located on Route 220 between Reservoir Road and Route 58 that rely on exposure to regional traffic. The severity and immediacy of this effect is constrained by the time required to construct a similar density and diversity of services along the evaluated alignment. Another mitigating factor is the preservation of the Route 220/Route 58 interchange. This interchange would still provide the existing businesses easy access to the highway system and the regional traffic. Additionally, the reduction of traffic, including trucks, could make the businesses along Route 220 more accessible and desirable to current and potential residents. Studies on the impact of bypasses, where a road or highway avoids a built-up area or town to let regional through traffic flow without local traffic interference, on rural towns and communities support the potential for such effects (Rogers, Marshment, 2000; TRB, 2014).

Water quality in the ICE Natural Resources Study Area has the potential to be adversely affected by any new growth induced by Alternative A. Induced growth would lead to an increase in impervious surface and the clearing of natural areas particularly around the potential interchange with Soapstone Road, since the area is in a largely rural and forested setting. These actions could indirectly degrade water quality by reducing the ability of affected watersheds to capture precipitation and altering the volume, velocity, and quality of runoff entering surface-water bodies. However, meeting Federal, state, and local regulations addressing stormwater runoff and protecting water quality could reduce potential adverse impacts by reducing the volume of runoff to reduce pollutant loads, treating runoff to reduce pollutant concentration and loads, or a

combination of both. Modern temporary and permanent stormwater management measures, including stormwater management ponds, sediment basins, vegetative controls, and other measures could be implemented to minimize potential degradation of water quality due to increased impervious surface, drainage alternation, and soil disturbance. In the southern portion of Alternative A, new development could have a beneficial effect on water quality by prompting the replacement of outdated or obsolete drainage infrastructure. Induced growth associated with Alternative A also would have the potential to adversely affect nearby streams, wetlands, floodplains, and wildlife. Since it is unclear how, when, and/or why land would be developed, it is not possible to quantify the scale of either class of effects at this time. However, regardless of their size, extent, or use, any developments which impact surface-water resources would be required to comply with existing Federal and state regulatory controls. Similarly, any Federal or state-sponsored development would be regulated to minimize potential impacts to protected wildlife and wildlife habitat. Potential impacts to Federally protected species on private property are also regulated as previously described. Potential modifications to wetlands, streams, and floodplains that may occur because of induced growth would be minimized by Federal and state regulations governing construction impacts to Waters of the US. These regulations require avoidance, minimization, and compensatory mitigation.

New construction associated with induced growth has the potential to adversely affect archaeological and architectural historic properties. This could occur by:

- demolition, excavation, or vibration effects;
- changing the design, materials, or workmanship; and
- altering the setting, feeling and association of historic properties

Projects funded, permitted, or on lands controlled by Federal and state agencies are required to consider effects on historic properties by complying with Section 106 of the NHPA and the Virginia Antiquities Act and Burial Law, respectively. Additionally, the City of Martinsville's Architectural Review Board assures that changes to contributing structures in the historic districts are made complimentary to its historic fabric. These processes would reduce the potential adverse effects to historic properties from induced growth associated with constructing Alternative A.

2.6.3 Alternative B

2.6.3.1 Encroachment Effects on Socioeconomic Resources

The potential relocation of 26 residences (nine of which are in EJ block groups) and potential acquisition of 584 acres of right of way would result in properties that were previously not near a major roadway, now being immediately adjacent to the new alignment. Some of these adjacent property owners may choose to leave even though their property is not directly impacted by the project. These secondary relocations could indirectly degrade community cohesion in the long-term. Alternatively, replacement uses, such as commercial or industrial development, could occur in the new front row of properties, especially near the existing and potential interchanges. Additionally, the introduction of new access points and a new roadway could improve travel times for residents located near the new roadway, possibly making those areas more desirable in the long-term.

The construction of Alternative B would redirect regional traffic away from business located on existing Route 220 between Soapstone Road and Route 58. While this may have some adverse impact to local business, traffic modeling indicates that the majority of trips that travel through the length of the corridor do not stop. Therefore, redirecting regional traffic away from Route 220 would have limited adverse effect on local business. Alternatively, reduction of traffic, including trucks, could make the businesses along Route 220 more accessible and desirable to current and potential residents. Studies on the impact of bypasses, where a road or highway avoids a built-

up area or town to let regional through traffic flow without local traffic interference, on rural towns and communities support the potential for such effects; however, these studies also indicate that the changes caused by bypasses in the rural environment are minimal (Rogers, Marshment 2000; TRB, 2014).

As currently designed, Alternative B would require the relocation of four industrial properties, the two warehouses located at 1507 Joseph Martin Highway, and the Appalachian Power Company substation, and an unimproved property zoned for industrial use. The relocation of the two warehouses would decrease the supply of industrial space, which could, in turn, increase the relative value of the remaining properties and therefore incentivize the development of additional facilities.

During the consideration of possible indirect effects, it is important to note that this study does not address how existing Route 220 would be managed in the future. Decisions on how the road would be signed (business route or local road), the type of information that would be provided to drivers (information on businesses along the route), and the type of geometric changes that may be implemented along the existing corridor would have a great influence on how the potential indirect effects are realized.

2.6.3.2 Encroachment Effects on Natural Resources

Water Resources

Construction of Alternative B would require the clearing of approximately 261 acres of forests. This change in land cover would decrease the capacity of the affected watershed to sequester heavy rainfall through evapotranspiration. While the areas converted to roadway would remain unvegetated long-term, vegetation removal and amount of denuded ground surfaces are likely to be highest during construction.

Construction activities such as the use of heavy equipment and staging of materials may also contribute to increased soil compaction. Compacted soils have reduced rates of rainfall infiltration, thus contributing to increased surface runoff. Increased runoff from land-clearing and ground disturbance associated with construction has the potential to introduce additional sediment and nutrients into downstream waters. These added sediments and nutrients can affect the physical and chemical properties of receiving waters. For example, increased sediment loads can reduce water clarity, storage capacity, and quality of habitat in streams, ponds, and wetlands. Increased nutrient loads may lead to eutrophication in water bodies, which can result in low oxygen levels and the proliferation of harmful algae and bacteria. These effects related to construction are expected to be short-term, and proper use of stormwater management and erosion and sediment control measures can reduce the severity of these impacts.

Thermal pollution is also a potential indirect effect on water quality. The removal of 261 acres of forest could lead to more direct exposure of approximately 60 stream reach impacts, associated with Alternative B, to solar radiation. Additionally, common roadway materials absorb heat which can then be transferred to surface runoff flowing across the roadway. An increase in ambient water temperature or pollutants can impair valuable ecological functions by harming aquatic organisms as well as contribute to eutrophication.

Should the construction of the new roadway alignment require streams to be relocated, straightened, piped through culverts, or lined, the change in slope, number and extent of curves, and hydraulic roughness (frictional resistance) could affect the velocity of the water through, and downstream of, the directly impacted sections. Stormwater drainage channels associated with construction and maintenance of the roadway would likely drain into existing streams. Due to high flow velocities often observed through pipes or within hardened channels, there is an increased

risk of bed and bank erosion often present at, and/or downstream of, these drainage connections. Other indirect effects of adding hard structures along the stream channels can also include the limitation of the stream's natural ability to move laterally in response to changes within the watershed.

As discussed previously, the permanent removal of vegetation, compaction of soils, and addition of impervious surfaces within the watershed all increase stormwater runoff (VDEQ, 2019b). This runoff often drains into streams and rapidly increases the peak velocity and volume of flow within the channel, commonly referred to as flashiness. Greater velocities are likely to increase erosion along the stream bed and/or banks (VDEQ, 2019b). Erosion or downcutting along the stream bed, known as degradation, can cause a stream to become disconnected from its floodplain. The inability for the stream to access its floodplain often leads to an increased rate of bank erosion, which can impact valuable infrastructure. The clearing of trees and other vegetation in riparian buffers can worsen this risk, as roots provide structural stability to the banks, and above-ground growth provides surface roughness to reduce flow velocities. Stream channels that become deeply incised can also lower the surrounding water table, draining adjacent wetlands and altering the nearby vegetative composition (Rosgen, 1997).

Increased loads of runoff, nutrients, sediment, and chemical pollutants can have long-term effects on the physical, chemical, and biological processes in wetlands. Many wetland plants and animals are adapted to specific hydrologic conditions and could be extirpated if those conditions are altered severely. Alternative B would have the potential to generate additional indirect effects to the wetland areas in proximity to the new alignment through habitat conversion. In this case, habitat conversion refers to changes in the composition of a wetland's plant community that could occur because of changes in the availability of light. In areas where canopy cover would be removed, the increase in light would reduce the competitiveness of woody wetland species that are adapted to shady conditions and support the colonization of the site by more sun-tolerant species. In some cases, the new plant community may be comprised of native species. However, the rapid alteration of environmental conditions brought on by deforestation can facilitate the introduction and expansion of invasive species. An increased presence of invasive species would in turn indirectly affect wetlands by disrupting the ecological process associated with specific native plant species. This change in the biological community, combined with an increased presence of road-sourced water pollutants, could cause wetlands outside of the potential LOD for Alternative B to fail or be negatively altered.

The severity of adverse indirect effects generated by Alternative B on streams, wetlands, and overall water quality can be reduced and/or neutralized through the construction of stormwater management facilities and any mitigation measures determined to be warranted through the regulatory permitting process. In the sections of Alternative B which utilize existing Route 220, the replacement of outdated or obsolete stormwater management facilities with facilities designed to meet more rigorous environmental requirements would reduce the severity of existing impairments caused by highway drainage. Mitigation measures identified during more detailed phases of project development would not only help restore attenuation capacity, but also help restore degraded natural areas.

Floodplains

Construction of Alternative B could potentially cause indirect effects due to the 13.7 acres of direct impact to 100-year floodplain. These indirect effects could include changing drainage patterns, water quality degradation, changes in flood flow levels, and associated effects on floral and faunal communities. Fill floodplains would also result in loss of floodplain functions. Floodplain encroachment could alter the hydrology of the floodplain that could indirectly result in more severe flooding in terms of flood height, duration, and erosion (FEMA, 2016). However, adequately-sized

and properly-placed culverts, bridges, and stormwater BMPs can reduce the severity of, or eliminate, indirect impacts to floodplains by allowing the controlled release and sufficient passage of stormwater.

Wildlife Habitat

The development of Alternative B could indirectly affect the ICE Natural Resources Study Area's wildlife habitat by altering vegetative structure and species composition, expanding highway usage, and altering hydrologic regimes. Alternative B would impact approximately 473 acres of wildlife habitat. The majority of these impacts would occur in the northern section of Alternative B (Reservoir Road to Route 58) where large contiguous blocks of forests would be cleared within the maintained right of way. This would lead to the creation of more open space and edge habitats. The creation of additional edge habitats could indirectly affect the ICE Natural Resources Study Area's forests by creating opportunities for invasive plants to spread, causing habitat conversion, and fragmenting habitats.

Clearing vegetation for the maintained right of way could allow invasive plants to spread into areas that are currently occupied by native species. Many invasive species thrive in disturbed areas where vegetation has been removed and soil exposed. This could result in the expansion of existing colonies (see **Section 2.3.2**) or the creation of new colonies created through the introduction of invasive species on construction equipment and vehicles. Over time, the increased presence of these colonies of invasive plants could alter the structure and functioning of otherwise unimpacted wildlife areas. A change in the composition of plant species can affect wildlife movement by altering food supply, shelter, or travel corridors due to plant density in the understory.

In some cases, the change in environmental conditions along new forest edges is substantial enough to cause habitat conversion. In the case of forested wetlands, for example, the removal of nearby canopy trees can change light conditions enough that the wetland's shade-tolerant woody plants are replaced with herbaceous plants more adapted to direct sunlight. In the case of the animal communities, habitat conversion at the edges of woodlands can increase the abundance of species which thrive at the margin between grasslands and forests. Examples of these species include white-tailed deer, rabbits, racoons, and opossums. However, other species that are better suited for forest-interior dwelling may not be able to persist. Over time, these effects could reduce the size and diversity of wildlife communities.

Habitat fragmentation occurs when disturbance events, like the construction of a highway or the clearing of land for agriculture, break large and contiguous natural areas into isolated patches. In this case, the construction of a roadway on new alignment fragments habitat by creating new barriers and hazards to animals attempting to reach resources on the other side of the road. Habitat fragmentation can have wide-ranging adverse effects on wildlife, including:

- reduced availability of food sources;
- difficulty finding mates;
- increased pressure from outside predators; and
- the creation of physical barriers to movement and seasonal migration.

Another way the expansion of highway facilities has the potential to indirectly affect the ICE Natural Resources Study Area's wildlife habitat is by increasing the intensity and prevalence of roadway noise. Roadway noise can result in altered habitat utilization, strained communication, and heightened metabolic rates on wildlife, especially avian communities, indirectly causing wildlife abandonment of the area, increased predation, reduced foraging success, decreased breeding success, and decreased wildlife health. Such indirect effects could occur where the potential alignment is not utilizing the existing Route 220 corridor.

In addition to the immediate loss of habitat through direct impacts, these disturbances could indirectly affect the ICE Natural Resources Study Areas' wildlife habitats by altering surface-water hydrology. Impacts to streams could indirectly affect wildlife habitats by altering the chemical and physical characteristics of water flowing to downstream communities. Impacts to floodplains and wetlands, as well as an increase in impervious surface coverage could reduce the ability of the affected watershed to attenuate precipitation, and therefore exacerbate stream flashiness and other habitat impairments associated with soil erosion.

The severity of habitat impacts caused by altered hydrology can be reduced by the proper use of erosion and sediment control measures and stormwater management practices. The potential fragmentation of stream habitats directly impacted by the development of Alternative B could be avoided through the use of facilities and structures which preserve stream morphology and hydrologic connectivity. For example, bridges can be used in lieu of culverts or pipes across larger streams. Bridges may also provide areas for wildlife to safely cross beneath the roadway. In smaller streams, countersunk culverts could be used to preserve the structure of the impacted streambeds and therefore provide safe passage for some forms of wildlife.

Construction activities associated with the implementation of Alternative B could potentially result in temporary indirect effects to wildlife habitat. Increased noise, human activity, and dust caused by the operation of heavy machinery, installation of access roads, and staging of building materials could temporarily fragment habitat and displace wildlife. The severity of these effects could be reduced through proper location and minimization of staging areas and construction access roads in valuable habitats. In addition, these effects on wildlife habitat would be temporary as construction activities at any one place are short-term in nature.

Threatened and Endangered Species

Impacts to threatened and endangered species for Alternative B would be similar to the impacts to wildlife habitat discussed in the preceding section, except that the characteristics of many threatened and endangered species tend to render them less resilient when faced with habitat loss/alteration or competition from invasive species.

The ICE Natural Resources Study Area contains six species listed as endangered or threatened by the USFWS and 11 species listed as endangered or threatened by Virginia and/or North Carolina (see **Table 2-11**). The potential indirect effects of Alternative B on these species are the same as those discussed for wildlife habitat.

For aquatic species listed as threatened or endangered, such as fish and mussels, common threats to their survival include changes in water quality, water turbidity, and stream substrate material. As discussed previously, Alternative B would have the potential to increase runoff. An increase in runoff can lead to additional sediment and pollutants being carried into streams as well as increasing flow velocities, turbidity, and erosion. Any existing habitat or populations of the protected aquatic species within the ICE Natural Resources Study Area could be impacted by these indirect effects.

Bat species within the ICE Natural Resources Study Area for Alternative B could be indirectly affected by the clearing of trees; increase in traffic, noise, and lights; and construction of bridges. Bat species such as the northern long-eared bat and little brown bat often use trees that are hollow or have shaggy bark for roosting during part of the year (NatureServe Explorer, 2019b). Increased noise and light associated with motor vehicle traffic may also dissuade bats from roosting in the areas adjacent to the roadway. However, bats will also occasionally roost beneath bridges for part of the year (NatureServe Explorer, 2019b). Construction of new bridges may provide additional roosting habitat for protected bat species.

The loggerhead shrike is a protected predatory bird species. The shrike prefers open fields and grasslands to forage (NatureServe Explorer, 2019c). Conversion of forests to open areas for roadway construction may provide suitable foraging habitat if the vegetation is not regularly maintained. Conversion of existing grasslands or open fields to roadways could potentially have adverse effects on the loggerhead shrike by reducing the area of suitable foraging habitat.

Protected plant species, such as the smooth coneflower, often require very specific conditions in order to survive. Changes in sunlight exposure, grazing pressure, vegetative competition, and soil moisture can impact the coneflower. The coneflower prefers areas with at least partial exposure to sunlight and is occasionally found along roadsides due to the break in the tree canopy (NatureServe Explorer, 2019d). Construction of a road on new alignment could potentially create or improve conditions suitable for the smooth coneflower by reducing the amount of tree cover and reducing the vegetative competition. However, it may indirectly have an effect to any existing habitat or populations through alteration of wildlife movement and grazing pressure, changes in surface hydrology, and invasive species colonization.

Should any improvements from the Martinsville Southern Connector Study advance to detailed design, refinements would avoid and minimize impacts to habitats associated with rare, threatened, and endangered species as well as the overall limit of disturbance.

2.6.3.3 Encroachment Effects on Historic Resources

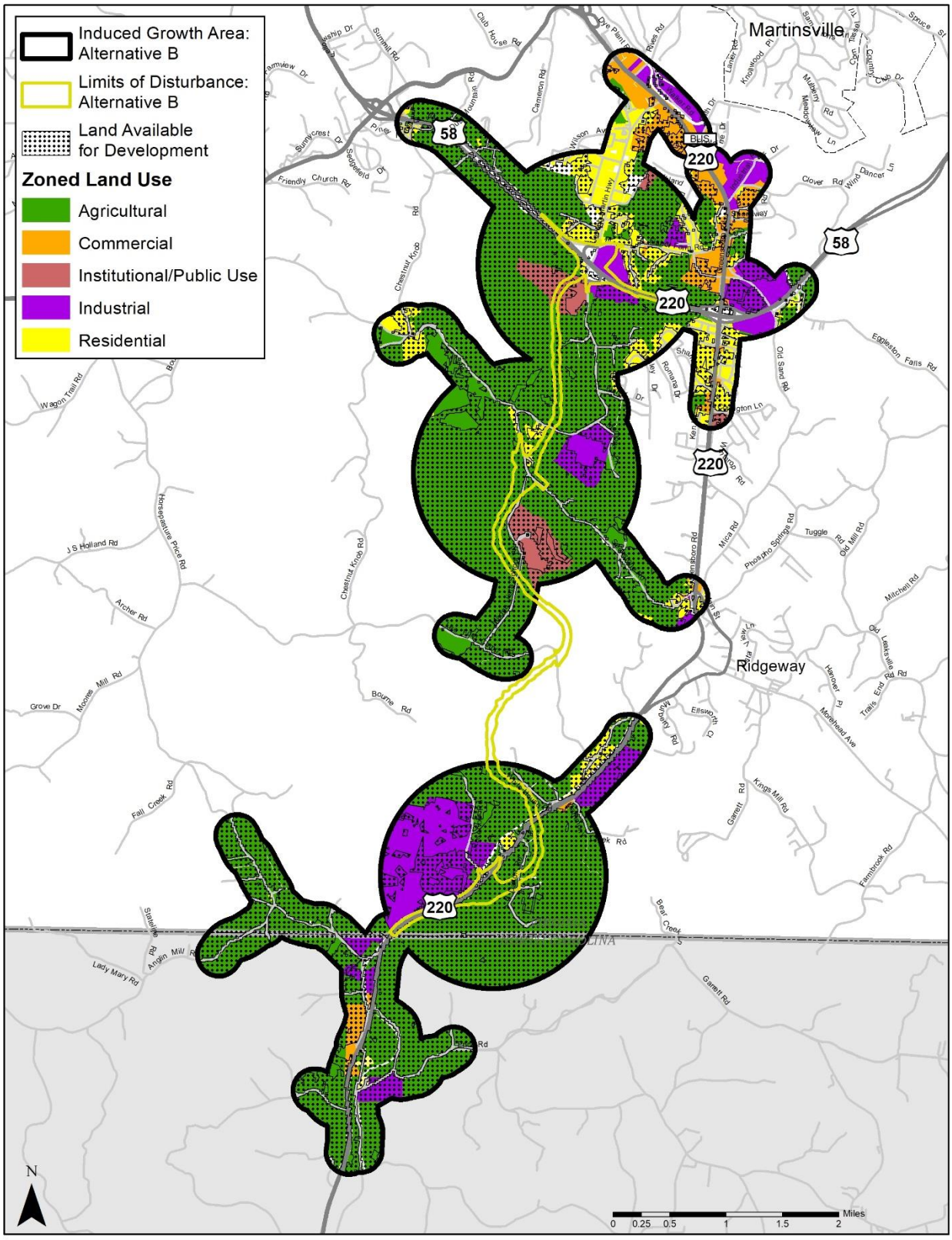
Five architectural historic properties are located within the direct or indirect effects APE for Alternative B. During construction, access to historic properties could be temporarily impacted by temporary road closures, detours, and loss of parking, potentially affecting visitation. However, any change in access or parking would be mitigated through appropriate construction signage to allow for detours or alternative parking areas. These construction effects would be short-term and therefore minor. Based upon the direct and/or indirect effects, Alternative B would have the potential to adversely affect two historic resources and/or impact their NRHP eligibility.

2.6.3.4 Induced Growth Effects

Induced growth could occur with the implementation of Alternative B because it would introduce a new roadway, shift regional traffic, and create new highway access points. To estimate the potential for induced growth, land available for development (identified by NLCD as forests, grasslands, and pastures) was identified (see **Figure 2-15**). The zoning designation was then identified for each mapped parcel. The total acres available for development within each land use zone are summarized in **Table 2-14**.

Based on this methodology, approximately 7,500 acres are available for development within the induced growth area. Approximately 82 percent (6,130 acres) are zoned for agricultural, three percent (191 acres) are zoned for commercial, two percent (177 acres) are zoned for institutional/public use, seven percent (520 acres) are zoned for industrial, and six percent (435 acres) are zoned for residential land use. The potential for development would be greatest in areas proximate to other developed areas, especially for those areas that already have utilities available. The extent, intensity, and character of the new development is unclear at this time; many factors that operate beyond the scope of this study (*e.g.* local development policies and incentives, favorable economic conditions, and ease of financing) would influence development outcomes. However, considering the existing land cover, it is reasonable to conclude that any induced growth that does occur would likely involve the clearing of land rather than infill or redevelopment.

Figure 2-15: Alternative B Induced Growth Area- Zoned Land Use



Additionally, since limited growth has occurred over the last ten to 20 years, rapid growth in the area is not anticipated. Should new development occur, the tax base would increase and would serve as funding for the increased demand on existing community facilities.

Although approximately one-quarter of the Induced Growth Study Area for Alternative B is located within EJ census block groups, the effect to the existing housing stock should be minimal since 435 acres of land available for development are zoned for residential. These parcels, as well as the 6,130 acres of agricultural land, would likely be developed prior to the redevelopment of existing housing stock.

The lands within the Induced Growth Area of Alternative B are covered by two local planning documents: the *Henry County Comprehensive Plan* and the *Rockingham County Land Use Plan* (HCPC, 1995; Rockingham County, 2006). Neither of these documents identify the Martinsville Southern Connector as a future project. However, both identify the Route 220 corridor as an area where growth is expected and desired. Throughout the entirety of the LOD for Alternative B, Henry County Comprehensive Plan calls for the expansion of commercial land uses and the implementation of a Highway Corridor Overlay (see **Section 2.2.2.2**). In the Rockingham County Land Use Plan, Route 220 and the lands adjacent to it are identified as an urban transition area linking Ridgeway with Stoneville, North Carolina. The Plan defines urban transition areas as "*Lands where local government plans to accommodate moderate to high density development during the following twenty-year period and where necessary public services will likely be provided to accommodate growth and economic development*" (Rockingham County, 2006). Based on these two recommendations, any induced growth caused by the development of Alternative B should be compatible with local land use priorities and projections.

Induced growth could have both beneficial and adverse effects on the ICE Socioeconomic Resources Study Area's economic resources. The conversion of rural lands around the potential interchanges could create opportunities for businesses which require ready access to the highway system and exposure to regional traffic. This development would, in turn, create employment opportunities and generally increase the local demand for labor. At the Commonwealth Crossing Business Centre, for example, the construction of the proposed Reservoir Road Interchange could make bringing heavy trucks in and out of the site safer and faster. This change could indirectly affect the ICE Socioeconomic Resources Study Area's economic resources by making the Centre more attractive to potential tenants.

There is also the possibility that commercial development around the new interchanges and the rerouting of regional traffic could reduce the viability of the commercial properties located on Route 220 between Reservoir Road and Route 58 that rely on exposure to regional traffic. The severity and immediacy of this effect is constrained by the time required to construct a similar density and diversity of services along the potential alignment. Another mitigating factor is the preservation of the Route 220/Route 58 interchange. This interchange would still provide the existing businesses easy access to the highway system and the regional traffic. Additionally, the reduction of traffic, including trucks, could make the businesses along Route 220 more accessible and desirable to current and potential residents.

Water quality in the ICE Natural Resources Study Area has the potential to be adversely affected by any new growth induced by Alternative B. Induced growth would lead to an increase in impervious surface and the clearing of natural areas particularly around the potential interchange with Soapstone Road, since the area is a largely rural and forested setting. These actions could indirectly degrade water quality by reducing the ability of affected watersheds to capture precipitation and altering the volume, velocity, and quality of runoff entering surface-water bodies. However, meeting Federal, state, and local regulations addressing stormwater runoff and protecting water quality could reduce potential adverse impacts by reducing the volume of runoff

to reduce pollutant loads, treating runoff to reduce pollutant concentration and loads, or a combination of both. Modern temporary and permanent stormwater management measures, including stormwater management ponds, sediment basins, vegetative controls, and other measures could be implemented to minimize potential degradation of water quality due to increased impervious surface, drainage alternation, and soil disturbance. In the southern portion of Alternative B, new development could have a beneficial effect on water quality by prompting the replacement of outdated or obsolete drainage infrastructure. Induced growth associated with Alternative B also would have the potential to adversely affect nearby streams, wetlands, floodplains, and wildlife. Since it is unclear how, when, and/or why land would be developed, it is not possible to quantify the scale of either class of effects at this time. However, regardless of their size, extent, or use, any developments which impact surface-water resources would be required to comply with existing Federal and state regulatory controls. Similarly, any Federal or state-sponsored development would be regulated to minimize potential impacts to protected wildlife and wildlife habitat. Potential impacts to Federally protected species on private property are also regulated as previously described. Potential modifications to wetlands, streams, and floodplains that may occur because of induced growth would be minimized by Federal and state regulations governing construction impacts to Waters of the US. These regulations require avoidance, minimization, and compensatory mitigation.

New construction associated with induced growth has the potential to adversely affect archaeological and architectural historic properties. This could occur by:

- demolition, excavation, or vibration effects;
- changing the design, materials, or workmanship; and
- altering the setting, feeling and association of historic properties

Projects funded, permitted, or on lands controlled by Federal and state agencies are required to consider effects on historic properties by complying with Section 106 of the NHPA and the Virginia Antiquities Act and Burial Law, respectively. Additionally, the City of Martinsville's Architectural Review Board assures that changes to contributing structures in the historic districts are made complimentary to its historic fabric. These processes would reduce the potential adverse effects to historic properties from induced growth associated with constructing Alternative B.

2.6.4 Alternative C

2.6.4.1 Encroachment Effects on Socioeconomic Resources

The relocation of 25 residences (nine of which are in EJ block groups) and potential acquisition of 541 acres of right of way would result in properties that were previously not near a major roadway, now being immediately adjacent to the new alignment. Some of these adjacent property owners may choose to leave even though their property is not directly impacted by the alternative. These secondary relocations could indirectly degrade community cohesion in the long-term. This indirect effect would affect both EJ and non-EJ communities. Alternatively, replacement uses, such as commercial or industrial development, could occur in the new front row of properties, especially near the existing and potential interchanges. Additionally, the introduction of new access points and a new roadway could improve travel times for residents located near the new roadway, possibly making those areas more desirable in the long-term.

The construction of Alternative C could redirect regional traffic away from business located on existing Route 220 between Soapstone Road and Route 58. While this may have some adverse impact to local business, traffic modeling indicates that the majority of trips that travel through the length of the corridor do not stop. Therefore, redirecting regional traffic away from Route 220 would have limited adverse effect on local business. Alternatively, reduction of traffic, including trucks, could make the businesses along Route 220 more accessible and desirable to current and

potential residents. Studies on the impact of bypasses on rural towns and communities support the potential for such effects; however, these studies also indicate that the changes caused by bypasses, where a road or highway avoids a built-up area or town to let regional through traffic flow without local traffic interference, in the rural environment are minimal (Rogers, Marshment 2000; TRB, 2014).

As currently designed, Alternative C would require the relocation of three industrial properties, the two warehouses located at 1507 Joseph Martin Highway, and the Appalachian Power Company substation. The relocation of the two warehouses would decrease the supply of industrial space, which could, in turn, increase the relative value of the remaining properties and therefore incentivize the development of additional facilities.

During the consideration of possible indirect effects, it is important to note that this study does not address how existing Route 220 would be managed in the future. Decisions on how the road would be signed (business route or local road), the type of information that would be provided to drivers (information on businesses along the route), and the type of geometric changes that may be implemented along the existing corridor would have a great influence on how the potential indirect effects are realized.

2.6.4.2 Encroachment Effects on Natural Resources

Water Quality

Construction of Alternative C would require the clearing of approximately 224 acres of forests. This change in land cover would decrease the capacity of the affected watershed to sequester heavy rainfall through evapotranspiration. While the areas converted to roadway would remain unvegetated long-term, vegetation removal and amount of denuded ground surfaces are likely to be highest during construction.

Construction activities such as the use of heavy equipment and staging of materials may also contribute to increased soil compaction. Compacted soils have reduced rates of rainfall infiltration, thus contributing to increased surface runoff. Increased runoff from land-clearing and ground disturbance associated with construction has the potential to introduce additional sediment and nutrients into downstream waters. These added sediments and nutrients can affect the physical and chemical properties of receiving waters. For example, increased sediment loads can reduce water clarity, storage capacity, and quality of habitat in streams, ponds, and wetlands. Increased nutrient loads may lead to eutrophication in water bodies, which can result in low oxygen levels and the proliferation of harmful algae and bacteria. These effects related to construction are expected to be short-term, and proper use of stormwater management and erosion and sediment control measures can reduce the severity of these impacts.

Thermal pollution is also a potential indirect effect on water quality. The removal of 224 acres of forest could lead to more direct exposure of approximately 60 stream reach impacts, associated with Alternative C, to solar radiation. Additionally, common roadway materials absorb heat which can then be transferred to surface runoff flowing across the roadway. An increase in ambient water temperature or pollutants can impair valuable ecological functions by harming aquatic organisms as well as contribute to eutrophication.

Should the construction of the new roadway alignment require streams to be relocated, straightened, piped through culverts, or lined, the change in slope, number and extent of curves, and hydraulic roughness (frictional resistance) could affect the velocity of the water through, and downstream of, the directly-impacted sections. Stormwater drainage channels associated with construction and maintenance of the roadway would likely drain into existing streams. Due to high flow velocities often observed through pipes or within hardened channels, there is an increased

risk of bed and bank erosion often present at, and/or downstream of, these drainage connections. Other indirect effects of adding hard structures along the stream channels can also include the limitation of the stream's natural ability to move laterally in response to changes within the watershed.

As discussed previously, the permanent removal of vegetation, compaction of soils, and addition of impervious surfaces within the watershed all increase stormwater runoff (VDEQ, 2019b). This runoff often drains into streams and rapidly increases the peak velocity and volume of flow within the channel, commonly referred to as flashiness. Greater velocities are likely to increase erosion along the stream bed and/or banks (VDEQ, 2019b). Erosion or downcutting along the stream bed, known as degradation, can cause a stream to become disconnected from its floodplain. The inability for the stream to access its floodplain often leads to an increased rate of bank erosion, which can impact valuable infrastructure. The clearing of trees and other vegetation in riparian buffers can worsen this risk, as roots provide structural stability to the banks, and above-ground growth provides surface roughness to reduce flow velocities. Stream channels that become deeply incised can also lower the surrounding water table, draining adjacent wetlands and altering the nearby vegetative composition (Rosgen, 1997).

Increased loads of runoff, nutrients, sediment, and chemical pollutants can have long-term effects on the physical, chemical, and biological processes in wetlands. Many wetland plants and animals are adapted to specific hydrologic conditions and could be extirpated if those conditions are altered severely. Alternative C would have the potential to generate additional indirect effects to the wetland areas in proximity to the new alignment through habitat conversion. In this case, habitat conversion refers to changes in the composition of a wetland's plant community that could occur because of changes in the availability of light. In areas where canopy cover would be removed, the increase in light would reduce the competitiveness of woody wetland species that are adapted to shady conditions and support the colonization of the site by more sun-tolerant species. In some cases, the new plant community may be comprised of native species. However, the rapid alteration of environmental conditions brought on by deforestation can facilitate the introduction and expansion of invasive species. An increased presence of invasive species would in turn indirectly affect wetlands by disrupting the ecological process associated with specific native plant species. This change in the biological community, combined with an increased presence of road-sourced water pollutants, could cause wetlands outside of the potential LOD of Alternative C to fail or be negatively altered.

The severity of adverse indirect effects generated by Alternative C on streams, wetlands, and overall water quality can be reduced and/or neutralized through the construction of stormwater management facilities and any mitigation measures determined to be warranted through the regulatory permitting process. In the southern section of Alternative C (from the Virginia-North Carolina state line to Reservoir Road), the replacement of outdated or obsolete stormwater management facilities with facilities designed to meet more rigorous environmental requirements would reduce the severity of existing impairments caused by highway drainage. Mitigation measures identified during more detailed phases of project development would not only help restore attenuation capacity, but also help restore degraded natural areas.

Floodplains

Construction of Alternative C could potentially cause indirect effects due to the 7.5 acres of direct impact to 100-year floodplain. These indirect effects could include changing drainage patterns, water quality degradation, changes in flood flow levels, and associated effects on floral and faunal communities. Fill floodplains would also result in loss of floodplain functions. Floodplain encroachment could alter the hydrology of the floodplain that could indirectly result in more severe flooding in terms of flood height, duration, and erosion (FEMA, 2016). However, adequately sized

and properly-placed culverts, bridges, and stormwater BMPs can reduce the severity of, or eliminate, indirect impacts to floodplains by allowing the controlled release and sufficient passage of stormwater.

Wildlife Habitat

The development of Alternative C could indirectly affect the ICE Natural Resources Study Area's wildlife habitat by altering vegetative structure and species composition, expanding highway usage, and altering hydrologic regimes. Alternative A would impact approximately 441 acres of wildlife habitat. The majority of these impacts to forests would occur in the northern section of Alternative C (Reservoir Road to Route 58) where large contiguous blocks of forests would be cleared within the maintained right of way. This would lead to the creation of more open space and edge habitats. The creation of additional edge habitats could indirectly affect the ICE Natural Resources Study Area's forests by creating opportunities for invasive plants to spread, causing habitat conversion, and fragmenting habitats.

Clearing vegetation for the maintained right of way could allow invasive plants to spread into areas that are currently occupied by native species. Many invasive species thrive in disturbed areas where vegetation has been removed and soil exposed. This could result in the expansion of existing colonies or the creation of new colonies created through the introduction of invasive species on construction equipment and vehicles. Over time, the increased presence of these colonies of invasive plants could alter the structure and functioning of otherwise unimpacted wildlife areas. A change in the composition of plant species can affect wildlife movement by altering food supply, shelter, or travel corridors due to plant density in the understory.

In some cases, the change in environmental conditions along new forest edges is substantial enough to cause habitat conversion. In the case of forested wetlands, for example, the removal of nearby canopy trees can change light conditions enough that the wetland's shade-tolerant woody plants are replaced with herbaceous plants more adapted to direct sunlight. In the case of the animal communities, habitat conversion at the edges of woodlands can increase the abundance of species which thrive at the margin between grasslands and forests. Examples of these species include white-tailed deer, rabbits, racoons, and opossums. However, other species that are better suited for forest-interior dwelling may not be able to persist. Over time, these effects could reduce the size and diversity of wildlife communities.

Habitat fragmentation occurs when disturbance events, like the construction of a highway or the clearing of land for agriculture, break large and contiguous natural areas into isolated patches. In this case, the construction of a roadway on new alignment fragments habitat by creating new barriers and hazards to animals attempting to reach resources on the other side of the road. Habitat fragmentation can have wide-ranging adverse effects on wildlife, including:

- reduced availability of food sources;
- difficulty finding mates;
- increased pressure from outside predators;
- the creation of physical barriers to movement and seasonal migration.

Another way the expansion of highway facilities has the potential to indirectly affect the ICE Natural Resources Study Area's wildlife habitat is by increasing the intensity and prevalence of roadway noise. Roadway noise can result in altered habitat utilization, strained communication, and heightened metabolic rates on wildlife, especially avian communities, indirectly causing wildlife abandonment of the area, increased predation, reduced foraging success, decreased breeding success, and decreased wildlife health. Such indirect effects could occur where the potential alignment is not utilizing the existing Route 220 corridor.

In addition to the immediate loss of habitat through direct impacts, these disturbances could indirectly affect the ICE Natural Resources Study Areas' wildlife habitats by altering surface-water hydrology. Impacts to streams could indirectly affect wildlife habitats by altering the chemical and physical characteristics of water flowing to downstream communities. Impacts to floodplains and wetlands, as well as an increase in impervious surface coverage could reduce the ability of the affected watershed to attenuate precipitation, and therefore exacerbate stream flashiness and other habitat impairments associated with soil erosion.

The severity of habitat impacts caused by altered hydrology can be reduced by the proper use of erosion and sediment control measures and stormwater management practices. The potential fragmentation of stream habitats directly impacted by the development of Alternative C could be avoided through the use of facilities and structures which preserve stream morphology and hydrologic connectivity. For example, bridges can be used in lieu of culverts or pipes across larger streams. Bridges may also provide areas for wildlife to safely cross beneath the roadway. In smaller streams, countersunk culverts could be used to preserve the structure of the impacted streambeds and therefore provide safe passage for some forms of wildlife.

Construction activities associated with the implementation of Alternative C could potentially result in temporary indirect effects to wildlife habitat. Increased noise, human activity, and dust caused by the operation of heavy machinery, installation of access roads, and staging of building materials could temporarily fragment habitat and displace wildlife. The severity of these effects could be reduced through proper location and minimization of staging areas and construction access roads in valuable habitats. In addition, these effects on wildlife habitat would be temporary as construction activities at any one place are short-term in nature.

Threatened and Endangered Species

Impacts to threatened and endangered species for Alternative C would be similar to the impacts to wildlife habitat discussed in the preceding section, except that the characteristics of many threatened and endangered Species tend to render them less resilient when faced with habitat loss/alteration or competition from invasive species.

The ICE Natural Resources Study Area contains six species listed as endangered or threatened by the USFWS and 11 species listed as endangered or threatened by Virginia and/or North Carolina (see **Table 2-11**). The potential indirect effects of Alternative C on these species are the same as those discussed for wildlife habitat.

For aquatic species listed as threatened or endangered, such as fish and mussels, common threats to their survival include changes in water quality, water turbidity, and stream substrate material. As discussed previously, Alternative C would have the potential to increase runoff. An increase in runoff can lead to additional sediment and pollutants being carried into streams as well as increasing flow velocities, turbidity, and erosion. Any existing habitat or populations of the protected aquatic species within the ICE Natural Resources Study Area could be adversely impacted by these indirect effects.

Bat species within the ICE Natural Resources Study Area for Alternative C could be indirectly affected by the clearing of trees; increase in traffic, noise, and lights; and construction of bridges. Bat species such as the northern long-eared bat and little brown bat often use trees that are hollow or have shaggy bark for roosting during part of the year (NatureServe Explorer, 2019b). Increased noise and light associated with motor vehicle traffic may also dissuade bats from roosting in the areas adjacent to the roadway. However, bats will also occasionally roost beneath bridges for part of the year (NatureServe Explorer, 2019b). Construction of new bridges may provide additional roosting habitat for protected bat species.

The loggerhead shrike is a protected predatory bird species. The shrike prefers open fields and grasslands to forage (NatureServe Explorer, 2019c). Conversion of forests to open areas for roadway construction may provide suitable foraging habitat if the vegetation is not regularly maintained. Conversion of existing grasslands or open fields to roadways could potentially have an effect on the loggerhead shrike by reducing the area of suitable foraging habitat.

Protected plant species, such as the smooth coneflower, often require very specific conditions in order to survive. Changes in sunlight exposure, grazing pressure, vegetative competition, and soil moisture can impact the coneflower. The coneflower prefers areas with at least partial exposure to sunlight and is occasionally found along roadsides due to the break in the tree canopy (NatureServe Explorer, 2019d). Construction of a road on new alignment could potentially create or improve conditions suitable for the smooth coneflower by reducing the amount of tree cover and reducing the vegetative competition. However, it may indirectly have an effect to any existing habitat or populations through alteration of wildlife movement and grazing pressure, changes in surface hydrology, and invasive species colonization.

Should any improvements from the Martinsville Southern Connector Study advance to detailed design, refinements would avoid and minimize impacts to habitats associated with rare, threatened, and endangered species as well as the overall limit of disturbance.

2.6.4.3 Encroachment Effects on Historic Resources

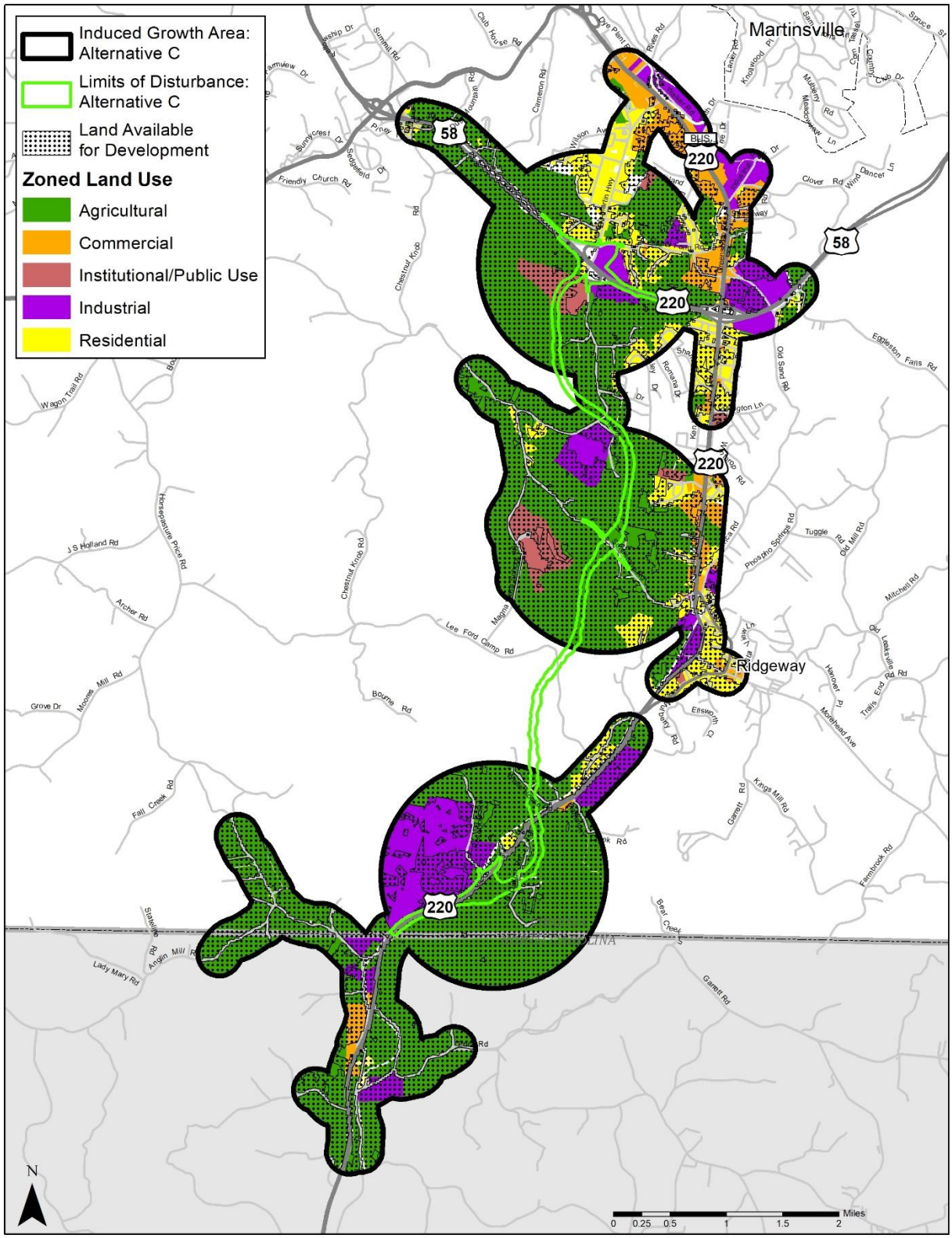
Three architectural historic properties are located within the direct or indirect effects APE for Alternative C. During construction, access to historic properties could be temporarily impacted by temporary road closures, detours, and loss of parking, potentially affecting visitation. However, any change in access or parking would be mitigated through appropriate construction signage to allow for detours or alternative parking areas. These construction effects would be short term and therefore minor. The indirect effects are not anticipated to be substantial enough to alter the use of these historic resources or to impact their NRHP eligibility.

2.6.4.4 Induced Growth Effects

Induced growth could occur with the implementation of Alternative C because it would introduce a new roadway, shift regional traffic, and create new access points. To estimate the potential for induced growth, land available for development (identified by NLCD as forests, grasslands, and pastures) was identified (see **Figure 2-16**). The zoning designation was then identified for each mapped parcel. The total acres available for development within each land use zone are summarized in **Table 2-14**.

Based on this methodology, approximately 7,200 acres are available for development within the induced growth area. Approximately 79 percent (5,723 acres) are zoned for agricultural, four percent (258 acres) are zoned for commercial, three percent (190 acres) are zoned for institutional/public use, seven percent (494 acres) are zoned for industrial, and eight percent (554 acres) are zoned for residential land use. The potential for development would be greatest in areas proximate to other developed areas, especially for those areas that already have utilities available. The extent, intensity, and character of the new development is unclear at this time; many factors that operate beyond the scope of this study (*e.g.* local development policies and incentives, favorable economic conditions, and ease of financing) would influence development outcomes. However, considering the existing land cover, it is reasonable to conclude that any induced growth that does occur would likely involve the clearing of land rather than infill or redevelopment. Additionally, since limited growth has occurred over the last ten to 20 years, rapid growth in the area is not anticipated. Should new development occur, the tax base would increase and would serve as funding for the increased demand on existing community facilities.

Figure 2-16: Alternative C Induced Growth Area- Zoned Land Use



Although approximately one-quarter of the Induced Growth Study Area for Alternative C is located within EJ census block groups, the effect to the existing housing stock should be minimal since 554 acres of land available for development are zoned for residential. These parcels, as well as the 5,723 acres of agricultural land, would likely be developed prior to the redevelopment of existing housing stock.

The lands within the Induced Growth Area of Alternative C are covered by two local planning documents: the *Henry County Comprehensive Plan* and the *Rockingham County Land Use Plan* (HCPC, 1995; Rockingham County, 2006). Neither of these documents identify the Martinsville Southern Connector as a future project. However, both identify the Route 220 corridor as an area where growth is expected and desired. Throughout the entirety of the LOD for Alternative C, Henry County Comprehensive Plan calls for the expansion of commercial land uses and the implementation of a Highway Corridor Overlay (see **Section 2.2.2.2**). In the Rockingham County Land Use Plan, Route 220 and the lands adjacent to it are identified as an urban transition area linking Ridgeway with Stoneville, North Carolina. The Plan defines urban transition areas as "*Lands where local government plans to accommodate moderate to high density development during the following twenty-year period and where necessary public services will likely be provided to accommodate growth and economic development*" (Rockingham County, 2006). Based on these two recommendations, any induced growth caused by the development of Alternative C should be compatible with local land use priorities and projections.

Induced growth could have both beneficial and adverse effects on the ICE Socioeconomic Resources Study Area's economic resources. The potential conversion of rural lands around the potential interchanges could create opportunities for businesses which require ready access to the highway system and exposure to regional traffic. This development would, in turn, create employment opportunities and generally increase the local demand for labor. At the Commonwealth Crossing Business Centre, for example, the construction of the proposed Reservoir Road Interchange could make bringing heavy trucks in and out of the site safer and faster. This change could indirectly affect the ICE Socioeconomic Resources Study Area's economic resources by making the Centre more attractive to potential tenants.

There is also the possibility that commercial development around the new interchanges and the rerouting of regional traffic could reduce the viability of the commercial properties located on Route 220 between Reservoir Road and Route 58 that rely on exposure to regional traffic. The severity and immediacy of this effect is constrained by the time required to construct a similar density and diversity of services along the potential alignment. Another mitigating factor is the preservation of the Route 220/Route 58 interchange. This interchange would still provide the existing businesses easy access to the highway system and the regional traffic that it bears. Additionally, the reduction of traffic, including trucks, could make the businesses along Route 220 more accessible and desirable to current and potential residents.

Water quality in the ICE Natural Resources Study Area has the potential to be adversely affected by any new growth induced by Alternative A. Induced growth would lead to an increase in impervious surface and the clearing of natural areas particularly around the potential interchange with Soapstone Road, since the area is a largely rural and forested setting. These actions could indirectly degrade water quality by reducing the ability of affected watersheds to capture precipitation and altering the volume, velocity, and quality of runoff entering surface-water bodies. However, meeting Federal, state, and local regulations addressing stormwater runoff and protecting water quality could reduce potential adverse impacts by reducing the volume of runoff to reduce pollutant loads, treating runoff to reduce pollutant concentration and loads, or a combination of both. Modern temporary and permanent stormwater management measures, including stormwater management ponds, sediment basins, vegetative controls, and other measures could be implemented to minimize potential degradation of water quality due to

increased impervious surface, drainage alternation, and soil disturbance. In the southern portion of Alternative C, new development could have a beneficial effect on water quality by prompting the replacement of outdated or obsolete drainage infrastructure. Induced growth associated with Alternative C also would have the potential to adversely affect nearby streams, wetlands, floodplains, and wildlife. Since it is unclear how, when, and/or why land would be developed, it is not possible to quantify the scale of either class of effects at this time. However, regardless of their size, extent, or use, any developments which impact surface-water resources would be required to comply with existing Federal and state regulatory controls. Similarly, any Federal or state-sponsored development would be regulated to minimize potential impacts to protected wildlife and wildlife habitat. Potential impacts to Federally protected species on private property are also regulated as previously described. Potential modifications to wetlands, streams, and floodplains that may occur because of induced growth would be minimized by Federal and state regulations governing construction impacts to Waters of the US. These regulations require avoidance, minimization, and compensatory mitigation.

New construction associated with induced growth has the potential to adversely affect archaeological and architectural historic properties. This could occur by:

- demolition, excavation, or vibration effects;
- changing the design, materials, or workmanship; and
- altering the setting, feeling and association of historic properties

Projects funded, permitted, or on lands controlled by Federal and state agencies are required to consider effects on historic properties by complying with Section 106 of the NHPA and the Virginia Antiquities Act and Burial Law, respectively. Additionally, the City of Martinsville's Architectural Review Board assures that changes to contributing structures in the historic districts are made complimentary to its historic fabric. These processes would reduce the potential adverse effects to historic properties from induced growth associated with constructing Alternative C.

2.7 STEP 7: ASSESS CONSEQUENCES AND DEVELOP MITIGATION

2.7.1 No-Build Alternative

Under the No-Build Alternative, no improvements within the ICE Study Areas would occur other than routine maintenance to existing facilities. This would result in continued conflicts between regional and local traffic. Over time, this could result in impacts to community cohesion and loss of business and employment in the ICE Socioeconomic Resources Study Area. The lack of improvements to the roadway network could indirectly effect the ability of visitors to access historic properties within the ICE Historic Resources Study Area. With continued use of Route 220 as the area's primary road for regional and freight traffic, pollutants associated with automotive travel would continue to enter nearby water bodies via surface runoff. Existing development within the watersheds would continue to contribute to surface water impairments.

No induced growth is expected under the No-Build Alternative, as no new interchanges or access points would be constructed. While much of the area surrounding Route 220 is already developed, planned and/or approved for development (such as the Commonwealth Crossing Business Centre), or is zoned to allow development, the increase in truck and passenger car volumes along Route 220, with no associated improvements, could affect the desirability of developing in this area. As this alternative is the baseline against which the Build Alternatives are compared to assess environmental effects, no mitigation measures are necessary for the No-Build Alternative.

2.7.2 Alternatives A, B, and C

2.7.2.1 Socioeconomic Resources

Alternatives A, B, and C could result in the development of land in the vicinity of the new interchanges, and along the approach roads to these interchanges. Henry County, Martinsville, and Rockingham County identify the Route 220 corridor as an area where growth is expected and desired, and all of the localities have noted in their comprehensive plans that redevelopment and new development is planned and likely to occur; therefore, it would not change the overall existing and planned land use pattern in Henry County, Martinsville, or Rockingham County. To manage this potential growth, the localities would be advised to review their zoning and community plans to ensure that they encourage potential growth in the desired locations.

While the construction of a new alignment has the potential to cause a loss in sales to businesses along Route 220, the potential for new business growth in the vicinity of the interchanges could increase business sales in the area. To avoid or minimize the reduction in sales to businesses along Route 220, VDOT would coordinate with the localities about how the road should be signed (business route or local road), the type of information that would be provided to drivers (information on businesses along the route), and the type of geometric changes.

2.7.2.2 Natural Resources

Water Resources

Traffic could indirectly impact water quality through spills and vehicular deposition of pollutants such as heavy metals, asbestos, and petroleum products and their byproducts. In the event of a spill, VDOT would support first responders and emergency management efforts, as necessary, to reduce direct and indirect effects to surface waters. Implementation of strict erosion and sediment control measures during construction would reduce temporary indirect impacts to surface waters. Modern temporary and permanent stormwater management measures, including stormwater management ponds, sediment basins, vegetative controls, and other measures would be implemented to minimize potential degradation of water quality due to increased impervious surface, drainage alteration, as well as soil and vegetation disturbance. These measures would reduce or detain discharge volumes and remove many pollutants before discharging into receiving bodies of water. All VDOT projects on state-owned lands are required to comply with the Virginia Erosion & Sediment Control (ESC) Law and Regulations, the Virginia Stormwater Management (SWM) Law and Regulations, the most current version of the VDOT Annual ESC and SWM Specifications and Standards, and the project-specific ESC and SWM plans, as well as any other permit conditions, as applicable.

VDOT's practice is generally to maintain both water quality and quantity post-development equal to or better than pre-development, as described in current guidance, Minimum Requirements for the Engineering, Plan Preparation and Implementation of Post Development Stormwater Management Plans (Instructional and Informational Memorandum Number: IIM-LD-195.8, VDOT – Location and Design Division). Impacts to water quality from contaminant loadings would be reduced through highway design that incorporates runoff pre-treatment, including vegetated medians and swales, stormwater BMPs, and forebays (basins designed to detain the runoff for initial settling of coarse particulates). Development in any induced growth areas would be subject to the same erosion and sediment control as described above, or equivalent North Carolina regulations for any induced growth within that state. Modifications to wetlands, streams, and floodplains that may occur because of induced growth would be minimized by Federal and state regulations governing construction impacts to Waters of the US. Unavoidable impacts to wetlands and streams would require mitigation by the project sponsor in accordance with the 2008 final

Federal regulations entitled *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule* (33 CFR §325 and 332; 40 CFR §230).

2.7.2.3 Floodplains

Potential indirect effects to floodplains from any of the Alternatives would be minimized by adherence to regulations governing construction impacts to floodplains. These regulations require avoidance, minimization, and compensatory mitigation. Design modifications to eliminate or minimize floodplain encroachments to the extent practicable are required by EO 11988: Floodplain Management. Implementation of strict erosion and sediment control measures during construction would minimize temporary impacts to floodplains. Development due to induced growth could be subject to the same regulations.

All roadway construction would utilize structures designed to adequately pass design floods and accommodate passage of aquatic organisms. Realignment, proper resizing, and replacement of existing culverts can reduce overall current stream quality degradation by improving locations where the roadway would intersect a floodplain. Design and construction techniques that reduce water quality impacts and protect aquatic species, as described in the Virginia Stormwater Management BMP Clearinghouse, would be incorporated into construction and maintenance of each of the Alternatives.

During more detailed phases of project development, a hydrologic and hydraulic analysis would be conducted to ensure adequate design of the hydraulic openings of culverts and bridges, allowing proper conveyance of floodwaters and minimizing potential indirect impacts to floodplains and floodplain hazards. The design would ensure that no substantial increase in downstream flooding would occur and/or would document the need for any Letters of Map Revision (LOMR) or Conditional Letters of Map Revision (CLOMR) and that all encroachments would conform with all applicable state and local floodplain protection standards.

2.7.2.4 Wildlife Habitat

The indirect effects to wildlife from habitat loss, fragmentation, and degradation due to reduced water quality or altered hydrology associated with the Alternatives should be minimized and mitigated by the measures discussed above for water resources. Design modifications to stream crossings mindful of maintaining natural stream bottoms, such as countersinking culverts and using bridges, would be incorporated to reduce adverse indirect effects to aquatic wildlife. Using bridges for crossings of streams and associated riparian corridors can also provide habitat connection and allow for safe overland wildlife movement. Preliminary designs at this stage of the study do not incorporate details regarding these bridges and pipe culverts. These measures would be fully considered during design and permitting.

Temporary construction impacts to fish and macroinvertebrates would be reduced through appropriate use of temporary stream crossing structures and strict adherence to erosion and sedimentation controls. Temporary impacts would also be reduced through proper location and minimization of staging areas and avoidance of construction access roads in valuable habitats whenever possible. Minimizing roadway cut/fill footprint as well as the median width can reduce both direct and indirect effects on aquatic and terrestrial wildlife habitat. Restricting the timing and duration of some construction activities relative to specific species needs would also minimize potential indirect effects to wildlife feeding, migration, breeding, nesting, and spawning. Post-construction plantings with native species that are present along the Preferred Alternative corridor can help minimize habitat loss. In some cases, habitat restoration in areas that are currently disturbed along the alignment can mitigate for direct and indirect impacts associated with roadway construction.

In keeping with the requirements of EO 13112: *Invasive Species*, invasive plant species management techniques would be used to minimize any indirect effects to wildlife and wildlife habitat from the introduction and spread of invasive species that may occur as a result of the construction of any of the Alternatives. VDOT's *Roadside Development Specification 244* and *Roadside Vegetation Management Policy* includes these and other measures to manage invasive plant species. These provisions require prompt seeding of disturbed areas with mixes that are tested in accordance with the Virginia Seed Law and VDOT's standards and specifications to ensure that seed mixes are free of noxious species. To prevent the introduction and establishment of invasive species during construction, the contractor would be required to adhere to VDOT's *Road and Bridge Specifications Manual*, Chapter 40 of Title 3.2 of the Code of Virginia, Virginia Administrative Code (VAC) 2VAC-5-390-20, and other applicable regulations.

2.7.2.5 Threatened and Endangered Species

Based on completed habitat assessments, field surveys, desktop review, and agency coordination, the Build Alternatives are not likely to directly impact threatened and endangered species. However, Alternatives A, B, and C would result in the denuding of forested and currently undeveloped lands, and thus would have the potential to indirectly affect these species. Potential indirect impacts to threatened and endangered species could be minimized through the design measures and construction practices discussed above for protection of water resources, floodplains, and wildlife habitat.

Additional coordination with VDGIF and USFWS would occur prior to construction in the advanced stages of the project design, at which point any necessary mitigation measures would be further developed. Through the consultation process under the Endangered Species Act, indirect effects are considered and appropriate mitigation measures identified. Consultation would occur before the permit decision, as any mitigation measures, conditions, or restrictions determined necessary by USFWS would be included by regulatory agencies as conditions of any permit issued. Mitigation measures may include the use of time-of-year restrictions on construction; contractor training in recognizing and avoiding threatened and endangered species and their habitats; or restoration of habitat. Potential impacts that may result from induced growth would be regulated by the agencies mentioned above, or the North Carolina Wildlife Resources Commission and North Carolina Department of Agriculture Plant Conservation Program for any future development in that state.

2.7.2.6 Historic Resources

During construction, access to historic properties could be temporarily impacted by temporary road closures, detours, and loss of parking, potentially affecting visitation. However, any change in access or parking would be mitigated through appropriate construction signage to allow for detours or alternative parking areas. These construction effects would be short-term and therefore minor. The indirect effects are not anticipated to be substantial enough to alter the use of these historic resources or to impact their NRHP eligibility.

3. CUMULATIVE EFFECT ANALYSIS

As noted in **Section 2.2** the cumulative effects analysis is based on the process outlined in Fritiofson v. Alexander, 772 F.2d 1225 (Fifth Cir. 1985), as described in FHWA's Guidance: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process (FHWA, 2019). The following sections follow this direction.

3.1 WHAT IS THE GEOGRAPHIC AREA AND TEMPORAL BOUNDARIES AFFECTED BY THE STUDY?

The geographic limits for the cumulative effects analysis are the same as the ICE Study Areas described in **Section 2.2.1** of this report.

The analysis of cumulative effects considers past, present, and reasonably foreseeable future actions. The temporal boundaries that were used for the cumulative effects assessment span from 1926, when Route 220 was constructed as a two-lane roadway, to 2040, the design year for the Build Alternatives design year. Infrastructure development and land use trends, such as the emergence of the local textile industry in the 1930s, and the clearing of forests throughout the first half of the 20th century, influenced the function and stability of the ICE Study Areas' notable resources. **Section 3.3.1** describes these and other influential projects to give context to the development of the ICE Study Areas.

3.2 WHAT ARE THE RESOURCES AFFECTED BY THE STUDY?

The resources affected by the Build Alternatives would be the same as those resources identified in **Step 3** of the indirect effects analysis discussed in **Section 2.3**.

3.3 WHAT ARE THE OTHER PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS THAT HAVE IMPACTED OR MAY IMPACT THE RESOURCES?

3.3.1 Past Actions

Many of the past actions that have broadly contributed to the baseline for this analysis occurred as part of the historic development and land use practices described in **Section 2.2.2.1**. The early 20th century was selected as the starting point for the consideration of past actions. This phase in the ICE Study Areas' history was the point where industrial manufacturing became an important part of the local economy and the historical pattern of agrarian land use began giving way to urban and suburban forms of development. This point in time also coincides with the local completion of Route 220 and other elements of the existing highway network.

Although predating the temporal boundary of 1926, the 1924 USGS topographical map discussed in the beginning of **Section 2.2.2.1** (see **Figure A-1** in **Appendix A**) provides a useful visual representation of the ICE Study Areas at the onset of the review period. At this point in time, the Martinsville area is transitioning from the tobacco-based economy that supported the region since the Revolutionary War and into one more focused on converting the area's timber resources into furniture, lumber, and related commodities. From a land use perspective, this transition led to the clearing of forests for timber; the conversion of agricultural fields into industrial workshops; and the intensification of development in established centers. Beyond the communities of Martinsville and Ridgeway in Virginia and Price in North Carolina, the only social resources shown on the 1924 USGS historical map (**Figure A-1**) are places of worship (i.e., churches & chapels) and schools. The number and distribution of these community facilities suggest that, while Martinsville is beginning to assert itself as an urban center, some aspects of social life still operate at a smaller, more decentralized scale. Some of the notable projects leading up to this period include:

- completion of the Danville & Western Division of the Southern Railway in the 1880s and the Norfolk & Western Railway in the 1890s;
- opening of the Bassett Furniture Company in 1902;
- opening of the Marshall Field & Company (and the founding of Fieldale as the company-town) in 1917;
- construction of the Martinsville Dam on the Smith River in 1924; and
- construction of Route 220 as a two-lane roadway in 1926.

Many of the ICE Natural Resources Study Area's notable streams can be seen on the 1924 USGS historical map, including the Smith River, Stillhouse Run, and Surry Martin Branch. Towns, roadways, and railways are shown along these streams as well as their tributaries. This development most likely had an adverse effect on water quality, streams, wetlands, and floodplains. Based on the location of the development along the stream valleys, it is likely that extensive vegetation removal occurred within the floodplains, wetlands were filled and/or drained, streams were realigned and piped, and bridge supports were placed within the streambeds.

In the 1930s and 1940s, the expansion of Martinsville's industrial capacity led to an increase in population and clearing of local forests. In the 1944 USGS topographical map (see **Figure A-2** in **Appendix A**), these changes are illustrated by the expansion of Martinsville, the emergence of several small satellite communities, and the extent of cleared land. This period also saw the emergence of textile production as another facet of the area's manufacturing sector. Some notable projects which occurred in this period include:

- opening of the Sale Knitting Company in 1937;
- opening of the DuPont Nylon Plant in 1941;
- opening of the Lacy Manufacturing Company in 1942; and
- the construction of the Martinsville Speedway in 1947.

In addition to these socioeconomic indication of growth, signs of natural resource extraction are also visible. Particularly in the area west of Route 220 (around Chestnut Knob and present-day Magna Vista High School), the map shows large areas that have been logged and converted to shrublands. This spike in tree removal and development, both along stream valleys and higher in the watersheds, likely worsened adverse effects to water quality, streams, wetlands, and floodplains. The conversion of landcover and expansion of impervious surface coverage presumably increased surface runoff, stream turbidity, and pollutant loading. Fill was likely added to wetlands and floodplains for additional development and/or to protect existing infrastructure.

In the 1950s and 1960s, the growth in Martinsville shifted away from a heavy emphasis on factories to less intense forms of development, most notably institutional and residential land uses as shown on the 1965 USGS historical mapping (see **Figure A-3** in **Appendix A**). For example, the residential neighborhoods between Spruce Street and the Route 220-Business Corridor were largely built during this period. Another good example is the residential neighborhood south of Fayette Street, between the Smith River and Memorial Boulevard South. Many of the warehouses located on Route 220 Business, just north of the Martinsville Speedway, were also built during this period. Some of the notable projects during this period include the:

- reconstruction of Route 220 widened to four lanes south of Ridgeway in 1958;
- founding of Patrick Henry Community College in 1962;
- opening of two-lane bypass of Route 220 over the railroad west of Ridgeway opened in 1963;
- reconstruction of Route 220 north of Main Street to Route 58 to four lanes with turn lanes in 1966;
- building of Martinsville High School and Martinsville Memorial Hospital in 1967; and
- opening of Nationwide Homes' manufacturing complex on Rives Road in 1968.

In some areas, the forested cover shown in the 1965 mapping is less extensive than in the 1944 map. However, in many other areas, such as Chestnut Knob, the extent of forest cover has remained static or even increased. In terms of transportation infrastructure, the 1966 map shows substantial expansion of the paved road network. Joseph Martin Highway, Route 683, Route 684, and Route 781 all appear to be paved. The slower rate of land clearing and reforestation allowed to occur in some areas during this time period likely had a beneficial effect on water resources in the region. However, the expansion of urban development in some areas around Martinsville likely contributed to increased runoff and pollution entering the nearby waterways.

Based on Henry County's property database, most of the local development that occurred during the 1970s, 1980s, and 1990s was commercial. Many of the storefronts located on Route 220 Business north of Route 58, for example, were constructed in this period as shown on the 1984 USGS historical mapping and the 1999 USGS historic aerial imagery provided by Google Maps™ (see **Figures A-4** through **A-9** in **Appendix A**. The shopping center located at the intersection of West Market Street and Commonwealth Boulevard West is a good example of the shift towards more suburban forms of development. Based upon a review of aerials, the ICE study area portion of Rockingham County has not experienced much growth over this time period. Some notable projects which occurred in the Martinsville area during this period include the:

- reconstruction of Route 220 bypass of Ridgeway widened to 4 lanes in 1972;
- building of the Route 58/ Route 220 bypass west of Route 220 in 1977;
- opening of Magna Vista High School 1988;
- opening of the Patriot Centre Industrial Park at Beaver Creek in the early 1990s;
- building of the Joseph Martin Highway interchange with Route 58/Route 220 in 1993; and
- completing the Route 58 east of Route 220 was constructed in 1993.

Many of the areas shown as forested in 1965 are also shown as forested in 1984. This suggests that these forests were able to become more mature and better established. Notable exceptions to this trend are areas that were cleared for construction of the Route 220 bypass and associated development, such as the area north of the Route 220/Route 58 intersection. Based on the land use along stream valleys, it can be inferred that this time period had both beneficial and adverse effects on water resources in the area. The establishment of more mature forests likely improved stormwater attenuation in some areas, and riparian areas negatively affected by previous logging may have begun to improve. In areas cleared and developed as a result of the Route 220 bypass construction, surface runoff and pollutant loading likely increased. Some streams were probably piped, realigned, or otherwise altered. Fill material may have been placed in wetlands and floodplains.

While it appears that little development expansion occurred in this area between 1984 and 1999, water resources in the area have likely been adversely affected by continued runoff and pollutant loading from yards and impervious surfaces as well as maintenance and construction activities. However, any improvements made to the area's stormwater management facilities may have provided beneficial effects to water quality.

Since the year 2000, development in Henry County has slowed. According to the Henry County's property database the clear majority of the area's housing stock predates this period. Most the existing commercial retail sites also predate this period. However, there have been sporadic developments over the past decade, including the introduction of the Monogram Foods manufacturing plant in 2009 and Eastman in 2013.

3.3.2 Present and Reasonably Foreseeable Future Actions

The list of present and foreseeable future actions was generated by reviewing local and state planning and financial documents, including: *VDOT's 2019 SYIP for FY 2020 – 2025*, the *NCDOT 2019 SYIP Map*, the *Henry County Budget FY 2019-2020*, and the *Rockingham County, North Carolina FY 2018-2019 Adopted Budget* (VDOT, 2019; NCDOT, 2019; Henry County, 2019; and Rockingham County, 2019). Projects identified in these planning documents are treated as reasonably foreseeable actions because future construction funds have been set aside for them in the planning process. While the *Henry County Comprehensive Plan*, *Martinsville's 2009 Comprehensive Plan Update*, and the WPPDC's 2019 *Comprehensive Economic Development Strategy Annual Report* and *2035 Rural Long-Range Transportation Plan* were reviewed, these documents only identify planning priorities and do not allocate future funding towards these projects. Therefore, projects from these plans are not reasonably foreseeable future actions. Other local non-transportation projects and projects under construction by private entities are also included as reasonably foreseeable projects. **Table 3-1** lists the ten development actions that are occurring and/or are planned to occur that could contribute to cumulative effects on resources affected by the study.

One of the most noteworthy items included in this list is the Route 220 Preservation and Improvement Plan. This Plan is a part of VDOT's Arterial Preservation Planning effort and is an excellent example of the range of improvements VDOT is planning to implement to improve operations without making capacity improvements. The limits for the Route 220 Preservation and Improvement Plan extend from the North Carolina-Virginia state line to Roanoke, with a few breaks in between. Presently, the plan does not include any improvement with any of the ICE Study Areas. However, it is reasonable to conclude that it would in the future. Since all of the improvements currently being recommended by the Plan focus on small-scale geometric changes (*i.e.* intersection reconfiguration) and widening for auxiliary lanes, the Plan is not expected to have minimal disturbance compared to larger roadway projects. For this reason, possible future actions developed as part of the Route 220 Preservation and Improvement Plan were excluded from this analysis. For more information on Route 220 Preservation and Improvement Plan, please visit the study website (*http://www.virginiadot.org/projects/*). To help resolve this informational gap, the Martinsville Fiscal Year 2018 Comprehensive Annual Financial Report was used to identify the scale of ongoing planning, design, and construction activities. This review indicates that engineering and road construction accounts for less than 7 percent of the City's $4.96 million-year end expenditures on highways, streets, bridges, sidewalks, and public work. An additional project that is outside of the ICE Study Areas; however, is a large County project in close proximity to the ICE Study Areas is the Henry County Jail Project, which would be located on the DuPont site, adjacent to Henry County's Department of Public Safety and the Piedmont Regional Criminal Justice Training Academy (Henry County, 2019b). Henry County also has a project to relocate the Sheriff's Office Administration building to this location, further expanding the reuse of this former industrial site (Henry County, 2019a).

Table 3-1: Present and Reasonably Foreseeable Future Projects

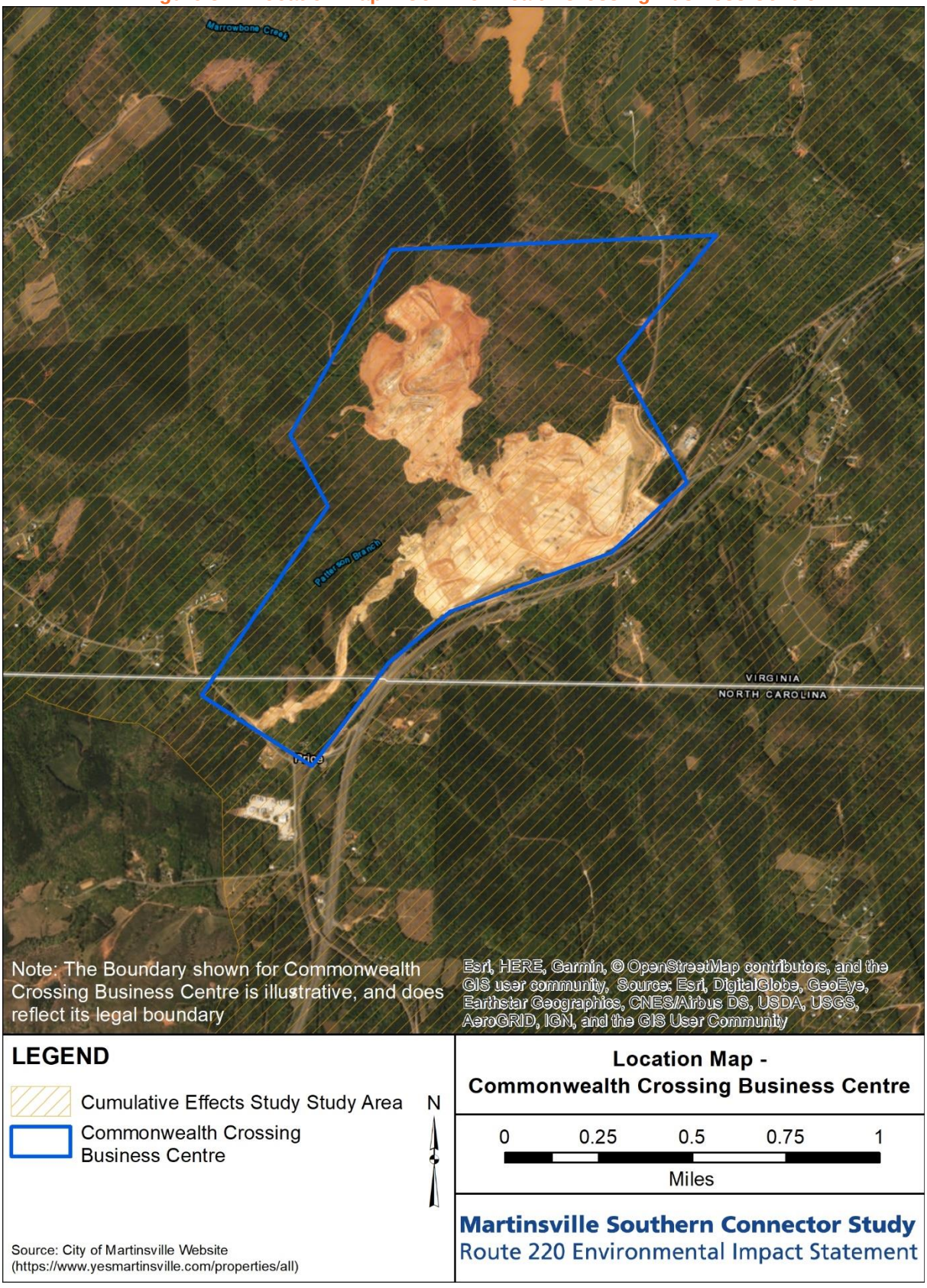
Associated Agency	Project	Status
VDOT	Route 220 Preservation and Improvement Plan (Various Locations)*	Design
VDOT	Route 220 / Lee Ford Camp Road Safety Improvements	Design
VDOT	Route 58 East Turn Lane at Route 58 / Route 220 Bypass	Under Construction
Henry County	Lower Smith River Wastewater Treatment Facility Renovations[2]	Design
Henry County	Patriot Centre Storm Water Management Pond #2 – Dam Study	Design
Henry County	Henry County Jail at the DuPont site[2]*	Design
Henry County	Sheriff's administration office renovation and relocation to the DuPont site[2]*	Design
Henry County /Martinsville-Henry County Economic Development Corporation	Commonwealth Crossing Business Centre Phase II	Under Construction
American Electrical Power	Commonwealth Crossing Transmission Line Project[3]	Under Construction
Eastman	Eastman to add capacity at its Patriot Centre facilities and expand into a former furniture facility in Bowles Industrial Park[4]	Design

* These locations are outside of the ICE Study Areas, but are listed since they are important projects for this area.
1 www.henrycountyva.gov/content/uploads/PDF/financials/psa_budget_binder_2019_adopted.pdf
2 www.henrycountyva.gov/jail-project; https://wset.com/news/local/construction-of-70-million-henry-county-jail-to-begin-soon
3 www.henrycountyva.gov/content/uploads/PDF/countyfinalbudgetapproved_2019.pdf
4 www.aeptransmission.com/virginia/CommonwealthCrossing/index.php
5 www.yesmartinsville.com/news/details/id/246/eastman-announces-$7-7-m-expansion-in-he

Of the actions reviewed, the most notable is a development known as the Commonwealth Crossing Business Centre (see **Figure 3-1**). The Commonwealth Crossing Business Centre is a 726-acre planned industrial park located to the west of Route 220, north of the North Carolina state line. The site is a regional, revenue-sharing industrial park, owned by Henry County in conjunction with Martinsville. The cleared area covers approximately 120 acres consisting of two separate tracts of land. To date, two lots have been graded for development. The remaining acreage is occupied by forests and open fields.

Most of the Business Centre has yet to be purchased or leased. In July 2018, Henry County announced that Press Glass (a European glass manufacturer) is moving forward with plans to establish a 280,000 square foot manufacturing facility on the site (Henry County, 2018). The construction of the Commonwealth Centre for Advanced Training (CCAT) was recently completed and was used as the venue for recruitment for employees to for the new Press Glass facility (Martinsville Bulletin, 2019). CCAT would be available only to firms that locate at Commonwealth Crossing and would allow for office space where companies can recruit employees and provide training space with a high bay where companies can temporarily install manufacturing equipment to train new employees (CCBC, 2019).

Figure 3-1: Location Map – Commonwealth Crossing Business Centre



In addition, a series of actions have been designed to eliminate sources of water quality impairment from agriculture, forestry, and manufacturing practices in the Dan River Basin (DRBA). DRBA also has a Riparian Buffer Project at five demonstration sites, one of which is just north of the study area, the Beaver Creek Reservoir in Martinsville, Virginia, protecting the Smith River (DRBA, 2019). The DRBA has also produced a Riparian Buffer Guide to give property owners a guide to planting riparian buffer.

3.4 WHAT ARE THE IMPACTS?

Cumulative impacts consist of the direct and indirect impacts of the alternatives under consideration in the Draft EIS in combination with the impacts of past, present, and reasonably foreseeable actions. This analysis relies on CEQ guidance to assess the severity of an impact based on context and intensity. Context may be geographic at multiple scales such as society, an affected region, affected interests, and specific localities.

Intensity, as defined by CEQ, is the severity of impact with regard to multiple factors, including:

- impacts both beneficial and adverse
- degree of public health and safety impacted
- unique characteristics of the geographic area
- degree of controversy surrounding that action and the effect
- potential to set precedent for future actions
- cumulative effects which may be significant, even though the action itself would not create significant impacts
- whether there is a violation of Federal, state, or local law or requirements meant to protect the environment

Impacts with respect to each of the intensity criteria can be described in various levels of severity, from minor to major (see **Table 3-2**). The significance or importance of impacts is determined by evaluating the potential improvements against existing environmental standards, thresholds, guidelines, or objectives established by Federal, state, and local agencies. These impact significance factors are applied to all resource areas. Impacts can also be described as to their level of extent, as shown in **Table 3-2**. Impacts can range from a large extent, which means an impact would be statewide, to a medium extent, with regional impacts, to a small extent, with local impacts. The duration of an impact could range from long to short, with a long duration corresponding to over five years, a medium duration would be one to five years, and a short duration would be less than one year. It is important to note that many regulatory agencies, such as the USACE, classify long-term effects as permanent. These potential effects are taken into consideration in the following discussions of cumulative effects of the alternatives to different resources. Finally, the likelihood of an affect could range from probable to unlikely.

Table 3-2: General Effects Determination Matrix

Severity	Extent	Duration	Likelihood
Major	Large	Long	Probable
Moderate	Medium	Medium	Possible
Minor	Small	Short	Unlikely

The following briefly discusses the cumulative effects to socioeconomic, natural and historic resources. For a detailed discussion of any of the socioeconomic resources discussed in the following sections, please see the ***Socioeconomic and Land Use Technical Report*** (VDOT, 2020c). Likewise, detailed information regarding natural resources can be found in the ***Natural Resources Technical Report*** (VDOT, 2020d) and detailed information regarding historic resources can be found in ***Architectural History Survey*** *(*VDOT, 2020i).

3.4.1 Socioeconomic Resources

3.4.1.1 Effects from Past, Present, and Reasonably Foreseeable Actions

The cumulative impacts to socioeconomic resources due to past and present actions are closely related and are described together in the following sections.

Since the 1920's, the past actions described above have transformed the region from a rural agricultural community to a more developed area with an increase in residential and commercial development, along with continued industrial growth. Past and present actions have been both beneficial and adverse to socioeconomic resources within the ICE Study Areas, and it is expected reasonably foreseeable future actions could as well. Past and present growth and development have increased the number of communities as well as the standards of living for communities and provided for community cohesion.

As discussed in **Section 3.3**, all local and state planning and financial documents were reviewed to develop the list of reasonably foreseeable projects; although, this list is limited to only ten projects. The reasonably foreseeable future actions identified during this study consists predominately of transportation projects designed to improve safety and enhance the function of the existing highway network. These are very unlikely to generate induced growth or become a catalyst for land use change. The primary non-transportation action identified is the continued development of the Commonwealth Crossing Business Centre. At present, approximately 120 acres of the site has been cleared and prepared for development. The remaining portion (606 acres) is still wooded as of the publication of the Draft EIS. The development of the Commonwealth Crossing Business Centre is designed to provide employment opportunities for the local workforce and generally stimulate economic development. Since this conversion was and would be undertaken to provide room for the development of new commercial and industrial facilities, it and the other reasonably foreseeable actions are considered as having a minor beneficial effect on the ICE Socioeconomic Resources Study Area's notable socioeconomic resources. However, the development would also have a minor negative impact by increasing regional traffic through the area due to increases in commuters and freight traffic. The increase in traffic would likely increase commuting times for local residents, as well as increase travel times for residents to travel to community facilities, including the schools. The associated increases in traffic noise would also continue to further fragment communities. These minor negative impacts would involve both EJ and non-EJ communities.

Collectively, the past, present and future actions identified by this analysis led to the expansion of public infrastructure, the development of community facilities, and the creation of economic opportunities for a substantial portion of the local population. The emergence of regional trends which reduced the competitiveness of the local manufacturing sector have undermined the impact of these benefits. However, coordinated efforts amongst the local officials and members of the business community show that alternatives economic models are possible. Therefore, the past, present and future actions identified by this analysis contribute to a moderate beneficial impact on the ICE Socioeconomic Resources Study Area's notable socioeconomic resources.

3.4.1.2 No-Build Alternative

The No-Build Alternative would result in continued conflicts between regional and local traffic, increasing traffic through the area that has already encountered an increase in regional traffic. Over time, this reduction in accessibility between the communities, community facilities, and local businesses could result in impacts to community cohesion and loss of business and employment in the ICE Socioeconomic Resources Study Area. As traffic volumes increase in the future, crossing Route 220 would become increasingly difficult and dangerous, continuing the community fragmentation of residences located on either side of the roadway. Additionally, the increased traffic volume would emphasize the fragmentation and further contribute to traffic delays. These conditions would also continue to inhibit the movement of emergency vehicles traveling along Route 220. The increase in truck and passenger vehicles on Route 220 could contribute to safety concerns to adjacent communities. Additional proximity impacts, such as traffic noise, are also expected as a result of the increased traffic along the existing roadway network.

3.4.1.3 Alternative A

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on land use and community cohesiveness by potentially converting 574 acres of residential, agricultural, and industrial land uses and public right of way/undeveloped land into transportation facilities. Over the short term, the conversion of developed properties has the potential to disrupt community life. Vehicular access and general mobility would both be altered as construction progresses. These effects would interrupt household and community activities but are not expected to lead to changes in land use or community cohesion. Over the long term, the potential relocation of homes and other properties have the potential to change the character of the affected areas. Given the projected impacts associated with Alternative A, this change in character is most likely to occur in the southern segment of Alternative A (between Reservoir Road and the North Carolina-Virginia state line). In this area, the construction of a new interchange would effectively split the J.B. Dalton neighborhood. In addition to the disruption caused by relocations, Alternative A in this area would adversely affect community cohesion by potentially increasing traffic noise and visual intrusions. The conversion of undeveloped parcels (found mostly in the northern segments of Alternative A) may also lead to changes in land use (through induced growth). In these areas, the direct effects associated with the introduction of an access-controlled highway facility are buffered by larger setbacks and the prevalence of low-density rural development. Combined with the increase in the number of communities that has occurred over the years, the increase in the standards of living for the communities, and the potential increase in traffic associated with the Commonwealth Crossing Business Centre, the cumulative effect would be minor.

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on the ICE Socioeconomic Resources Study Area's economic resources by reducing the congestion on Route 220, allowing easier access to those traveling to the local businesses located on the existing alignment. Additionally, the addition of potential interchanges under Alternative A would provide redevelopment opportunities in their vicinity. The scale and extent of the redevelopment opportunities would be strongly influenced by factors such as: the willingness of nearby landowners to develop or sell their property, the demand for highway related services, and how Henry County's planners and commissioners respond to proposed zoning changes. Combined with the reasonably foreseeable future transportation projects and the development of the Commonwealth Crossing Business Centre, the cumulative effect would be a beneficial increase in employment opportunities for the local workforce and a benefit to the business economy within the area.

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on the ICE Socioeconomic Resources Study Area's community facilities, parks, and open spaces by making them easier to access. Existing congestion reduces access to these facilities. Alternative A would divert regional traffic to the new roadway. This change would allow vehicles turning off local roads, such as Lee Ford Camp Road and Church Street, to cross and enter Route 220 more freely. Similarly, the reduced presence of regional traffic would make pedestrian crossings of Route 220 safer. At community facilities, such as Drewry Mason Elementary School, this improvement would facilitate better connections with residential uses on the opposite side of Route 220. The potential relocation of one cemetery could cause long-term minor adverse effects by potentially redirecting the use associated with the displaced cemetery to other facilities. Combined with the development of community facilities that has occurred over the years, and the number of cemeteries available in the area, the cumulative effect would be minimal.

Alternative A would contribute to the cumulative effect of past, present, and reasonably foreseeable future actions on environmental justice populations through potential right of way acquisition, altering traffic operations, creating new access points, and expanding roadway capacity. Out of 17 potential residential relocations, three occur within block groups identified as having environmental justice populations. These potential relocations, combined with the introduction of the new roadway facility in an otherwise rural setting, could adversely affect community cohesion in the short-term. Since most of the potential relocations required for Alternative A do not occur in minority block groups, the potential cumulative effect is not considered disproportionate. Alternative A would contribute minor adverse but not disproportionate increments to the overall cumulative effect to environmental justice populations associated with past, present, and other reasonably foreseeable future actions.

Overall, Alternative A would likely generate a variety of minor adverse and beneficial effects, incrementally contributing to the overall cumulative effect to the ICE Socioeconomic Resources Study Area's notable socioeconomic resources associated with past, present, and other reasonably foreseeable future actions.

3.4.1.4 Alternative B

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on land use and community cohesiveness by potentially converting 584 acres of residential, agricultural, and industrial land uses, and public right of way/undeveloped land into transportation facilities. The character of the short and long-term effects associated with these forms of land conversion are the same as those discussed for Alternative A.

As discussed for Alternative A, Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on the ICE Socioeconomic Resources Study Area's economic resources by redirecting regional traffic and creating new roadway access points. The character of the environmental consequences associated with these actions are the same as those discussed for Alternative A.

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on the ICE Socioeconomic Resources Study Area's community facilities, parks, and open spaces by making them easier to access. Alternative B is expected to generate the same operational benefits as Alternative A.

Alternative B would contribute to the cumulative effect of past, present, and reasonably foreseeable future actions on environmental justice populations through potential right of way acquisition, altering traffic operations, creating new highway access points, and expanding roadway capacity. Out of 26 potential residential relocations, nine occur within block groups

identified as having environmental justice populations. These potential relocations, combined with the development of a new roadway facility within in an otherwise rural setting, could deter interactions between community members and therefore indirectly undermine community cohesion in the short-term. Since most of the potential relocations required for Alternative B do not occur in minority block groups, the potential indirect adverse effect is not considered disproportionate. Alternative B would contribute minor adverse but not disproportionate increments to the overall cumulative effect to environmental justice populations associated with past, present, and other reasonably foreseeable future actions.

Overall, Alternative B would likely generate a variety of minor adverse and beneficial effects, incrementally contributing to the overall cumulative effect to the ICE Socioeconomic Resources Study Area's notable socioeconomic resources associated with past, present, and other reasonably foreseeable future actions.

3.4.1.5 Alternative C (Preferred Alternative)

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on land use and community cohesiveness by potentially converting 541 acres of residential, agricultural, and industrial land uses, and public right of way/undeveloped land into transportation facilities. The character of the short and long-term effects associated with these forms of land conversion are fundamentally the same as those discussed for Alternative A.

As discussed for Alternative A, Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on the ICE Socioeconomics Resources Study Area's economic resources by redirecting regional traffic and creating new roadway access points. The basic environmental consequences associated with these actions are the same as those discussed for Alternative A.

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on the ICE Socioeconomics Resources Study Area's community facilities, parks, and open spaces by making them easier to access. Alternative C is expected to generate the same operational benefits as Alternatives A and B.

Alternative C would contribute to the cumulative effect of past, present, and reasonably foreseeable future actions on environmental justice populations through potential right of way acquisition, altering traffic operations, creating new roadway access points, and expanding roadway capacity. Out of the 25 potential residential relocations, nine occur within block groups identified as having environmental justice populations. These potential relocations, combined with the development of a new roadway facility within in an otherwise rural setting, could deter interactions between community members and therefore indirectly undermine community cohesion in the short-term. Since most of the potential relocations required for Alternative C do not occur in minority block groups, the potential indirect adverse effect is not considered disproportionate. Alternative C would contribute minor adverse but not disproportionate increments to the overall cumulative effect to environmental justice populations associated with past, present, and other reasonably foreseeable future actions.

Overall, Alternative C would likely generate a variety of minor adverse and beneficial effects, incrementally contributing to the overall cumulative effect to the ICE Socioeconomic Resources Study Area's notable socioeconomic resources associated with past, present, and other reasonably foreseeable future actions.

3.4.2 Natural Resources

3.4.2.1 Effects from Past, Present, and Reasonably Foreseeable Actions

The following analysis is based on a review of historic aerials and topographic maps that was conducted in **Section 2.2.2**. Past and present actions have been both beneficial and adverse to natural resources within the ICE Natural Resources Study Area, and it is expected that reasonably foreseeable future actions could be as well. The area's growth and development in the early 20th century was primarily associated with the regional transition away from the tobacco industry and towards logging, furniture manufacturing, and textiles. Based on the historical surveys conducted by the National Trust for the Historic Preservation (NTHP) and the Virginia Department of Historic Resources (VDHR) (see **Sections 2.2.2 and 2.3.3**), this transition required the clearing of land for building materials and agricultural production. The oldest mapping maintained by the USGS (dated August 1925), however, does not illustrate the extent of terrestrial habitats, floodplains, or wetlands. Because of, there is not adequate evidence to support a quantitative assessment of the effects of early periods of development on the ICE Natural Resources Study Area's notable natural resources. Based on the general description of the industrialization process provided in the NTHP and VDHR surveys, however, some qualitative determinations can be made.

The industrialization of the Martinsville area generally required the clearing of forested lands to meet the growing demand for building materials, food, and open land. Although its exact location and extent of clearing is not known, it is reasonable to assume that this clearing reduced the amount and quality of habitat available for the area's forest-adapted species. Other than the clearing itself, the primary mechanisms driving habitat degradation would have been the creation of edge conditions where plants and animals adapted to the shady forest understory do poorly. It is worth noting that since invasive species were less common during this era, the disturbed sites would likely have been colonized by native plants and animals adapted to the area's grasslands.

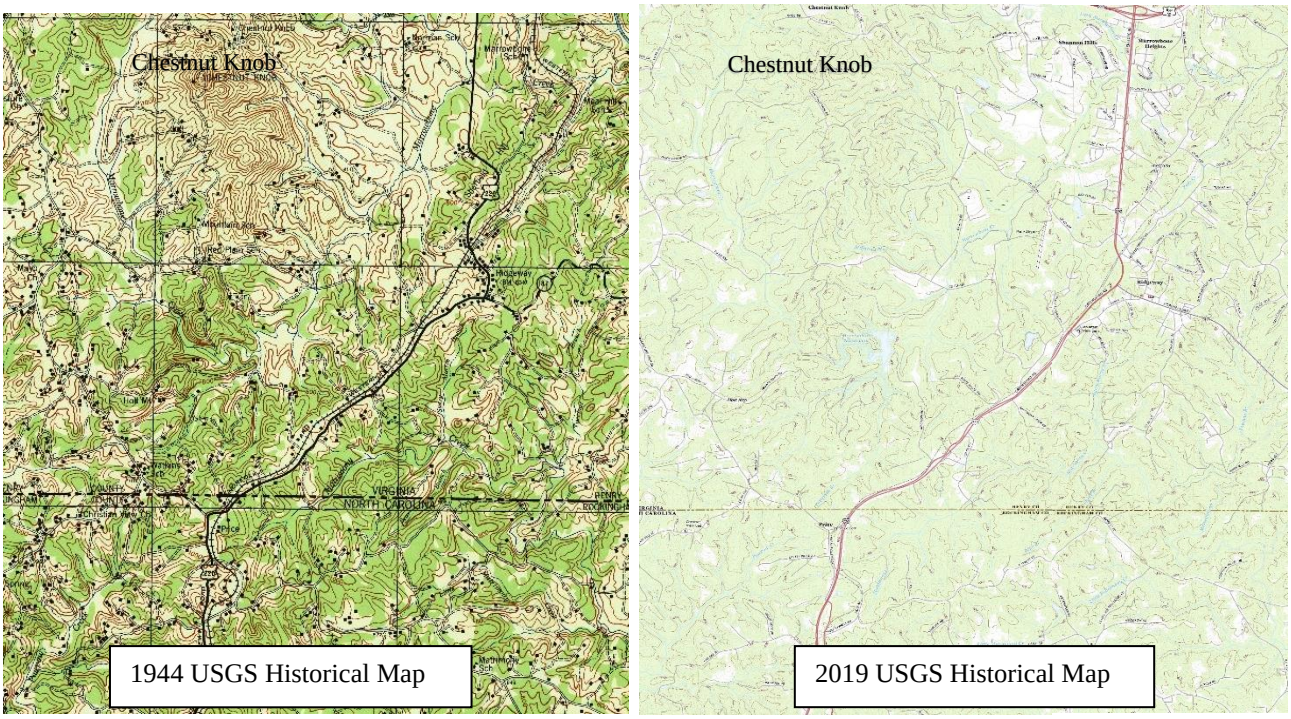
Given the presence of numerous streams and wetlands within the ICE Natural Resources Study Area's existing forests, it is reasonable to assume that the clearing adversely affected the quality and extent of aquatic habitats. In some cases, the effect would have been the result of changes to the physical environment surrounding the aquatic habitat. The removal of shading-casting trees around a stream, for example, can result in increased water temperatures and reduced levels of dissolved oxygen. Other noteworthy examples include the removal of vegetation stabilizing floodplains and the installation of drainage tiles in wetlands. These direct changes would have in turn led to systemic water quality issues, most notably increased turbidity and stream discharge immediately following storm events. Another likely consequence of the disruption of aquatic habitats is a change in flooding patterns. The continued conversion of the area's forested floodplains would likely have generated both water quality issues (due to increased soil erosion during flood events) and a loss of habitat for waterfowl and other species which are known to use riparian forests. The construction of a hydroelectric dam across the Smith River in 1924 would have mitigated some of the flooding concerns by moderating the River's flow but would have become a barrier for the movement of some aquatic species.

The degradation of both terrestrial and aquatic habitats during the early part of the 20th century would have placed some stress on the ICE Natural Resources Study Area's threatened and endangered species. Based on the lack of historical records discussing the characteristics of wildlife populations, it is difficult to discern the severity of this stress. However, given the sheer amount of habitat available at the time and the limited scale of development that has occurred, it is reasonable to conclude that the actions taken during this period of development likely resulted in a minor adverse effect on the ICE Natural Resources Study Area's notable natural resources.

During the 1940's, the ICE Natural Resources Study Area's economic prosperity continued, supporting the creation of new residential subdivisions, the Martinsville Speedway, factories, and

public institutions. The best available reference for the state of the area's notable natural resources at the beginning of this period is a USGS map prepared in 1944. **Figure 3-2** shows a side by side comparison of 1944 USGS historical map to the 2019 USGS historic map. These figures are shown in greater detail in **Figures A-2**, **A-10**, and **A-11** in **Appendix A**). The 1944 map shows cleared land and brush occupying a much greater amount of the ICE Natural Resources Study Area than the 2019 map. The area where this distinction between the present and mid-20th century condition is most stark is the roughly 8-square mile area surrounding Chestnut Knob (36.6137489°N, -79.9172628°W). In the 1944 USGS map, what is currently a mix of open and forested environments is shown as almost entirely brush and open land. This cleared area extends roughly from: Route 220 in the east to Horsepasture Price Road in the west and from Lee Ford Camp Road in the south to Route 687 (Soapstone Road) in the north. Since the 1925 USGS map does not contain land cover information, it is unclear when this area was deforested. However, based on the general description of the industrialization process provided in the NTHP and VDHR surveys, it most likely occurred around in the 1930's and 40's.

Figure 3-1: 1944 USGS Historical Map and 2019 USGS Historical Map



The clearing of large swaths of forests in the middle of 20th century intensified the impacts generated during earlier periods of industrialization. As a result, the effects on natural areas and wildlife would have been like those generated during early periods of development, but potentially more intense. The emergence of habitat fragmentation is a good example of this change in severity. Whereas earlier periods of resource extraction left the overall network intact, the clearing illustrated in the 1944 USGS map clearly shows the creation of isolated forests. This fragmentation not only alters the physical characteristics of the remaining habitat, but also makes it difficult for animals and plant populations to reproduce and react to changes in resource availability and disturbance events. This effect is perhaps the most meaningful for aquatic species, which often have few, if any, opportunities for relocation.

The other land use change that is visible in this 1944 USGS map is the expansion of Martinsville. Whereas the 1925 USGS map showed a relatively tight network of streets, the 1944 map shows

a network of corridors expanding beyond the City's core. Within the ICE Natural Resources Study Area, Routes 58 and 220 were the corridors which included the most development. Since the 1925 USGS map lacks land cover information, it is unclear if the development along these corridors involved the clearing of forests. However, given the age of both corridors, it is likely that some of the structures shown in the 1944 USGS map utilized previously developed sites. In addition to effects associated with deforestation and land conversion, the expansion of Martinsville's urban footprint had an adverse effect on water quality by increasing the generation of both point source (*e.g.* sewage and industrial waste) and non-point source (*e.g.* run-off) water pollution. Both forms of pollution in turn had an adverse impact on the quality of aquatic habitats and the wildlife that utilize them. Fecal coliform and *E. coli* are primary examples of pollutants whose concentrations likely increased because of urban growth. These effects, combined with the fragmentation of wildlife habitats, suggests that this period of development had a major adverse effect on the ICE Natural Resources Study Area's notable natural resources.

By the mid-1960s suburban development around Martinsville was occurring but the overall rate of deforestation had slowed. The best references for this period are a series of USGS maps produced in 1964, 1965, and 1966. Like the 1944 USGS map, these maps provide a record of infrastructure, general land cover, and prominent natural features. Most of the development shown in the maps (relative to the 1944 USGS map), are located at the edge of Martinsville's municipal boundary. The neighborhood located along Route 685 between Route 58 and Route 220-Business is a good example. In this area, the 1944 USGS map shows a dirt road with a handful of structures. The landcover is a mix of cleared land and forest. In the 1965 USGS map, much of the present-day Rich Acres neighborhood is identified, including: more than 50 structures, a school, a church, and a drive-in theater. Forested areas seem to have expanded slightly, but otherwise the landcover remained unchanged. Another good example of suburban development is the residential community surrounding Lake Lanier. In this area, the 1944 USGS map shows two paved roads, the Lanier Farm School, and as many as two dozen structures. Except for the southern portion (which is cleared) the area is shown as forested. In the 1964 USGS map, dozens of paved streets provide access to hundreds of structures, Lake Lanier (a reservoir), and the Forest Parks County Club. The development of Rich Acres, Lake Lanier, and other suburban communities adversely impacted the ICE Natural Resources Study Area's notable natural resources by increasing the prevalence of impervious surface and the generation of non-point source water pollution. In areas where natural areas were cleared, development also led to reduction in the availability of wildlife habitat.

In addition to illustrating suburban development around Martinsville, the USGS mapping collected during the mid-1960's provides evidence that some of the areas which are shown as being open or brushy in the 1944 USGS map have begun to regenerate. The complete regeneration of hardwood forests is a process that can takes decades, if not centuries to complete. However, the presence of intact forests nearby suggests the formerly cleared areas were probably recolonized rapidly by native plants and animal species. Although the overall effect of clearing forests is adverse, this recolonization offset some of the disruption actions taken and reduced the period's overall effect on the ICE Natural Resources Study Area's notable natural resources to a minor level.

Starting in the late 1980s, a series of local and regional actions combined to notably weaken the local manufacturing sector. This downward trend resulted in a much lower demand for cleared land and development. Some commercial development occurred during this period, but most were associated with developed corridors such as Route 457. From a natural resource perspective, this period of slowed growth was beneficial because it provided an opportunity for formerly-cleared areas to continue to regenerate. Aerial images collected in 1999 show clear evidence that many of the areas shown as deforested in the earlier USGS mapping have undergone some level of reforestation. As noted earlier in this Section, the area that most clearly illustrates this trend is

the land around Chestnut Knob. In addition to providing a large amount of terrestrial habitat, this area also contains numerous streams (*e.g.* Marrowbone Creek, Patterson Branch, and Stillhouse Run) and wetlands (see **Section 2.3.2**). Although this process of reforestation is more of a passive trend than the result of any private or public program, it is an important aspect of the ICE Natural Resources Study Area's history and meaningfully enough that it most likely offset enough of the impacts associated with this period of development so that the overall effect to the ICE Natural Resources Study Area's notable natural resources was adverse but minor.

The reasonably foreseeable future actions consist predominately of transportation projects designed to protect and enhance the safety and function of the existing highway network. Many of these projects are not inherently designed to address existing natural resources impairments, but they may provide the opportunity to have a beneficial impact on aquatic habitats and water quality by updating or including stormwater management facilities. If completed, these actions could have a minor beneficial effect on the ICE Natural Resources Study Area's aquatic habitats and general water quality.

The primary non-transportation action identified is the continued development of the Commonwealth Crossing Business Centre. At present, approximately 120 acres of the site has been cleared and prepared for development. The remaining portion (606 acres) is still wooded. Based on aerial photography, the land which the development occupies was once completely forested. Because of this clearing, both the present and future development of the Business Centre would have an adverse impact on the ICE Natural Resources Study Area's notable natural resources by reducing the availability of wildlife habitat, adding impervious surface to the local watersheds, and increasing the generation of nonpoint source water pollution. Some of these adverse impacts on water quality may be offset by the construction of on-site stormwater management facilities.

Other reasonably foreseeable future actions include the completion of the Commonwealth Crossing Transmission Line Project and the relocation of the Henry County Jail to the Dupont Site along the Smith River. The continued work on the Commonwealth Crossing Transmission Line Project would likely result in additional clearing and habitat conversion, thus having an adverse impact on the ICE Natural Resources Study Area's natural resources. The relocation of the Henry County Jail would result in the repurposing of an abandoned industrial site and could result in updates to existing stormwater facilities and infrastructure. If so, this project may have a minor beneficial impact on natural resources within the ICE Natural Resources Study Area.

Collectively, the past, present and future actions identified by this analysis include the clearing and fragmentation of forests, the destruction of aquatic habitats, and the general degradation of water quality. These actions have led to adverse impacts to the ICE Natural Resources Study Area's notable natural resources. In the last quarter of the 20th century, however, the decline in the local manufacturing sector reduced the demand for cleared land and created an opportunity for some of the previously cleared forests to regenerate. Although this process of regeneration is more of a passive trend than the result of a private or public program, it nevertheless has had a positive impact on not only the ICE Natural Resources Study Area's forests, but also the streams, wetlands, and floodplains they contain. Therefore, the past, present and future actions identified by this analysis constitute a moderate adverse effect on the ICE Natural Resources Study Area's notable natural resources

3.4.2.2 No-Build Alternative

The No-Build Alternative would not result in any incremental effect to water resources, floodplains, wildlife habitat, or threatened and endangered species in the Cumulative Effects Study Area.

3.4.2.3 Alternative A

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on water quality by disturbing existing natural areas, increasing the extent of impervious surfaces and compacted soils, increasing nonpoint source pollution from roadways, and renovating existing stormwater management facilities. Over 20 percent of the waterways in the Dan River Basin are currently classified as impaired (PTRC, 2012). The primary source of this impairment is the presence of high levels of E. coli. Since Alternative A would not affect the status of the existing sanitary sewer infrastructure, it is unlikely that it would have any effect on this source of impairment. The clearing of forested lands required to construct Alternative A would contribute to forms of water quality impairment associated with the removal of vegetation and an increased presence of impervious surfaces. These actions would likely decrease the capacity of affected watersheds to capture heavy rainfalls thereby increasing stream turbidity, increasing the concentration of road-sourced water pollutants in surface water bodies, and increasing the occurrence of thermal pollution. Although these effects are not projected to affect Beaver Creek (the ICE Natural Resources Study Area's primary source drinking water), they would contribute to the general degradation of water quality.

Alternative A is projected to have a large direct impact on the ICE Natural Resources Study Area's overall water quality. This is based on the combined impacts to vegetative cover and aquatic systems including streams and wetlands. Since Alternative A would involve the renovation and/or installation of existing stormwater management facilities, some of the adverse effects could likely be offset. The construction of any mitigation measures determined to be warranted through the regulatory permitting process presents a similar opportunity. Taking this into consideration, Alternative A would contribute moderate adverse impacts to the overall cumulative effects on water quality associated with past, present, and other reasonably foreseeable future actions.

The ICE Natural Resources Study Area's past and present developments have adversely affected the quality of local streams through channelization, the creation of impoundments (i.e., the Smith River Dam and the Martinsville Reservoir), and altering the surrounding natural landscape. Alternative A, and similar future actions, would exacerbate these effects by placing some streams in drainage conveyances, altering surface-water hydrology, and clearing forested lands. Of the three alternatives, Alternative A is projected to generate a large direct impact to streams (approximately 28,998 linear feet of stream channel). Some of the adverse effects could be minimized by the renovation and installation of stormwater management facilities and proper use of erosion and sediment controls during construction. Some of the unavoidable impacts could be offset through the implementation of mitigation measures determined to be warranted through the regulatory permitting process. Considering all these factors, Alternative A would contribute moderate to major adverse impacts to the cumulative effects on streams associated with past, present, and other reasonably foreseeable future actions.

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on wetlands by disturbing existing natural areas, altering surface-water hydrology, and renovating existing stormwater management facilities. The ICE Natural Resources Study Area's past and present developments have adversely affected the quality of local wetlands by reducing their extent (through the installation of drainage tiles and the placement of fill), altering surface water hydrology through the alteration of the surrounding land cover, and the creation of impoundments (i.e., the Smith River Dam and the Martinsville Reservoir). Alternative A, and similar future actions, would exacerbate these effects by filling wetlands, altering surface-water hydrology, and clearing forested lands. Alternative A is projected to impact approximately 7.8 acres of wetlands. Some of the adverse effects could be minimized by the renovation and installation of stormwater management facilities, proper use of erosion and sediment control practices during construction, and replanting temporarily impacted areas with native species

observed on site. Some of the unavoidable impacts could be offset through the implementation of mitigation measures determined to be warranted by the regulatory permitting process. Considering all these factors, Alternative A would contribute moderate to minor adverse impacts to the overall cumulative effect on wetlands associated with past, present, and other reasonably foreseeable future actions.

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on floodplains in ways previously discussed for streams and wetlands. Overall, Alternative A is projected to generate a direct impact on floodplains (approximately 7.0 acres). Some of the adverse effects could be offset by the renovation and installation of stormwater management facilities, allowing proper drainage and connectivity of surface flow, and the use of bridges that span floodplains rather than using fill and piping streams. Some of the unavoidable impacts could be offset through the implementation of mitigation measures determined to be warranted by the regulatory permitting process. Taking this into consideration, Alternative A would contribute minor adverse impacts to the overall cumulative effects on floodplains associated with past, present, and other reasonably foreseeable future actions.

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on wildlife habitat by disturbing existing natural areas, altering vegetative structure and species composition, expanding highway usage, fragmenting habitat, and altering hydrologic regimes. The ICE Natural Resources Study Area's past and present developments have adversely affected the quality and viability of local wildlife and the habitat they rely on. This effect is derived from many activities, including deforestation, conversion of grasslands and floodplains for agricultural use, altering surface water hydrology, the creation of impoundments (i.e., the Smith River Dam and the Martinsville Reservoir), and the introduction of invasive species. Despite these impacts, areas of high-quality forested habitat can still be found within the ICE Natural Resources Study Area. Alternative A is projected to have a direct impact on forested areas (approximately 318 acres). Some of the adverse effects could be minimized by the proper use of erosion and sediment control measures and stormwater management practices, the use of structures which preserve stream morphology and wildlife habitat connectivity such as bridges and countersunk culverts, replanting temporarily impacted areas with native species observed on site, and using caution to avoid the introduction of invasive species. Some of the unavoidable impacts could be offset through the implementation of mitigation measures determined to be warranted through the regulatory permitting process. Taking this into consideration, Alternative A would contribute moderate adverse impacts to the overall cumulative effects on wildlife habitat associated with past, present, and other reasonably foreseeable future actions.

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on threatened and endangered species in many of the same ways discussed above for wildlife habitat. The ICE Natural Resources Study Area contains six species listed as threatened or endangered by the USFWS and 11 species listed as endangered or threatened by Virginia and/or North Carolina (see **Table 2-11**). Natural areas which may provide suitable habitat for some of the listed species are relatively abundant in the ICE Natural Resources Study Area but have encountered degradation because of past and present development. Alternative A, and similar future actions, could exacerbate this degradation. Some of the adverse effects could be minimized by the proper use of sediment and erosion control and stormwater management practices, the use of structures which preserve stream morphology and wildlife habitat connectivity such as bridges and countersunk culverts, replanting temporarily impacted areas with native species observed on site, using caution to avoid the introduction of invasive species, and phasing construction to follow any necessary Time of Year Restrictions (TOYR). Some of the unavoidable impacts could be offset through the implementation of any mitigation measures determined to be warranted through the regulatory permitting process. Taking this into

consideration, Alternative A would contribute moderate adverse impacts to the overall cumulative effects on threatened and endangered species associated with past, present, and other reasonably foreseeable future actions.

3.4.2.4 Alternative B

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on water quality by disturbing existing natural areas, increasing the extent of impervious surface and compacted soils, increasing nonpoint source pollution from roadways, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. The practices that could be used to minimize and mitigate impacts to water quality for Alternative B are the same as those discussed for Alternative A. Taking this into consideration, Alternative B would contribute moderate to minor adverse impacts to the overall cumulative effects on water quality associated with past, present, and other reasonably foreseeable future actions.

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on streams by disturbing existing natural areas, placing some streams in conveyances, altering surface-water hydrology, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative B is projected to impact approximately 20,548 linear feet of stream channel. The practices that could be used to minimize and mitigate impacts to streams for Alternative B are the same as those discussed for Alternative A. Since Alternative B involves the reconstruction of the existing Route 58/Joseph Martin Highway interchange, the scale of beneficial effects generated from the renovation of existing drainage facilities should be larger than that from Alternative A. Taking this into consideration, Alternative B would contribute moderate adverse impacts to the overall cumulative effects on streams associated with past, present, and other reasonably foreseeable future actions.

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on wetlands by disturbing existing natural areas, altering surface-water hydrology, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative B is projected to impact approximately 5.9 acres of wetland. The practices that could be used to minimize and mitigate impacts to wetlands for Alternative B are the same as those discussed for Alternative A. Taking this into consideration, Alternative B would contribute moderate to minor adverse impacts to the overall cumulative effects on wetlands associated with past, present, and other reasonably foreseeable future actions.

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on floodplains by disturbing existing natural areas, altering surface hydrology, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative B is projected to impact approximately 13.7 acres of floodplains. The practices that could be used to minimize and mitigate impacts to floodplains for Alternative B are the same as those discussed for Alternative A. The reconstruction of the existing Route 58/Joseph Martin Highway interchange would contribute moderate to minor adverse impacts to the overall cumulative effects on floodplains associated with past, present, and other reasonably foreseeable future actions.

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on wildlife habitat by disturbing existing natural areas, altering vegetative structure and species composition, expanding highway usage, fragmenting habitat, and altering hydrologic regimes. The type of environmental consequences associated with these

actions are similar to those discussed under Alternative A. Alternative B is projected to impact approximately 261 acres of forests. The practices that could be used to minimize and mitigate impacts to wildlife habitat for Alternative B are the same as those discussed for Alternative A. Taking this into consideration, Alternative B would contribute moderate adverse impacts to the overall cumulative effects on wildlife habitat associated with past, present, and other reasonably foreseeable future actions.

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on threatened and endangered species in many of the same ways discussed for wildlife habitat. The ICE Natural Resources Study Area contains six species listed as endangered or threatened by the USFWS and 11 species listed as endangered or threatened by Virginia and/or North Carolina (see **Table 2-11**). Natural areas which may provide suitable habitat for some of the listed species are relatively abundant in the ICE Natural Resources Study Area but have encountered degradation because of past and present development. Alternative B, and similar future actions, could exacerbate this degradation. The practices that could be used to minimize and mitigate impacts to protected species for Alternative B are the same as those discussed for Alternative A. Taking this into consideration, Alternative B would contribute moderate adverse impacts to the overall cumulative effects on threatened and endangered species associated with past, present, and other reasonably foreseeable future actions.

3.4.2.5 Alternative C (Preferred Alternative)

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on water quality by disturbing existing natural areas, increasing the extent of impervious surface and compacted soils, increasing nonpoint source pollution from roadways, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. The practices that could be used to minimize and mitigate impacts to water quality for Alternative C are the same as those discussed for Alternative A. Taking this into consideration, Alternative C would contribute moderate to minor adverse impacts to the overall cumulative effects on water quality associated with past, present, and other reasonably foreseeable future actions.

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on streams by disturbing existing natural areas, placing some streams in conveyances, altering surface-water hydrology, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative C is projected to impact approximately 21,882 linear feet of stream channel. The practices that could be used to minimize and mitigate impacts to streams for Alternative C are the same as those discussed for Alternative A. Since Alternative C involves the reconstruction of the existing Route 58/Joseph Martin Highway interchange, the scale of beneficial effects generated from the renovation of existing drainage facilities should be similar to that of Alternative B but larger than that of Alternative A. Taking this into consideration, Alternative C would contribute moderate adverse impacts to the overall cumulative effects on streams associated with past, present, and other reasonably foreseeable future actions.

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on wetlands by disturbing existing natural areas, altering surface-water hydrology, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative C is projected to impact approximately 3.7 acres of wetland. The practices that could be used to minimize and mitigate impacts to wetlands for Alternative C are the same as those discussed for Alternative A. Since Alternative C involves the reconstruction of the existing Route

58/Joseph Martin Highway interchange, the scale of beneficial effects generated from the renovation of existing drainage facilities should be similar to that of Alternative B but larger than that of Alternative A. Taking this into consideration, Alternative C would contribute minor adverse impacts to the overall cumulative effects on wetlands associated with past, present, and other reasonably foreseeable future actions.

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on floodplains by disturbing existing natural areas, altering surface hydrology, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative C is projected to impact approximately 7.5 acres of floodplains. The practices that could be used to minimize and mitigate impacts to floodplains for Alternative C are the same as those discussed for Alternative A. The reconstruction of the existing Route 58/Joseph Martin Highway interchange would contribute moderate to minor adverse impacts to the overall cumulative effects on floodplains associated with past, present, and other reasonably foreseeable future actions.

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on wildlife habitat by disturbing existing natural areas, altering vegetative structure and species composition, expanding highway usage, fragmenting habitat, and altering hydrologic regimes. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative C is projected to directly impact approximately 224 acres of forests. The practices that could be used to minimize and mitigate impacts to wildlife habitat for Alternative C are the same as those discussed for Alternative A. Taking this into consideration, Alternative C would contribute moderate to minor adverse impacts to the overall cumulative effects on wildlife habitat associated with past, present, and other reasonably foreseeable future actions.

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on threatened and endangered species in many of the same ways discussed for wildlife habitat. The ICE Natural Resources Study Area contains six species listed as endangered or threatened by the USFWS and 11 species listed as endangered or threatened by Virginia and/or North Carolina (see **Table 2-11**). Natural areas which may provide suitable habitat for some of the listed species are relatively abundant in the ICE Natural Resources Study Area but have encountered degradation because of past and present development. Alternative C, and similar future actions, could exacerbate this degradation. The practices that could be used to minimize and mitigate impacts to protected species for Alternative C are the same as those discussed for Alternative A. Taking this into consideration, Alternative C would contribute moderate to minor adverse impacts to the overall cumulative effects on threatened and endangered species associated with past, present, and other reasonably foreseeable future actions.

3.4.3 Historic Resources

With human occupation of the Martinsville area extending thousands of years into the past and ongoing today, archaeological and architectural historic properties have been continuously created and destroyed by succeeding developments over time in the ICE Historic Resources Study Area. These modifications occurred most extensively from the early 1920s through the 1970s, as the area's industrialization fueled the expansion of multiple forms of development. Transportation improvements and other actions potentially adversely affected archaeological and architectural historic properties by destruction or altering the integrity of their historically important characteristics. Federal and state laws requiring agencies to consider effects to historic properties have slowed the loss of historic properties. As described in **Section 3.4**, Section 106 of the NHPA

of 1966 (as amended) (54 U.S.C. §306108) and its implementing regulations (36 CFR §800) require Federal agencies to take into account the effects of their undertakings on historic and archaeological properties. Additionally, Section 4(f) of the USDOT Act of 1966 allows for the use of a historic property only if there is no prudent and feasible alternative. Transportation improvements can also increase visitation to historic properties open to the public, sustaining historic resources tourism and providing incentives for preservation. Other incentives for historic preservation are offered by Federal, state, and local governments in the form of grants and tax breaks.

3.4.3.1 No-Build Alternative

Under the No-Build Alternative, historic resources in the vicinity of Route 220 would continue to have proximity effects associated with vehicular and truck traffic.

3.4.3.2 Alternatives A, B, and C

All direct and indirect effects to archaeological and historic architectural properties have been considered under Section 106 of the NHPA as described in the archaeological and historic architectural sections of the Draft EIS.

Past and present development actions have directly and indirectly impacted archaeological and historic architectural historic properties. Future actions in the ICE Historic Resources Study Area such as redevelopment projects conducted by local governments, various transportation projects, and other present and reasonably foreseeable projects could have adverse effects to historic properties. Federal, state, and local regulations would continue to minimize potential adverse effects to historic properties from their actions. Section 4(f) requires Federal departments of transportation to avoid adversely impacting architectural historic properties important for preservation in place and authorizes adverse effects only if there is no other prudent and feasible alternative. The incremental contribution of the Build Alternatives to cumulative effects on historic properties would be none to minor adverse.

3.5 WHAT IS THE OVERALL IMPACT ON VARIOUS RESOURCES FROM ACCUMULATIONS OF THE ACTIONS?

Alternatives A, B, and C would likely generate a variety of adverse and beneficial effects to socioeconomic resources. In most cases, there are procedures and regulations in place at both the state and local level to help offset losses and accentuate gains. Some of the procedures, such as the relocation assistance services provided by VDOT, are consistent enough to be reasonably foreseeable. However, many of the other processes (most notably the opportunities for economic redevelopment around interchanges), are reliant not only on timely administrative updates to local ordinances (i.e., rezoning) but also favorable economic conditions. Overall, Alternatives A, B, and C would contribute adverse increments to the cumulative effect to the ICE Socioeconomics Resources Study Area's notable socioeconomic resources associated with past, present, and other reasonably foreseeable future actions.

Alternatives A, B, and C would likely generate a variety of adverse and beneficial effects to water resources, floodplains, wildlife habitat, and threatened and endangered species. In most cases, there are procedures and regulations in place at both state and local level to help offset losses and accentuate gains. Some of the procedures, such as state and Federal requirements to mitigate direct impacts to wetlands, are consistent enough to be reasonably foreseeable. However, many of the other processes (most notably the extent and focus of ongoing soil and water conservation efforts), are variable. Overall, Alternatives A, B, and C would contribute adverse impacts to the overall cumulative effects associated with past, present, and other reasonably foreseeable future actions.

Alternatives A, B, and C would likely generate a variety of adverse and beneficial effects to historic resources. Alternatives A, B, and C would contribute none to adverse impacts to the overall cumulative effects associated with past, present, and other reasonably foreseeable future actions.

The potential incremental contribution of the Build Alternatives to cumulative effects on the resources evaluated are summarized in **Table 3-3**. Incremental effects of the alternatives contributing to cumulative socioeconomic, natural, and historic resources would range from moderate beneficial to major adverse. Coupled with past, present, and future actions, the overall cumulative effects of the Build Alternatives would range from beneficial to adverse to socioeconomic resources, adverse to natural resources, and none to minor to historic resources.

Table 3-3: Summary of Build Alternative Incremental Contribution Effects[1]

Resource	Alternative A	Alternative B	Alternative C (Preferred Alt.)	Cumulative Effect
Land Use / Community Cohesion	Minor Adverse	Minor Adverse	Minor Adverse	Adverse
Economic Resources	Minor Beneficial	Minor Beneficial	Minor Beneficial	Beneficial
Community Facilities, Parks, and Open Spaces	Minor Adverse	Minor Adverse	Minor Adverse	Adverse
Environmental Justice	Minor Adverse	Minor Adverse	Minor Adverse	Adverse
Water Resources	Major to Minor Adverse	Moderate to Minor Adverse	Moderate to Minor Adverse	Adverse
Floodplains	Minor Adverse	Moderate to Minor Adverse	Moderate to Minor Adverse	Adverse
Wildlife Habitat	Moderate Adverse	Moderate Adverse	Moderate to Minor Adverse	Adverse
Threatened & Endangered	Moderate Adverse	Moderate Adverse	Moderate to Minor Adverse	Adverse
Archaeological Sites	Minor Adverse	Minor Adverse	Minor Adverse	Adverse
Historic Structures	Minor Adverse	Minor Adverse	None	None to Adverse

Note: Shaded column denotes Preferred Alternative.
*[1] See **Table 3-2** for definitions of the severity of cumulative effects*

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APPENDIX A

USGS HISTORICAL MAPS

Figure A-1:

USGS Martinsville 15’ Quadrangle (1924)

819-N-III-W/2

STATE OF VIRGINIA

GEOLOGICAL SURVEY

ALBERT W. GILES, ACTING DIRECTOR

DEPARTMENT OF THE INTERIOR

U. S. GEOLOGICAL SURVEY

VIRGINIA-NORTH CAROLINA

MARTINSVILLE QUADRANGLE

Topography by T. F. Slaughter, Olinus Smith, R.C. Seitz, G.E. Sisson, Elmer Elshire, and L.A. Freeman
Control in part by railroad valuation surveys
Surveyed in 1924

Polyconic projection. North American datum
5000 yard grid based upon U. S. zone system, B

Scale 1/48,000

1 ½ 0 1 2 3 4 Miles

5,000 0 5,000 10,000 15,000 Feet

1 ½ 0 1 2 3 4 Kilometers

Contour interval 20 feet

Datum is mean sea level

APPROXIMATE MEAN DECLINATION, 1924

MAGNETIC NORTH 3° TRUE NORTH

818 | 819 | 820 | 803 | 831

MARTINSVILLE, VA-N.C.

Figure A-2:

USGS Martinsville 15’ Quadrangle (1944)

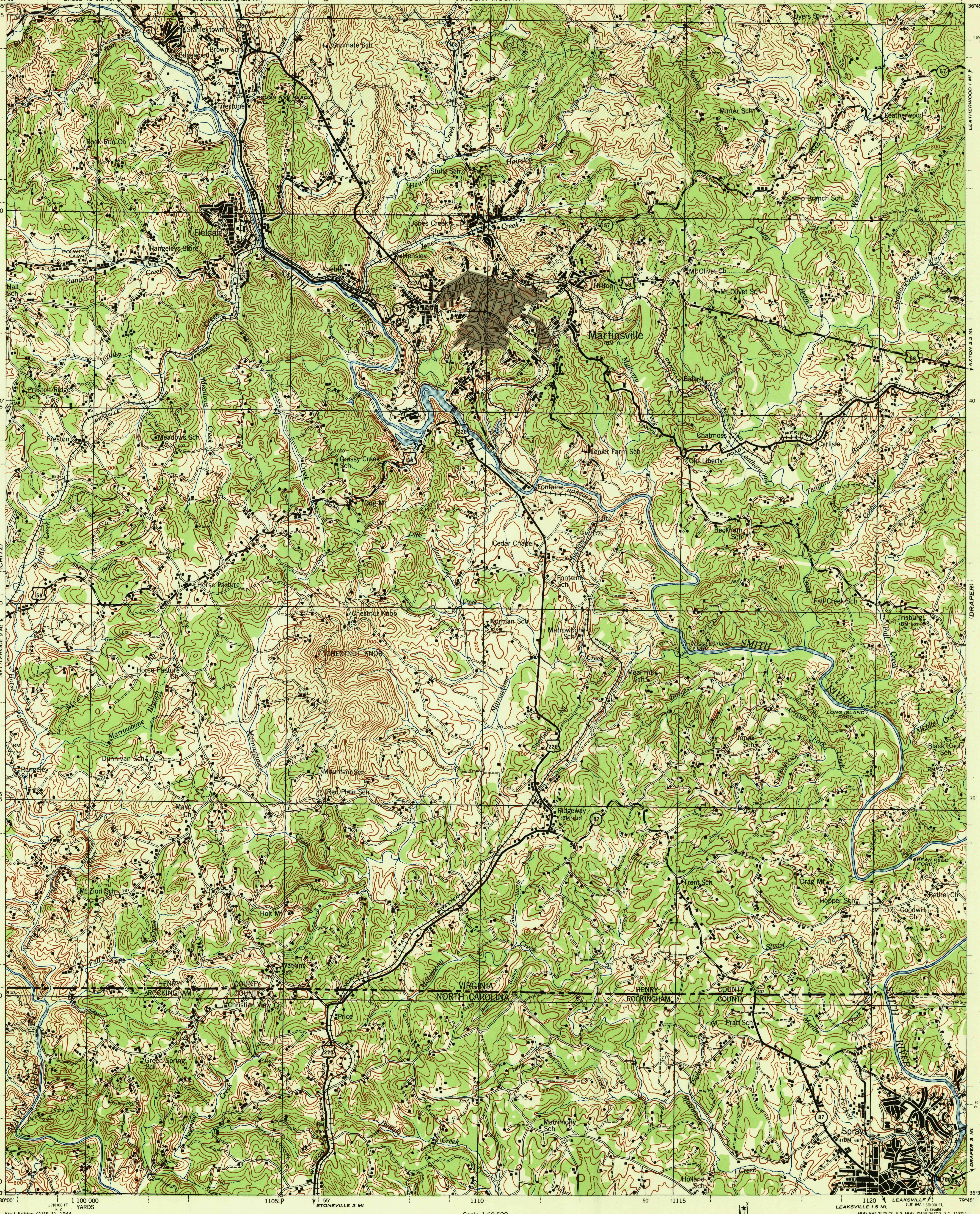
VA.—N.C. 1:62,500

WAR DEPARTMENT
CORPS OF ENGINEERS, U.S. ARMY

FIRST EDITION-AMS 1

MARTINSVILLE QUADRANGLE

15 MINUTE SERIES



First Edition (AMS 1), 1944.

Prepared under the direction of the Chief of Engineers, U. S. Army, by the Army Map Service (QU), U. S. Army, Washington, D. C., 1944.
Based on U.S.G.S. Quadrangle, Martinsville, 1:62,500 (1924).
Control by U. S. Geological Survey.
Surveyed in cooperation with the State of Virginia, 1924.
Revised from single lens vertical aerial photographs.
Aerial photography - A.A.A., Department of Agriculture, 1941.
Polyconic Projection, North American Datum.

ROAD CLASSIFICATION 1943

Dependable hard-surface, heavy-duty road. — Loose-surface graded, dry weather road. — U. S. Route 160
Secondary, hard-surface, all-weather road. — Dirt road. — State Route 30
More than two lanes indicated by note along road with tick at point of change. 3 LANE | 4 LANE

Scale 1:62,500

1 ½ 0 1 2 3 Miles

1000 0 1000 2000 3000 4000 5000 Yards

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

FIVE THOUSAND YARD GRID COMPUTED FROM "GRID SYSTEM FOR PROGRESSIVE MAPS IN THE U.S.", ZONE B. U.S.C. & G.S. SPECIAL PUBLICATION NO. 59

THE LAST THREE DIGITS OF THE GRID NUMBERS ARE OMITTED

THE STATE GRIDS ARE INDICATED FOR VIRGINIA, ZONE SOUTH BY ····· TICKS, FOR NORTH CAROLINA BY —·— TICKS OUTSIDE THE NEAT LINE AT 10,000 FOOT INTERVALS

NOTE: OFFICERS USING THIS MAP WILL MARK HEREON CORRECTIONS AND ADDITIONS WHICH COME TO THEIR ATTENTION AND MAIL DIRECT TO THE CHIEF OF ENGINEERS, WASHINGTON, D.C.

4°00' OR 71 MILS — 0°40' OR 12 MILS — MAGNETIC NORTH — GRID NORTH

APPROXIMATE MEAN DECLINATION 1944 FOR CENTER OF SHEET
ANNUAL MAGNETIC CHANGE 1' DECREASE

Use diagram only to obtain numerical values. To determine magnetic north line, connect the pivot point "P" on the south edge of the map with the value of the angle between GRID NORTH and MAGNETIC NORTH, as plotted on the degree scale at the north edge of the map.

ARMY MAP SERVICE, U.S. ARMY, WASHINGTON, D.C. 113353 1944
3/45-KA

LEGEND

BRUSH

MARTINSVILLE, VA.-N.C.
N3630-W7945/15

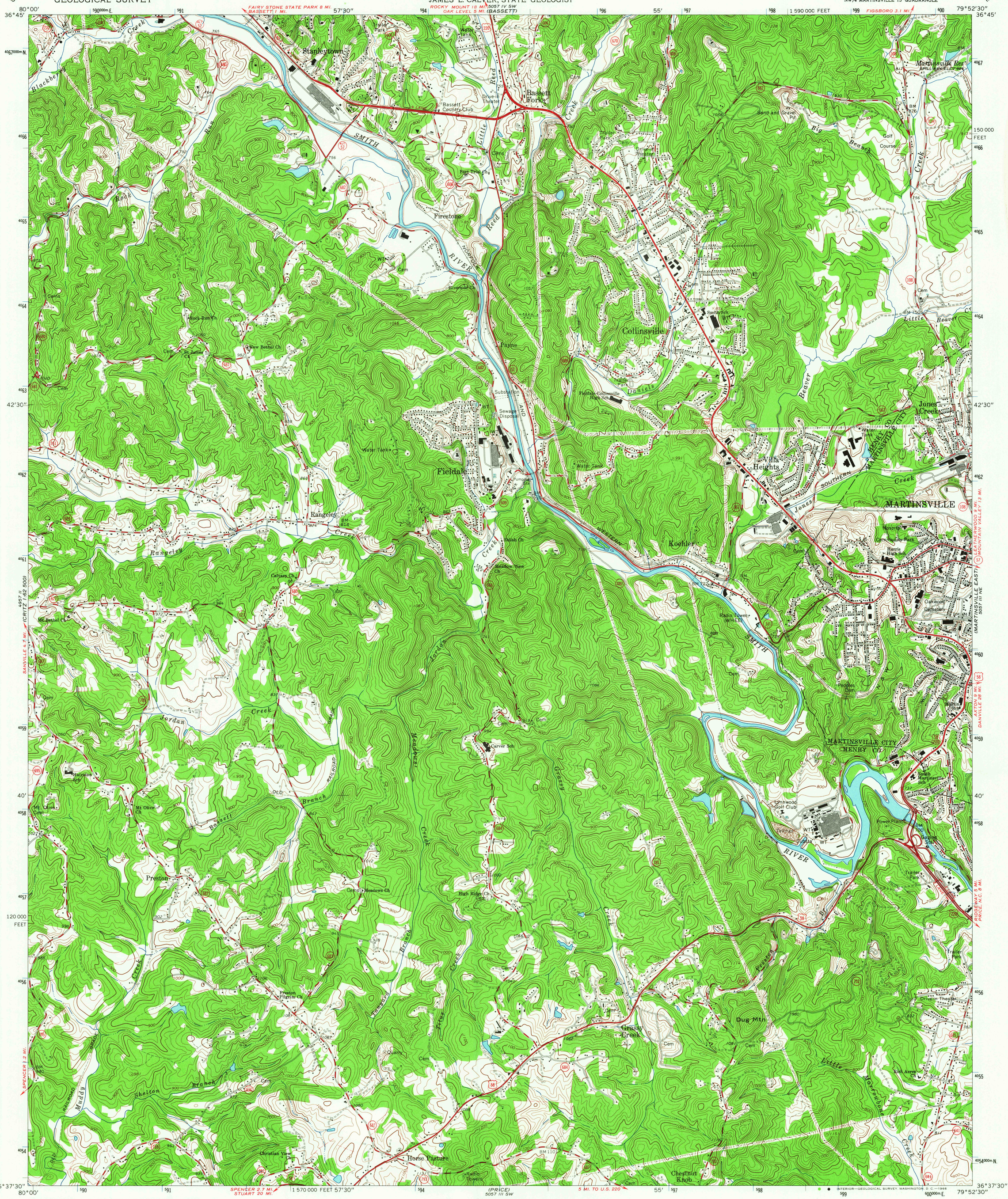
Figure A-3:

USGS Martinsville West 7.5’ Quadrangle (1965)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST

MARTINSVILLE WEST QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 MARTINSVILLE 15' QUADRANGLE



Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1965

Polyconic projection. 1927 North American datum
10,000-foot grid based on Virginia coordinate system, south zone
1000-meter Universal Transverse Mercator grid ticks,
zone 17, shown in blue

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

MN 3½° 62 MILS GN 0°38' 11 MILS
UTM GRID AND 1965 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C. 20242
AND VIRGINIA DIVISION OF MINERAL RESOURCES, CHARLOTTESVILLE, VIRGINIA
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION
Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
U. S. Route — State Route

VIRGINIA
QUADRANGLE LOCATION

MARTINSVILLE WEST, VA.
NW/4 MARTINSVILLE 15' QUADRANGLE
N3637.5—W7952.5/7.5
1965

AMS 5057 III NW—SERIES V834

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1966

Figure A-4:

USGS Martinsville West 7.5’ Quadrangle (Photorevised 1984)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

MARTINSVILLE WEST QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

4957 I SE (PHILPOTT RESERVOIR)
5057 IV SE (SNOW CREEK)
80°00'
36°45'
57'30"
55'
79°52'30"
FAIRY STONE STATE PARK 8 MI.
BASSETT 1 MI.
ROCKY MOUNT 18 MI.
OAK LEVEL 5 MI.
5057 IV SW (BASSETT)
FIGSBORO 3.1 MI.
1 590 000 FEET
150 000 FEET
42'30"
40'
120 000 FEET
36°37'30"
1 570 000 FEET
Stanleytown
Bassett Forks
Bassett Country Club
Firestone
Riverside Ch
Payne
Collinsville
Smith Sch
Fieldale-Collinsville High Sch
Fieldale
Martinsville Res
Golf Course
Sand and Gravel Pit
Jones Creek
Villa Heights
MARTINSVILLE
Hospital
Community Park
Harris High Sch
Oakwood Cemetery
Koehler
Radio Tower (WHEE)
Rangeley
Calvary Ch
Mt Bethel Ch
Rock Run Ch
New Bethel Ch
St James Ch
Shiloh Ch
Meadow View Ch
Carver Sch
Hairston Sch
Mt Olive Ch
Mt Olive Cem
Preston
Meadows Ch
High Ridge Ch
Preston Pilgrim Ch
Christian View Ch
Horse Pasture
Radio Towers
Grassy Creek
Dug Mtn
Chestnut Knob
Rich Acres Ch
Drive-in Theater
Trailer Park
Lynnwood Golf Club
Power Plant
Gaging Sta
South Martinsville Sch
MARTINSVILLE CITY
HENRY CO
Peoples Cem
SMITH RIVER
Quarry
SANVILLE 4.7 MI.
4957 II NE (SANVILLE)
SPENCER 1.2 MI.
SPENCER 2.7 MI.
STUART 20 MI.
5 MI. TO U.S. 220
LEATHERWOOD 9 MI.
MOUNTAIN VALLEY 13 MI.
(MARTINSVILLE EAST) 5057 III NE
AXTON 9 MI.
DANVILLE 28 MI.
RIDGEWAY 5 MI.
PRICE, N.C. 8 MI.
0.9 MI. TO U.S. B-R 220
(PRICE) 5057 III SW
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1989

(SPENCER) 4957 II SE

Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1965

Polyconic projection. 10,000-foot grid ticks based on Virginia coordinate system, south zone
1000-meter Universal Transverse Mercator grid ticks, zone 17, shown in blue
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 10 meters south and 19 meters west as shown by dashed corner ticks

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

MN GN
6° 107 MILS
0°38' 11 MILS

UTM GRID AND 1984 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225
OR RESTON, VIRGINIA 22092
AND VIRGINIA DIVISION OF MINERAL RESOURCES, CHARLOTTESVILLE, VIRGINIA 22903
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

VIRGINIA
QUADRANGLE LOCATION

Revisions shown in purple and woodland compiled in cooperation with Commonwealth of Virginia agencies from aerial photographs taken 1982 and other sources. This information not field checked
Map edited 1984

ROAD CLASSIFICATION

Heavy-duty	Light-duty
Medium-duty	Unimproved dirt
U. S. Route	State Route

(NORTHWEST EDEN) 5057 III SE

MARTINSVILLE WEST, VA.

36079-F8-TF-024

1965
PHOTOREVISED 1984
DMA 5057 III NW—SERIES V834

Figure A-5:

Google Earth Pro™ / USGS Aerial Imagery (1999)

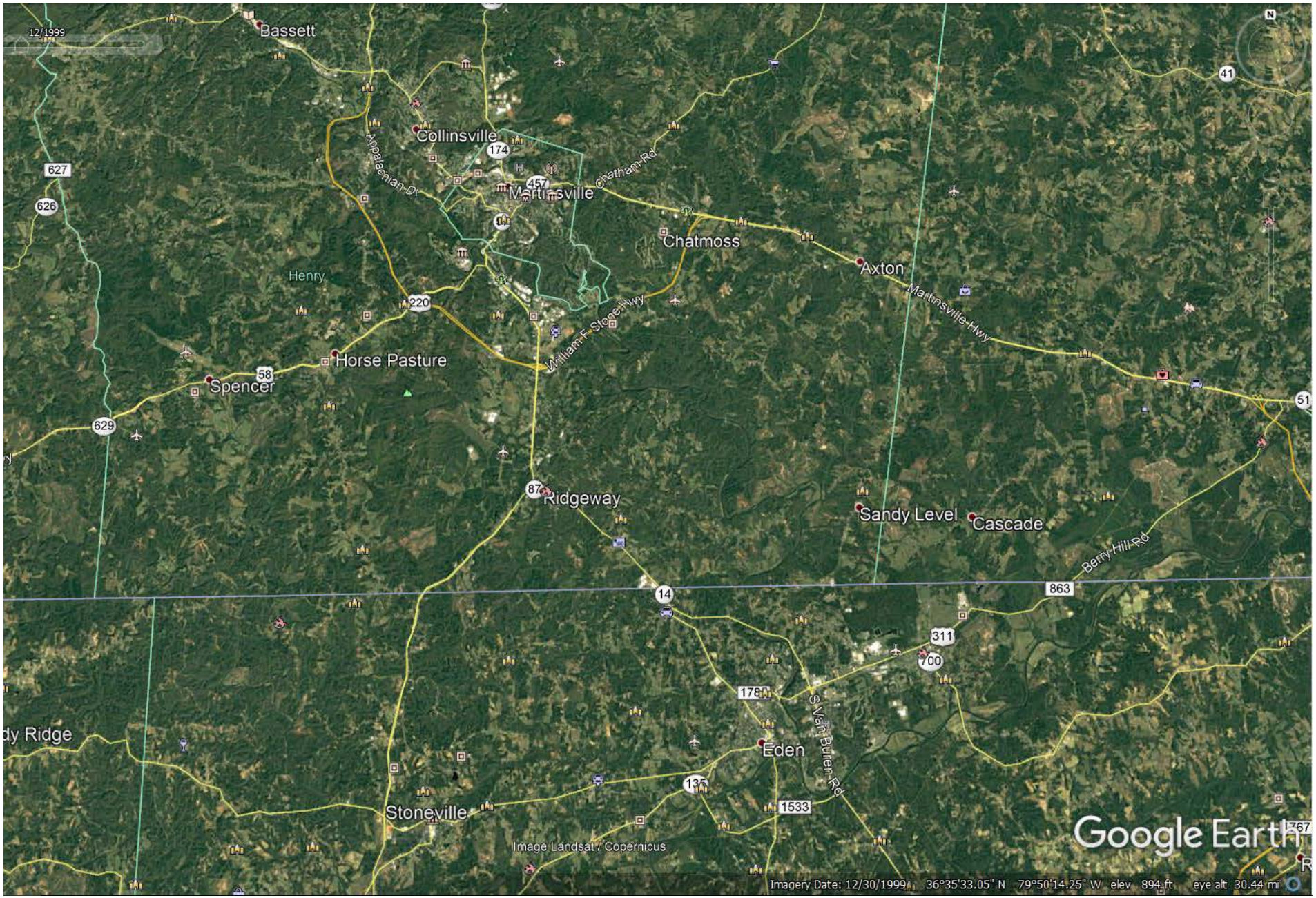

12/1999
Bassett
Collinsville
Appalachian Dr
Chatham Rd
Martinsville
Chatmoss
Axton
Martinsville Hwy
Henry
William F Stoge Hwy
Horse Pasture
Spencer
Ridgeway
Sandy Level
Cascade
Berry Hill Rd
S Van Buren Rd
Eden
Stoneville
dy Ridge
Image Landsat / Copernicus
Google Earth
Imagery Date: 12/30/1999 36°35'33.05" N 79°50'14.25" W elev 894 ft eye alt 30.44 mi

Figure A-6:

Google Earth Pro™ / USGS Aerial Imagery (1999)


Fieldale
701
Villa Heights
174
Commonwealth Blvd W
Martinsville
457
Chatham Rd
Laurel Park
Appalachian Dr
Fayette St
Stanley Ave
57
Chatmoss
BUS
220
58
William F Stone Hwy
Philpott Hwy
Greensboro Rd
609
Image U.S. Geological Survey
Google Earth
1995
Imagery Date: 2/13/1999 36°39'47.58" N 79°51'45.78" W elev 834 ft eye alt 40499 ft

Figure A-7:

Google Earth Pro™ / USGS Aerial Imagery (1999)

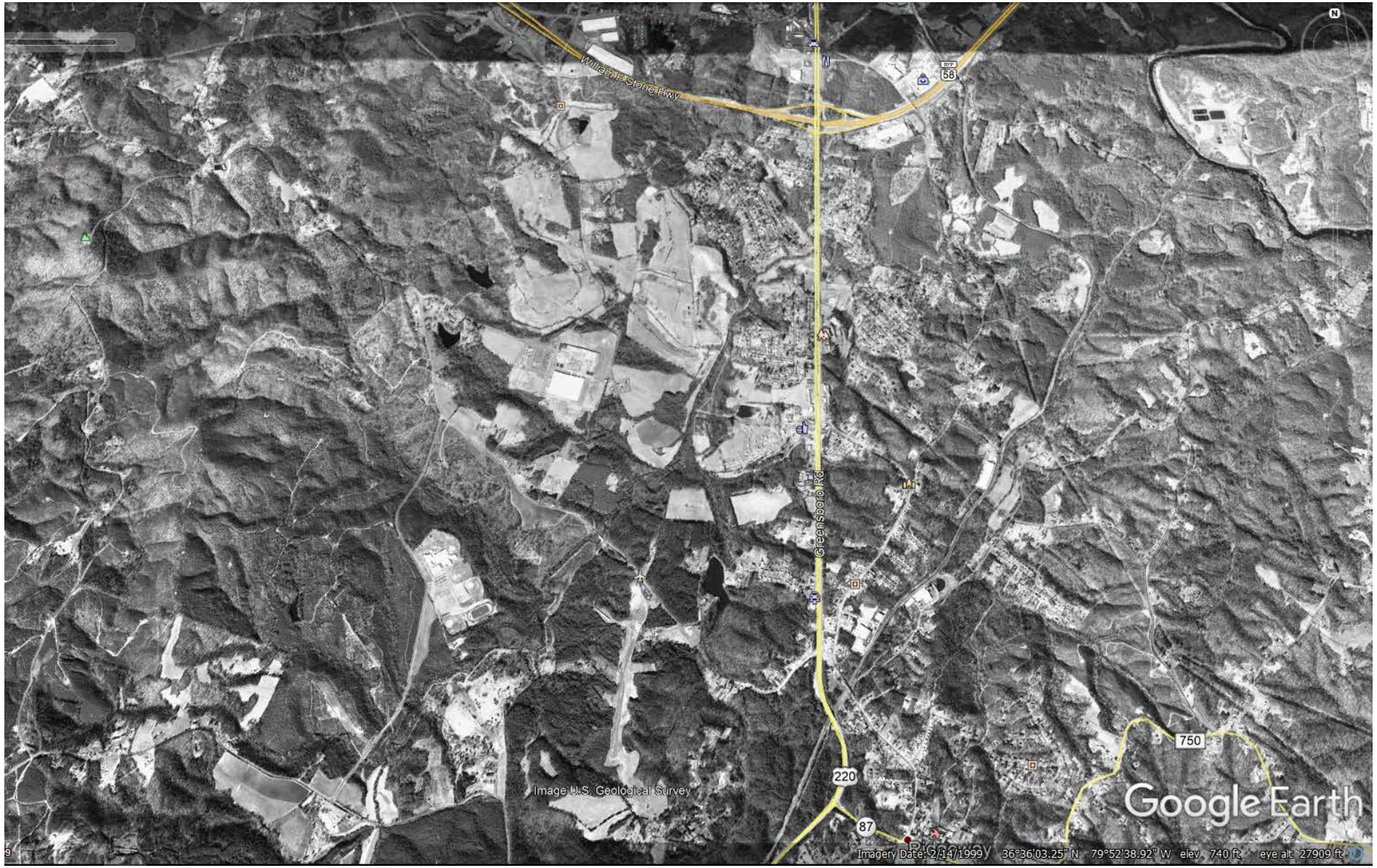

William P. Stone Hwy
58
Green Sea Rd
220
87
750
Image U.S. Geological Survey
Google Earth
Imagery Date: 2/14/1999 36°36'03.25" N 79°52'38.92" W elev 740 ft eye alt 27909 ft

Figure A-8:

Google Earth Pro™ / USGS Aerial Imagery (1999)

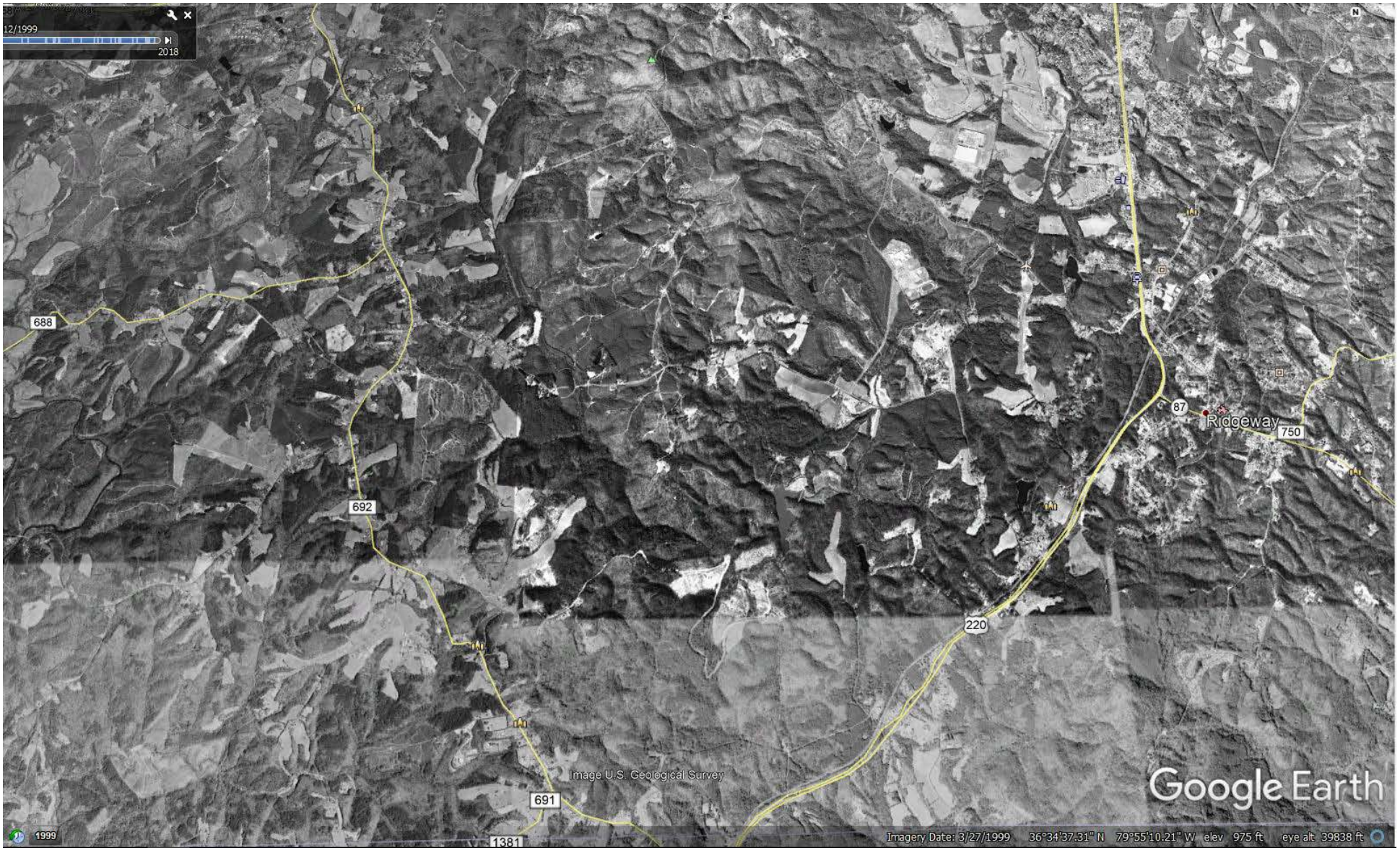

12/1999
2018
688
692
691
1381
220
87
Ridgeway
750
Image U.S. Geological Survey
Google Earth
1999
Imagery Date: 3/27/1999 36°34'37.31" N 79°55'10.21" W elev 975 ft eye alt 39838 ft

Figure A-9:

Google Earth Pro™ / USGS Aerial Imagery (1999)

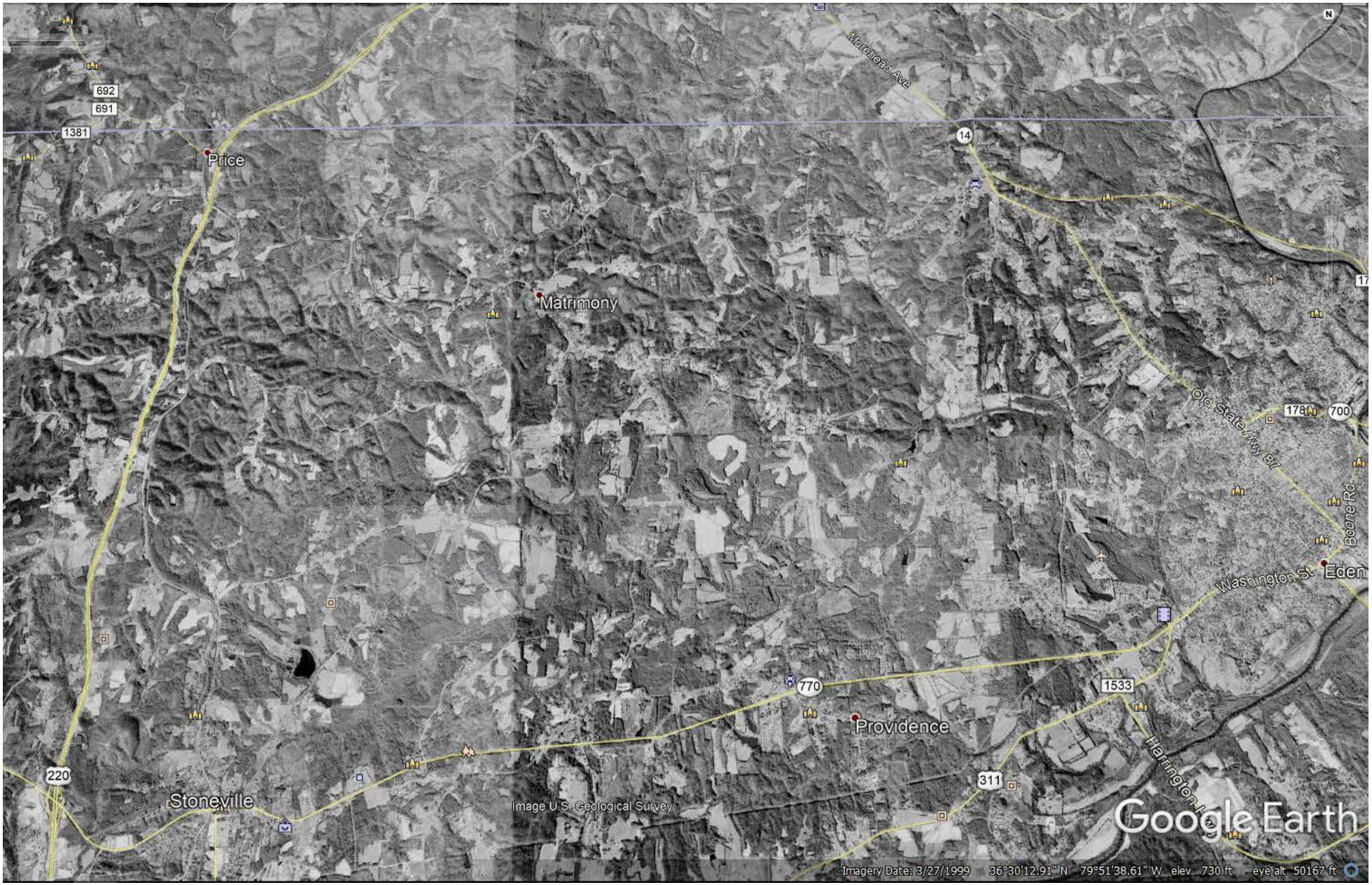

692
691
1381
Price
Matrimony
Morehead Ave
14
Old State Hwy 87
178
700
Boone Rd
Eden
Washington St
770
1533
Providence
311
220
Stoneville
Image U.S. Geological Survey
Google Earth
Imagery Date: 3/27/1999 36°30'12.91" N 79°51'38.61" W elev 730 ft eye alt 50167 ft

Figure A-10:

USGS Price, NC, VA 7.5’ Quadrangle (2019)

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

PRICE QUADRANGLE
NORTH CAROLINA - VIRGINIA
7.5-MINUTE SERIES

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid:Universal Transverse Mercator, Zone 17S
This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery............NAIP, April 2016 - November 2016
Roads............U.S. Census Bureau, 2016
Names............GNIS, 1979 - 2016
Hydrography............National Hydrography Dataset, 2005
Contours............National Elevation Dataset, 1999 - 2010
Boundaries............Multiple sources; see metadata file 2017 - 2018
Wetlands............FWS National Wetlands Inventory 1982

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
NA | PA
Grid Zone Designation 17S

QUADRANGLE LOCATION

ROAD CLASSIFICATION
Expressway — Local Connector
Secondary Hwy — Local Road
Ramp — 4WD
Interstate Route — US Route — State Route

ADJOINING QUADRANGLES
1 Sanville
2 Martinsville West
3 Martinsville East
4 Spencer
5 Northwest Eden
6 Ayersville
7 Mayodan
8 Southwest Eden

PRICE, NC, VA
2019

NSN. 7643016379128
NGA REF NO. USGSX24K36416

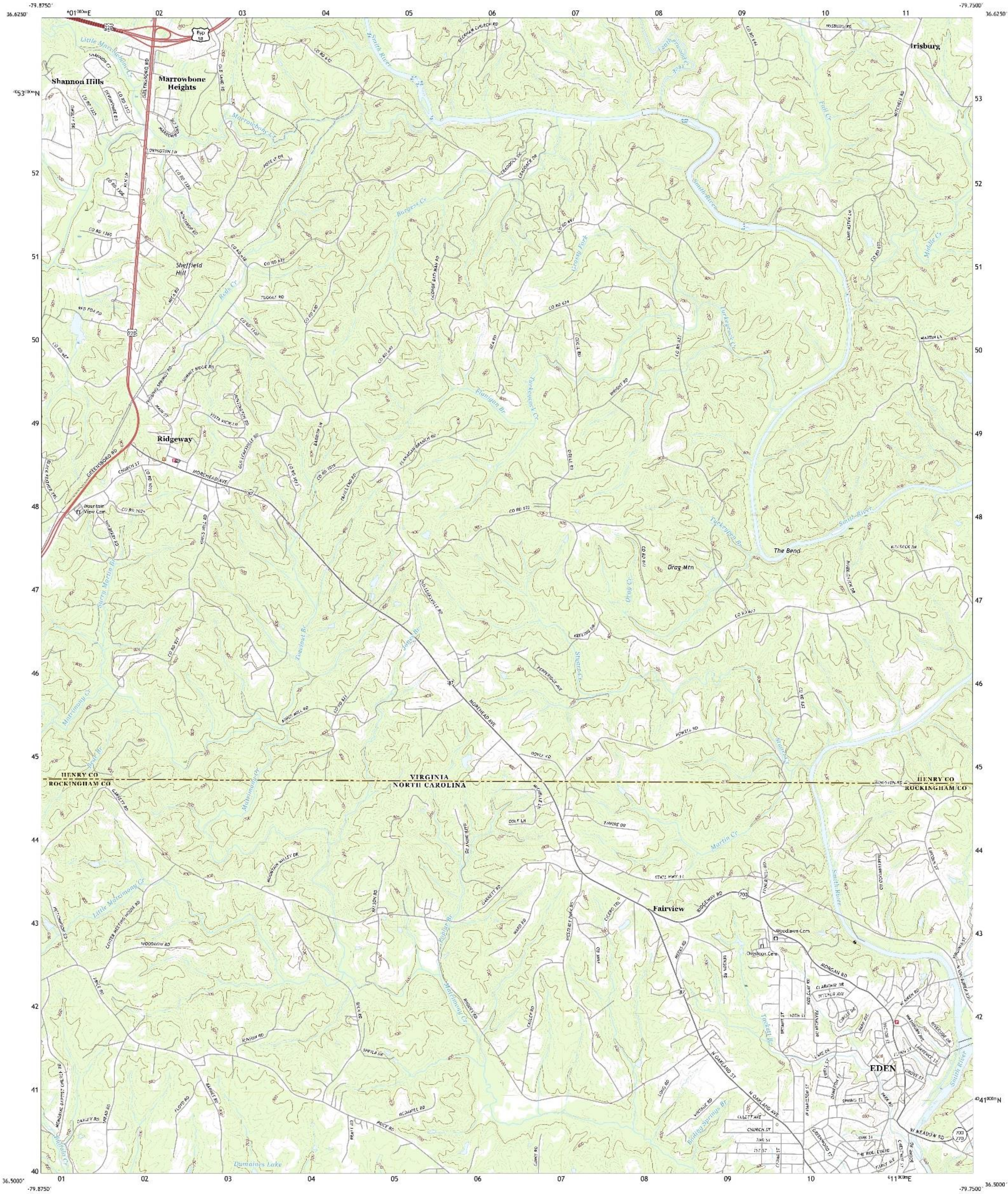
Figure A-11:

USGS Northwest Eden, NC, VA 7.5’ Quadrangle (2019)

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

NORTHWEST EDEN QUADRANGLE
NORTH CAROLINA - VIRGINIA
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 17S

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery....NAIP, April 2016 - November 2016
Roads....U.S. Census Bureau, 2016
Names....GNIS, 1979 - 2019
Hydrography....National Hydrography Dataset, 2005
Contours....National Elevation Dataset, 2010
Boundaries....Multiple sources; see metadata file 2017 - 2018
Wetlands....FWS National Wetlands Inventory 1982

UTM GRID AND 2018 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
PA
Grid Zone Designation
17S

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

QUADRANGLE LOCATION

ADJOINING QUADRANGLES
1 Martinsville West
2 Martinsville East
3 Axton
4 Price
5 Northeast Eden
6 Mayodan
7 Southwest Eden
8 Southeast Eden

ROAD CLASSIFICATION
Expressway — Local Connector
Secondary Hwy — Local Road
Ramp — 4WD
Interstate Route — US Route — State Route

NORTHWEST EDEN, NC, VA
2019

APPENDIX B

COMMUNITY FACILITIES INVENTORY

Community Facilities within the Socioeconomics ICE Study Area

Facility Name, Location	Facility Type
Pace Aviation, Route 687	Airport
Unnamed Cemetery near Route 220 and Route 614	Cemetery
Unnamed Cemetery on Soapstone Road	Cemetery
Unnamed Cemetery on Route 614	Cemetery
Redd Family Cemetery, Route 614	Cemetery
Unnamed Cemetery on Soapstone Road	Cemetery
Unnamed Cemetery on White House Road	Cemetery
Price Family Cemetery on US 220	Cemetery
Patterson Family Cemetery on US 220	Cemetery
Old Fashion Gospel Cemetery, Main Street	Cemetery
Ohev Zion Cemetery, Church Street	Cemetery
Mountain View Cemetery, Church Street	Cemetery
Ridgeway Ruritan Club, Morehead Avenue	Community Center
Ridgeway District Volunteer Fire Department Substation, Route 614	Fire/ Rescue Services
Ridgeway District Rescue Squad, Morehead Avenue	Fire/ Rescue Services
Ridgeway District Fire Department, Morehead Avenue	Fire/ Rescue Services
Mayor's Office, Main Street	Government Offices
U.S. Post Office, Morehead Avenue	Government Offices
State Police – Area 42 Office, Fisher Farm Road	Government Offices
Ridgeway Branch Library, Morehead Avenue	Library
The Ridgeway Jaycee Centennial Park	Parks and Recreation
Forest Park Country Club, Mulberry Road	Parks and Recreation
Martinsville Church of Truth, Place of Worship	Place of Worship
Mercy Crossing Church, Route 614	Place of Worship
Temple of Christ Church, Fishers Farm Road	Place of Worship
Fontaine Baptist Church, Industrial Park Drive	Place of Worship
New Light Baptist Church, Rush Drive	Place of Worship
Grace Baptist Church, Route 220	Place of Worship
Living Waters Church, Route 220	Place of Worship
New Life Community Church, Old Sand Road	Place of Worship
Highland Baptist Church, Mica Road	Place of Worship
Shiloh Temple Apostle Church, Route 1007	Place of Worship
Antioch Baptist Church, Main Street	Place of Worship
Old Fashion Gospel Church, Main Street	Place of Worship
Ridgeway United Methodist Church, Church Street	Place of Worship
Casa de Alabanza, Church Street	Place of Worship
Paradise Temple Family Center, Church Street	Place of Worship
Kingdom Point Pentecostal Church), Lee Ford Camp Road	Place of Worship
First Baptist Church of Ridgeway, Church Street	Place of Worship
New Bethel Progressive Primitive Baptist Church, Kings Mill Road	Place of Worship
Horsepasture Christian Church, Horsepasture Price Road	Place of Worship
New Jerusalem Church, Lee Ford Camp Road	Place of Worship
Mayo Missionary Baptist Church, Horsepasture Price Road	Place of Worship
Whites Chapel Baptist Church, Horsepasture Price Road	Place of Worship

Facility Name, Location	Facility Type
Smith Memorial Church, Horsepasture Price Road	Place of Worship
Friendly Worship Center, Morehead Avenue	Place of Worship
Wayside Baptist Church, Morehead Avenue	Place of Worship
Rich Acres Baptist Church, Stuart Ridge Road	Place of Worship
Rich Acres Christian Church, Aladdin Drive	Place of Worship
Smith River Missionary Baptist Church, Route 781	Place of Worship
Holmes Memorial Presbyterian Church, Route 781	Place of Worship
Mt. Zion Missionary Baptist Church, Soapstone Road	Place of Worship
Magna Vista High School, Magna Vista School Road	School
Drewry Mason Elementary School, Route 220	School
Rich Acres Elementary School, Rich Acres School Road	School
Mercy Crossing Christian Academy, Route 614	School
Blackfeather Trail Convenience Center	Waste Disposal Facilities

Sources: *Henry County GIS Database, Federal/State/Local Databases maintained by VDOT, Google Maps™*

APPENDIX C

ANIMAL SPECIES INVENTORY

Virginia Department of Game and Inland Fisheries

9/26/2019 3:21:34 PM

Fish and Wildlife Information Service

VaFWIS Search Report Compiled on 9/26/2019, 3:21:34 PM

Help

Database Search found in **(089) Henry [County], VA;**

View Map of Site Location

386 Known or Likely Species ordered by Status Concern for Conservation

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
060017	FESE	Ia	Spinymussel, James	Parvaspina collina	Yes	BOVA,HU6,SppObs,TEWater,Habitat
010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes	BOVA,HU6,SppObs,TEWater,Habitat
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis		BOVA
050020	SE	Ia	Bat, little brown	Myotis lucifugus	Yes	BOVA,HU6,SppObs
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus		BOVA,HU6
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus		BOVA
060081	ST	IIa	Floater, green	Lasmigona subviridis	Potential	HU6,TEWater,Habitat
010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes	BOVA,HU6,SppObs,TEWater,Habitat
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans		BOVA
030012	CC	IVa	Rattlesnake, timber	Crotalus horridus	Yes	BOVA,HU6,SppObs

010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes	BOVA,HU6,SppObs,Habitat
100248		Ia	Fritillary, regal	Speyeria idalia idalia		HU6
040052		IIa	Duck, American black	Anas rubripes	Potential	BOVA,HU6,BBA
040320		IIa	Warbler, cerulean	Setophaga cerulea		BOVA,HU6
040140		IIa	Woodcock, American	Scolopax minor	Potential	BOVA,HU6,BBA
040203		IIb	Cuckoo, black-billed	Coccyzus erythropthalmus		BOVA
040105		IIb	Rail, king	Rallus elegans		BOVA
040304		IIc	Warbler, Swainson's	Limnothlypis swainsonii		HU6
010131		IIIa	Eel, American	Anguilla rostrata	Yes	BOVA,SppObs
030068		IIIa	Turtle, woodland box	Terrapene carolina carolina	Yes	BOVA,HU6,SppObs
040100		IIIa	Bobwhite, northern	Colinus virginianus	Potential	BOVA,HU6,BBA
040202		IIIa	Cuckoo, yellow-billed	Coccyzus americanus	Potential	BOVA,HU6,BBA
040099		IIIa	Grouse, ruffed	Bonasa umbellus		BOVA
040094		IIIa	Harrier, northern	Circus cyaneus		BOVA,HU6
040204		IIIa	Owl, barn	Tyto alba pratincola		BOVA,HU6
040333		IIIa	Warbler, Kentucky	Geothlypis formosa	Potential	BOVA,HU6,BBA
040215		IIIa	Whip-poor-will, Eastern	Antrostomus vociferus	Yes	BOVA,HU6,BBA,SppObs

060145		IIIa	Rainbow, Notched	Villosa constricta		HU6
040220		IIIb	Kingfisher, belted	Ceryle alcyon	Potential	BOVA,BBA
010110		IIIc	Jumprock, bigeye	Moxostoma ariommum	Yes	BOVA,HU6,SppObs
010387		IIIc	Redhorse, silver	Moxostoma anisurum	Yes	BOVA,SppObs
010115		IIIc	Sucker, rustyside	Thoburnia hamiltoni	Yes	BOVA,HU6,SppObs
010038		IVa	Herring, alewife	Alosa pseudoharengus	Yes	BOVA,SppObs
010052		IVa	Trout, brook	Salvelinus fontinalis	Yes	BOVA,HU6,SppObs
020069		IVa	Salamander, eastern mud	Pseudotriton montanus montanus		HU6
030045		IVa	Ribbonsnake, common	Thamnophis sauritus sauritus		BOVA
030017		IVa	Scarletsnake, northern	Cemophora coccinea copei	Yes	BOVA,HU6,SppObs
030033		IVa	Snake, queen	Regina septemvittata	Yes	BOVA,HU6,SppObs
040272		IVa	Catbird, gray	Dumetella carolinensis	Yes	BOVA,HU6,BBA,SppObs
040337		IVa	Chat, yellow-breasted	Icteria virens virens	Potential	BOVA,HU6,BBA
040142		IVa	Dowitcher, short-billed	Limnodromus griseus		BOVA
040229		IVa	Kingbird, eastern	Tyrannus tyrannus	Potential	BOVA,HU6,BBA
040344		IVa	Meadowlark, eastern	Sturnella magna	Potential	BOVA,HU6,BBA
040107		IVa	Rail, Virginia	Rallus limicola	Potential	BOVA,HU6,BBA
040065		IVa	Scaup,	Aythya marila		HU6

			greater			
040391		IVa	Sparrow, field	Spizella pusilla	Potential	BOVA,HU6,BBA
040378		IVa	Sparrow, grasshopper	Ammodramus savannarum pratensis	Potential	BOVA,HU6,BBA
040273		IVa	Thrasher, brown	Toxostoma rufum	Potential	BOVA,HU6,BBA
040375		IVa	Towhee, eastern	Pipilo erythrophthalmus	Potential	BOVA,HU6,BBA
040302		IVa	Warbler, black-and-white	Mniotilta varia	Potential	BOVA,HU6,BBA
050029		IVa	Bat, eastern red	Lasiurus borealis		BOVA,HU6
050030		IVa	Bat, hoary	Lasiurus cinereus		BOVA,HU6
050025		IVa	Bat, silver-haired	Lasionycteris noctivagans		BOVA
030050		IVb	Turtle, snapping	Chelydra serpentina	Yes	BOVA,HU6,SppObs
040221		IVb	Flicker, northern	Colaptes auratus	Yes	BOVA,HU6,BBA,SppObs
040028		IVb	Heron, green	Butorides virescens	Potential	BOVA,HU6,BBA
040243		IVb	Pewee, eastern wood	Contopus virens	Potential	BOVA,HU6,BBA
040217		IVb	Swift, chimney	Chaetura pelagica	Potential	BOVA,HU6,BBA
040277		IVb	Thrush, wood	Hylocichla mustelina	Yes	BOVA,HU6,BBA,SppObs
040340		IVb	Warbler, Canada	Cardellina canadensis		BOVA,HU6
010459		IVc	Redhorse, notchlip	Moxostoma collapsum	Yes	HU6,SppObs
010376		IVc	Shiner, redlip	Notropis chiliticus	Yes	BOVA,HU6,SppObs

010109		IVc	Sucker, Roanoke hog	Hypentelium roanokense	Yes	BOVA,HU6,SppObs
020085		IVc	Salamander, Blue Ridge dusky	Desmognathus orestes		HU6
030024		IVc	Snake, eastern hog-nosed	Heterodon platirhinos	Yes	BOVA,HU6,SppObs
030043		IVc	Snake, southeastern crowned	Tantilla coronata	Yes	BOVA,HU6,SppObs
040248		IVc	Swallow, northern rough-winged	Stelgidopteryx serripennis	Potential	BOVA,HU6,BBA
060194		IVc	Snail, gravel elimia	Elimia catenaria		HU6
010188			Bass, largemouth	Micropterus salmoides	Yes	BOVA,SppObs
010175			Bass, rock	Ambloplites rupestris	Yes	BOVA,SppObs
010186			Bass, smallmouth	Micropterus dolomieu	Yes	BOVA,SppObs
010183			Bluegill	Lepomis macrochirus	Yes	BOVA,SppObs
010123			Bullhead, brown	Ameiurus nebulosus	Yes	BOVA,SppObs
010124			Bullhead, flat	Ameiurus platycephalus	Yes	BOVA,SppObs
010122			Bullhead, yellow	Ameiurus natalis	Yes	BOVA,SppObs
010062			Carp, common	Cyprinus carpio	Yes	BOVA,SppObs
010125			Catfish, channel	Ictalurus punctatus	Yes	BOVA,SppObs
010120			Catfish, white	Ameiurus catus	Yes	BOVA,SppObs
010066			Chub,	Nocomis	Yes	BOVA,SppObs

			bluehead	leptocephalus		
010373			Chub, bull	Nocomis raneyi	Yes	BOVA,SppObs
010103			Chub, creek	Semotilus atromaculatus	Yes	BOVA,SppObs
010455			Chub, Genus = Nocomis	Nocomis spp.	Yes	SppObs
010067			Chub, river	Nocomis micropogon	Yes	BOVA,SppObs
010190			Crappie, black	Pomoxis nigromaculatus	Yes	BOVA,SppObs
010189			Crappie, white	Pomoxis annularis	Yes	BOVA,SppObs
010101			Dace, blacknose	Rhinichthys atratulus	Yes	BOVA,SppObs
010060			Dace, mountain redbelly	Chrosomus oreas	Yes	BOVA,SppObs
010366			Dace, rosyside	Clinostomus funduloides	Yes	BOVA,SppObs
010460			Darter, chainback	Percina nevisense	Yes	SppObs
010193			Darter, fantail	Etheostoma flabellare	Yes	BOVA,SppObs
010204			Darter, glassy	Etheostoma vitreum	Yes	BOVA,SppObs
010198			Darter, johnny	Etheostoma nigrum	Yes	BOVA,SppObs
010200			Darter, riverweed	Etheostoma podostemone	Yes	BOVA,HU6,SppObs
010061			Darter, Roanoke	Percina roanoka	Yes	BOVA,SppObs
010213			Darter, shield	Percina peltata	Yes	BOVA,SppObs
010112			Jumprock, black	Moxostoma cervinum	Yes	BOVA,SppObs
010129			Madtom,	Noturus insignis	Yes	BOVA,SppObs

			margined			
010432			Madtom, spotted-margin	Noturus insignis ssp 1	Yes	BOVA,HU6,SppObs,Habitat
010099			Minnow, bluntnose	Pimephales notatus	Yes	BOVA,SppObs
010063			Minnow, cutlips	Exoglossum maxillingua	Yes	BOVA,SppObs
010408			Minnow, eastern silvery	Hybognathus regius		BOVA
010148			Mosquitofish, eastern	Gambusia holbrooki	Yes	BOVA,SppObs
010182			Pumpkinseed	Lepomis gibbosus	Yes	BOVA,SppObs
010114			Redhorse, golden	Moxostoma erythrurum	Yes	BOVA,SppObs
010116			Redhorse, shorthead	Moxostoma macrolepidotum	Yes	SppObs
010113			Redhorse, v-lip	Moxostoma pappillosum	Yes	BOVA,SppObs
010283			Sculpin, mottled	Cottus bairdii	Yes	BOVA,SppObs
010041			Shad, gizzard	Dorosoma cepedianum	Yes	BOVA,SppObs
010080			Shiner, common	Luxilus cornutus	Yes	BOVA,SppObs
010078			Shiner, crescent	Luxilus cerasinus	Yes	BOVA,SppObs
010068			Shiner, golden	Notemigonus crysoleucas	Yes	BOVA,SppObs
010074			Shiner, rosefin	Lythrurus ardens	Yes	BOVA,SppObs
010466			shiner, rosyface	Notropis rubellus	Yes	BOVA,SppObs

010073			Shiner, satinfin	Cyprinella analostana	Yes	BOVA,SppObs
010082			Shiner, spottail	Notropis hudsonius	Yes	BOVA,SppObs
010086			Shiner, swallowtail	Notropis procne	Yes	BOVA,SppObs
010069			Shiner, white	Luxilus albeolus	Yes	BOVA,SppObs
010081			Shiner, whitetail	Cyprinella galactura	Yes	BOVA,SppObs
010058			Stoneroller, central	Campostoma anomalum	Yes	BOVA,SppObs
010108			Sucker, northern hog	Hypentelium nigricans	Yes	BOVA,SppObs
010118			Sucker, torrent	Thoburnia rhothoeca	Yes	BOVA,SppObs
010105			Sucker, white	Catostomus commersonii	Yes	BOVA,SppObs
010178			Sunfish, bluespotted	Enneacanthus gloriosus	Yes	BOVA,SppObs
010181			Sunfish, green	Lepomis cyanellus	Yes	BOVA,SppObs
010180			Sunfish, redbreast	Lepomis auritus	Yes	BOVA,SppObs
010185			Sunfish, redear	Lepomis microlophus	Yes	BOVA,SppObs
010051			Trout, brown	Salmo trutta	Yes	BOVA,SppObs,Trout
010050			Trout, rainbow	Oncorhynchus mykiss	Yes	BOVA,SppObs
010216			Walleye	Sander vitreus vitreus	Yes	BOVA,SppObs
010177			Warmouth	Lepomis gulosus	Yes	BOVA,SppObs
020004			Bullfrog, American	Lithobates catesbeianus	Yes	BOVA,SppObs
020012			Frog, eastern cricket	Acris crepitans	Yes	SppObs

020008			Frog, green	Lithobates clamitans	Yes	BOVA,SppObs
020013			Frog, pickerel	Lithobates palustris	Yes	BOVA,SppObs
020018			Frog, upland chorus	Pseudacris feriarum	Yes	BOVA,SppObs
020019			Frog, wood	Lithobates sylvaticus	Yes	BOVA,SppObs
020065			Newt, red-spotted	Notophthalmus viridescens viridescens	Yes	BOVA,SppObs
020071			Peeper, spring	Pseudacris crucifer	Yes	BOVA,SppObs
020025			Salamander, black-bellied	Desmognathus quadramaculatus	Yes	BOVA,SppObs
020043			Salamander, eastern red-backed	Plethodon cinereus	Yes	BOVA,SppObs
020029			Salamander, four-toed	Hemidactylium scutatum	Yes	BOVA,SppObs
020035			Salamander, marbled	Ambystoma opacum		BOVA
020038			Salamander, northern dusky	Desmognathus fuscus	Yes	BOVA,SppObs
020070			Salamander, northern red	Pseudotriton ruber ruber	Yes	BOVA,SppObs
020047			Salamander, northern slimy	Plethodon glutinosus	Yes	BOVA,SppObs
020077			Salamander, northern spring	Gyrinophilus porphyriticus porphyriticus	Yes	BOVA,SppObs
020075			Salamander, seal	Desmognathus monticola	Yes	BOVA,SppObs

020050			Salamander, southern two-lined	Eurycea cirrigera	Yes	BOVA,SppObs
020049			Salamander, spotted	Ambystoma maculatum	Yes	BOVA,SppObs
020051			Salamander, three-lined	Eurycea guttolineata		BOVA
020080			Salamander, white-spotted slimy	Plethodon cylindraceus	Yes	BOVA,SppObs
020059			Toad, eastern American	Anaxyrus americanus americanus	Yes	BOVA,SppObs
020060			Toad, eastern narrow-mouthed	Gastrophryne carolinensis	Yes	BOVA,SppObs
020062			Toad, Fowler's	Anaxyrus fowleri	Yes	BOVA,SppObs
020006			Treefrog, Cope's gray	Hyla chrysoscelis	Yes	BOVA,SppObs
020007			Treefrog, gray	Hyla versicolor	Yes	BOVA,SppObs
030041			Brownsnake, Dekay's	Storeria dekayi	Yes	BOVA,SppObs
030016			Copperhead, eastern	Agkistrodon contortrix	Yes	BOVA,SppObs
030022			Cornsnake, red	Pantherophis guttatus		BOVA
030049			Earthsnake, eastern smooth	Virginia valeriae valeriae	Yes	BOVA,SppObs
030044			Gartersnake, eastern	Thamnophis sirtalis sirtalis	Yes	BOVA,SppObs
030038			Greensnake, northern rough	Opheodrys aestivus aestivus	Yes	BOVA,SppObs

030026			Kingsnake, eastern	Lampropeltis getula	Yes	BOVA,SppObs
030027			Kingsnake, northern mole	Lampropeltis rhombomaculata	Yes	BOVA,SppObs
030002			Lizard, eastern fence	Sceloporus undulatus	Yes	BOVA,SppObs
030029			Milksnake, eastern	Lampropeltis triangulum		BOVA
030018			Racer, northern black	Coluber constrictor constrictor		BOVA
030008			Racerunner, eastern six-lined	Aspidoscelis sexlineata sexlineata	Yes	BOVA,SppObs
030023			Ratsnake, eastern	Pantherophis alleghaniensis	Yes	BOVA,SppObs
030006			Skink, broad-headed	Plestiodon laticeps	Yes	BOVA,SppObs
030004			Skink, common five-lined	Plestiodon fasciatus	Yes	BOVA,SppObs
030007			Skink, little brown	Scincella lateralis	Yes	BOVA,SppObs
030005			Skink, southeastern five-lined	Plestiodon inexpectatus		BOVA
030077			Slider, red-eared	Trachemys scripta elegans		BOVA
030042			Snake, northern red-bellied	Storeria occipitomaculata occipitomaculata	Yes	BOVA,SppObs
030020			Snake, northern ring-necked	Diadophis punctatus edwardsii	Yes	BOVA,SppObs
030052			Turtle, eastern musk	Sternotherus odoratus		BOVA

030060			Turtle, eastern painted	Chrysemys picta picta	Yes	BOVA,SppObs
030034			Watersnake, northern	Nerodia sipedon sipedon	Yes	BOVA,SppObs
030019			Wormsnake, eastern	Carphophis amoenus amoenus	Yes	BOVA,SppObs
040346			Blackbird, red-winged	Agelaius phoeniceus	Potential	BOVA,BBA
040282			Bluebird, eastern	Sialia sialis	Yes	BOVA,BBA,SppObs
040361			Bunting, indigo	Passerina cyanea	Potential	BOVA,BBA
040357			Cardinal, northern	Cardinalis cardinalis	Yes	BOVA,BBA,SppObs
040258			Chickadee, Carolina	Poecile carolinensis	Yes	BOVA,BBA,SppObs
040214			Chuck-will's-widow	Antrostomus carolinensis		BOVA,HU6
040113			Coot, American	Fulica americana		BOVA
040024			Cormorant, double-crested	Phalacrocorax auritus		BOVA
040353			Cowbird, brown-headed	Molothrus ater	Potential	BOVA,BBA
040264			Creeper, brown	Certhia americana		BOVA,HU6
040373			Crossbill, white-winged	Loxia leucoptera		BOVA
040255			Crow, American	Corvus brachyrhynchos	Potential	BOVA,BBA
040364			Dickcissel	Spiza americana		BOVA
040198			Dove,	Zenaida	Potential	BOVA,BBA

			mourning	macroura carolinensis		
040061			Duck, wood	Aix sponsa	Potential	BOVA,BBA
040093			Eagle, bald	Haliaeetus leucocephalus		HU6
040032			Egret, great	Ardea alba egretta	Potential	BOVA,BBA
040367			Finch, house	Haemorhous mexicanus	Yes	BOVA,BBA,SppObs
040366			Finch, purple	Haemorhous purpureus		BOVA
040239			Flycatcher, Acadian	Empidonax virescens	Potential	BOVA,BBA
040234			Flycatcher, great crested	Myiarchus crinitus	Potential	BOVA,BBA
040240			Flycatcher, willow	Empidonax traillii	Potential	BOVA,HU6,BBA
040053			Gadwall	Anas strepera		BOVA
040284			Gnatcatcher, blue-gray	Polioptila caerulea	Potential	BOVA,BBA
040371			Goldfinch, American	Spinus tristis	Yes	BOVA,BBA,SppObs
040045			Goose, Canada	Branta canadensis		BOVA
040352			Grackle, common	Quiscalus quiscula	Potential	BOVA,BBA
040008			Grebe, pied-billed	Podilymbus podiceps		BOVA
040360			Grosbeak, blue	Guiraca caerulea caerulea	Potential	BOVA,BBA
040365			Grosbeak, evening	Coccothraustes vespertinus		BOVA
040358			Grosbeak, rose-breasted	Pheucticus ludovicianus		HU6
040089			Hawk, broad-	Buteo	Potential	BOVA,BBA

			winged	platypterus		
040086			Hawk, Cooper's	Accipiter cooperii		BOVA
040088			Hawk, red-shouldered	Buteo lineatus lineatus	Potential	BOVA,BBA
040087			Hawk, red-tailed	Buteo jamaicensis	Potential	BOVA,BBA
040090			Hawk, rough-legged	Buteo lagopus johannis		BOVA
040085			Hawk, sharp-shinned	Accipiter striatus velox	Yes	BOVA,BBA,SppObs
040027			Heron, great blue	Ardea herodias herodias	Potential	BOVA,BBA
040218			Hummingbird, ruby-throated	Archilochus colubris	Yes	BOVA,BBA,SppObs
040252			Jay, blue	Cyanocitta cristata	Potential	BOVA,BBA
040387			Junco, dark-eyed	Junco hyemalis	Yes	BOVA,SppObs
040098			Kestrel, American	Falco sparverius sparverius	Potential	BOVA,BBA
040119			Killdeer	Charadrius vociferus	Potential	BOVA,BBA
040285			Kinglet, golden-crowned	Regulus satrapa		BOVA
040286			Kinglet, ruby-crowned	Regulus calendula		BOVA
040245			Lark, horned	Eremophila alpestris		BOVA
040051			Mallard	Anas platyrhynchos	Potential	BOVA,BBA
040251			Martin, purple	Progne subis	Potential	BOVA,BBA
040271			Mockingbird,	Mimus	Yes	BOVA,BBA,SppObs

			northern	polyglottos		
040112			Moorhen, common	Gallinula chloropus cachinnans	Yes	BOVA,BBA,SppObs
040216			Nighthawk, common	Chordeiles minor	Potential	BOVA,BBA
040263			Nuthatch, brown-headed	Sitta pusilla	Potential	BOVA,HU6,BBA
040262			Nuthatch, red-breasted	Sitta canadensis		BOVA
040261			Nuthatch, white-breasted	Sitta carolinensis	Potential	BOVA,BBA
040348			Oriole, Baltimore	Icterus galbula	Potential	BOVA,BBA
040347			Oriole, orchard	Icterus spurius	Potential	BOVA,BBA
040330			Ovenbird	Seiurus aurocapilla	Yes	BOVA,HU6,BBA,SppObs
040209			Owl, barred	Strix varia	Potential	BOVA,BBA
040206			Owl, great horned	Bubo virginianus	Potential	BOVA,BBA
040210			Owl, long-eared	Asio otus	Yes	BOVA,SppObs
040211			Owl, short-eared	Asio flammeus		BOVA
040312			Parula, northern	Setophaga americana	Potential	BOVA,HU6,BBA
040101			Pheasant, ring-necked	Phasianus colchicus		BOVA
040236			Phoebe, eastern	Sayornis phoebe	Potential	BOVA,BBA
040197			Pigeon, rock	Columba livia	Potential	BOVA,BBA
040254			Raven,	Corvus corax	Yes	BOVA,SppObs

			common			
040341			Redstart, American	Setophaga ruticilla		BOVA
040275			Robin, American	Turdus migratorius	Potential	BOVA,BBA
040132			Sandpiper, solitary	Tringa solitaria		BOVA
040134			Sandpiper, spotted	Actitis macularia		BOVA
040225			Sapsucker, yellow-bellied	Sphyrapicus varius	Yes	BOVA,SppObs
040205			Screech-owl, eastern	Megascops asio	Potential	BOVA,BBA
040370			Siskin, pine	Spinus pinus		BOVA
040141			Snipe, Wilson's	Gallinago delicata		BOVA
040389			Sparrow, chipping	Spizella passerina	Potential	BOVA,BBA
040395			Sparrow, fox	Passerella iliaca		BOVA
040342			Sparrow, house	Passer domesticus	Yes	BOVA,BBA,SppObs
040377			Sparrow, savannah	Passerculus sandwichensis		BOVA
040398			Sparrow, song	Melospiza melodia	Yes	BOVA,BBA,SppObs
040397			Sparrow, swamp	Melospiza georgiana		BOVA
040383			Sparrow, vesper	Pooecetes gramineus		BOVA
040393			Sparrow, white-crowned	Zonotrichia leucophrys		BOVA
040394			Sparrow, white-	Zonotrichia albicollis	Yes	BOVA,SppObs

			throated			
040294			Starling, European	Sturnus vulgaris	Potential	BOVA,BBA
040249			Swallow, barn	Hirundo rustica	Potential	BOVA,BBA
040246			Swallow, tree	Tachycineta bicolor	Potential	BBA
040355			Tanager, scarlet	Piranga olivacea	Potential	BOVA,HU6,BBA
040356			Tanager, summer	Piranga rubra	Potential	BOVA,BBA
040189			Tern, Caspian	Sterna caspia		BOVA
040278			Thrush, hermit	Catharus guttatus		BOVA
040260			Titmouse, tufted	Baeolophus bicolor	Yes	BOVA,BBA,SppObs
040102			Turkey, wild	Meleagris gallopavo silvestris	Potential	BOVA,BBA
040298			Vireo, blue-headed	Vireo solitarius	Potential	BOVA,BBA
040299			Vireo, red-eyed	Vireo olivaceus	Potential	BOVA,BBA
040301			Vireo, warbling	Vireo gilvus gilvus		BOVA
040295			Vireo, white-eyed	Vireo griseus	Potential	BOVA,BBA
040297			Vireo, yellow-throated	Vireo flavifrons	Potential	BOVA,HU6,BBA
040081			Vulture, black	Coragyps atratus	Potential	BOVA,BBA
040080			Vulture, turkey	Cathartes aura	Yes	BOVA,BBA,SppObs
040316			Warbler, black-throated blue	Setophaga caerulescens		BOVA

040319			Warbler, black-throated green	Setophaga virens		BOVA
040325			Warbler, blackpoll	Setophaga striata		BOVA
040307			Warbler, blue-winged	Vermivora cyanoptera		BOVA
040323			Warbler, chestnut-sided	Setophaga pensylvanica		BOVA
040338			Warbler, hooded	Setophaga citrina	Potential	BOVA,BBA
040314			Warbler, magnolia	Setophaga magnolia		BOVA
040311			Warbler, Nashville	Oreothlypis ruficapilla		BOVA
040329			Warbler, palm	Setophaga palmarum		BOVA
040326			Warbler, pine	Setophaga pinus	Potential	BOVA,BBA
040328			Warbler, prairie	Setophaga discolor	Potential	BOVA,HU6,BBA
040303			Warbler, prothonotary	Protonotaria citrea	Potential	BOVA,HU6,BBA
040305			Warbler, worm-eating	Helmitheros vermivorus	Potential	BOVA,HU6,BBA
040313			Warbler, yellow	Setophaga petechia	Potential	BOVA,HU6,BBA
040317			Warbler, yellow-rumped	Setophaga coronata	Yes	BOVA,SppObs
040322			Warbler, yellow-throated	Setophaga dominica	Potential	BOVA,BBA
040332			Waterthrush, Louisiana	Parkesia motacilla	Potential	BOVA,HU6,BBA

040331			Waterthrush, northern	Parkesia noveboracensis	Yes	BOVA,SppObs
040290			Waxwing, cedar	Bombycilla cedrorum	Yes	BOVA,BBA,SppObs
040227			Woodpecker, downy	Picoides pubescens medianus	Potential	BOVA,BBA
040226			Woodpecker, hairy	Picoides villosus	Yes	BOVA,BBA,SppObs
040222			Woodpecker, pileated	Dryocopus pileatus	Potential	BOVA,BBA
040223			Woodpecker, red-bellied	Melanerpes carolinus	Potential	BOVA,BBA
040224			Woodpecker, red-headed	Melanerpes erythrocephalus	Potential	BOVA,BBA
040268			Wren, Carolina	Thryothorus ludovicianus	Yes	BOVA,BBA,SppObs
040265			Wren, house	Troglodytes aedon	Potential	BOVA,BBA
040266			Wren, winter	Troglodytes troglodytes		BOVA
040336			Yellowthroat, common	Geothlypis trichas	Potential	BOVA,BBA
050028			Bat, big brown	Eptesicus fuscus	Yes	BOVA,SppObs
050037			Bear, American black	Ursus americanus		BOVA
050069			Beaver, American	Castor canadensis		BOVA
050116			Beaver, Carolina	Castor canadensis carolinensis		BOVA
050051			Bobcat	Lynx rufus rufus	Yes	BOVA,SppObs
050056			Chipmunk,	Tamias striatus	Yes	BOVA,SppObs

			common eastern	striatus		
050055			Chipmunk, Fisher's eastern	Tamias striatus fisheri		BOVA
050103			Cottontail, eastern	Sylvilagus floridanus mallurus	Yes	BOVA,SppObs
050125			Coyote	Canis latrans		BOVA
050108			Deer, white-tailed	Odocoileus virginianus		BOVA
050050			Fox, common gray	Urocyon cinereoargenteus cinereoargenteus	Yes	BOVA,SppObs
050049			Fox, red	Vulpes vulpes fulva		BOVA
050042			Mink, common	Neovison vison mink		BOVA
050017			Mole, eastern	Scalopus aquaticus aquaticus	Yes	BOVA,SppObs
050016			Mole, hairy-tailed	Parascalops breweri	Yes	BOVA,SppObs
050019			Mole, star-nosed	Condylura cristata cristata	Yes	BOVA,SppObs
050110			Mole, star-nosed	Condylura cristata parva	Yes	BOVA,SppObs
050077			Mouse, common golden	Ochrotomys nuttalli aureolus	Yes	BOVA,SppObs
050074			Mouse, common white-footed	Peromyscus leucopus leucopus	Yes	BOVA,SppObs
050070			Mouse, eastern harvest	Reithrodontomys humulis humulis	Yes	BOVA,SppObs

050098			Mouse, house	Mus musculus musculus		BOVA
050076			Mouse, Lewis' golden	Ochrotomys nuttalli nuttalli		BOVA
050099			Mouse, meadow jumping	Zapus hudsonius americanus		BOVA
050073			Mouse, northern white-footed	Peromyscus leucopus noveboracensis	Yes	BOVA,SppObs
050100			Mouse, woodland jumping	Napaeozapus insignis roanensis	Yes	BOVA,SppObs
050126			Mouse, woodland jumping	Napaeozapus insignis insignis	Yes	BOVA,SppObs
050093			Muskrat, large-toothed	Ondatra zibethicus macrodon		BOVA
050001			Opossum, Virginia	Didelphis virginiana virginiana	Yes	BOVA,SppObs
050045			Otter, northern river	Lontra canadensis lataxina	Yes	BOVA,SppObs
050038			Raccoon	Procyon lotor lotor	Yes	BOVA,SppObs
050079			Rat, hispid cotton	Sigmodon hispidus virginianus		BOVA
050095			Rat, Norway	Rattus norvegicus norvegicus	Yes	BOVA,SppObs
050010			Shrew, American pygmy	Sorex hoyi		BOVA

050003			Shrew, eastern	Sorex cinereus fontinalis	Yes	BOVA,SppObs
050015			Shrew, least	Cryptotis parva	Yes	BOVA,SppObs
050012			Shrew, northern short-tailed	Blarina brevicauda churchi	Yes	BOVA,SppObs
050013			Shrew, northern short-tailed	Blarina brevicauda kirtlandi	Yes	BOVA,SppObs
050004			Shrew, smoky	Sorex fumeus	Yes	BOVA,SppObs
050007			Shrew, southeastern	Sorex longirostris longirostris		BOVA
050011			Shrew, southern short-tailed	Blarina carolinensis	Yes	BOVA,SppObs
050048			Skunk, striped	Mephitis mephitis mephitis		BOVA
050063			Squirrel, eastern fox	Sciurus niger vulpinus		BOVA
050057			Squirrel, eastern gray	Sciurus carolinensis carolinensis	Yes	BOVA,SppObs
050065			Squirrel, southern flying	Glaucomys volans volans	Yes	BOVA,SppObs
050090			Vole, common pine	Microtus pinetorum pinetorum	Yes	BOVA,SppObs
050082			Vole, meadow	Microtus pennsylvanicus pennsylvanicus	Yes	BOVA,SppObs
050087			Vole, southern red-backed	Myodes gapperi	Yes	BOVA,SppObs
050040			Weasel, least	Mustela nivalis		BOVA

				allegheniensis		
050041			Weasel, long-tailed	Mustela frenata noveboracensis		BOVA
050054			Woodchuck	Marmota monax monax	Yes	BOVA,SppObs
060177			Clam, Asian	Corbicula fluminea	Yes	BOVA,SppObs
060226			Clam, Unknown Pea - Genus = Pisidium	Pisidium sp.	Yes	SppObs
060025			Mussel, eastern elliptio	Elliptio complanata		BOVA
060134			Snail, crested mudalia	Leptoxis carinata	Yes	BOVA,SppObs
060198			Snail, sprite elimia	Elimia proxima	Yes	BOVA,SppObs
070130			CRAYFISH	Orconectes c. f. spinosus		BOVA
070102			Crayfish, Common	Cambarus bartonii bartonii		BOVA
070095			Crayfish, devil	Cambarus diogenes diogenes		BOVA
070093			Crayfish, no common name	Cambarus longulus	Yes	BOVA,SppObs
070094			Crayfish, no common name	Cambarus acuminatus	Yes	BOVA,SppObs
100043			Armyworm	Pseudaletia unipuncta		BOVA
100041			Borer, European corn	Ostrinia nubilatis		BOVA

100165			Butterfly, cobweb skipper	Hesperia metea		BOVA
100225			Butterfly, eastern pine elfin	Callophrys niphon		BOVA
100093			Butterfly, eastern tiger swallowtail	Papilio glaucus		BOVA
100145			Butterfly, Hayhurst's scallopwing	Staphylus hayhurstii		BOVA
100163			Butterfly, Leonard's skipper	Hesperia leonardus		BOVA
100211			Butterfly, orange sulphur	Colias eurytheme		BOVA
100257			Butterfly, pearl crescent	Phyciodes tharos		BOVA
100359			Butterfly, Peck's skipper	Polites peckius		BOVA
100200			Butterfly, pipevine swallowtail	Battus philenor		BOVA
100082			Butterfly, silver-spotted skipper	Epargyreus clarus		BOVA
100042			Earworm, corn	Heliathis zea		BOVA
100040			Moth, codling	Cydia pomonella		BOVA
110230			Tick, American dog	Dermacentor variabilis		BOVA
110232			Tick, brown	Rhipicephalus		BOVA

			dog	sanguineus		
110228			Tick, lone star	Amblyomma americanum		BOVA
110231			Tick, rabbit	Haemaphysalis leporispalustris		BOVA
110229			Tick, winter	Dermacentor albipictus		BOVA

*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; CC=Collection Concern

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need;
II=VA Wildlife Action Plan - Tier II - Very High Conservation Need;
III=VA Wildlife Action Plan - Tier III - High Conservation Need;
IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need
Virginia Widlife Action Plan Conservation Opportunity Ranking:
a - On the ground management strategies/actions exist and can be feasibly implemented.;
b - On the ground actions or research needs have been identified but cannot feasibly be implemented at this time.;
c - No on the ground actions or research needs have been identified or all identified conservation opportunities have been exhausted.

Compiled on 9/26/2019, 3:21:35 PM I994556.1 report=1 searchType= R dist= poi= 36.6977539 -79.8699709

Database Search Timing: initialize=0.02, BOVA=0.46, HU6=0.48, BBA=0.37, SppObs=1.39, BAEANests=0.03, CWB=0.04, Trout=0.00, TEWater=0.10, BECAR=0.00, TierReaches=0.22, TierTerrestrial=0.00, Anadromous=0.00, Impediments=0.00, PublicLand=0.01, Total=3.48

audit no. 994556 9/26/2019 3:21:35 PM Virginia Fish and Wildlife Information Service

APPENDIX D

THREATENED AND ENDANGERED SPECIES DATABASE RESULTS

U.S. Fish and Wildlife Service (USFWS)

Information for Planning and Consultation (IPaC)

Virginia Field Office

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
http://www.fws.gov/northeast/virginiafield/

In Reply Refer To: September 23, 2019
Consultation Code: 05E2VA00-2019-SLI-6502
Event Code: 05E2VA00-2019-E-16417
Project Name: Route 220 Martinsville Southern Connector Study

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered

species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
(919) 856-4520

Project Summary

Consultation Code: 05E2VA00-2019-SLI-6502

Event Code: 05E2VA00-2019-E-16417

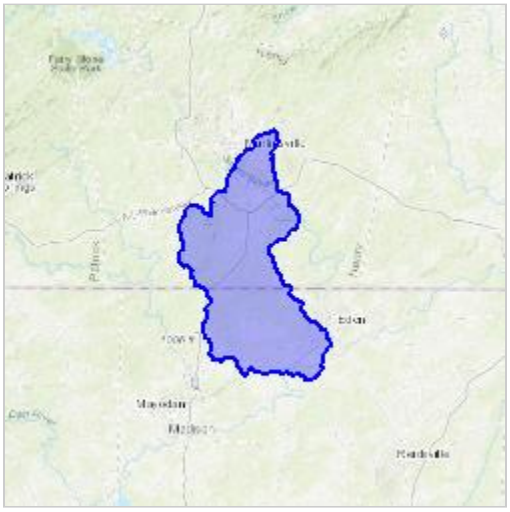
Project Name: Route 220 Martinsville Southern Connector Study

Project Type: TRANSPORTATION

Project Description: The VDOT, in coordination with the FHWA, is conducting a study to evaluate potential transportation improvements along the U.S. Route 220 corridor between the North Carolina state line and U.S. Route 58 near the City of Martinsville, Virginia.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/36.57641673973071N79.89232945482524W



Counties: Rockingham, NC | Henry, VA | Martinsville, VA

Endangered Species Act Species

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Fishes

NAME	STATUS
Roanoke Logperch *Percina rex* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1134	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

U.S. Fish and Wildlife Service (USFWS)

Information for Planning and Consultation (IPaC)

Raleigh, North Carolina Field Office

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
Phone: (919) 856-4520 Fax: (919) 856-4556

In Reply Refer To:
Consultation Code: 04EN2000-2019-SLI-1637
Event Code: 04EN2000-2019-E-03747
Project Name: Route 220 Martinsville Southern Connector Study

September 23, 2019

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The species list generated pursuant to the information you provided identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Section 7 of the Act requires that all federal agencies (or their designated non-federal representative), in consultation with the Service, insure that any action federally authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species. A biological assessment or evaluation may be prepared to fulfill that requirement and in determining whether additional consultation with the Service is necessary. In addition to the federally-protected species list, information on the species' life histories and habitats and information on completing a biological assessment or

evaluation and can be found on our web page at http://www.fws.gov/raleigh. Please check the web site often for updated information or changes

If your project contains suitable habitat for any of the federally-listed species known to be present within the county where your project occurs, the proposed action has the potential to adversely affect those species. As such, we recommend that surveys be conducted to determine the species' presence or absence within the project area. The use of North Carolina Natural Heritage program data should not be substituted for actual field surveys.

If you determine that the proposed action may affect (i.e., likely to adversely affect or not likely to adversely affect) a federally-protected species, you should notify this office with your determination, the results of your surveys, survey methodologies, and an analysis of the effects of the action on listed species, including consideration of direct, indirect, and cumulative effects, before conducting any activities that might affect the species. If you determine that the proposed action will have no effect (i.e., no beneficial or adverse, direct or indirect effect) on federally listed species, then you are not required to contact our office for concurrence (unless an Environmental Impact Statement is prepared). However, you should maintain a complete record of the assessment, including steps leading to your determination of effect, the qualified personnel conducting the assessment, habitat conditions, site photographs, and any other related articles.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

Not all Threatened and Endangered Species that occur in North Carolina are subject to section 7 consultation with the U.S Fish and Wildlife Service. Atlantic and shortnose sturgeon, sea turtles,when in the water, and certain marine mammals are under purview of the National Marine Fisheries Service. If your project occurs in marine, estuarine, or coastal river systems you should also contact the National Marine Fisheries Service, http://www.nmfs.noaa.gov/

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office. If you have any questions or comments, please contact John Ellis of this office at john_ellis@fws.gov.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
(919) 856-4520

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Consultation Code: 04EN2000-2019-SLI-1637

Event Code: 04EN2000-2019-E-03747

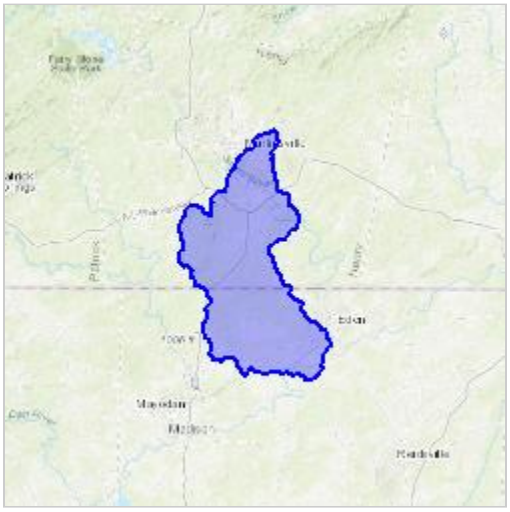
Project Name: Route 220 Martinsville Southern Connector Study

Project Type: TRANSPORTATION

Project Description: The VDOT, in coordination with the FHWA, is conducting a study to evaluate potential transportation improvements along the U.S. Route 220 corridor between the North Carolina state line and U.S. Route 58 near the City of Martinsville, Virginia.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/36.57641673973071N79.89232945482524W



Counties: Rockingham, NC | Henry, VA | Martinsville, VA

Endangered Species Act Species

There is a total of 4 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Fishes

NAME	STATUS
Roanoke Logperch *Percina rex* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1134	Endangered

Clams

NAME	STATUS
Atlantic Pigtoe *Fusconaia masoni* There is **proposed** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5164	Proposed Threatened
James Spinymussel *Pleurobema collina* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2212	Endangered

Flowering Plants

NAME	STATUS
Smooth Coneflower *Echinacea laevigata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3473	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Department of Game and Inland Fisheries (DGIF)

Virginia Fish and Wildlife Information Service (VaFWIS)

VaFWIS Search Report Compiled on 9/23/2019, 5:15:54 PM

Help

Known or likely to occur within a **2 mile buffer around polygon; center 36.7084000 -79.8259399** in **089 Henry County, 690 Martinsville City, VA**

View Map of Site Location

391 Known or Likely Species ordered by Status Concern for Conservation
(displaying first 20) (18 species with Status* or Tier I** or Tier II**)

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
060017	FESE	Ia	Spinymussel, James	Parvaspina collina		BOVA
010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes	BOVA,TEWaters,Habitat,SppObs,HU6
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis		BOVA
050020	SE	Ia	Bat, little brown	Myotis lucifugus	Yes	BOVA,SppObs,HU6
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus		BOVA
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus		BOVA
060081	ST	IIa	Floater, green	Lasmigona subviridis	Potential	Habitat,HU6
010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes	BOVA,TEWaters,Habitat,SppObs,HU6
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans		BOVA
030012	CC	IVa	Rattlesnake, timber	Crotalus horridus		BOVA,HU6
010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes	BOVA,Habitat,SppObs,HU6
100248		Ia	Fritillary, regal	Speyeria idalia idalia		HU6
040052		IIa	Duck, American black	Anas rubripes	Potential	BOVA,BBA,HU6
040320		IIa	Warbler, cerulean	Setophaga cerulea		BOVA,HU6
040140		IIa	Woodcock, American	Scolopax minor	Potential	BOVA,BBA,HU6
040203		IIb	Cuckoo, black-billed	Coccyzus erythropthalmus		BOVA
040105		IIb	Rail, king	Rallus elegans		BOVA
040304		IIc	Warbler, Swainson's	Limnothlypis swainsonii		HU6
010131		IIIa	Eel, American	Anguilla rostrata		BOVA
030068		IIIa	Turtle, woodland box	Terrapene carolina carolina	Yes	BOVA,SppObs,HU6

To view **All 391 species** View 391

*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; CC=Collection Concern

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need; II=VA Wildlife Action Plan - Tier II - Very High Conservation Need; III=VA Wildlife Action Plan - Tier III - High Conservation Need; IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need
Virginia Widlife Action Plan Conservation Opportunity Ranking:
a - On the ground management strategies/actions exist and can be feasibly implemented.;
b - On the ground actions or research needs have been identified but cannot feasibly be implemented at this time.;
c - No on the ground actions or research needs have been identified or all identified conservation opportunities have been exhausted.

View Map of All Query Results from All Observation Tables

Bat Colonies or Hibernacula: **Not Known**

Anadromous Fish Use Streams

N/A

Impediments to Fish Passage

N/A

Colonial Water Bird Survey

N/A

Threatened and Endangered Waters (57 Reaches - displaying first 20)

View Map of All Threatened and Endangered Waters

Stream Name	T&E Waters Species					View Map
	Highest TE*	BOVA Code, Status*, Tier**, Common & Scientific Name				
Smith River (0322278)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0323749)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	

Smith River (0325801)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0326581)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0326755)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0329417)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0329477)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0329763)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0329782)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0329845)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0329953)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0329964)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0329986)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0330010)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0330185)	FESE						Yes

		010127	ST	IIb	Madtom, orangefin	Noturus gilberti	
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0330192)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331078)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331179)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331215)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331216)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331245)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331339)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331357)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes

To view **All 57 Threatened and Endangered Waters records** View 57

Managed Trout Streams (1 records) (Click on Stream Name to view complete reach history) **View Map of All Trout Stream Surveys**

Reach ID	Stream Name	Class	Brook Trout	Brown Trout	Rainbow Trout	View Map
05SRE-01	Smith River	Wild trout		Y		Yes

Bald Eagle Concentration Areas and Roosts

N/A

Bald Eagle Nests

N/A

Species Observations (282 records - displaying first 20 , 11 Observations with Threatened or Endangered species)

View Map of All Query Results
Species Observations

obsID	class	Date Observed	Observer	N Species			View Map
				Different Species	Highest TE*	Highest Tier**	
622501	SppObs	Oct 13 2014	Greg; Anderson| Brandon; Plunkett| AJ; Barnard| Zoey; Car	16	FESE	II	Yes
301292	SppObs	Apr 10 2001	Donald Orth (principal permittee)/Marcy Anderson & Anne Hunter, collectors	20	FESE	II	Yes
315308	SppObs	Jul 1 1999	DEQ	21	FESE	II	Yes
315307	SppObs	Jul 1 1999	DEQ	25	FESE	II	Yes
55294	SppObs	Sep 21 1998	Scott Smith, VDGIF	1	FESE	II	Yes
55295	SppObs	Sep 21 1998	Scott Smith, VDGIF	1	FESE	II	Yes
55279	SppObs	Aug 11 1998	Scott Smith, DGIF	1	FESE	II	Yes
8807	SppObs	Aug 2 1995	S M Smith, VDGIF	11	FESE	II	Yes
610591	SppObs	Oct 1 2010	Ottie; Leffel	1	SE	I	Yes
316545	SppObs	Jul 7 2006	NANCY MONCRIEF	1	SE	I	Yes
311315	SppObs	Jun 27 2005	Paul Angermeier (Principle Permittee) & Brett Albanese, Virginia Tech	22	ST	II	Yes
621262	SppObs	Sep 3 2013	Jamie; Roberts	1		I	Yes
315310	SppObs	Jul 1 1999	DEQ	22		I	Yes

315309	SppObs	Jul 1 1999	DEQ	25		I	Yes
337084	SppObs	Jan 1 1981	REJ-B-JENKINS	22		I	Yes
319635	SppObs	Jun 13 2007	Rick Browder (Principle Permittee)	6		III	Yes
29766	SppObs	Jan 1 1900	Mitchell, J. C.	1		III	Yes
625163	SppObs	Aug 23 2016	Jason; Hill| Drew; Miller	15		IV	Yes
613951	SppObs	Sep 20 2011	Christopher; Plummer| Brock; Reggi	24		IV	Yes
601913	SppObs	Oct 23 2008	Jason Hill and Mike Hutch	13		IV	Yes

Displayed 20 Species Observations

Selected 282 Observations View all 282 Species Observations

Habitat Predicted for Aquatic WAP Tier I & II Species (34 Reaches - displaying first 20)

View Map Combined Reaches from Below of Habitat Predicted for WAP Tier I & II Aquatic Species

Stream Name	Tier Species					View Map
	Highest TE*	BOVA Code, Status*, Tier**, Common & Scientific Name				
Beaver Creek (30101031)	FESE	010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
		010432			Madtom, spotted-margin	Noturus insignis ssp 1	
Beaver Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
		010432			Madtom, spotted-margin	Noturus insignis ssp 1	
Camp Branch (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
Camp Branch (30101032)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
Cobbs Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
Drag Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
Fall Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes

Fall Creek (30101032)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
Jones Creek (30101031)		010432			Madtom, spotted-margin	Noturus insignis ssp 1	Yes
Leatherwood Creek (30101031)	FESE	010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Leatherwood Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
Leatherwood Creek (30101032)	FESE	010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Little Beaver Creek (30101031)		010432			Madtom, spotted-margin	Noturus insignis ssp 1	Yes
Little Marrowbone Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
		010432			Madtom, spotted-margin	Noturus insignis ssp 1	
Marrowbone Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
		010432			Madtom, spotted-margin	Noturus insignis ssp 1	
Marrowbone Creek (30101031)		010432			Madtom, spotted-margin	Noturus insignis ssp 1	Yes
Marrowbone Creek (30101032)	FESE	010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Marrowbone Creek (30101032)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
		010432			Madtom, spotted-margin	Noturus insignis ssp 1	
Marrowbone Creek (30101032)		010432			Madtom, spotted-margin	Noturus insignis ssp 1	Yes
Matrimony Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
Mayo River (30101031)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
		010432			Madtom, spotted-margin	Noturus insignis ssp 1	
		060081	ST	IIa	Floater, green	Lasmigona subviridis	
Meadows Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes

		010432			Madtom, spotted-margin	Noturus insignis ssp 1	
Middle Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes

To view **All 34 Tier Reaches records records** View 34

Habitat Predicted for Terrestrial WAP Tier I & II Species

N/A

Virginia Breeding Bird Atlas Blocks (8 records)

View Map of All Query Results
Virginia Breeding Bird Atlas Blocks

BBA ID	Atlas Quadrangle Block Name	Breeding Bird Atlas Species			View Map
		Different Species	Highest TE*	Highest Tier**	
32023	Martinsville East, CW	3		IV	Yes
32021	Martinsville East, NW	2		IV	Yes
32026	Martinsville East, SE	60		III	Yes
32025	Martinsville East, SW	1			Yes
31022	Martinsville West, NE	1			Yes
31026	Martinsville West, SE	65		II	Yes
32014	Northwest Eden, CE	48		III	Yes
31014	Price, CE	50		III	Yes

Public Holdings:

N/A

Summary of BOVA Species Associated with Cities and Counties of the Commonwealth of Virginia:

FIPS Code	City and County Name	Different Species	Highest TE	Highest Tier
089	Henry	329	FESE	I
690	Martinsville City	285	FTSE	I

USGS 7.5' Quadrangles:
Price
Martinsville West
Northwest Eden
Martinsville East
Northeast Eden

USGS NRCS Watersheds in Virginia:

N/A

USGS National 6th Order Watersheds Summary of Wildlife Action Plan Tier I, II, III, and IV Species:

HU6 Code	USGS 6th Order Hydrologic Unit	Different Species	Highest TE	Highest Tier
RD11	Horse Pasture Creek	50	FESE	I
RD12	North Mayo River-Koger Creek	57	FESE	I
RD13	Mayo River-Pawpaw Creek	45	FESE	I
RD14	Dan River-Matrimony Creek	46	FESE	I
RD24	Smith River-Beaver Creek	56	FESE	I
RD25	Marrowbone Creek	47	FESE	I
RD26	Smith River-Mulberry Creek	48	FESE	I
RD28	West Fork Leatherwood Creek-Peters Branch	52	FESE	I
RD29	Lower Leatherwood Creek	46	FESE	I
RD30	Smith River-Fall Creek	47	FESE	I

Compiled on 9/23/2019, 5:15:54 PM I993951.0 report=all searchType= P dist= 3218 poi= 36.7084000 -79.8259399 siteDD= 36.7084000 -79.8259498;36.7075400 -79.8256198;36.7069000 -79.8254698;36.7064100 -79.8251798;36.7061000 -79.8248398;36.7054300
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Virginia Fish and Wildlife Information Service

36,42,30.2 -79,49,33.3
is **the Search Point**

Show Position Rings
(•) Yes ( ) No
4 miles and 1 mile at the **Search Point**

Show Search Area
(•) Yes ( ) No
2 Search distance miles buffer

Display at center	**Search Point** is not at map center

Base Map Choices
Topography

Map Overlay Choices
Current List: Position, Search, BECAR, BAEANests, TEWaters, TierII, Habitat, Trout, Anadromous

Map Overlay Legend

T & E Waters
- Federal
- State

Predicted Habitat WAP Tier I & II
- Aquatic
- Terrestrial

Trout Waters
- Class I - IV
- Class V - VI

Anadromous Fish Reach
- Confirmed

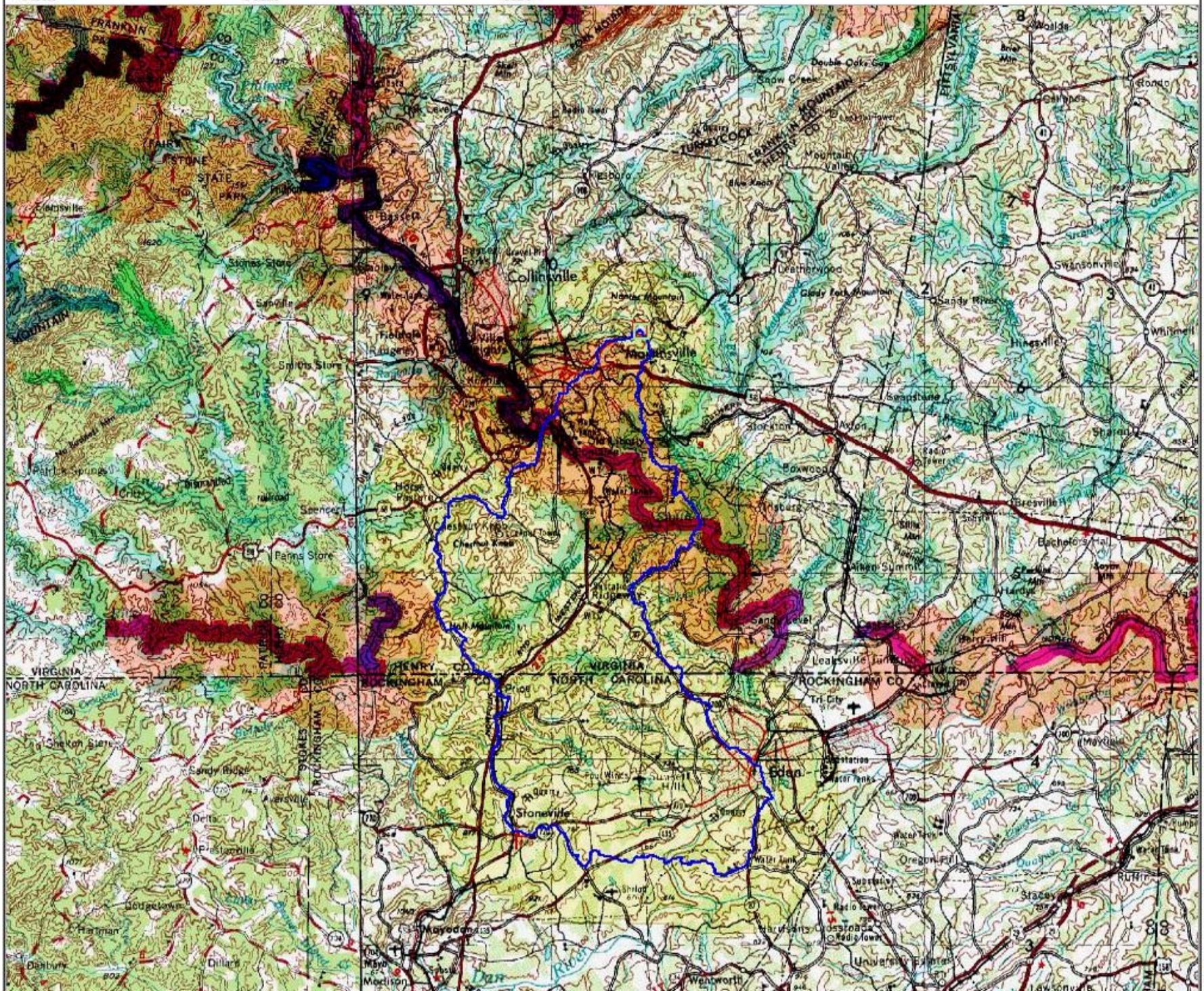
back | Refresh Browser Page

Map Click: Pan | Id | M

Map Scale: In — Zoom — Out

Screen Size: Small — Size — Big

Help



Virginia Department of Conservation and Recreation (DCR)

Natural Heritage Program (DNH)

Natural Heritage Resources

Your Criteria

Watershed (8 digit HUC): 03010103 - Upper Dan River

Subwatershed (12 digit HUC): RD14 - Dan River-Matrimony Creek,RD25 - Marrowbone Creek,RD26 - Smith River-Mulberry Creek

Search Run: 9/24/2019 11:06:20 AM

Result Summary

Total Species returned: 3

Total Communities returned: 1

Click scientific names below to go to NatureServe report.

Click column headings for an explanation of species and community ranks.

Common Name/Natural Community	Scientific Name	Scientific Name Linked	Global Conservation Status Rank	State Conservation Status Rank	Federal Legal Status	State Legal Status	Statewide Occurrences	Virginia Coastal Zone
Upper Dan								
Dan River-Matrimony Creek								
VASCULAR PLANTS								
Downy Phlox	Phlox pilosa	Phlox pilosa	G5	S1	None	None	11	N
Smith River-Mulberry Creek								
TERRESTRIAL NATURAL COMMUNITY								

Common Name/Natural Community	Scientific Name	Scientific Name Linked	Global Conservation Status Rank	State Conservation Status Rank	Federal Legal Status	State Legal Status	Statewide Occurrences	Virginia Coastal Zone
Northern Coastal Plain / Piedmont Oak - Beech / Heath Forest	Fagus grandifolia - Quercus (alba, montana, rubra) / Kalmia latifolia Forest	Fagus grandifolia - Quercus (alba, montana, rubra) / Kalmia latifolia Forest	G4	S3	None	None	20	N
VASCULAR PLANTS								
Sweet-shrub	Calycanthus floridus	Calycanthus floridus	G5	S1	None	None	11	N
Carolina alumroot	Heuchera caroliniana	Heuchera caroliniana	G3	S1	None	None	1	N

Note: On-line queries provide basic information from DCR's databases at the time of the request. They are NOT to be substituted for a project review or for on-site surveys required for environmental assessments of specific project areas.

For Additional Information on locations of Natural Heritage Resources please submit an information request.

To Contribute information on locations of natural heritage resources, please fill out and submit a rare species sighting form.

North Carolina Department of Natural and Cultural Resources

Natural Heritage Program (NCNHP)

NC DEPARTMENT OF
NATURAL AND CULTURAL RESOURCES

Roy Cooper, **Governor**
Susi Hamilton, **Secretary**
Walter Clark, **Director, Land and Water Stewardship**

NCNHDE-10257

September 18, 2019

Kim Glinkin
Whitman, Requardt, and Associates, LLP
9030 Stony Point Parkway
Richmond, VA 23235
RE: 220 ICE Natural Resources Study Area; 45615.006

Dear Kim Glinkin:

The North Carolina Natural Heritage Program (NCNHP) appreciates the opportunity to provide information about natural heritage resources for the project referenced above.

A query of the NCNHP database indicates that there are records for rare species, important natural communities, natural areas, and/or conservation/managed areas within the proposed project boundary. These results are presented in the attached 'Documented Occurrences' tables and map.

The attached 'Potential Occurrences' table summarizes rare species and natural communities that have been documented within a one-mile radius of the property boundary. The proximity of these records suggests that these natural heritage elements may potentially be present in the project area if suitable habitat exists. Tables of natural areas and conservation/managed areas within a one-mile radius of the project area, if any, are also included in this report.

If a Federally-listed species is documented within the project area or indicated within a one-mile radius of the project area, the NCNHP recommends contacting the US Fish and Wildlife Service (USFWS) for guidance. Contact information for USFWS offices in North Carolina is found here: https://www.fws.gov/offices/Directory/ListOffices.cfm?statecode=37.

Please note that natural heritage element data are maintained for the purposes of conservation planning, project review, and scientific research, and are not intended for use as the primary criteria for regulatory decisions. Information provided by the NCNHP database may not be published without prior written notification to the NCNHP, and the NCNHP must be credited as an information source in these publications. Maps of NCNHP data may not be redistributed without permission.

Also please note that the NC Natural Heritage Program may follow this letter with additional correspondence if a Dedicated Nature Preserve, Registered Heritage Area, Clean Water Management Trust Fund easement, or an occurrence of a Federally-listed species is documented near the project area.

If you have questions regarding the information provided in this letter or need additional assistance, please contact Rodney A. Butler at rodney.butler@ncdcr.gov or 919-707-8603.

Sincerely,
NC Natural Heritage Program

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Intersecting the Project Area
220 ICE Natural Resources Study Area
Project No. 45615.006
September 18, 2019
NCNHDE-10257

Element Occurrences Documented Within Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Freshwater Bivalve	3622	Lasmigona subviridis	Green Floater	2017-10-03	E	3-Medium	---	Endangered	G3	S2
Freshwater Fish	5537	Ambloplites cavifrons	Roanoke Bass	2016-06-15	E	3-Medium	---	Significantly Rare	G3	S2
Freshwater Fish	27492	Carpiodes cyprinus	Quillback	2009-01-21	E	3-Medium	---	Significantly Rare	G5	S2
Freshwater Fish	29707	Etheostoma podostemone	Riverweed Darter	2015-07-30	E	3-Medium	---	Significantly Rare	G4	S2
Freshwater Fish	36790	Exoglossum maxillingua	Cutlip Minnow	2015-07-30	E	3-Medium	---	Special Concern	G5	S1
Freshwater Fish	11787	Moxostoma ariommum	Bigeye Jumprock	2008-08-18	E	3-Medium	---	Threatened	G4	S2
Freshwater Fish	25404	Percina rex	Roanoke Logperch	2016-07-28	E	3-Medium	Endangered	Endangered	G1G2	S1

Natural Areas Documented Within Project Area

Site Name	Representational Rating	Collective Rating
ROA/Dan River Aquatic Habitat	R1 (Exceptional)	C1 (Exceptional)

Managed Areas Documented Within Project Area*

Managed Area Name	Owner	Owner Type
Dan River Game Land	NC Wildlife Resources Commission	State
NC Clean Water Management Trust Fund Easement	NC DNCR, Clean Water Management Trust Fund	State

*NOTE: If the proposed project intersects with a conservation/managed area, please contact the landowner directly for additional information. If the project intersects with a Dedicated Nature Preserve (DNP), Registered Natural Heritage Area (RHA), or Federally-listed species, NCNHP staff may provide additional correspondence regarding the project.

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/content/help. Data query generated on September 18, 2019; source: NCNHP, Q3 Jul 2019. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Within a One-mile Radius of the Project Area
220 ICE Natural Resources Study Area
Project No. 45615.006
September 18, 2019
NCNHDE-10257

Element Occurrences Documented Within a One-mile Radius of the Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Dragonfly or Damselfly	33770	Somatochlora georgiana	Coppery Emerald	2004-Pre	H?	5-Very Low	---	Significantly Rare	G3G4	S2?
Freshwater Bivalve	3622	Lasmigona subviridis	Green Floater	2017-10-03	E	3-Medium	---	Endangered	G3	S2
Freshwater Fish	5537	Ambloplites cavifrons	Roanoke Bass	2016-06-15	E	3-Medium	---	Significantly Rare	G3	S2
Freshwater Fish	27492	Carpiodes cyprinus	Quillback	2009-01-21	E	3-Medium	---	Significantly Rare	G5	S2
Freshwater Fish	29707	Etheostoma podostemone	Riverweed Darter	2015-07-30	E	3-Medium	---	Significantly Rare	G4	S2
Freshwater Fish	36790	Exoglossum maxillingua	Cutlip Minnow	2015-07-30	E	3-Medium	---	Special Concern	G5	S1
Freshwater Fish	11787	Moxostoma ariommum	Bigeye Jumprock	2008-08-18	E	3-Medium	---	Threatened	G4	S2
Freshwater Fish	25404	Percina rex	Roanoke Logperch	2016-07-28	E	3-Medium	Endangered	Endangered	G1G2	S1
Natural Community	27615	Basic Mesic Forest (Piedmont Subtype)	---	1995-06-22	C	3-Medium	---	---	G3G4	S3S4
Natural Community	1700	Basic Mesic Forest (Piedmont Subtype)	---	2006	C	2-High	---	---	G3G4	S3S4
Natural Community	27679	Piedmont Cliff (Basic Subtype)	---	1995-08-07	B	2-High	---	---	G2?	S1
Vascular Plant	5086	Parthenium auriculatum	Glade Wild Quinine	1956-07-07	H	3-Medium	---	Significantly Rare Throughout	G3G4	S3
Vascular Plant	22121	Polemonium reptans var. reptans	Jacob's Ladder	1956-05	H	3-Medium	---	Threatened	G5T5	S1
Vascular Plant	6945	Tradescantia virginiana	Virginia Spiderwort	2019-04-24	A	2-High	---	Threatened	G5	S2S3

Natural Areas Documented Within a One-mile Radius of the Project Area

Site Name	Representational Rating	Collective Rating
Bear Slide Bluff	R3 (High)	C5 (General)
Smith River Bluffs	R3 (High)	C4 (Moderate)

Natural Areas Documented Within a One-mile Radius of the Project Area

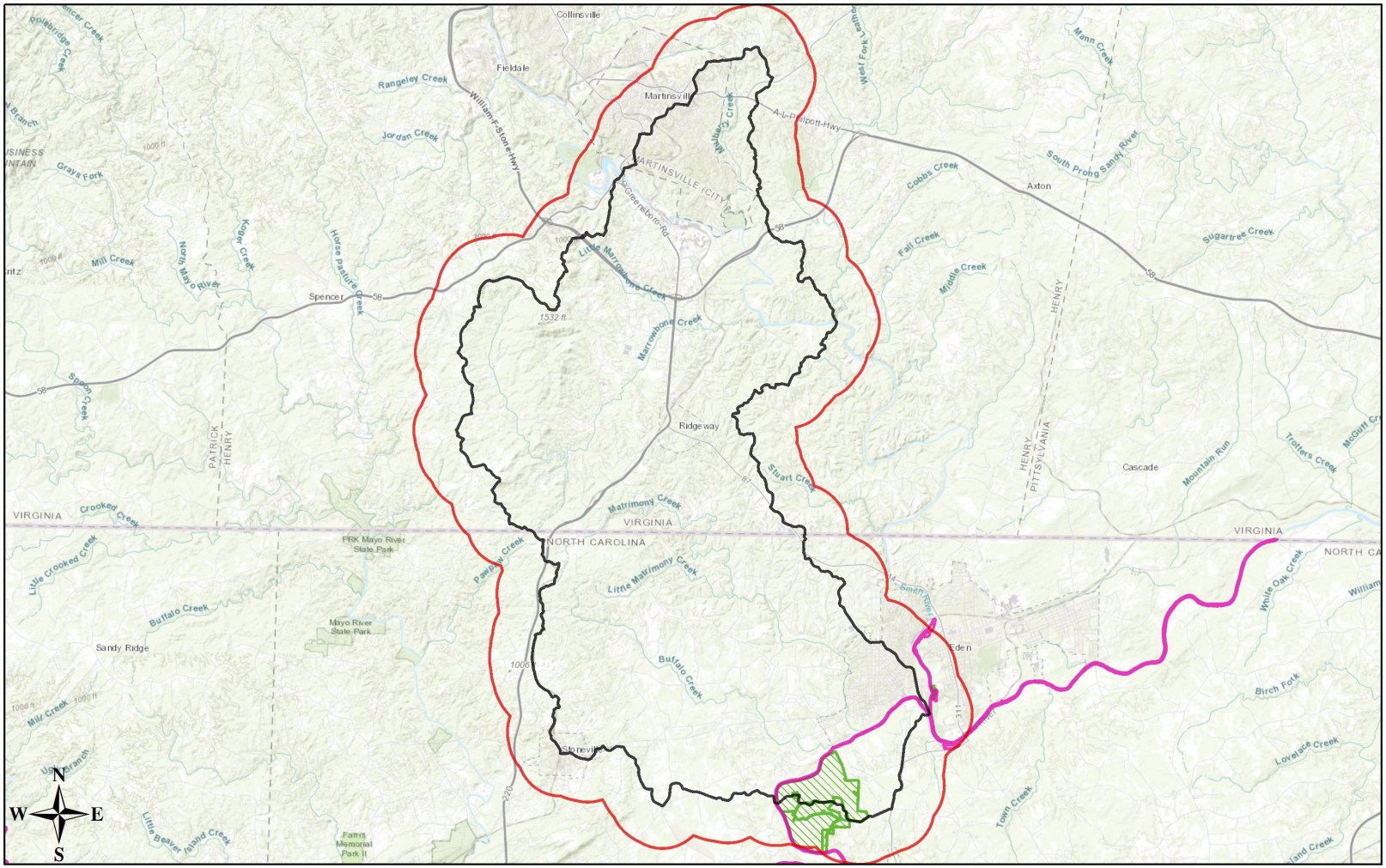
Site Name	Representational Rating	Collective Rating
Mebane Bridge Slope	R5 (General)	C5 (General)
ROA/Dan River Aquatic Habitat	R1 (Exceptional)	C1 (Exceptional)

Managed Areas Documented Within a One-mile Radius of the Project Area

Managed Area Name	Owner	Owner Type
Dan River Game Land	NC Wildlife Resources Commission	State
NC Clean Water Management Trust Fund Easement	NC DNCR, Clean Water Management Trust Fund	State
Bear Slide Registered Heritage Area	Rockingham Community College	State

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/content/help. Data query generated on September 18, 2019; source: NCNHP, Q3 Jul 2019. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

NCNHDE-10257: 220 ICE Natural Resources Study Area



September 18, 2019

- Project Boundary
- Buffered Project Boundary
- NHP Natural Area (NHNA)
- Managed Area (MAREA)

1:205,459

0 1.75 3.5 7 mi

0 2.75 5.5 11 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community