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I-81 CORRIDOR IMPROVEMENT STUDY

Wetlands and Water Resources Technical Report

Tier 1 Environmental Impact Statement

This technical report was prepared to support the Tier 1 Draft EIS and contains some verbiage regarding the NEPA process that was applicable at that time. This errata sheet only addresses the technical corrections to the report as a result of the public and agency review process. Please see the Tier 1 Final EIS for the proposed Tier 1 NEPA decisions and the rationale for those decisions.

Technical corrections to the *I-81 Corridor Improvement Study Wetlands and Water Resources Technical Report* include:

1. p. 4-2, Section 4.2.1, paragraph one, sentence one should be revised to, "Potential wetland impacts were approximated by overlaying wetland hydrography and NWI mapping over the footprints described in Chapter 2."
2. p. 4-8, paragraph two, sentence two, the following sentence should be added, "Mitigation measures such as countersinking of culverts or the use of bottomless or floodplain culverts, would be considered in Tier 2 studies."
3. p. 4-8, paragraph four, sentence three should be revised to, "Some of the larger streams within the I-81 corridor have been formally designated as navigable waters by the USACE and therefore regulated under Section 10 of the Rivers and Harbors Act. Sections of the Middle Fork Holston River, Maury River, and New River within the I-81 corridor have all been formally designated as navigable waterways and are regulated by the USACE under both the Clean Water Act and the Rivers and Harbors Act. The James River and North Fork Roanoke River have been studied by the USACE and are assumed to be navigable waterways, but official determinations have not been made."

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1 Introduction

The Federal Highway Administration (FHWA) and the Virginia Department of Transportation (VDOT) have prepared a Tier 1 Draft Environmental Impact Statement (DEIS) for the *I-81 Corridor Improvement Study*. The Draft EIS, prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), identifies needs, develops solutions, and evaluates potential impacts associated with conceptual-level improvements along the entire 325-mile I-81 corridor in Virginia, as well as improvements to Norfolk Southern's Shenandoah and Piedmont rail lines in Virginia. The potential impacts of specific improvements would be analyzed in greater detail during Tier 2 if a "Build" concept (or portion of a "Build" concept) is advanced.

This *Wetlands and Water Resources Technical Report* provides detailed information on the wetlands and water resource data collection and analysis conducted for the *I-81 Corridor Improvement Study*. Information in this report is summarized in the Tier 1 Draft EIS.

1.1 Study Area

I-81 in Virginia runs for 325 miles in a southwest to northeast direction from western Virginia at the Tennessee border north to the West Virginia border. The highway passes through 21 cities and towns, and 13 counties. Improvements to the entire 325-mile length of I-81 in Virginia were evaluated based on the Purpose and Need. To characterize the affected environment along I-81, a variety of resources were identified within a defined study area. The study area for wetlands and water resources extends 500 feet from either side of the I-81 outside edge of pavement. This width was used because, based on the Purpose and Need for the project, it is believed to represent the limits of where potential highway improvements are most likely to occur.

Proposed improvements to Norfolk Southern's Shenandoah and Piedmont rail lines were also evaluated. The Shenandoah rail line and the I-81 study area are geographically close to each other. The Piedmont rail line, however, is geographically distant from these two facilities. Therefore, a separate rail study area also was created. Because rail improvements are only under consideration in certain sections, the rail study area consists of 13 discrete

sections along existing Norfolk Southern's Piedmont and Shenandoah rail lines in Virginia. The length of the rail improvement sections range from less than ½ mile to 10 miles long, but most of the sections are between 1 and 2 miles long. For each rail section, wetlands and water resources were generally identified within 500 feet on either side of the rail centerline.

Figure 1-1 shows the I-81 and rail study areas. All "Build" improvement concepts evaluated for this study were subsequently developed within the limits of the study areas as described.

1.2 Impact Footprints

The No-Build Concept and 211 combinations of Transportation System Management (TSM), highway improvements, rail improvements, and various toll scenarios were considered. Of these, 20 are "rail only" concepts meaning that 191 "Build" concepts include improvements along I-81.

Consistent with a tiered approach, potential impacts in the I-81 corridor are presented in terms of potential impacts associated with the narrowest highway footprint that meets the transportation needs and the widest highway footprint that could meet the identified needs. Referred to as Minimum Width and the Maximum Width, both footprints have a variable number of lanes for the length of I-81 depending on the transportation needs along the corridor. On sections of I-81 that need one additional lane in each direction, both footprints add a total of two lanes (one lane in each direction). On sections of I-81 that need two lanes in each direction, the need can be met by different means: 1) a total of four additional lanes can be added, or 2) various operational scenarios can be implemented (*e.g.* barrier separated lanes or exclusive lanes) that would meet the needs but would require the construction of up to eight additional lanes in order to operate efficiently. Where at least four lanes are needed, the Minimum Width footprint provides a total of four additional lanes (two lanes in each direction), and the Maximum Width footprint provides a total of eight additional lanes (four in each direction).

When evaluating the number of lanes needed for sections of I-81, a "no toll" and "no rail" base condition was assumed for the Minimum Width and Maximum Width footprints. This base condition assumption represents the highest traffic volumes and therefore the greatest number of lanes that may be needed on I-81. Variations in tolling and other operations could increase or decrease the number of lanes required and this in turn could affect potential impacts. However, based on preliminary impact analyses that were run for a variety of "Build" concepts, the difference in impacts was generally found to be negligible along the 325-mile corridor. If a "Build" concept (or portion of a "Build" concept) is advanced, the footprint of any of the improvements is generally anticipated to fall between the limits of the Minimum Width and Maximum Width footprints.

The width of the variable Minimum Width footprint ranges from roughly 240 feet (where a total of two lanes are added) to 430 feet (where a total of four lanes are added) depending on

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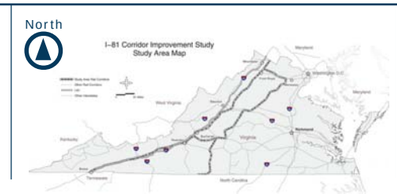


I-81 and Rail Study Areas

Figure 1-1

I-81 CORRIDOR IMPROVEMENT STUDY

the location. In comparison, the variable Maximum Width footprint ranges from 240 feet (where a total of two lanes are added) to 540 feet (where a total of eight lanes are added). These widths include existing pavement and new pavement. For the Minimum Width footprint, widening occurs in the median of I-81 to the extent possible. Conversely, the Maximum Width footprint widens to the outside right edge of I-81.

Potential impacts were also calculated for the Add 2-Lanes concept and Add 8-Lanes concept for illustrative purposes. Unlike the Minimum Width and Maximum Width footprints that both add either two or more lanes in each direction along the length of I-81, the Add 2-Lane concept consistently adds a total of two lanes the entire length of I-81 and the Add 8-Lanes concept consistently adds a total of eight additional lanes.

In addition, a footprint was developed to assess potential impacts associated with Rail Concept 3. Rail Concept 3 was chosen as the most appropriate rail concept to combine with roadway concepts because it provides the most diversion of freight from truck to rail per dollar of investment. The footprint, generally 100 feet wide, represents the limits of potential rail construction for the 13 rail improvement sections that comprise Rail Concept 3. The potential impacts associated with Rail Concept 3 can be added to I-81 "Build" concepts to consider the total potential impacts of highway plus rail improvements.

1.3 Regulatory Framework

Wetlands and water resources are regulated at the local, state, and federal level. Key regulations are briefly summarized below. The purpose of the Tier 1 wetlands and water resources analysis was to generally identify and characterize these resources throughout the study areas and estimate potential impacts based on conceptual-level improvements. More detailed investigations would be conducted during Tier 2 studies, if a "Build" concept (or portion of a "Build" concept) is advanced. Furthermore, after completion of Tier 2 and prior to construction of any improvements, the appropriate wetland and water quality permits would need to be obtained in accordance with the regulations described below.

Section 401 of the Clean Water Act

Section 401 of the Clean Water Act requires that "any applicant for a federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification from the State in which the discharge originates…" declaring that the discharge complies with the applicable provisions of the act, including water quality standards. The certifying agency for the Commonwealth of Virginia is the Virginia Department of Environmental Quality (DEQ). DEQ has the option of waiving certification for certain projects or requiring an individual certification through the Virginia Water Protection Permit (VWPP) program (see below).

Virginia Water Protection Permit Program

The Commonwealth of Virginia has enacted laws for the protection of all "state waters" defined as "all water, on the surface and under the ground, wholly or partially within or bordering the Commonwealth or within its jurisdiction, including wetlands." The federal definition of wetlands is also used by the Commonwealth. The DEQ has been delegated the authority to issue permits for work involving the dredging, filling, and/or significant alteration of wetlands through the VWPP program.

Section 404 of the Clean Water Act

The Environmental Protection Agency and the United States Army Corps of Engineers (USACE) regulate all waters of the United States (WOUS). These include all waters subject to the ebb and flow of the tide; interstate waters; intrastate waters such as lakes, rivers, and streams; impoundments; tributaries; and wetlands adjacent to waters. Wetlands are defined as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils conditions" (USACE, 1987). Determination of a jurisdictional wetland requires the presence of three parameters: hydria soil, a dominance of hydrophytic vegetation, and wetland hydrology. This determination is tied to Section 404 of the Clean Water Act, which instructs the USACE to issue permits for activities that result in the discharge of dredged or fill material into these areas.

Section 10

Section 10 of the Rivers and Harbors Act of 1899 prohibits the obstruction, building upon, excavation, fill, or altering of the course, location or capacity of any navigable water unless the work has been affirmatively authorized by Congress or has been recommended by the Chief of Engineers and authorized by the Secretary of War. Typically, work conducted within, on, or above Section 10 waters requires authorization by the Department of the Army, and often one permit issued by the Department of the Army may jointly serve to authorize work pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

Subaqueous Bottom Permits

The Virginia Marine Resources Commission (VMRC) has been given the authority to regulate all "Waters of the Commonwealth" defined as "a) any stream or that portion of any stream in the Commonwealth which prior to June 21, 1932, has been declared navigable by this Commonwealth, or b) any stream or that portion of any stream in this Commonwealth, the bed of which is owned by the Commonwealth, or c) those parts of streams or other bodies of water in this Commonwealth which either in their natural or improved condition, notwithstanding interruptions between the navigable parts of such streams or waters by fall, shallows, or rapids, compelling land carriage, are used or suitable for use for the transportation of persons or property in interstate or foreign commerce, including therein all

such interrupting falls, shallows or rapids, and also any stream or part thereof in this Commonwealth other than those above mentioned in this subdivision in which the construction of any dam or works as authorized by this chapter would affect the interests of interstate or foreign commerce, or d) that portion of any river or stream flowing between the high-water mark on the Virginia shore and the low-water mark when such low-water mark constitutes the boundary line between Virginia and another state." Such authorization by the VMRC for work in Waters of the Commonwealth is through the issuance of a subaqueous bottom permit.

Tennessee Valley Authority Permits

Since the Holston River watershed is within the larger Tennessee River watershed, the southern portion of I-81 is also under the purview of the Tennessee Valley Authority (TVA). TVA shoreline construction permits would be required for any construction activities that affect navigation, flood control, or public lands along the shoreline of the Tennessee River or its tributaries in accordance with Section 26a of the Tennessee Valley Authority Act of 1933. Applicable to highway projects, permits are required for the construction of bridges, culverts, and any work within a floodplain.

2 Methods

This chapter describes the methods used to identify and characterize wetlands and water resources within the study areas at a level of detail appropriate for the Tier 1 analysis. The potential impacts of specific improvements along I-81 would be analyzed in greater detail during subsequent Tier 2 NEPA document investigations, if a "Build" concept (or portion of a "Build" concept) is advanced.

2.1 Introduction

The following steps were taken to characterize wetlands and water resources within the I-81 and rail study areas, and then calculate potential impacts to these resources as a result of the "Build" concepts:

1. Inventoried wetlands and water resources using available GIS information;
2. Developed an ArcPad©-driven GIS application and loaded it on field-ready computers that allowed the user to modify and augment the inventory based on field observations;
3. Conducted a windshield survey to ground truth the GIS database using the ArcPad© software;
4. Fine-tuned the resulting database, merging results from multiple field trips into a single project dataset, and;
5. Calculated the extent of potential impacts by overlaying the GIS geospatial inventory of wetland and water resources over the footprints for the improvement concepts.

Each of these five steps is discussed in greater detail in the following sections.

2.2 GIS Inventory

Using 2000 aerial photography, the edge of pavement on both north and southbound lanes of I-81 were initially digitized and a 500-foot offset line was added on both sides. Similarly, a

500-foot offset on either side of the rail centerline was marked for each of the 13 rail improvement sections in the rail study area. A first approximation of the distribution of wetlands and surface-water bodies within the study areas was generated by superimposing available GIS coverage on 2000 color orthophotographs including hydrography and National Wetlands Inventory (NWI) mapping.

The existing GIS data were then reviewed for accuracy relative to the aerial photographs. Many of the GIS stream centerlines and wetland boundaries were found to be offset from their true positions as shown on the photography. Furthermore, several major stream and wetland features shown on the photography were found to be non-existent in the GIS data. Those stream centerlines and wetland boundaries were repositioned to align with the feature as shown on the photographs. Stream and wetland features that could be seen on the photography but were not part of the GIS data were also included, provided that their presence could be verified by other mapping resources such as USGS quadrangle maps and local soil surveys. These corrected GIS map layers were used by field specialists during the windshield survey for streams and wetlands.

2.3 ArcPad© -Driven GIS Field Application

GIS specialists coordinated with wetland scientists to develop a custom-designed software application consisting of multiple pull-down menus and text-entry boxes, providing a digital tool for data collection in the field. The geospatial inventory discussed in Section 2.2 above was loaded onto lightweight and portable Fujitsu Stylistic ST-Series tablet computers. The data were queried using ESRI's ArcPad© GIS software. Prior to fieldwork, known stream/wetland GIS attribute information (*i.e.*, stream names and NWI data) were entered into the application using drop-down menus.

During the windshield survey, additional attribute information was entered into the program based on field observations. A full list of stream and wetland attributes collected for the application is provided below. A graphical depiction of the menu boxes and the flowchart logic employed to guide the data collection is provided in Figures 2-1 and 2-2.

Stream attributes:

- Stream name (if known);
- Location relative to I-81 (east, west, median);
- Flow status (intermittent, perennial, or unknown);
- Channel type (engineered or unaltered);
- Channel substrate (gravel, sand, bedrock, etc.);
- Faunal observations supporting a perennial determination (*e.g.* fish, EPT taxa);
- Channel stability based on the Channel Evolution Model (Schumm *et al*. 1984);

- Observations of instability (bank erosion, bed erosion, structures, excessive deposition, etc.);
- Stream restoration potential;
- Riparian conditions (forested, pasture/herbaceous, impervious, etc.), and;
- Field notes.

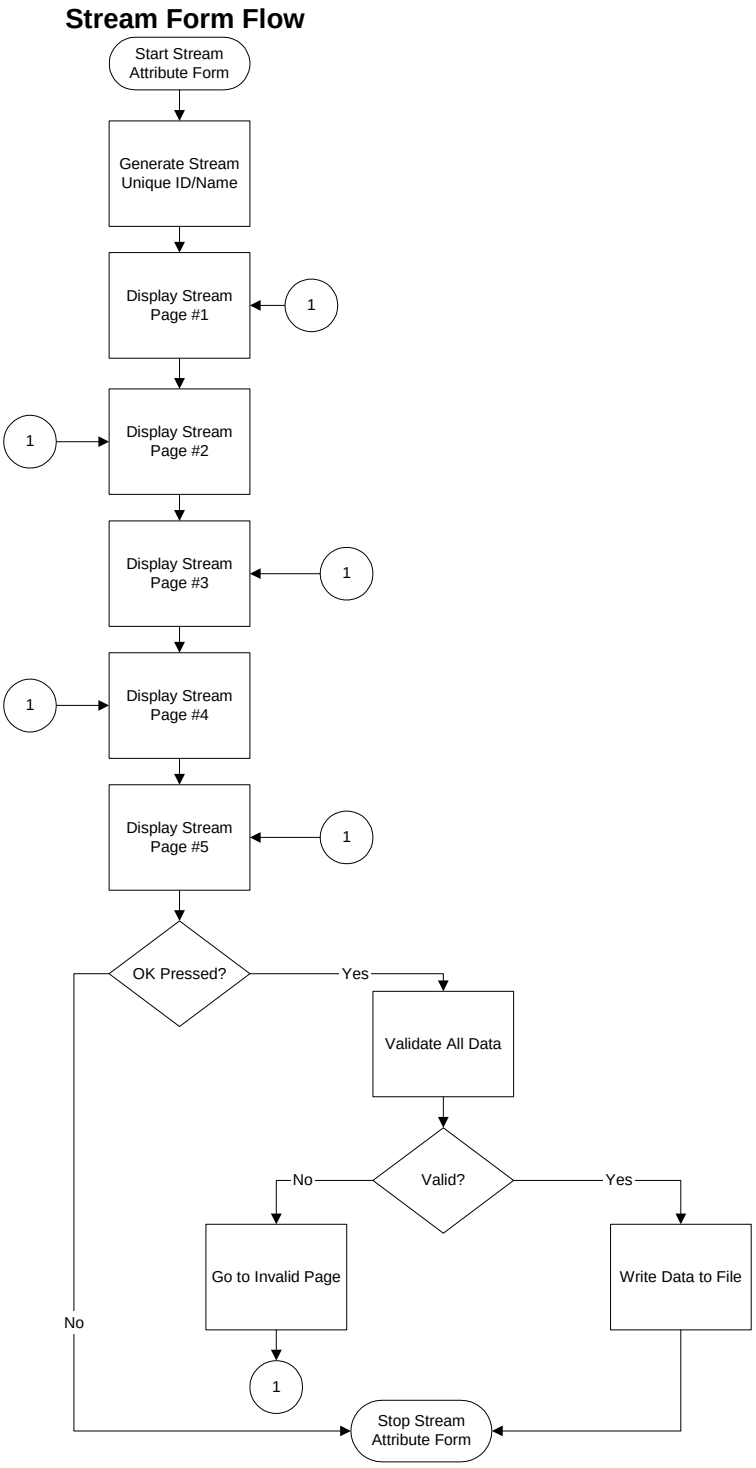
Wetland attributes:

- Wetland name (if allocated);
- Location relative to I-81 (east, west, median);
- Setting: isolated or contiguous with a perennial water body;
- Previously mapped by the NWI or new wetland;
- Verification of Cowardin classification for NWI mapped wetlands or Cowardin classification for wetlands not previously identified by NWI;
- Mitigation potential in terms of size, location, and type (forested and/or emergent) and relative percentages of creation, restoration, enhancement, and preservation, and;
- Field notes.

In the field, general navigation was facilitated by integrated Global Positioning System (GPS) technology consisting of an onboard Pharos iGPS-360 receiver. Within the ArcPad© program, the position of stream centerlines and boundaries of wetlands could be modified in the field by. Similarly, stream segments could be merged or split according to observations in the field. Previously unmapped streams and wetlands could also be drawn in manually. Any NWI wetlands not encountered in the field due to filling, drainage, or mapping error were deleted from the database.

Once an existing stream or wetland was modified to reflect actual field conditions, or a new stream or wetland created, a menu-driven data entry form was automatically initiated and completed by the user. The appearance of the form on-screen is provided in Figures 2-3 and 2-4, the former showing an example of the menu box to select the size of a potential wetland mitigation site, the latter depicting the menu box for stream restoration potential and riparian vegetation. Both the stream and wetland programs also provided a blank textbox within which the user could enter other field observations such as the existence of groundwater springs, potential threatened and endangered species habitat, degraded areas, and hindrances to access.

Figure 2-1 ArcPad© Project Development: Stream Attributes



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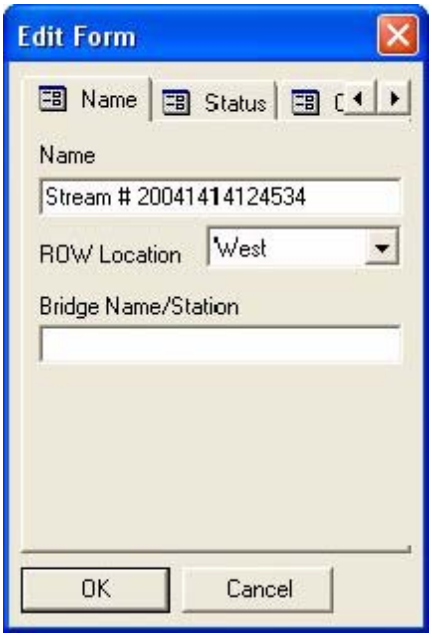

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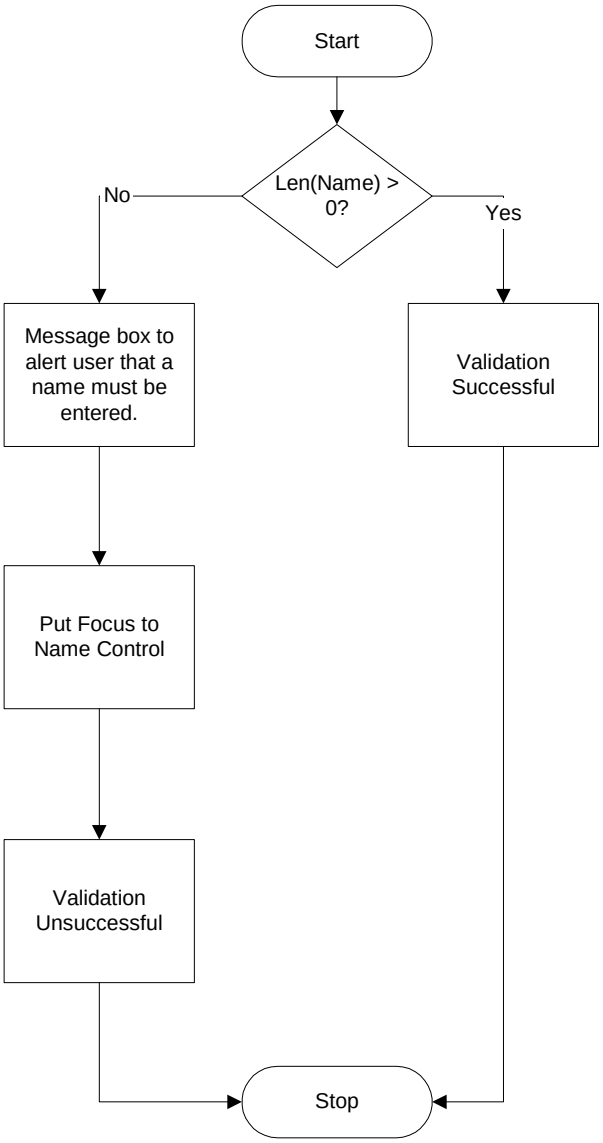

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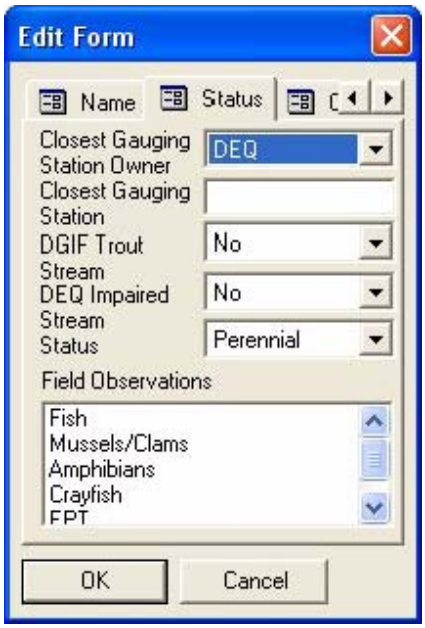

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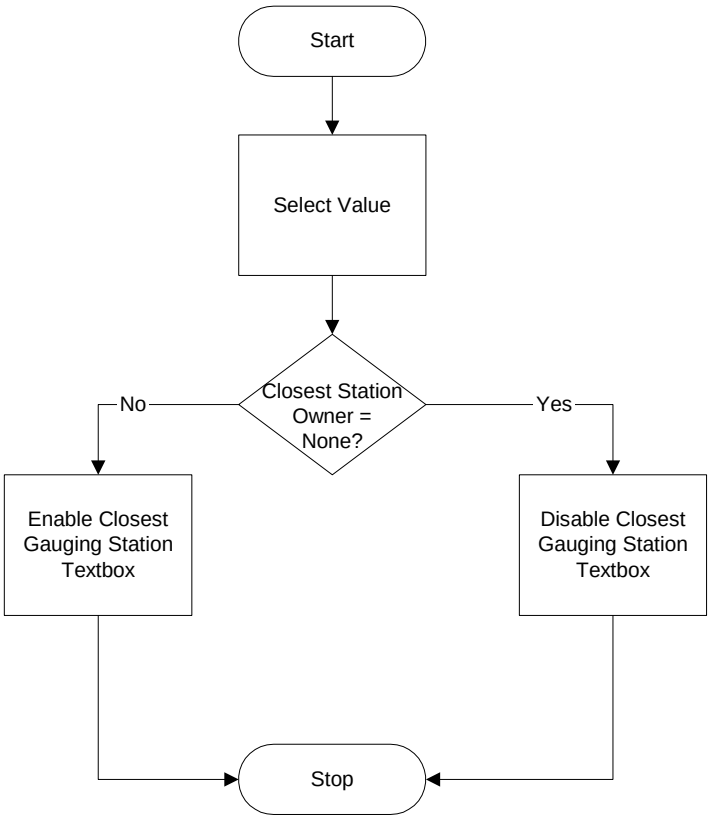

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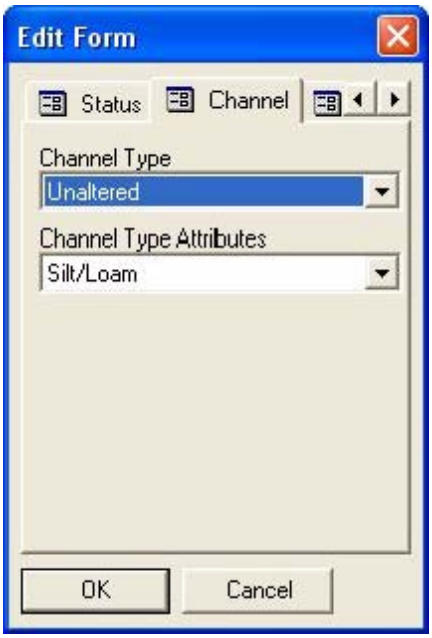

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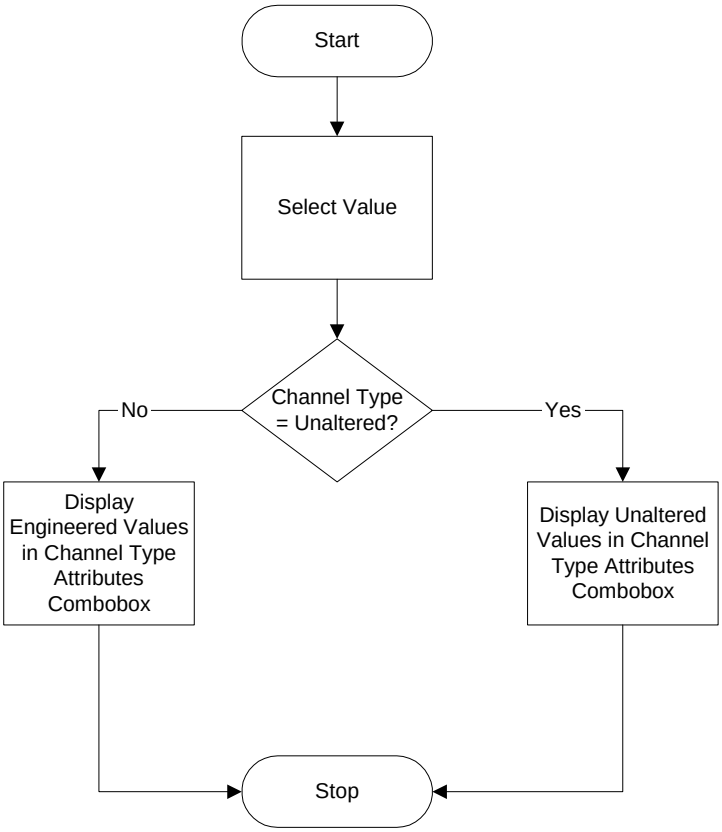

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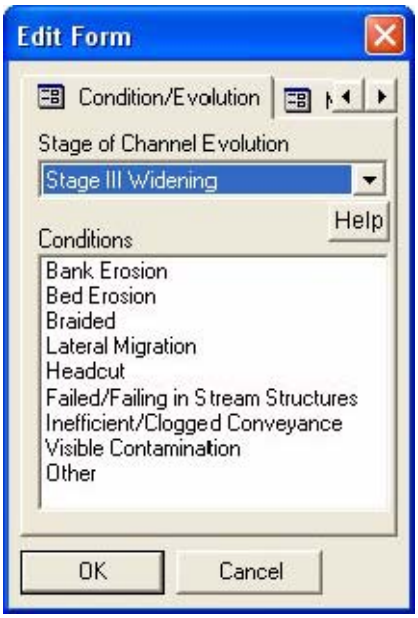

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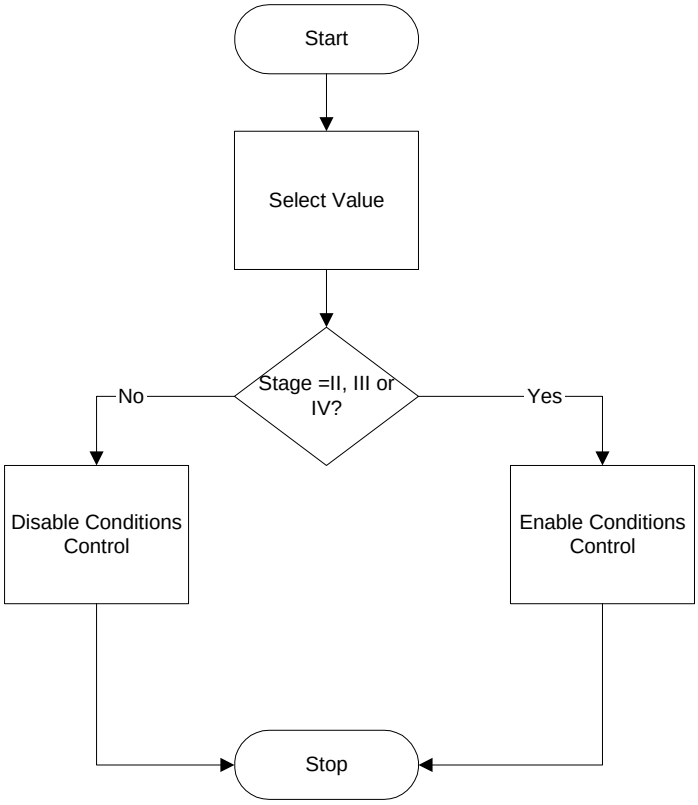

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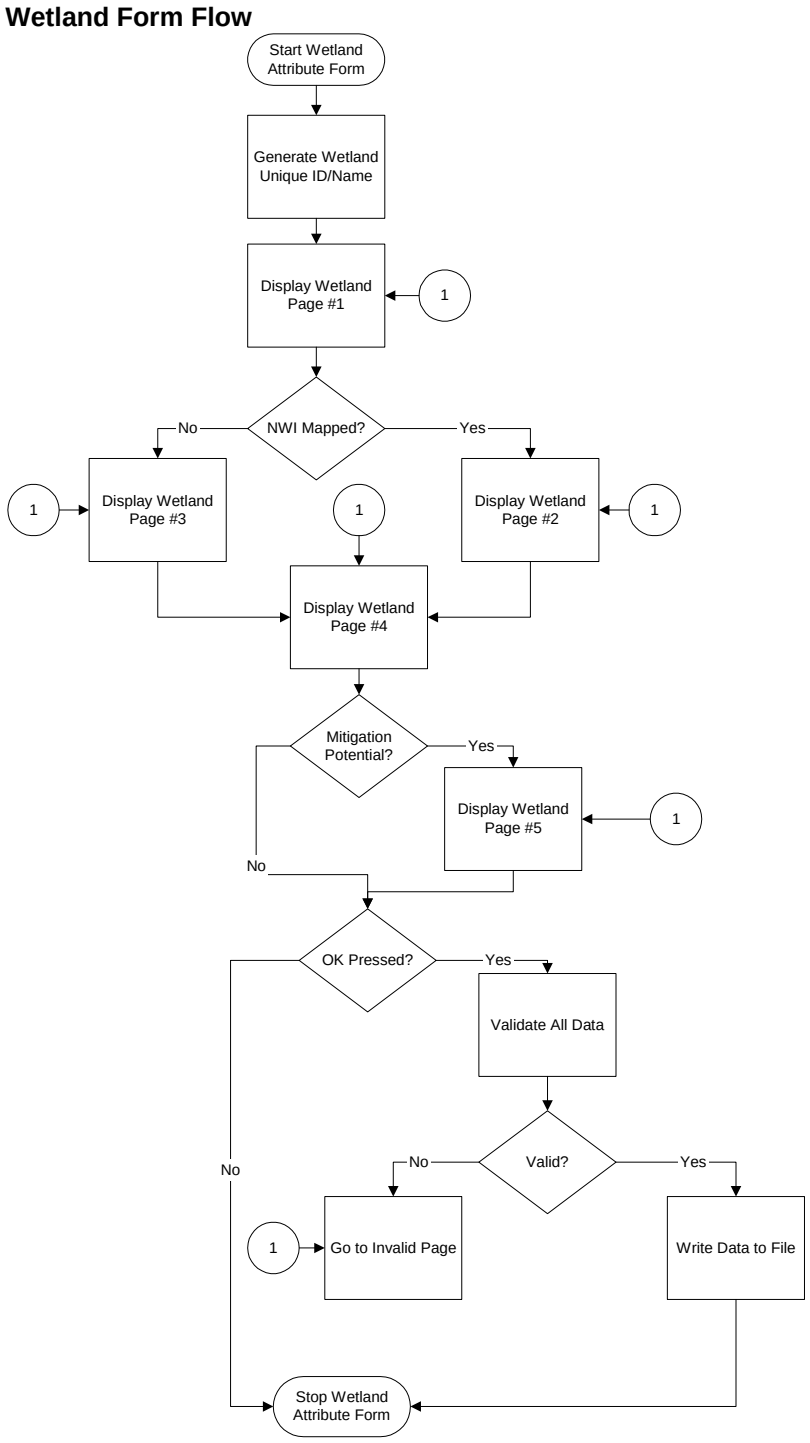
Figure 2-2 ArcPad© Project Development: Wetland Attributes



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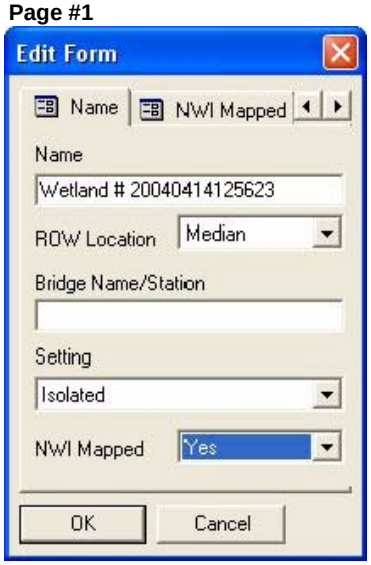

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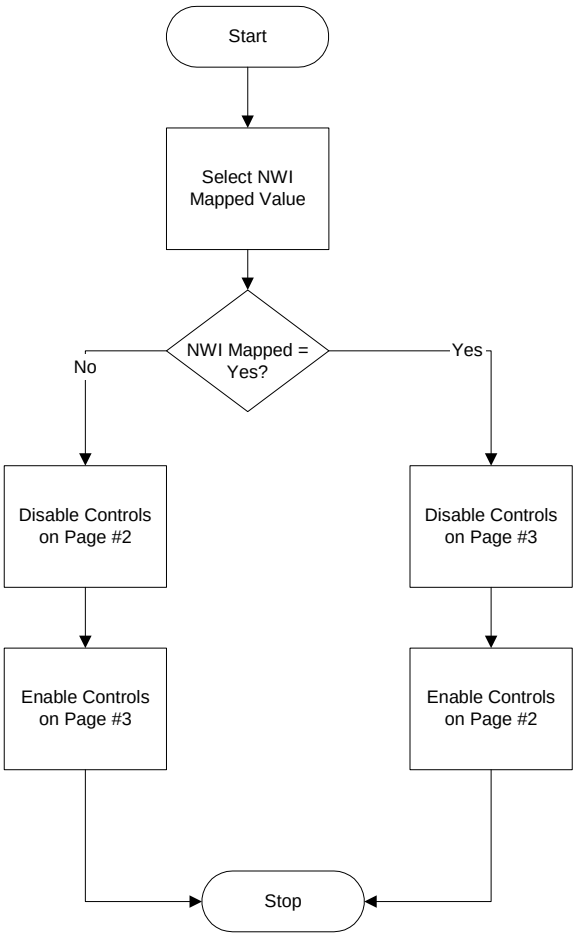

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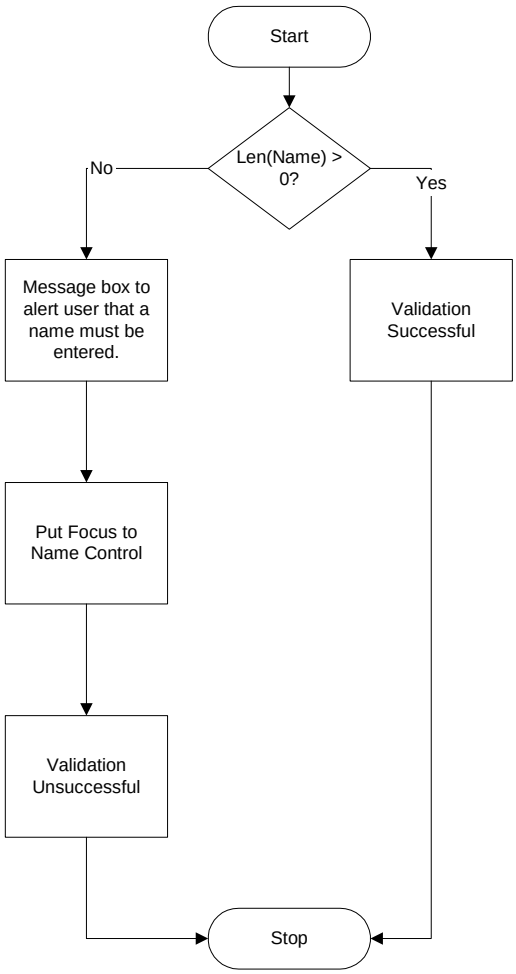

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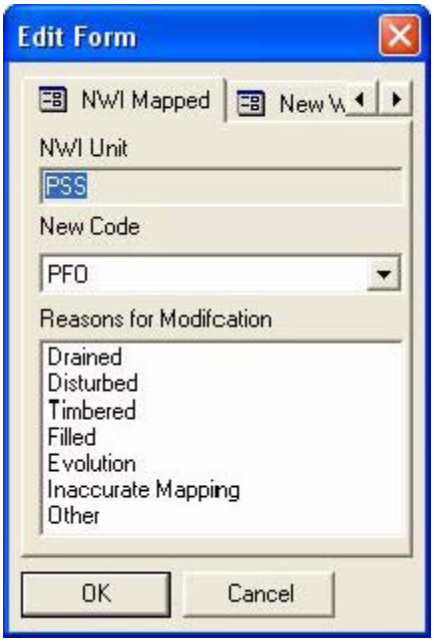

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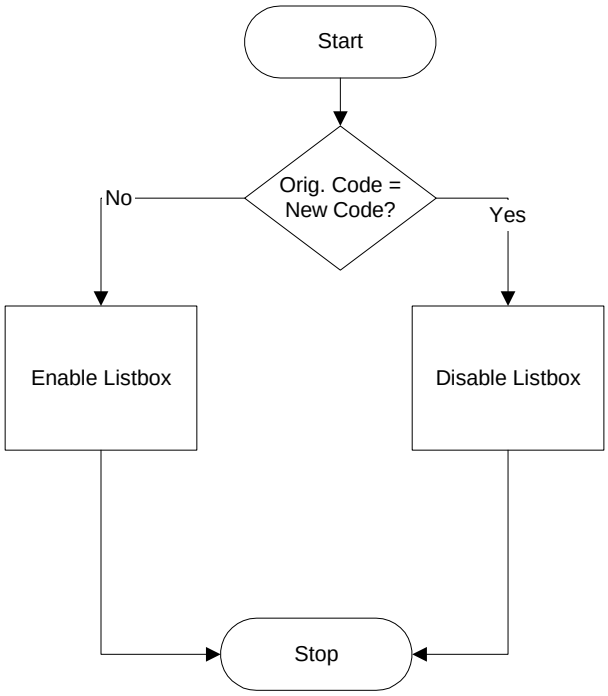

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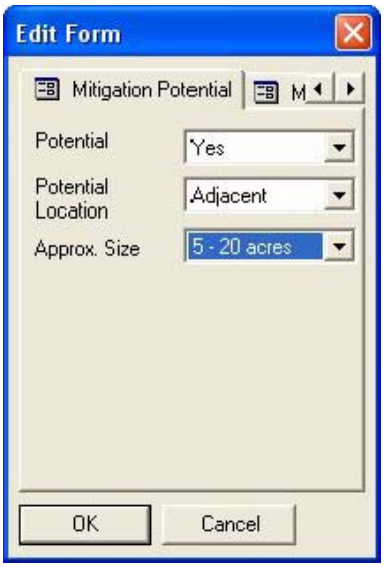
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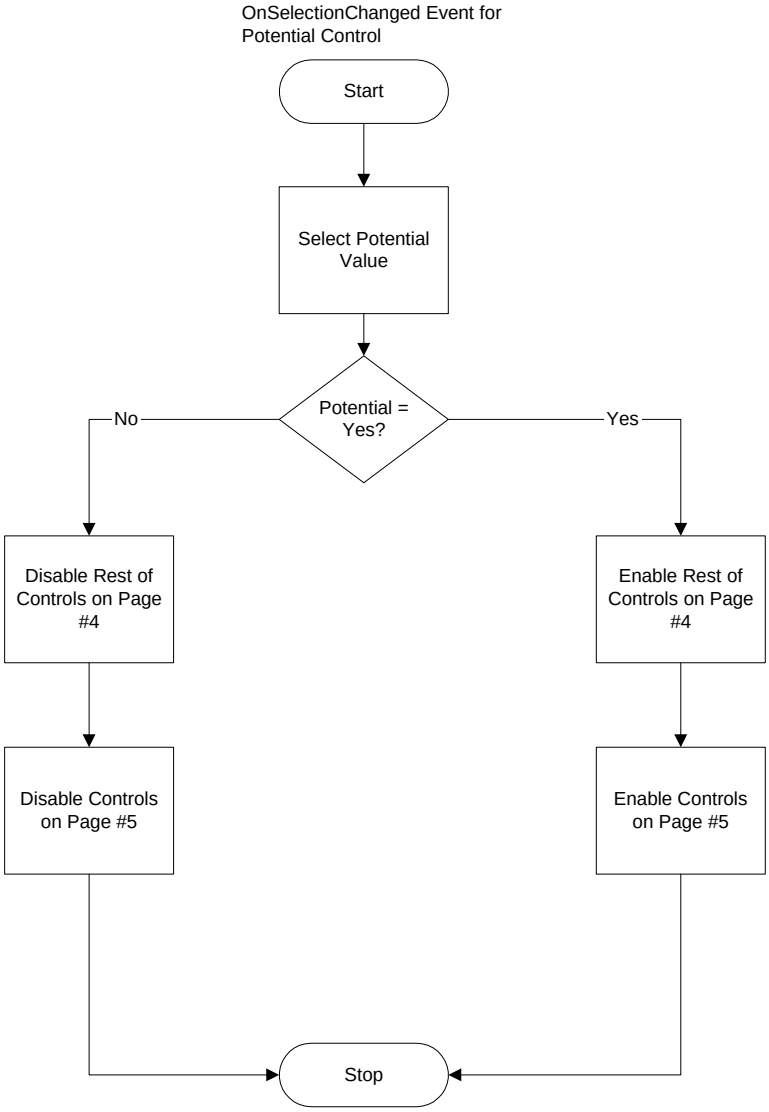
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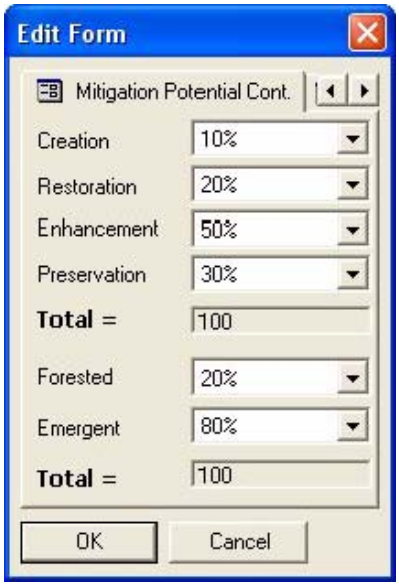
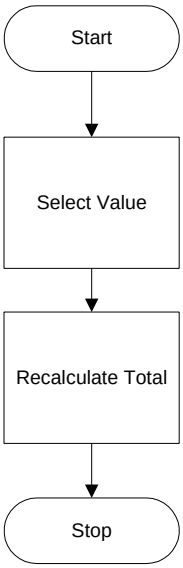
Stop

Page #5



OnSelectionChanged Event for Combobox Controls



OnKillActive Event for Page

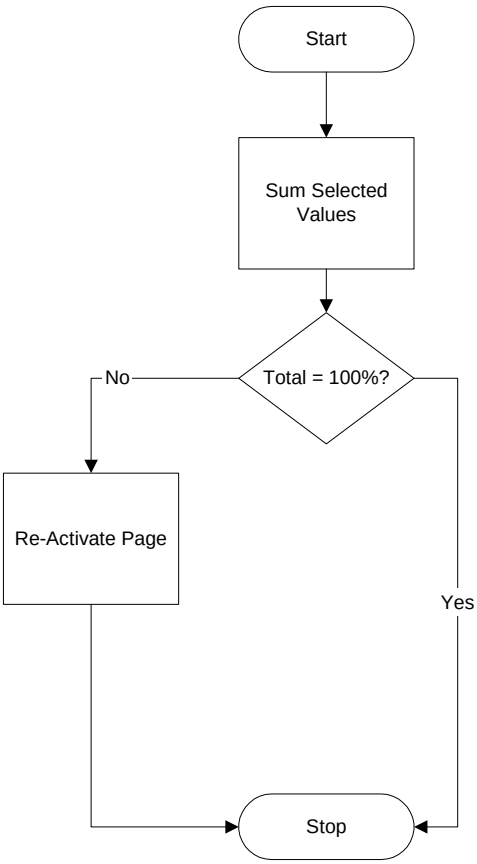


Figure 2-3 Screenshot of Wetland Attribute Menu

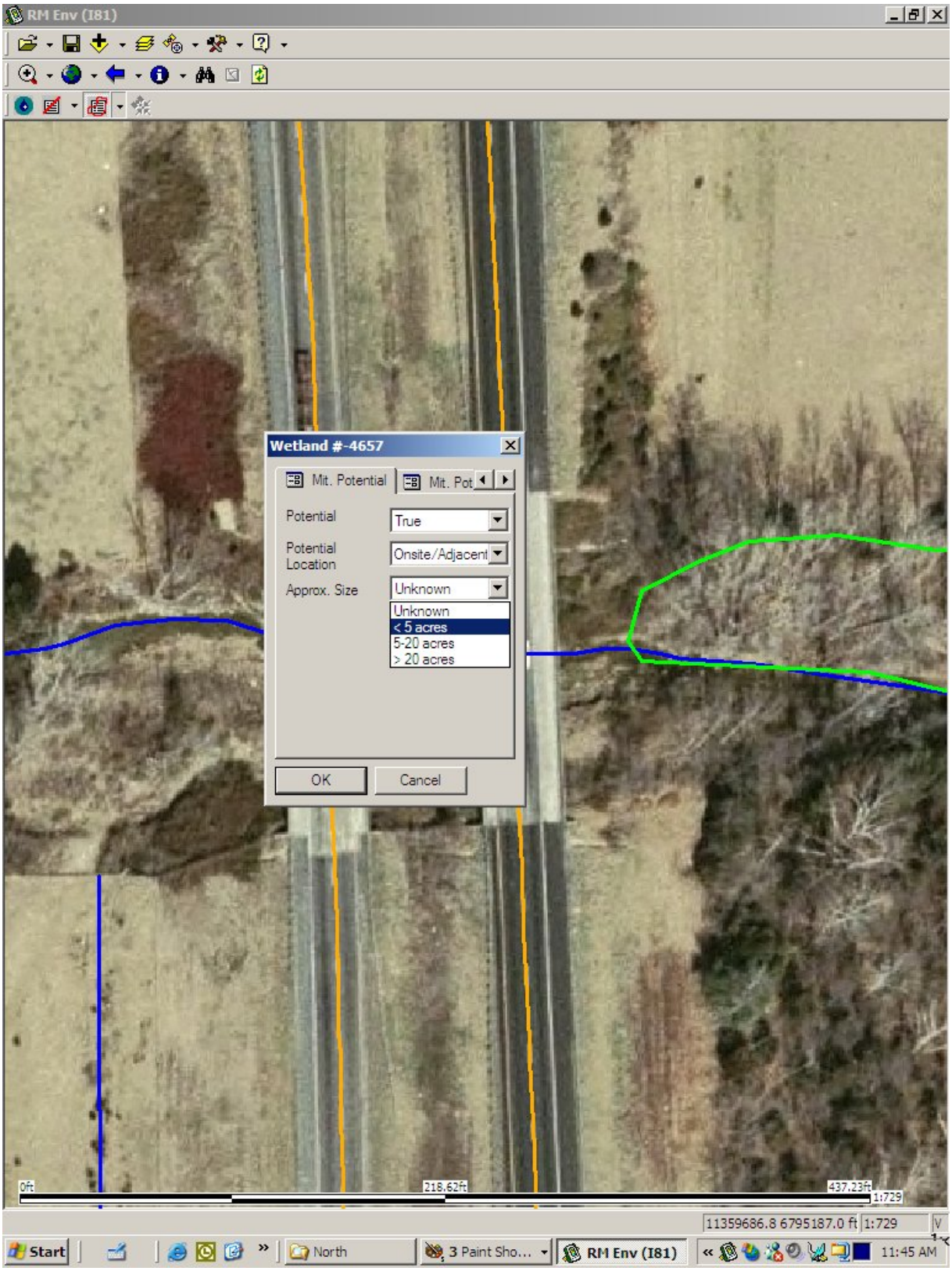
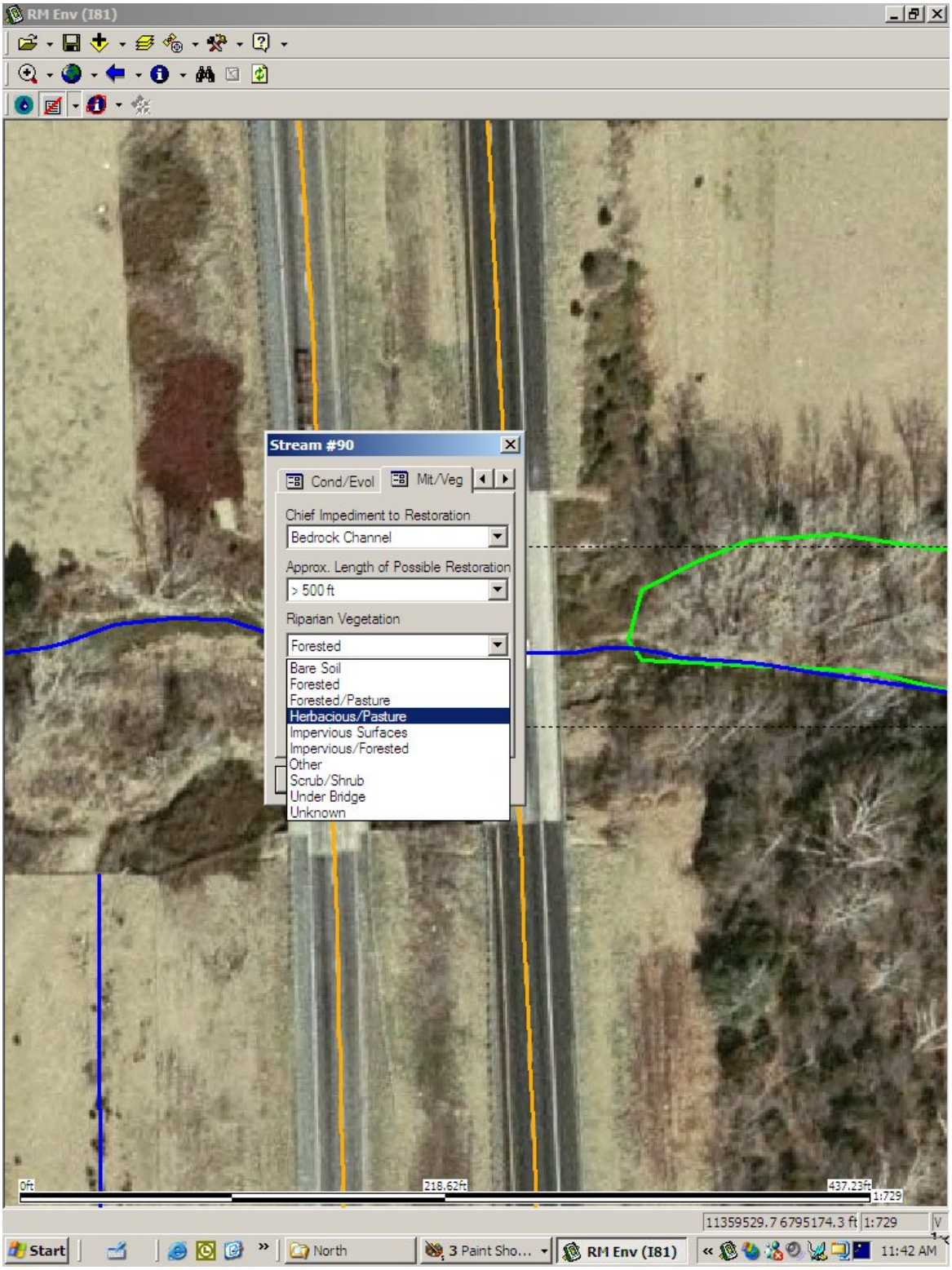


Figure 2-4 Screenshot of Stream Attribute Menu



2.3 Windshield Survey Methods

2.3.1 I-81 Study Area

Windshield surveys in the I-81 study area were completed over the course of 18 days in 2004 from June 14 to June 18, June 21 to June 25, June 28 to July 1, and July 11 to July 14. Using the tablet computers and integrated GPS receiver, environmental scientists drove slowly along the paved shoulder of I-81 until they encountered a previously mapped stream or wetland or directly observed a feature from the vehicle. For those features highly visible from the vehicle, such as a stream channel or farm pond within an open pasture, the existing geospatial data were verified for accuracy or new lines were added, and the feature attributes assigned from the vehicle. On many occasions, however, streams and wetlands were not readily discernable from the roadside due to vegetative cover or steep terrain. In these cases, scientists walked to the feature and made corrections and collected attribute data.

Wetlands

Once a wetland was identified in the field, biologists examined the boundary of the wetland using the three-parameter approach of hydrophytic vegetation, hydric soils, and hydrology described in the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual (USACE, 1987). Scientists mapped wetland areas based on a cursory assessment of a dominance of hydrophytic vegetation and where abrupt boundaries between uplands and wetlands were easily discernable in the field and on the aerial photographs. For more difficult areas, scientists examined the soil profile for hydric-soil indicators, and reviewed the site for the presence of surface hydrology (*e.g.*, stained leaves, saturation within 12 inches of soil surface, etc.) to determine the approximate boundary. Existing NWI coverage was altered where appropriate with the help of the GPS, and the Cowardin classification was either confirmed or changed when in error or due to wetland evolution. For wetlands not previously included in the NWI, scientists digitized the approximate boundaries into the GIS database and included the appropriate attribute data.

Water Resources

The goal of the stream component of the windshield survey was to identify and characterize key perennial streams. The first criterion addressed by field scientists was the presence or absence of flowing or ponded water. Considering the favorable trends in rainfall throughout Virginia over the preceding 12 months, if the channel was observed to be dry, it was given intermittent or ephemeral status and not subjected to a full assessment of attributes. Large streams with plentiful flow and biological indicators such as fish and amphibians, and named streams were deemed perennial and their attributes recorded. Streams with weakly flowing or ponded water were designated “unknown” status, but subjected to a full characterization using the field protocol.

2.3.2 Rail Study Area

A preliminary windshield survey of the Piedmont and Shenandoah rail lines was conducted via a hy-rail tour on August 17 and 18, 2004, lead by representatives from Norfolk Southern. Photographs and notes were taken of the thirteen rail improvement sections from the vehicle traveling on the rail line. Using the same hardware and software previously described, a follow-up windshield survey was conducted via hy-rail on September 27 through 29, 2004 for the nine Piedmont line improvement sections, and on October 21, 2004 for the four Shenandoah line improvement sections. Due to rail safety procedures, all observations were made from the hy-rail. In areas with prohibitive access along the rail line, wetlands and streams were characterized based on visible observations at the nearest road crossing. Unlike the I-81 study area, the vast majority of existing stream and wetland GIS inventory data in the rail study area matched up with observed field conditions.

2.4 Data Processing

Because data collection was written directly into a GIS platform, the need for post-fieldwork processing was minimized. When fieldwork concluded, the scientists responsible for data collection reviewed the database to insure consistency between north and southbound records. All data were subsequently transferred from the tablet computers to a Structured Query Language (SQL) database and subjected to rigorous quality control review by both data analysts and field personnel.

The raw data for wetlands and stream segments collected on the tablet computers for the I-81 study area are provided in Appendix A of this technical report, in Tables A-1 and A-2. Columns within these tables represent each of the attribute menus triggered by the ArcPad© application.

2.5 Impact Analysis

As previously noted, the No-Build Concept and 211 combinations of Transportation System Management (TSM), highway improvements, rail improvements, and various toll scenarios were considered. Of these, 20 are "rail only" concepts meaning that 191 "Build" concepts include improvements along I-81. Preliminary efforts to evaluate concepts during the concept development process included an analysis of impacts to key resources, including NWI mapped wetlands. The results of this preliminary impact analysis indicated that the difference in potential environmental impacts between a variety of different "Build" concepts was generally negligible along the 325-mile I-81 corridor. One reason for this is that a large percent of potential impacts occur within the 91 interchange areas and the "Build" concept footprints used to calculate potential impacts do not vary substantially at the interchanges.

Given the results of the preliminary analysis, and because the number of improvement concepts for I-81 was so large, several footprints were created for the purpose of illustrating

potential impacts along I-81 associated with the "Build" concepts. The highway and rail footprints used to calculate potential impacts are described below.

Potential impacts to wetlands and water resources within the I-81 and rail corridors were quantified by superimposing the footprints over the wetland and water resources GIS database. All wetlands and perennial streams that were intersected by the "Build" concept footprint were considered a potential direct impact. No attempt was made to distinguish temporary, construction-related impacts from those that would permanently affect the resource. This level of detail would be included in subsequent Tier 2 analysis if a "Build" concept (or portion of a "Build" concept) is advanced.

I-81 Minimum Width and Maximum Width

Consistent with a tiered approach, potential impacts in the I-81 corridor are presented in terms of potential impacts associated with the narrowest highway footprint that meets the transportation needs and the widest highway footprint that could meet the identified needs. Referred to as Minimum Width and the Maximum Width, both footprints have a variable number of lanes for the length of I-81 depending on the transportation needs along the corridor. On sections of I-81 that need one additional lane in each direction, both footprints add a total of two lanes (one lane in each direction). On sections of I-81 that need two lanes in each direction, the need can be met by different means: 1) a total of four additional lanes can be added, or 2) various operational scenarios can be implemented (*e.g.* barrier separated lanes and exclusive lanes) that would meet the needs but would require the construction of up to eight additional lanes in order to operate efficiently. Where at least four lanes are needed, the Minimum Width footprint provides a total of four additional lanes (two lanes in each direction), and the Maximum Width footprint provides a total of eight additional lanes (four in each direction).

When evaluating the number of lanes needed to address the needs along I-81, a "no toll" and "no rail" base condition was assumed for the purpose of developing the footprints. This base condition represents the highest traffic volumes and therefore the greatest number of lanes that may be needed on I-81. Tolling and rail improvements could decrease the number of lanes needed on I-81. If a "Build" concept (or portion of a "Build" concept) is advanced, the footprint of any of the improvements is anticipated to fall between the limits of the Minimum Width and Maximum Width footprints.

Approximately 37 percent of the total lane miles along I-81 need only two additional lanes (one in each direction) as discussed in the *I-81 Corridor Improvement Study Transportation Technical Report*. Specifically, the following sections need only two additional lanes:

- Exit 3 to Exit 5 northbound;
- Exit 19 to Exit 81 northbound;
- Exit 162 to Exit 168 northbound;
- Exit 243 to Exit 245 northbound;
- Exit 86 to Exit 89 southbound;
- Exit 96 to Exit 101 southbound;
- Exit 105 to Exit 109 southbound;
- Exit 114 to Exit 118 southbound;

- Exit 247 to Exit 251 northbound;
- Exit 257 to Exit 269 northbound;
- Exit 273 to Exit 279 northbound;
- Exit 310 to Exit 313 northbound;
- Exit 7 to Exit 10 southbound;
- Exit 17 to Exit 84 southbound;
- Exit 156 to Exit 167 southbound;
- Exit 168 to Exit 191 southbound;
- Exit 243 to Exit 251 southbound;
- Exit 264 to Exit 277 southbound; and
- Exit 310 to Exit 313 southbound;

Both the Minimum Width and Maximum Width footprint have a total of two additional lanes (one lane in each direction) in those locations where two additional lanes are needed. The typical 2-lane widening cross section used for impact analysis adds two new lanes in the median of I-81 to the extent possible.

Approximately 61 percent of the total lane miles along I-81 need at least four additional lanes (two in each direction) as discussed in the *I-81 Corridor Improvement Study Transportation Technical Report*).[1] In these sections, two different cross sections were developed for the impact analysis to reflect various types of highway improvement concepts under consideration with different operating conditions (*i.e.*, separation of cars from commercial vehicles, non-separated lanes, etc.): 1) four additional lanes (4-lane widening cross section), and 2) eight additional lanes (8-lane widening cross section).

The 4-lane cross section adds two additional lanes in each direction, widening in the median of I-81 as much as possible, and then widening to the outside where needed. This cross section, which does not provide a physical separation between vehicle types, is used for the Minimum Width footprint in those locations where more than two lanes are needed (one lane in each direction). It reflects the smallest potential construction footprint. The 8-lane cross section adds four additional lanes in each direction. It is used for the Maximum Width footprint in those locations where more than two lanes are needed. It provides barrier separated lanes with all of the widening occurring to the outside of the I-81 travel lane to reflect the largest potential construction footprint.

The impacts are represented by 4-lane and 8-lane cross section templates approximate the narrowest highway concept and the widest concept under consideration. When coupled with the 2-lane section (adding one additional lane in each direction where needed), the Minimum Width and the Maximum Width footprint are derived for the mainline of I-81. The width of the variable Minimum Width footprint ranges from roughly 240 feet (where a total of two lanes are added) to 430 feet (where a total of four lanes are added). In comparison, the Maximum Width footprint ranges from 240 feet (where a total of two lanes are added) to 540 feet (where a total of eight lanes are added).

Finally, based on future travel patterns and traffic volumes at each interchange, either a diamond or full cloverleaf interchange was considered in the analysis of potential impacts.

[1] The remaining two percent of total lane miles (37 percent + 61 percent = 98 percent) does not need any additional lanes. This occurs between Milepost 0 and 7.

Depending on the number of lanes on the mainline of I-81, different footprints were developed for each interchange design, although the difference between these footprints are not substantial.

Table 2-1 below summarizes the elements that comprise the Minimum Width and Maximum Width impact footprints.

Table 2-1 Elements of Impact Footprints

Footprint	Areas Where 2 New Lanes Needed	Areas Where 4 New Lanes Needed	Interchanges
Minimum Width	2-lane Cross Section	4-lane Cross Section	Minimum Cloverleaf / Minimum Diamond
Maximum Width	2-lane Cross Section	8-lane Cross Section	Maximum Cloverleaf / Maximum Diamond

I-81 Consistent "Add 2-Lane" and "Add 8-Lane"

Potential impacts were also calculated for concepts that add a consistent number of lanes the entire length of I-81 in Virginia. Unlike the Minimum Width and Maximum Width footprints that both add a total of two lane where needed, and add a total of four or more lanes where needed, the Add 2-Lane concept consistently adds two lanes (one lane in each direction) the entire length of I-81. The Add 8-Lanes concept consistently adds a total of eight additional lanes (four in each direction).

Rail Concept 3

Many of the improvement concepts included in this study involve rail improvements. Therefore, an impact footprint was developed for the 13 rail improvement sections that comprise Rail Concept 3. Rail Concept 3 was chosen as the most appropriate rail concept to combine with roadway concepts because it provides the most diversion of freight from truck to rail per dollar of investment (see Chapter 3, *Improvement Concepts*). The rail footprint, generally 100 feet wide, represents the limits of potential rail construction.

3
Existing Conditions

As noted in Chapter 1, a variety of local, state, and federal laws and regulations govern the protection of wetlands and water quality including Sections 404 and 401of the Clean Water Act. This chapter describes the existing wetland and water resources in the I-81 and rail study areas based upon the previously described methods.

3.1 Wetlands

3.1.1 I-81 Study Area

In general, vegetated wetland systems are found sporadically within the I-81 study area. Natural forested, scrub-shrub, and emergent wetland systems observed in the study area occur as a result of various hydrologic regimes. Due to the predominance of steep terrain and open pasture lands, wetlands are generally restricted to fringe wetlands around farm ponds, emergent systems associated with springs and seeps, and pockets of forested wetlands along floodplains or depressional areas. These wetlands are discussed in greater detail below and summarized in Table 3-1.

Forested Wetlands

Forested wetland systems comprise only 21 percent of the total wetlands identified within the I-81 study area. Most of these (94 percent) were not found on existing NWI maps but were field-located by wetland specialists. Many of these wetlands were also identified as having relatively high functional value.

Totaling approximately 34 acres, forested wetlands are mostly comprised of bottomland hardwoods in association with streams and coves. Dominant vegetation includes green ash (*Fraxinus pennsylvanica*), red maple (*Acer rubrum*), American sycamore (*Platanus occidentalis*), sweet-gum (*Liquidambar styraciflua*), pin oak (*Quercus palustris*), swamp white oak (*Quercus bicolor*), willow oak (*Quercus phellos*), silver maple (*Acer saccharinum*), black willow (*Salix nigra*), slippery elm (*Ulmus rubra*), and eastern cottonwood (*Populus deltoides*) in the overstory with spicebush (*Lindera benzoin*), arrowwood (*Viburnum dentatum*), poison ivy (*Toxicodendron radicans*), and impatiens (*Impatiens capensis*) as common understory plants. Forested systems

tend to be more prevalent in the northern half of the study area from Botetourt County to the West Virginia line. Frederick County at the extreme northern end of the I-81 study area contains the largest amount (12 acres). The area between Wythe County and the City of Roanoke contains very few forested wetland areas. This portion of the highway lies on higher topographic ridges that are void of large wetland areas as compared to the lower valleys.

Table 3-1 Wetland Summary by County: I-81 Study Area

County	Type of Wetland	Acres	Total Acres	County	Type of Wetland	Acres	Total Acres
Washington	PEM	2.9		Rockbridge	PEM	12.3	
	PFO	1.8			PFO	1.7	
	PSS	0.0			PSS	0.0	
			4.7				14.0
Smyth	PEM	16.3		Augusta	PEM	24.9	
	PFO	6.0			PFO	1.1	
	PSS	3.7			PSS	4.2	
			26.0				30.2.
Wythe	PEM	12.4		Rockingham	PEM	5.2	
	PFO	0.0			PFO	2.6	
	PSS	1.8			PSS	0.7	
			14.2				8.5
Pulaski	PEM	2.6		Shenandoah	PEM	6.3	
	PFO	0.6			PFO	1.0	
	PSS	0.0			PSS	0.6	
			3.2				7.9
Montgomery	PEM	4.0		Warren	PEM	0.0	
	PFO	0.6			PFO	0.0	
	PSS	0.0			PSS	0.0	
			4.6				0
Roanoke	PEM	0.1		Frederick	PEM	27.0	
	PFO	0.8			PFO	11.9	
	PSS	0.1			PSS	3.1	
			1.0				42.0
Botetourt	PEM	0.7					
	PFO	5.4					
	PSS	0.0					
			6.1	Total Wetlands			162.4

PEM – Palustrine Emergent Wetlands; PFO – Palustrine Forested Wetlands; PSS – Palustrine Scrub-Shrub Wetlands

Emergent Wetlands

Emergent wetlands are the dominant wetland community type in the I-81 study area with a total of 115 acres, or 71 percent of all wetlands. The majority (85 percent) were not found on existing NWI maps but field-located by wetland scientists. This wetland type can be found throughout the entire corridor. Large emergent systems are primarily associated with

seepage slopes located in pastures and meadows. The smaller emergent wetlands typically surround the fringe of farm ponds or are part of disturbed areas such as ditches. The most common emergent species include cattails (*Typha latifolia*), sedges (*Carex spp.*), woolgrass (*Scirpus cyperinus*), smartweeds (*Polygonum spp.*), spike rushes (*Eleocharis spp.*), soft rush (*Juncus effusus*), and impatiens.

Scrub-Shrub Wetlands

Few scrub-shrub wetlands occur in the I-81 study area (14 acres or 8 percent of all wetlands). Of these, roughly 3 acres were actually a mix of emergent plants and scrub-shrub plants within a single ecologically functioning system. The largest concentration of scrub-shrub wetlands is present in Augusta and Frederick Counties in association with hillside seeps and springs. The most common species include alder (*Alnus serrulata*), black willow, arrowwood, hawthorns (*Crataegus spp.*), swamp rose (*Rosa palustris*), and young saplings of sweet-gum and red maple trees. The scrub-shrub/emergent wetlands tend to occur in the southern end of the I-81 study area (Smyth and Wythe Counties).

Tables 3-2, 3-3, and 3-4 on the following pages provide detailed information on all three wetland types described above.

Table 3-2 Forested Wetlands: I-81 Study Area

Watershed	County	Wetland ID	Milepost	NWI/ New Wetland	Location in ROW	Size (acres)
Holston River	Washington	S-72	28.2	New	East	0.06
Holston River	Washington	S-74	34.1	New	East	1.72
Holston River	Smyth	S-81	37.9	New	East	1.68
Holston River	Smyth	S-252	38.5	New	West	0.62
Holston River	Smyth	S-89	41.5	New	East	2.39
Holston River	Smyth	S-91	42.1	New	East	0.05
Holston River	Smyth	S-98	52.7	New	East	0.99
Holston River	Smyth	S-243	56.2	New	West	0.24
New River	Pulaski	S-231	96.7	New	West	0.62
Roanoke River	Montgomery	S-171	129.6	NWI	West	0.65
Roanoke River	Roanoke	S-215	141.5	New	West	0.85
James River	Botetourt	S-54	171.6	New	East	0.49
James River	Botetourt	S-55	171.6	New	East	4.87
James River	Rockbridge	S-56	175.9	New	West	0.21
James River	Rockbridge	S-57	177.0	New	East	1.50
Potomac-Shenandoah Rivers	Augusta	N-205	217.4	New	West	0.11
Potomac-Shenandoah Rivers	Augusta	N-197	220.4	New	West	0.05
Potomac-Shenandoah Rivers	Augusta	N-59	224.2	New	East	0.02
Potomac-Shenandoah Rivers	Augusta	N-60	224.3	New	East	0.01
Potomac-Shenandoah Rivers	Augusta	N-63	225.2	New	East	0.03
Potomac-Shenandoah Rivers	Augusta	N-134	236.9	NWI	West	0.26
Potomac-Shenandoah Rivers	Augusta	N-74	237.1	New	East	0.64
Potomac-Shenandoah Rivers	Rockingham	N-386	239.6	New	West	0.58
Potomac-Shenandoah Rivers	City of Harrisonburg	N-78	244.9	New	East	1.17
Potomac-Shenandoah Rivers	City of Harrisonburg	N-380	246.5	New	West	0.81
Potomac-Shenandoah Rivers	Shenandoah	N-30	266.1	NWI	East	0.57
Potomac-Shenandoah Rivers	Shenandoah	N-100	278.6	New	East	0.19
Potomac-Shenandoah Rivers	Shenandoah	N-211	299.2	New	East	0.09
Potomac-Shenandoah Rivers	Shenandoah	N-212	299.7	New	East	0.19
Potomac-Shenandoah Rivers	Frederick	N-351	302.7	New	West	0.24
Potomac-Shenandoah Rivers	Frederick	N-233	302.7	New	East	0.38
Potomac-Shenandoah Rivers	Frederick	N-245	304.2	New	East	0.32
Potomac-Shenandoah Rivers	Frederick	N-336	304.5	New	West	0.17
Potomac-Shenandoah Rivers	Frederick	N-250	305.3	New	East	0.28
Potomac-Shenandoah Rivers	Frederick	N-251	305.4	New	East	1.16
Potomac-Shenandoah Rivers	Frederick	N-327	305.5	New	West	2.86
Potomac-Shenandoah Rivers	Frederick	N-253	306.1	New	East	0.47
Potomac-Shenandoah Rivers	Frederick	N-263	309.0	New	East	0.58
Potomac-Shenandoah Rivers	Frederick	N-312	309.8	New	West	0.44
Potomac-Shenandoah Rivers	Frederick	N-282	312.7	New	East	0.30
Potomac-Shenandoah Rivers	Frederick	N-284	312.7	New	East	0.29
Potomac-Shenandoah Rivers	Frederick	N-286	314.8	New	East	0.31
Potomac-Shenandoah Rivers	Frederick	N-288	315.1	New	East	0.09
Potomac-Shenandoah Rivers	Frederick	N-289	315.3	New	East	0.12
Potomac-Shenandoah Rivers	Frederick	N-290	315.4	New	East	0.17
Potomac-Shenandoah Rivers	Frederick	N-293	316.5	New	East	0.07
Potomac-Shenandoah Rivers	Frederick	N-291	316.6	New	East	0.68
Potomac-Shenandoah Rivers	Frederick	N-295	316.9	New	East	2.65
Potomac-Shenandoah Rivers	Frederick	N-302	319.5	New	West	0.28

Table 3-3 Emergent Wetlands: I-81 Study Area

Watershed	County	Wetland ID	Milepost	NWI /New Wetland	Location in ROW	Size (acres)
Holston River	Washington	S-66	9.6	New	East	0.24
Holston River	Washington	S-261	13.1	New	West	0.17
Holston River	Washington	S-140	16.2	New	East	0.05
Holston River	Washington	S-67	20.0	New	East	0.11
Holston River	Washington	S-5	20.5	NWI	East	0.06
Holston River	Washington	S-257	21.0	New	West	0.60
Holston River	Washington	S-258	25.3	New	West	0.15
Holston River	Washington	S-6	28.1	NWI	East	0.27
Holston River	Washington	S-71	28.1	New	East	0.30
Holston River	Washington	S-73	31.9	New	East	0.20
Holston River	Washington	S-253	32.2	New	West	0.32
Holston River	Washington	S-75	34.0	New	East	0.40
Holston River	Smyth	S-78	35.4	New	East	0.03
Holston River	Smyth	S-76	35.4	New	East	0.11
Holston River	Smyth	S-79	35.5	New	East	0.01
Holston River	Smyth	S-77	35.5	New	East	0.07
Holston River	Smyth	S-82	38.5	New	East	0.12
Holston River	Smyth	S-83	38.9	New	East	0.10
Holston River	Smyth	S-9	39.3	NWI	East	5.42
Holston River	Smyth	S-85	39.8	New	East	0.28
Holston River	Smyth	S-86	40.0	New	East	0.02
Holston River	Smyth	S-88	41.5	New	East	0.30
Holston River	Smyth	S-87	41.6	New	East	0.14
Holston River	Smyth	S-90	41.7	New	East	0.12
Holston River	Smyth	S-92	42.9	New	East	0.13
Holston River	Smyth	S-93	43.2	New	East	0.51
Holston River	Smyth	S-94	43.5	New	East	2.02
Holston River	Smyth	S-95	43.6	New	East	0.22
Holston River	Smyth	S-141	45.8	New	East	0.06
Holston River	Smyth	S-96	45.9	New	East	0.29
Holston River	Smyth	S-249	49.6	New	West	1.05
Holston River	Smyth	S-97	51.8	New	East	0.03
Holston River	Smyth	S-101	54.4	New	East	0.10
Holston River	Smyth	S-248	54.5	New	West	0.43
Holston River	Smyth	S-102	54.7	New	East	0.52
Holston River	Smyth	S-247	54.9	New	West	0.03
Holston River	Smyth	S-103	54.9	New	East	2.76
Holston River	Smyth	S-105	55.0	New	East	0.48
Holston River	Smyth	S-104	55.0	New	East	0.45
Holston River	Smyth	S-107	55.0	New	East	0.33
Holston River	Smyth	S-244	55.1	New	West	0.01
Holston River	Smyth	S-242	57.0	New	West	0.15

Table 3-3 Emergent Wetlands: I-81 Study Area (Cont'd)

Watershed	County	Wetland ID	Milepost	NWI /New Wetland	Location in ROW	Size (acres)
New River	Wythe	S-108	59.5	New	East	1.48
New River	Wythe	S-110	63.4	New	East	5.08
New River	Wythe	S-239	69.9	New	West	0.52
New River	Wythe	S-111	71.2	New	East	0.46
New River	Wythe	S-112	73.0	New	East	0.43
New River	Wythe	S-114	73.1	New	East	0.79
New River	Wythe	S-115	79.9	New	East	0.01
New River	Wythe	S-116	80.1	New	East	0.03
New River	Wythe	S-159	80.5	NWI	West	0.22
New River	Wythe	S-16	80.8	New	East	0.12
New River	Wythe	S-117	81.1	New	East	0.96
New River	Wythe	S-119	81.2	New	East	0.36
New River	Wythe	S-120	81.3	New	East	0.06
New River	Wythe	S-121	86.2	New	East	1.18
New River	Wythe	S-123	86.6	New	East	0.04
New River	Wythe	S-124	87.0	New	East	0.64
New River	Pulaski	S-125	87.7	New	East	1.20
New River	Pulaski	S-126	90.7	New	East	0.22
New River	Pulaski	S-232	96.0	New	West	0.13
New River	Pulaski	S-230	97.8	New	West	0.48
New River	Pulaski	S-228	98.7	New	West	0.49
New River	Pulaski	S-226	103.2	New	West	0.04
New River	Pulaski	S-227	103.2	New	West	0.05
New River	Montgomery	S-225	105.5	New	West	0.11
New River	Montgomery	S-224	106.6	New	West	0.09
New River	Montgomery	S-129	106.9	New	East	0.02
New River	Montgomery	S-130	108.7	New	East	0.01
New River	Montgomery	S-167	108.9	NWI	West	0.04
New River	Montgomery	S-168	108.9	NWI	West	0.11
New River	Montgomery	S-221	109.7	New	West	0.39
New River	Montgomery	S-131	110.0	New	East	0.67
New River	Montgomery	S-132	111.1	New	East	0.51
New River	Montgomery	S-134	113.2	New	East	0.07
New River	Montgomery	S-133	113.3	New	East	0.08
New River	Montgomery	S-30	114.6	NWI	East	0.19
Roanoke River	Montgomery	S-136	118.8	New	East	0.31
Roanoke River	Montgomery	S-34	119.1	NWI	East	0.49
Roanoke River	Montgomery	S-220	119.6	NWI	West	0.18
Roanoke River	Montgomery	S-138	126.2	New	East	0.33
Roanoke River	Montgomery	S-218	129.6	New	West	0.41
Roanoke River	Roanoke	S-216	131.2	New	West	0.13
Roanoke River	Botetourt	S-213	150.4	New	West	0.13
Roanoke River	Botetourt	S-214	150.5	New	West	0.06
James River	Botetourt	S-51	156.9	New	East	0.12

Table 3-3 Emergent Wetlands: I-81 Study Area (Cont'd)

Watershed	County	Wetland ID	Milepost	NWI /New Wetland	Location in ROW	Size (acres)
James River	Botetourt	S-53	171.6	New	East	0.24
James River	Botetourt	S-209	173.5	New	West	0.15
James River	Rockbridge	S-208	174.9	New	West	0.32
James River	Rockbridge	S-207	175.3	New	West	0.22
James River	Rockbridge	S-206	175.7	New	West	0.22
James River	Rockbridge	S-210	176.6	New	West	0.07
James River	Rockbridge	S-58	177.1	New	East	1.04
James River	Rockbridge	S-205	177.8	New	West	1.74
James River	Rockbridge	S-48	179.4	NWI	West	0.59
James River	Rockbridge	S-185	183.4	NWI	West	0.05
James River	Rockbridge	S-204	188.3	New	West	1.07
James River	Rockbridge	S-203	188.4	NWI	West	0.30
James River	Rockbridge	S-60	192.6	New	East	0.18
James River	Rockbridge	S-61	193.1	New	East	0.03
James River	Rockbridge	S-49	195.1	NWI	East	0.30
James River	Rockbridge	S-200	196.5	New	West	0.16
James River	Rockbridge	S-202	196.6	New	West	0.54
James River	Rockbridge	S-199	196.9	New	West	0.02
James River	Rockbridge	S-190	198.5	NWI	West	0.03
James River	Rockbridge	S-192	198.5	NWI	West	2.38
James River	Rockbridge	S-191	198.5	NWI	West	0.00
James River	Rockbridge	S-198	198.7	New	West	0.36
James River	Rockbridge	S-197	198.9	New	West	0.07
James River	Rockbridge	S-196	200.1	New	West	0.13
James River	Rockbridge	S-62	200.1	New	East	1.48
James River	Rockbridge	S-194	201.4	New	West	0.28
James River	Rockbridge	S-195	201.4	New	West	0.35
James River	Rockbridge	S-63	201.7	New	East	0.17
James River	Rockbridge	S-64	202.3	New	East	0.20
James River	Augusta	N-122	207.3	NWI	West	0.04
James River	Augusta	N-123	207.3	NWI	West	0.11
James River	Augusta	N-109	207.8	New	East	1.34
James River	Augusta	N-108	207.8	New	East	0.17
James River	Augusta	N-209	207.8	New	West	0.27
James River	Augusta	N-107	207.8	New	Median	0.01
Potomac-Shenandoah Rivers	Augusta	N-110	208.9	New	East	0.77
Potomac-Shenandoah Rivers	Augusta	N-2	209.0	NWI	East	0.12
Potomac-Shenandoah Rivers	Augusta	N-3	209.0	NWI	East	0.12
Potomac-Shenandoah Rivers	Augusta	N-5	209.0	NWI	East	0.10
Potomac-Shenandoah Rivers	Augusta	N-4	209.0	NWI	East	0.44
Potomac-Shenandoah Rivers	Augusta	N-6	209.7	NWI	East	1.29
Potomac-Shenandoah Rivers	Augusta	N-111	213.8	New	East	0.08
Potomac-Shenandoah Rivers	Augusta	N-208	214.7	New	West	0.43
Potomac-Shenandoah Rivers	Augusta	N-207	215.2	New	West	0.14

Table 3-3 Emergent Wetlands: I-81 Study Area (Cont'd)

Watershed	County	Wetland ID	Milepost	NWI /New Wetland	Location in ROW	Size (acres)
Potomac-Shenandoah Rivers	Augusta	N-127	216.7	NWI	Median	0.45
Potomac-Shenandoah Rivers	Augusta	N-113	217.0	New	East	0.75
Potomac-Shenandoah Rivers	Augusta	N-204	217.3	New	West	0.36
Potomac-Shenandoah Rivers	Augusta	N-202	217.4	New	West	0.17
Potomac-Shenandoah Rivers	Augusta	N-203	217.4	New	West	0.09
Potomac-Shenandoah Rivers	Augusta	N-115	217.8	New	Median	0.18
Potomac-Shenandoah Rivers	Augusta	N-114	217.9	New	East	0.56
Potomac-Shenandoah Rivers	Augusta	N-200	219.0	New	West	0.33
Potomac-Shenandoah Rivers	Augusta	N-199	220.3	New	West	0.27
Potomac-Shenandoah Rivers	Augusta	N-198	220.3	New	West	0.17
Potomac-Shenandoah Rivers	Augusta	N-196	220.4	New	West	0.24
Potomac-Shenandoah Rivers	Augusta	N-195	220.4	New	West	0.01
Potomac-Shenandoah Rivers	Augusta	N-116	220.4	New	East	0.68
Potomac-Shenandoah Rivers	Augusta	N-117	220.9	New	East	1.00
Potomac-Shenandoah Rivers	Augusta	N-118	221.0	New	East	0.52
Potomac-Shenandoah Rivers	Augusta	N-9	221.3	NWI	East	0.21
Potomac-Shenandoah Rivers	Augusta	N-119	222.2	New	East	0.64
Potomac-Shenandoah Rivers	Augusta	N-130	222.2	NWI	West	1.30
Potomac-Shenandoah Rivers	Augusta	N-406	222.6	New	West	1.88
Potomac-Shenandoah Rivers	Staunton	N-405	222.9	New	West	0.27
Potomac-Shenandoah Rivers	Staunton	N-404	223.4	New	West	0.24
Potomac-Shenandoah Rivers	Staunton	N-403	223.5	New	West	0.05
Potomac-Shenandoah Rivers	Staunton	N-401	224.3	New	West	0.11
Potomac-Shenandoah Rivers	Staunton	N-131	224.6	NWI	West	0.63
Potomac-Shenandoah Rivers	Augusta	N-61	224.7	New	East	0.16
Potomac-Shenandoah Rivers	Augusta	N-62	225.0	New	East	0.06
Potomac-Shenandoah Rivers	Staunton	N-400	225.1	New	West	1.02
Potomac-Shenandoah Rivers	Staunton	N-399	225.9	New	West	0.30
Potomac-Shenandoah Rivers	Augusta	N-397	226.3	New	West	0.04
Potomac-Shenandoah Rivers	Augusta	N-396	226.7	New	West	0.02
Potomac-Shenandoah Rivers	Augusta	N-395	226.9	New	West	0.11
Potomac-Shenandoah Rivers	Augusta	N-394	227.3	New	West	0.93
Potomac-Shenandoah Rivers	Augusta	N-67	227.3	New	Median	0.05
Potomac-Shenandoah Rivers	Augusta	N-66	227.3	New	East	0.58
Potomac-Shenandoah Rivers	Augusta	N-69	227.8	New	East	0.23
Potomac-Shenandoah Rivers	Augusta	N-14	228.1	NWI	East	0.14
Potomac-Shenandoah Rivers	Augusta	N-132	228.1	NWI	West	2.52
Potomac-Shenandoah Rivers	Augusta	N-393	228.8	New	West	0.15
Potomac-Shenandoah Rivers	Augusta	N-392	229.3	New	West	0.13
Potomac-Shenandoah Rivers	Augusta	N-391	229.6	New	West	0.16
Potomac-Shenandoah Rivers	Augusta	N-390	229.6	New	West	0.22
Potomac-Shenandoah Rivers	Augusta	N-389	231.9	New	West	0.10
Potomac-Shenandoah Rivers	Augusta	N-71	232.1	NWI	East	0.26
Potomac-Shenandoah Rivers	Augusta	N-72	232.8	New	East	0.11

Table 3-3 Emergent Wetlands: I-81 Study Area (Cont'd)

Watershed	County	Wetland ID	Milepost	NWI /New Wetland	Location in ROW	Size (acres)
Potomac-Shenandoah Rivers	Augusta	N-16	233.5	NWI	East	0.56
Potomac-Shenandoah Rivers	Augusta	N-73	233.5	New	East	0.12
Potomac-Shenandoah Rivers	Augusta	N-387	233.5	New	West	0.26
Potomac-Shenandoah Rivers	Augusta	N-17	234.8	NWI	East	0.13
Potomac-Shenandoah Rivers	Rockingham	N-75	238.4	New	East	0.16
Potomac-Shenandoah Rivers	City of Harrisonburg	N-384	243.4	New	West	0.03
Potomac-Shenandoah Rivers	City of Harrisonburg	N-383	244.0	New	West	0.62
Potomac-Shenandoah Rivers	City of Harrisonburg	N-139	245.2	New	West	0.08
Potomac-Shenandoah Rivers	City of Harrisonburg	N-382	246.3	New	West	0.14
Potomac-Shenandoah Rivers	City of Harrisonburg	N-381	246.5	New	West	0.19
Potomac-Shenandoah Rivers	Rockingham	N-379	249.6	New	West	0.20
Potomac-Shenandoah Rivers	Rockingham	N-378	249.7	New	West	0.35
Potomac-Shenandoah Rivers	Rockingham	N-81	250.0	New	East	0.12
Potomac-Shenandoah Rivers	Rockingham	N-377	251.1	New	West	0.08
Potomac-Shenandoah Rivers	Rockingham	N-376	252.4	New	West	0.92
Potomac-Shenandoah Rivers	Rockingham	N-142	252.5	NWI	West	0.06
Potomac-Shenandoah Rivers	Rockingham	N-121	253.1	New	East	0.64
Potomac-Shenandoah Rivers	Rockingham	N-375	254.5	New	West	0.04
Potomac-Shenandoah Rivers	Rockingham	N-84	254.8	NWI	East	0.47
Potomac-Shenandoah Rivers	Rockingham	N-85	255.7	New	East	0.33
Potomac-Shenandoah Rivers	Rockingham	N-87	259.4	New	East	0.64
Potomac-Shenandoah Rivers	Rockingham	N-90	263.4	New	East	0.18
Potomac-Shenandoah Rivers	Shenandoah	N-373	265.7	New	West	0.08
Potomac-Shenandoah Rivers	Shenandoah	N-92	265.7	New	East	0.02
Potomac-Shenandoah Rivers	Shenandoah	N-153	269.0	NWI	West	0.23
Potomac-Shenandoah Rivers	Shenandoah	N-372	269.0	New	West	0.16
Potomac-Shenandoah Rivers	Shenandoah	N-156	269.7	NWI	West	0.51
Potomac-Shenandoah Rivers	Shenandoah	N-41	271.0	NWI	East	0.20
Potomac-Shenandoah Rivers	Shenandoah	N-157	271.6	NWI	West	0.28
Potomac-Shenandoah Rivers	Shenandoah	N-98	274.3	New	East	0.05
Potomac-Shenandoah Rivers	Shenandoah	N-97	274.3	New	Median	0.06
Potomac-Shenandoah Rivers	Shenandoah	N-160	274.9	NWI	West	0.31
Potomac-Shenandoah Rivers	Shenandoah	N-161	275.4	NWI	West	0.72
Potomac-Shenandoah Rivers	Shenandoah	N-162	275.4	NWI	West	0.14
Potomac-Shenandoah Rivers	Shenandoah	N-368	276.9	New	West	0.10
Potomac-Shenandoah Rivers	Shenandoah	N-165	278.3	NWI	West	0.24
Potomac-Shenandoah Rivers	Shenandoah	N-168	280.7	NWI	West	0.60
Potomac-Shenandoah Rivers	Shenandoah	N-367	281.9	New	West	0.18
Potomac-Shenandoah Rivers	Shenandoah	N-48	283.3	NWI	East	0.36
Potomac-Shenandoah Rivers	Shenandoah	N-50	285.8	NWI	East	0.01
Potomac-Shenandoah Rivers	Shenandoah	N-171	286.1	NWI	West	0.21
Potomac-Shenandoah Rivers	Shenandoah	N-102	287.9	New	East	0.09
Potomac-Shenandoah Rivers	Shenandoah	N-53	288.2	NWI	East	0.09
Potomac-Shenandoah Rivers	Shenandoah	N-172	291.8	NWI	West	0.28

Table 3-3 Emergent Wetlands: I-81 Study Area (Cont'd)

Watershed	County	Wetland ID	Milepost	NWI /New Wetland	Location in ROW	Size (acres)
Potomac-Shenandoah Rivers	Shenandoah	N-177	296.6	NWI	West	0.11
Potomac-Shenandoah Rivers	Shenandoah	N-210	297.2	New	East	0.52
Potomac-Shenandoah Rivers	Shenandoah	N-105	298.1	New	East	0.20
Potomac-Shenandoah Rivers	Shenandoah	N-364	298.1	New	West	0.06
Potomac-Shenandoah Rivers	Shenandoah	N-363	298.1	New	West	0.05
Potomac-Shenandoah Rivers	Shenandoah	N-104	298.2	New	East	0.45
Potomac-Shenandoah Rivers	Frederick	N-362	301.2	New	West	0.14
Potomac-Shenandoah Rivers	Frederick	N-361	301.2	New	West	0.46
Potomac-Shenandoah Rivers	Frederick	N-215	301.3	New	Median	0.01
Potomac-Shenandoah Rivers	Frederick	N-216	301.3	New	Median	0.02
Potomac-Shenandoah Rivers	Frederick	N-359	301.5	New	West	0.19
Potomac-Shenandoah Rivers	Frederick	N-360	301.5	New	West	0.03
Potomac-Shenandoah Rivers	Frederick	N-220	301.5	New	Median	0.12
Potomac-Shenandoah Rivers	Frederick	N-218	301.5	New	Median	0.10
Potomac-Shenandoah Rivers	Frederick	N-358	301.5	New	West	0.06
Potomac-Shenandoah Rivers	Frederick	N-219	301.5	New	Median	0.02
Potomac-Shenandoah Rivers	Frederick	N-217	301.6	New	Median	0.06
Potomac-Shenandoah Rivers	Frederick	N-357	301.6	New	West	0.03
Potomac-Shenandoah Rivers	Frederick	N-223	301.7	New	East	0.28
Potomac-Shenandoah Rivers	Frederick	N-416	301.7	New	East	0.10
Potomac-Shenandoah Rivers	Frederick	N-222	301.7	New	East	0.06
Potomac-Shenandoah Rivers	Frederick	N-221	301.7	New	East	0.12
Potomac-Shenandoah Rivers	Frederick	N-356	301.7	New	West	0.06
Potomac-Shenandoah Rivers	Frederick	N-225	301.8	New	Median	0.08
Potomac-Shenandoah Rivers	Frederick	N-355	301.8	New	West	0.06
Potomac-Shenandoah Rivers	Frederick	N-224	301.8	New	East	0.04
Potomac-Shenandoah Rivers	Frederick	N-226	301.9	New	Median	0.10
Potomac-Shenandoah Rivers	Frederick	N-229	302.0	New	East	0.11
Potomac-Shenandoah Rivers	Frederick	N-228	302.0	New	East	0.09
Potomac-Shenandoah Rivers	Frederick	N-227	302.0	New	Median	0.11
Potomac-Shenandoah Rivers	Frederick	N-354	302.0	New	West	0.66
Potomac-Shenandoah Rivers	Frederick	N-230	302.3	New	East	0.10
Potomac-Shenandoah Rivers	Frederick	N-231	302.3	New	East	0.15
Potomac-Shenandoah Rivers	Frederick	N-353	302.3	New	West	0.09
Potomac-Shenandoah Rivers	Frederick	N-232	302.3	New	East	0.25
Potomac-Shenandoah Rivers	Frederick	N-352	302.5	New	West	0.29
Potomac-Shenandoah Rivers	Frederick	N-234	302.6	New	East	0.15
Potomac-Shenandoah Rivers	Frederick	N-350	302.7	New	West	0.06
Potomac-Shenandoah Rivers	Frederick	N-415	302.7	New	East	0.03
Potomac-Shenandoah Rivers	Frederick	N-349	302.7	New	West	0.06
Potomac-Shenandoah Rivers	Frederick	N-236	302.8	New	East	0.06
Potomac-Shenandoah Rivers	Frederick	N-235	302.8	New	East	0.08
Potomac-Shenandoah Rivers	Frederick	N-348	302.9	New	West	0.02
Potomac-Shenandoah Rivers	Frederick	N-237	303.0	New	East	0.12

Table 3-3 Emergent Wetlands: I-81 Study Area (Cont'd)

Watershed	County	Wetland ID	Milepost	NWI /New Wetland	Location in ROW	Size (acres)
Potomac-Shenandoah Rivers	Frederick	N-238	303.0	New	East	0.36
Potomac-Shenandoah Rivers	Frederick	N-240	303.1	New	East	0.10
Potomac-Shenandoah Rivers	Frederick	N-345	303.1	New	West	0.06
Potomac-Shenandoah Rivers	Frederick	N-346	303.1	New	West	0.02
Potomac-Shenandoah Rivers	Frederick	N-344	303.2	New	West	0.08
Potomac-Shenandoah Rivers	Frederick	N-343	303.2	New	West	0.07
Potomac-Shenandoah Rivers	Frederick	N-241	303.2	New	East	0.38
Potomac-Shenandoah Rivers	Frederick	N-342	303.3	New	West	0.50
Potomac-Shenandoah Rivers	Frederick	N-242	303.3	New	East	0.05
Potomac-Shenandoah Rivers	Frederick	N-341	303.5	New	West	0.07
Potomac-Shenandoah Rivers	Frederick	N-243	303.5	New	East	0.31
Potomac-Shenandoah Rivers	Frederick	N-340	303.5	New	West	0.34
Potomac-Shenandoah Rivers	Frederick	N-338	303.8	New	Median	0.04
Potomac-Shenandoah Rivers	Frederick	N-337	303.8	New	West	0.54
Potomac-Shenandoah Rivers	Frederick	N-244	303.9	New	East	0.33
Potomac-Shenandoah Rivers	Frederick	N-335	304.4	New	West	0.07
Potomac-Shenandoah Rivers	Frederick	N-246	304.4	New	Median	0.13
Potomac-Shenandoah Rivers	Frederick	N-182	304.5	NWI	East	0.56
Potomac-Shenandoah Rivers	Frederick	N-334	304.5	New	Median	0.08
Potomac-Shenandoah Rivers	Frederick	N-331	304.6	New	West	0.53
Potomac-Shenandoah Rivers	Frederick	N-330	304.7	New	West	1.19
Potomac-Shenandoah Rivers	Frederick	N-413	304.7	New	West	0.09
Potomac-Shenandoah Rivers	Frederick	N-247	304.9	New	East	0.23
Potomac-Shenandoah Rivers	Frederick	N-248	304.9	New	Median	0.08
Potomac-Shenandoah Rivers	Frederick	N-328	305.1	New	West	0.14
Potomac-Shenandoah Rivers	Frederick	N-326	305.6	New	West	0.32
Potomac-Shenandoah Rivers	Frederick	N-252	305.7	New	East	0.11
Potomac-Shenandoah Rivers	Frederick	N-325	305.8	New	West	0.32
Potomac-Shenandoah Rivers	Frederick	N-254	306.0	New	East	0.05
Potomac-Shenandoah Rivers	Frederick	N-324	306.0	New	West	0.01
Potomac-Shenandoah Rivers	Frederick	N-255	306.2	New	East	0.13
Potomac-Shenandoah Rivers	Frederick	N-323	306.3	New	West	1.22
Potomac-Shenandoah Rivers	Frederick	N-256	306.5	New	East	0.12
Potomac-Shenandoah Rivers	Frederick	N-322	306.6	New	West	0.23
Potomac-Shenandoah Rivers	Frederick	N-257	306.7	New	East	0.08
Potomac-Shenandoah Rivers	Frederick	N-258	307.0	New	East	0.39
Potomac-Shenandoah Rivers	Frederick	N-259	307.5	New	East	1.23
Potomac-Shenandoah Rivers	Frederick	N-320	307.5	New	West	5.30
Potomac-Shenandoah Rivers	Frederick	N-260	307.7	New	East	0.26
Potomac-Shenandoah Rivers	Frederick	N-261	307.9	New	East	0.05
Potomac-Shenandoah Rivers	Frederick	N-319	308.1	New	West	0.03
Potomac-Shenandoah Rivers	Frederick	N-318	308.2	New	West	0.06
Potomac-Shenandoah Rivers	Frederick	N-262	308.2	New	East	0.03
Potomac-Shenandoah Rivers	Frederick	N-317	308.3	New	West	0.03

Table 3-3 Emergent Wetlands: I-81 Study Area (Cont'd)

Watershed	County	Wetland ID	Milepost	NWI /New Wetland	Location in ROW	Size (acres)
Potomac-Shenandoah Rivers	Frederick	N-316	308.4	New	West	0.04
Potomac-Shenandoah Rivers	Frederick	N-314	308.9	New	West	0.14
Potomac-Shenandoah Rivers	Frederick	N-187	309.0	NWI	East	0.19
Potomac-Shenandoah Rivers	Frederick	N-313	309.0	New	West	0.07
Potomac-Shenandoah Rivers	Frederick	N-264	309.0	New	East	0.11
Potomac-Shenandoah Rivers	Frederick	N-266	309.8	New	East	0.02
Potomac-Shenandoah Rivers	Frederick	N-265	309.8	New	East	0.23
Potomac-Shenandoah Rivers	Frederick	N-267	310.0	New	East	0.22
Potomac-Shenandoah Rivers	Frederick	N-311	310.4	New	West	0.10
Potomac-Shenandoah Rivers	Frederick	N-309	310.7	New	West	0.29
Potomac-Shenandoah Rivers	Frederick	N-190	310.7	NWI	West	0.12
Potomac-Shenandoah Rivers	Frederick	N-276	310.8	New	East	0.02
Potomac-Shenandoah Rivers	Frederick	N-308	310.8	New	West	0.17
Potomac-Shenandoah Rivers	Frederick	N-270	310.8	New	East	0.04
Potomac-Shenandoah Rivers	Frederick	N-268	310.9	New	East	0.02
Potomac-Shenandoah Rivers	Frederick	N-271	311.2	New	East	0.00
Potomac-Shenandoah Rivers	Frederick	N-272	311.2	New	East	0.06
Potomac-Shenandoah Rivers	Frederick	N-307	311.4	New	West	0.36
Potomac-Shenandoah Rivers	Frederick	N-275	311.4	New	East	0.01
Potomac-Shenandoah Rivers	Frederick	N-273	311.4	New	East	0.10
Potomac-Shenandoah Rivers	Frederick	N-277	311.6	New	Median	0.02
Potomac-Shenandoah Rivers	Frederick	N-412	311.7	New	West	0.77
Potomac-Shenandoah Rivers	City of Winchester	N-305	311.8	New	West	0.05
Potomac-Shenandoah Rivers	Frederick	N-279	311.9	New	Median	0.07
Potomac-Shenandoah Rivers	Frederick	N-278	311.9	New	East	0.15
Potomac-Shenandoah Rivers	City of Winchester	N-304	312.1	New	West	0.03
Potomac-Shenandoah Rivers	Frederick	N-280	312.5	New	East	0.23
Potomac-Shenandoah Rivers	Frederick	N-281	312.6	New	East	0.65
Potomac-Shenandoah Rivers	Frederick	N-283	312.7	New	East	0.04
Potomac-Shenandoah Rivers	Frederick	N-285	314.3	New	East	0.07
Potomac-Shenandoah Rivers	Frederick	N-287	314.7	New	East	0.30
Potomac-Shenandoah Rivers	Frederick	N-292	316.5	New	East	0.03
Potomac-Shenandoah Rivers	Frederick	N-303	317.0	New	West	0.31
Potomac-Shenandoah Rivers	Frederick	N-296	317.6	New	East	0.33
Potomac-Shenandoah Rivers	Frederick	N-298	323.2	New	East	0.22
Potomac-Shenandoah Rivers	Frederick	N-301	324.2	New	West	0.48
Potomac-Shenandoah Rivers	Frederick	N-299	324.2	New	East	0.06
Potomac-Shenandoah Rivers	Frederick	N-300	324.3	New	West	0.07

Table 3-4 Scrub-Shrub Wetlands: I-81 Study Area

Watershed	County	Wetland ID	Milepost	NWI/New Wetland	Location in ROW	Size (acres)
Holston River	Smyth	S-8	39.3	NWI	East	1.82
Holston River	Smyth	S-99	52.9	New	East	0.07
Holston River	Smyth	S-100	54.4	New	East	0.76
Holston River	Smyth	S-245*	55.1	New	West	0.78
Holston River	Smyth	S-246*	55.1	New	West	0.28
New River	Wythe	S-156*	59.5	NWI	West	0.97
New River	Wythe	S-155*	59.6	NWI	West	0.06
New River	Wythe	S-109	60.8	New	East	0.11
New River	Wythe	S-241*	63.5	New	West	0.67
Roanoke River	Roanoke	S-217*	131.2	New	West	0.14
Potomac-Shenandoah Rivers	Augusta	N-10	223.0	NWI	East	2.10
Potomac-Shenandoah Rivers	Augusta	N-101	228.9	New	East	2.13
Potomac-Shenandoah Rivers	Rockingham	N-141	251.9	NWI	West	0.68
Potomac-Shenandoah Rivers	Shenandoah	N-96	274.3	New	East	0.23
Potomac-Shenandoah Rivers	Shenandoah	N-44	274.4	NWI	East	0.34
Potomac-Shenandoah Rivers	Frederick	N-239	303.0	New	East	0.22
Potomac-Shenandoah Rivers	Frederick	N-347	303.2	New	West	0.03
Potomac-Shenandoah Rivers	Frederick	N-414	303.6	New	West	0.32
Potomac-Shenandoah Rivers	Frederick	N-332	304.5	New	West	0.17
Potomac-Shenandoah Rivers	Frederick	N-333	304.6	New	West	0.16
Potomac-Shenandoah Rivers	Frederick	N-249	305.3	New	East	0.07
Potomac-Shenandoah Rivers	Frederick	N-315	308.9	New	West	1.31
Potomac-Shenandoah Rivers	Frederick	N-269	310.9	New	East	0.06
Potomac-Shenandoah Rivers	Frederick	N-274	311.5	New	East	0.23
Potomac-Shenandoah Rivers	City of Winchester	N-306	311.8	New	West	0.23
Potomac-Shenandoah Rivers	Frederick	N-294	316.9	New	East	0.31

* Wetland was field classified as PSS/PEM

High Quality Wetlands

In accordance with a Memorandum of Agreement between the U.S. Army Corps of Engineers and the Environmental Protection Agency (EPA), the assessment of wetland impacts and the determination of mitigation to achieve a no-net loss of wetlands should be based on the functions and values of the impacted wetlands (EPA, 1990). The assessment of functional values is based on the understanding that certain wetlands are more valuable, offer more functions, and are of a higher quality than others. Wetlands with a higher standard of functional quality should be avoided as much as possible. Furthermore, they require a higher level of compensatory mitigation compared to impacts to poor quality wetlands with low functional values.

For this study, during the windshield survey, the study team used best professional judgment to distinguish between wetlands of relatively low functional value (*e.g.*, small depressions in

fields, maintained drainage channels) and wetlands of relatively higher functional value based on their relative floral and faunal diversity, habitat quality, maturity, uniqueness, and/or rarity. These are listed in Table 3-5 below.

Table 3-5 Relatively High Quality Wetlands: I-81 Study Area

Watershed	County/City	Wetland ID #	Milepost	Wetland Code	Size (acre)	Functional Value
Holston River	Washington	S-257	21.0	PEM	0.6	Seepage wetlands, habitat diversity, flood attenuation
Holston River	Washington	S-74	34.1	PFO	1.7	Isolated wetland, flood attenuation, habitat
Holston River	Smyth	S-81	37.9	PFO	1.7	One of only two beaver ponds. Relatively large habitat
Holston River	Smyth	S-252	38.5	PFO	0.6	Flood attenuation, habitat
Holston River	Smyth	S-245	55.1	PSS/PEM	0.8	Relatively large area, habitat diversity, flood attenuation
Holston River	Smyth	S-246	55.2	PSS/PEM	0.3	Relatively large area, habitat diversity, flood attenuation
Holston River	Smyth	S-243	56.2	PFO	0.2	Spring-fed wetland, high water quality, habitat
New River	Wythe	S-156	59.6	PSS/PEM	1.0	Relatively large area, flood attenuation, habitat
New River	Wythe	S-241	63.5	PSS/PEM	0.7	Diverse plant assemblage, flood attenuation, habitat
New River	Wythe	S-239	69.9	PEM	0.5	Spring-fed wetland area, water quality, habitat
New River	Pulaski	S-231	96.8	PFO	0.6	Isolated wetland, rare hardwood site, habitat.
New River	Pulaski	S-228	98.7	PEM	0.5	Slope/seepage wetland, water quality, habitat.
New River	Pulaski	S-227	103.2	PEM	0.1	Spring-fed wetland area, water quality, habitat
Roanoke River	Roanoke	S-217	131.2	PSS/PEM	0.1	Seepage wetland and springs, habitat, water source, rarity
Roanoke River	Roanoke	S-216	131.3	PEM	0.1	Seepage wetland and springs, habitat, water source, rarity
Roanoke River	Roanoke	S-215	141.5	PFO	0.9	Sole beaver pond in study area. Abundant habitat
James River	Botetourt	S-54	171.6	PFO	0.5	Flood attenuation and habitat
James River	Botetourt	S-53	171.7	PEM	0.2	Seepage wetland, habitat, water source, rarity
James River	Botetourt	S-55	171.7	PFO	4.9	Large area contiguous with stream, habitat
James River	Rockbridge	S-56	175.9	PFO	0.2	Spring-fed wetland, high water quality, habitat, possible T&E species
James River	Rockbridge	S-57	177.0	PFO	1.5	Large area contiguous with intermittent stream, habitat
James River	Rockbridge	S-58	177.1	PEM	1.0	Flood attenuation, habitat
James River	Rockbridge	S-60	192.7	PEM	0.2	Spring-fed wetland area, water quality, habitat.
James River	Rockbridge	S-202	196.7	PEM	0.5	Seepage wetland, tributary to Mill Creek, rare feature, habitat and water source
James River	Rockbridge	S-192	198.5	PEM	2.4	Seepage wetland, size, habitat and possible flood attenuation
Potomac- Shenandoah	Augusta	N-6	209.7	PEM	1.3	Relatively large seepage area, habitat, potential enhancement.
Potomac- Shenandoah	Augusta	N-101	228.9	PSS	2.1	Flood attenuation for Middle River, large backwater area, habitat.
Potomac- Shenandoah	Augusta	N-74	237.3	PFO	0.6	Flood attenuation for Naked Creek, habitat
Potomac- Shenandoah	Rockingham	N-386	239.6	PFO	0.6	Flood attenuation and habitat
Potomac- Shenandoah	City of Harrisonburg	N-78	245.0	PFO	1.2	Flood attenuation for Blacks Run, enhancement candidate
Potomac- Shenandoah	Shenandoah	N-30	266.1	PFO	0.6	Isolated wetland, large depression, habitat, threatened site
Potomac- Shenandoah	Frederick	N-233	302.7	PFO	0.4	Hardwood floodplain, flood attenuation
Potomac- Shenandoah	Frederick	N-327	305.5	PFO	2.9	Hardwood floodplain, flood attenuation, habitat
Potomac- Shenandoah	Frederick	N-296	317.7	PEM	0.3	Flood attenuation for Redbud Run, habitat

A simplified qualitative approach was used to assess functional values of these wetlands. Functional values were assessed solely on the basis of the wetland offering that particular function (a "yes" or "no") based on the professional opinion of the scientist performing the

assessment. Those functions/values considered included sedimentation/erosion control, water quality, flood-flow attenuation (storage), wildlife habitat, rarity, and uniqueness. No attempt was made to measure the degree, or level, of each function. A more detailed functional value assessment would be completed during Tier 2, if one or more "Build" concepts (or portion of a "Build" concept) are advanced.

Of the total 162 acres of wetlands within the I-81 study area, only 25 acres were identified as having relatively higher functional value. They primarily include emergent and scrub-shrub systems associated with springs and seeps, forested floodplains, and forested beaver ponds.

3.1.2 Rail Study Area

Approximately 178 acres of wetlands are in the rail study area, primarily along the Piedmont rail line sections between Front Royal and Manassas. Wetlands in the rail study area are largely comprised of emergent and forested systems along floodplains or depressional areas. These wetlands are discussed in greater detail below and summarized in Table 3-6.

Forested Wetlands

Forested wetland systems were the second most frequent wetland type recorded in the rail study area, totaling approximately 68.2 acres. Forested systems tend to be more prevalent in the northern rail improvement sections. Specifically, the sections between Riverton Junction in Warren County and Manassas in Prince William County contain the largest amount (47.8 acres). The four rail improvement sections along the Shenandoah line do not contain any forested wetlands. All forested wetlands were designated as areas of high functional value due to their size and proximity to rivers.

Emergent Wetlands

Emergent wetlands are the dominant wetland community type in the rail study area with a total of 92.1 acres, or 52 percent of all wetlands. Emergent wetland systems are dominant in the Piedmont rail improvement sections, and are relatively uncommon in the Shenandoah rail improvement sections. All emergent systems were designated as having high functional values due to their relative size and proximity to river systems.

Scrub-Shrub Wetlands

Few scrub-shrub wetlands occur in the rail study area (17. 2 acres or 9 percent of all wetlands). The largest concentration of scrub-shrub wetlands is present in the Fauquier County Piedmont rail improvement sections between Riverton Junction and Manassas.

Table 3-6 Wetlands by Rail Section: Rail Study Area

Rail Section[1] - County	Type of Wetland	Acres	Total Acres	Rail Section - County	Type of Wetland	Acres	Total Acres
1 – Washington	PEM	0		8 – Warren/ Fauquier	PEM	1.3	
	PFO	0			PFO	1.2	
	PSS	0			PSS	5.9	
			0				8.4
2 – Smyth	PEM	0		9 – Fauquier	PEM	35.4	
	PFO	0			PFO	13.1	
	PSS	0			PSS	0	
	PUB	0	0		PUB	8.9	48.5
3 – Wythe	PEM	8.1		10 – Fauquier	PEM	21.5	
	PFO	0			PFO	2.0	
	PSS	0			PSS	0	
			8.1				23.5
4 – Wythe/Pulaski	PEM	0		11 – Fauquier/ Prince William	PEM	16.4	
	PFO	0			PFO	23.0	
	PSS	0			PSS	10.9	
			0				50.3
5 – Clarke	PEM	3.7		12 – Prince William	PEM	0.8	
	PFO	0			PFO	24.9	
	PSS	0			PSS	0	
			3.7				25.7
6 – Warren	PEM	3.2		13 – Pittsylvania	PEM	1.7	
	PFO	0			PFO	4.1	
	PSS	0			PSS	0.4	
			3.2				6.2
7 – Warren	PEM	0					
	PFO	0					
	PSS	0					
	PUB	0	0	Total Wetlands			177.6

PEM – Palustrine Emergent Wetlands; PFO – Palustrine Forested Wetlands; PSS – Palustrine Scrub-Shrub Wetlands

Tables 3-7, 3-8, and 3-9 on the following pages provide detailed information on all three wetland types.

Table 3-7 Forested Wetlands: Rail Study Area

Watershed	County	Wetland ID	Rail Section	NWI/ New Wetland	Location in ROW	Size (Acres)
Roanoke River	Pittsylvania	R-9	13	NWI	East	3.94
Roanoke River	Pittsylvania	R-10	13	NWI	East	0.12
Potomac-Shenandoah Rivers	Prince William	R-23	12	NWI	West	0.45
Potomac-Shenandoah Rivers	Prince William	R-24	12	NWI	West	2.22
Potomac-Shenandoah Rivers	Prince William	R-25	12	NWI	West	1.13
Potomac-Shenandoah Rivers	Prince William	R-26	12	NWI	West	2.09
Potomac-Shenandoah Rivers	Prince William	R-29	12	NWI	East	1.25
Potomac-Shenandoah Rivers	Prince William	R-30	12	NWI	East	0.02
Potomac-Shenandoah Rivers	Prince William	R-31	12	NWI	East	3.77
Potomac-Shenandoah Rivers	Prince William	R-32	12	NWI	West	6.92
Potomac-Shenandoah Rivers	Prince William	R-33	12	NWI	East	6.37
Potomac-Shenandoah Rivers	Prince William	R-34	12	NWI	East	0.17
Potomac-Shenandoah Rivers	Prince William	R-35	12	NWI	East	0.45
Potomac-Shenandoah Rivers	Prince William	R-37	11	NWI	West	1.10
Potomac-Shenandoah Rivers	Prince William	R-38	11	NWI	West	0.65
Potomac-Shenandoah Rivers	Prince William	R-39	11	NWI	West	0.62
Potomac-Shenandoah Rivers	Prince William	R-40	11	NWI	West	2.81
Potomac-Shenandoah Rivers	Prince William	R-41	11	NWI	West	0.16
Potomac-Shenandoah Rivers	Prince William	R-42	11	NWI	West	0.13
Potomac-Shenandoah Rivers	Prince William	R-45	11	NWI	West	0.90
Potomac-Shenandoah Rivers	Prince William	R-46	11	NWI	West	0.40
Potomac-Shenandoah Rivers	Prince William	R-47	11	NWI	West	0.88
Potomac-Shenandoah Rivers	Prince William	R-50	11	NWI	East	0.24
Potomac-Shenandoah Rivers	Prince William	R-51	11	NWI	East	1.01
Potomac-Shenandoah Rivers	Prince William	R-76	11	NWI	East	3.52
Potomac-Shenandoah Rivers	Prince William	R-65	11	NWI	East	2.16
Potomac-Shenandoah Rivers	Prince William	R-64	11	NWI	West	0.13
Potomac-Shenandoah Rivers	Prince William	R-69	11	NWI	West	1.49
Potomac-Shenandoah Rivers	Prince William	R-68	11	NWI	West	1.67
Potomac-Shenandoah Rivers	Prince William	R-70	11	NWI	West	2.17
Potomac-Shenandoah Rivers	Prince William	R-71	11	NWI	East	0.70
Potomac-Shenandoah Rivers	Prince William	R-74	11	NWI	East	0.57
Potomac-Shenandoah Rivers	Prince William	R-75	11	NWI	East	1.67
Potomac-Shenandoah Rivers	Fauquier	R-77	10	NWI	West	0.74
Potomac-Shenandoah Rivers	Fauquier	R-78	10	NWI	West	0.12
Potomac-Shenandoah Rivers	Fauquier	R-81	10	NWI	West	0.52
Potomac-Shenandoah Rivers	Fauquier	R-82	10	NWI	West	0.30
Potomac-Shenandoah Rivers	Fauquier	R-84	10	NWI	West	0.13
Potomac-Shenandoah Rivers	Fauquier	R-85	10	NWI	West	0.19
Potomac-Shenandoah Rivers	Fauquier	R-86	10	NWI	West	0.02
Potomac-Shenandoah Rivers	Fauquier	R-105	8	NWI	East	0.63
Potomac-Shenandoah Rivers	Warren	R-106	8	NWI	West	0.56
Potomac-Shenandoah Rivers	Fauquier	R-109	9	NWI	West	2.14
Potomac-Shenandoah Rivers	Fauquier	R-114	9	NWI	West	1.81
Potomac-Shenandoah Rivers	Fauquier	R-115	9	NWI	West	4.68
Potomac-Shenandoah Rivers	Fauquier	R-118	9	NWI	West	2.08
Potomac-Shenandoah Rivers	Fauquier	R-125	9	NWI	East	2.35

Table 3-8 Emergent Wetlands: Rail Study Area

Watershed	County	Wetland ID	Rail Section	NWI /New Wetland	Location in ROW	Size (Acres)
Roanoke River	Pittsylvania	R-8	13	NWI	West	1.52
Roanoke River	Pittsylvania	R-11	13	NWI	West	0.20
New River	Wythe	R-16	3	NWI	West	0.17
New River	Wythe	R-17	3	NWI	East	1.00
New River	Wythe	R-19	3	NWI	East	0.64
New River	Wythe	R-20	3	NWI	West	6.30
Potomac-Shenandoah Rivers	Prince William	R-27	12	NWI	East	0.77
Potomac-Shenandoah Rivers	Prince William	R-44	11	NWI	West	2.12
Potomac-Shenandoah Rivers	Fauquier	R-49	11	NWI	West	0.38
Potomac-Shenandoah Rivers	Prince William	R-48	11	NWI	West	5.61
Potomac-Shenandoah Rivers	Prince William	R-53	11	NWI	West	2.75
Potomac-Shenandoah Rivers	Prince William	R-57	11	NWI	West	2.70
Potomac-Shenandoah Rivers	Prince William	R-58	11	NWI	West	0.59
Potomac-Shenandoah Rivers	Prince William	R-60	11	NWI	West	0.99
Potomac-Shenandoah Rivers	Prince William	R-61	11	NWI	East	1.20
Potomac-Shenandoah Rivers	Fauquier	R-72*	11	NWI	West	0.00
Potomac-Shenandoah Rivers	Fauquier	R-73*	11	NWI	West	0.08
Potomac-Shenandoah Rivers	Fauquier	R-79	10	NWI	West	0.47
Potomac-Shenandoah Rivers	Fauquier	R-80	10	NWI	West	0.09
Potomac-Shenandoah Rivers	Fauquier	R-87	10	NWI	West	0.03
Potomac-Shenandoah Rivers	Fauquier	R-92	10	NWI	West	0.14
Potomac-Shenandoah Rivers	Fauquier	R-89	10	NWI	West	0.23
Potomac-Shenandoah Rivers	Fauquier	R-90	10	NWI	West	0.42
Potomac-Shenandoah Rivers	Fauquier	R-91	10	NWI	West	2.53
Potomac-Shenandoah Rivers	Fauquier	R-93	10	NWI	West	1.78
Potomac-Shenandoah Rivers	Fauquier	R-94	10	NWI	West	4.22
Potomac-Shenandoah Rivers	Fauquier	R-98	10	NWI	East	1.88
Potomac-Shenandoah Rivers	Fauquier	R-99	10	NWI	East	0.65
Potomac-Shenandoah Rivers	Fauquier	R-97	10	NWI	West	5.43
Potomac-Shenandoah Rivers	Fauquier	R-104	10	NWI	East	0.82
Potomac-Shenandoah Rivers	Fauquier	R-103	10	NWI	East	1.09
Potomac-Shenandoah Rivers	Fauquier	R-102	10	NWI	East	0.63
Potomac-Shenandoah Rivers	Fauquier	R-101	10	NWI	East	1.06
Potomac-Shenandoah Rivers	Fauquier	R-144	8	New	East	0.82
Potomac-Shenandoah Rivers	Fauquier	R-143	8	New	East	0.45
Potomac-Shenandoah Rivers	Fauquier	R-107	9	NWI	West	19.87
Potomac-Shenandoah Rivers	Fauquier	R-108	9	NWI	West	3.13
Potomac-Shenandoah Rivers	Fauquier	R-110	9	NWI	West	4.44
Potomac-Shenandoah Rivers	Fauquier	R-112	9	NWI	West	1.41
Potomac-Shenandoah Rivers	Fauquier	R-113	9	NWI	West	6.54
Potomac-Shenandoah Rivers	Warren	R-129	6	NWI	West	0.30
Potomac-Shenandoah Rivers	Warren	R-130	6	NWI	East	0.57
Potomac-Shenandoah Rivers	Warren	R-131	6	NWI	East	0.82
Potomac-Shenandoah Rivers	Warren	R-132	6	NWI	East	0.14
Potomac-Shenandoah Rivers	Warren	R-133	6	NWI	East	0.42
Potomac-Shenandoah Rivers	Warren	R-134	6	NWI	West	0.26
Potomac-Shenandoah Rivers	Warren	R-135	6	NWI	East	0.35
Potomac-Shenandoah Rivers	Warren	R-136	6	NWI	East	0.32
Potomac-Shenandoah Rivers	Clarke	R-140	5	NWI	West	0.05
Potomac-Shenandoah Rivers	Clarke	R-139	5	NWI	West	1.25
Potomac-Shenandoah Rivers	Clarke	R-141	5	NWI	West	1.09
Potomac-Shenandoah Rivers	Clarke	R-142	5	NWI	West	1.33

* Wetland was field classified as PEM/PSS

Table 3-9 Scrub-Shrub Wetlands: Rail Study Area

Watershed	County	Wetland ID	Rail Section	NWI/New Wetland	Location in ROW	Size (Acres)
Roanoke River	Pittsylvania	R-7	13	NWI	West	0.41
Potomac-Shenandoah Rivers	Fauquier	R-54	11	NWI	West	0.67
Potomac-Shenandoah Rivers	Fauquier	R-55	11	NWI	West	0.62
Potomac-Shenandoah Rivers	Fauquier	R-62	11	NWI	West	7.23
Potomac-Shenandoah Rivers	Fauquier	R-67	11	NWI	West	2.41
Potomac-Shenandoah Rivers	Fauquier	R-119	9	NWI	West	1.52
Potomac-Shenandoah Rivers	Fauquier	R-120	9	NWI	West	3.44
Potomac-Shenandoah Rivers	Fauquier	R-122	9	NWI	West	0.89

High Quality Wetlands

Table 3-10 summarizes high quality wetlands per rail section. Almost all of the vegetated wetlands described above are also considered to have relatively high functional value based on their habitat quality, maturity, and relative size. Such wetlands primarily include emergent and scrub-shrub systems associated with streams, forested floodplains, and wetland systems greater than 1.5 acres. Table 3-10 also includes one large pond in a forested area in Fauquier County. The greatest concentration of high quality wetlands are along the Piedmont Line in northern Virginia, particularly in Fauquier and Prince William Counties. These two rail sections traverse areas along streams with large forested wetland systems.

Table 3-10 Relatively High Quality Wetlands Per Rail Section

Watershed	County	Rail Section	Wetland Types	Number of Wetlands	Total Acres
New River	Wythe	3	PEM	3	7.5
Potomac-Shenandoah	Clarke	5	PEM	3	3.6
Potomac-Shenandoah	Warren/Fauquier	8	PEM, PFO	4	2.4
Potomac-Shenandoah	Fauquier	9	PUB, PSS, PEM, PFO	14	61.2
Potomac-Shenandoah	Fauquier	10	PFO, PEM	10	18.1
Potomac-Shenandoah	Prince William/Fauquier	11	PSS, PEM, PFO	27	47.2
Potomac-Shenandoah	Prince William	12	PFO	10	24.8
Roanoke River	Pittsylvania	13	PSS, PEM, PFO	4	6.0

Detailed information on the size and functional value for each high quality wetland is provided in Table 3-11 below.

Table 3-11 Relatively High Quality Wetlands: Rail Study Area

Watershed	County	Wetland ID	Section	Wetland Code	Size (Acre)	Functional Value
Roanoke River	Pittsylvania	R-7	13	PSS	0.41	Flood attenuation, habitat
Roanoke River	Pittsylvania	R-8	13	PEM	1.52	Relatively large area, habitat
Roanoke River	Pittsylvania	R-9	13	PFO	3.94	Large area contiguous with stream, habitat
Roanoke River	Pittsylvania	R-10	13	PFO	0.12	Flood attenuation, habitat
New River	Wythe	R-16	3	PEM	0.17	Flood attenuation, habitat
New River	Wythe	R-17	3	PEM	1.00	Flood attenuation, habitat
New River	Wythe	R-20	3	PEM	6.30	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Prince William	R-23	12	PFO	0.45	Habitat
Potomac-Shenandoah Rivers	Prince William	R-24	12	PFO	2.22	Relatively large area, habitat
Potomac-Shenandoah Rivers	Prince William	R-25	12	PFO	1.13	Habitat
Potomac-Shenandoah Rivers	Prince William	R-26	12	PFO	2.09	Relatively large area, habitat
Potomac-Shenandoah Rivers	Prince William	R-29	12	PFO	1.25	Habitat
Potomac-Shenandoah Rivers	Prince William	R-31	12	PFO	3.77	Relatively large area, habitat
Potomac-Shenandoah Rivers	Prince William	R-32	12	PFO	6.92	Relatively large area, habitat
Potomac-Shenandoah Rivers	Prince William	R-33	12	PFO	6.37	Relatively large area, habitat
Potomac-Shenandoah Rivers	Prince William	R-34	12	PFO	0.17	Habitat
Potomac-Shenandoah Rivers	Prince William	R-35	12	PFO	0.45	Habitat
Potomac-Shenandoah Rivers	Prince William	R-37	11	PFO	1.10	Habitat
Potomac-Shenandoah Rivers	Prince William	R-38	11	PFO	0.65	Habitat
Potomac-Shenandoah Rivers	Prince William	R-39	11	PFO	0.62	Habitat
Potomac-Shenandoah Rivers	Prince William	R-40	11	PFO	2.81	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Prince William	R-41	11	PFO	0.16	Habitat
Potomac-Shenandoah Rivers	Prince William	R-45	11	PFO	0.90	Habitat
Potomac-Shenandoah Rivers	Prince William	R-44	11	PEM	2.12	Relatively large area, habitat
Potomac-Shenandoah Rivers	Prince William	R-46	11	PFO	0.40	Habitat
Potomac-Shenandoah Rivers	Fauquier	R-49	11	PEM	0.38	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Prince William	R-47	11	PFO	0.88	Habitat
Potomac-Shenandoah Rivers	Prince William	R-48	11	PEM	5.61	Relatively large area, habitat
Potomac-Shenandoah Rivers	Prince William	R-50	11	PFO	0.24	Habitat
Potomac-Shenandoah Rivers	Prince William	R-51	11	PFO	1.01	Habitat
Potomac-Shenandoah Rivers	Prince William	R-76	11	PFO	3.52	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Fauquier	R-54	11	PSS	0.67	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Prince William	R-53	11	PEM	2.75	Relatively large area, habitat
Potomac-Shenandoah Rivers	Fauquier	R-55	11	PSS	0.62	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Prince William	R-57	11	PEM	2.70	Relatively large area, habitat
Potomac-Shenandoah Rivers	Prince William	R-65	11	PFO	2.16	Relatively large area, habitat
Potomac-Shenandoah Rivers	Fauquier	R-62	11	PSS	7.23	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Fauquier	R-67	11	PSS	2.41	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Prince William	R-69	11	PFO	1.49	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Prince William	R-68	11	PFO	1.67	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Prince William	R-70	11	PFO	2.17	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Prince William	R-71	11	PFO	0.70	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Prince William	R-74	11	PFO	0.57	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Prince William	R-75	11	PFO	1.67	Relatively large area, habitat

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Table 3-11 High-Quality Wetlands: Rail Study Area (Cont'd)

Watershed	County	Wetland ID	Section	Wetland Code	Size (acre)	Functional Value
Potomac-Shenandoah Rivers	Fauquier	R-77	10	PFO	0.74	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Fauquier	R-79	10	PEM	0.47	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Fauquier	R-81	10	PFO	0.52	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Fauquier	R-82	10	PFO	0.30	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Fauquier	R-85	10	PFO	0.19	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Fauquier	R-91	10	PEM	2.53	Relatively large area, habitat
Potomac-Shenandoah Rivers	Fauquier	R-93	10	PEM	1.78	Relatively large area, habitat
Potomac-Shenandoah Rivers	Fauquier	R-94	10	PEM	4.22	Relatively large area, habitat
Potomac-Shenandoah Rivers	Fauquier	R-98	10	PEM	1.88	Relatively large area, habitat
Potomac-Shenandoah Rivers	Fauquier	R-97	10	PEM	5.43	Relatively large area, habitat
Potomac-Shenandoah Rivers	Fauquier	R-144	8	PEM	0.82	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Fauquier	R-105	8	PFO	0.63	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Warren	R-143	8	PEM	0.45	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Warren	R-106	8	PFO	0.56	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Fauquier	R-107	9	PEM	19.8	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Fauquier	R-108	9	PEM	3.13	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Fauquier	R-109	9	PFO	2.14	Relatively large area, habitat
Potomac-Shenandoah Rivers	Fauquier	R-110	9	PEM	4.44	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Fauquier	R-112	9	PEM	1.41	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Fauquier	R-113	9	PEM	6.54	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Fauquier	R-114	9	PFO	1.81	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Fauquier	R-115	9	PFO	4.68	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Fauquier	R-116	9	PUB	7.01	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Fauquier	R-118	9	PFO	2.08	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Fauquier	R-119	9	PSS	1.52	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Fauquier	R-120	9	PSS	3.44	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Fauquier	R-122	9	PSS	0.89	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Fauquier	R-125	9	PFO	2.35	Large area contiguous with stream, habitat
Potomac-Shenandoah Rivers	Clarke	R-141	5	PEM	1.09	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Clarke	R-142	5	PEM	1.33	Flood attenuation, habitat
Potomac-Shenandoah Rivers	Clarke	R-139	5	PEM	1.25	Flood attenuation, habitat

3.2 Streams and Water Resources

The evaluation of surface water resources (waters of the United States) within the study areas was a two-stage process. First, the distribution of perennial streams was verified by the windshield survey as previously described. Second, the water quality of perennial streams was assessed based on the collection and review of technical documents from state and federal agencies such as the Virginia Department of Environmental Quality (DEQ) and U.S. Environmental Protection Agency (EPA).

Fieldwork to assess groundwater resources is beyond the scope of this study, but general conclusions about groundwater quality are included based on available technical and regulatory documents.

3.2.1 I-81 Study Area

Perennial Streams

Existing stream (hydrographic) GIS data compiled from the United States Geological Survey (USGS) was superimposed on aerial photography and used by scientists during the windshield survey. This data was annotated in the field as needed to reflect actual conditions in the field. Of the 189 streams identified by scientists in the field, only 148 were originally shown in the existing GIS database. The remaining 41 streams were field mapped and described.

Furthermore, 17 streams originally shown as perennial streams in the GIS database were either observed to be dry or anecdotal evidence of intermittency provided by adjacent residents. Many such streams constitute major stormwater conveyances in urbanized watersheds. In addition to inconsistencies in stream status, stream orientation was often incorrectly rendered, possibly as a result of stream channel evolution or modification, or mapping error. Such stream courses were digitally corrected in the field.

The complete list of perennial streams, including their location and the length occurring within the I-81 study area, is presented in Table 3-12 based on field-corrected data.

It is important to note that, in addition to the perennial streams identified in the I-81 study area, intermittent streams and features categorized as “unknown” were also located within the study area. If a “Build” concept (or portion of a “Build” concept) is advanced, additional investigations and coordination with regulatory agencies would be needed to determine the jurisdictional status of these features as well.

Table 3-12 Perennial Streams: I-81 Study Area

Watershed	County	Mile Post	Stream Name	Linear Footage in Study Area East	Median	West	Total	Road Crossing
Holston River	City of Bristol	0.3	0.356	0	0	485	485	None
Holston River	City of Bristol	0.3	Steele Creek	553	187	480	1220	Culvert
Holston River	City of Bristol	0.8	Stoffel Creek	698	939	641	2277	Culvert
Holston River	City of Bristol	1.2	1.2	553	198	529	1279	Culvert
Holston River	City of Bristol	2.0	Susong Branch	793	1249	472	2514	Culvert
Holston River	City of Bristol	3.2	Mumpower Creek	0	0	919	919	None
Holston River	City of Bristol	3.4	Little Creek	508	125	633	1266	Bridge
Holston River	City of Bristol	4.9	4.964	648	196	540	1383	Culvert
Holston River	City of Bristol	5.9	Beaver Creek	2863	150	2765	5778	Bridge
Holston River	City of Bristol	7.4	7.472	810	330	193	1334	Culvert
Holston River	Washington	11.2	Sinking Creek	656	128	1399	2183	Bridge
Holston River	Washington	11.2	11.201	0	0	667	667	None
Holston River	Washington	13.1	13.178	1866	0	0	1866	None
Holston River	Washington	13.1	Spring Creek	1152	130	1370	2652	Bridge
Holston River	Washington	16.3	Wolf Creek	842	85	648	1575	Culvert
Holston River	Washington	17.2	Town Creek	1396	49	1164	2609	Culvert
Holston River	Washington	17.2	17.232	0	0	871	871	None
Holston River	Washington	19.0	Berry Creek	730	205	883	1818	Culvert
Holston River	Washington	20.0	Fifteenmile Creek	558	313	454	1325	Culvert
Holston River	Washington	21.0	21.031	2611	325	704	3640	Culvert
Holston River	Washington	23.1	Greenway Creek	636	197	642	1475	Bridge
Holston River	Washington	24.0	West Fork Cedar Creek	841	50	609	1500	Culvert
Holston River	Washington	24.6	Cedar Creek	2151	490	1152	3794	Bridge
Holston River	Washington	28.1	Hall Creek	519	288	536	1344	Culvert
Holston River	Washington	32.1	Hutton Creek	1401	162	1485	3048	Culvert
Holston River	Washington	32.1	32.181	3737	0	638	4375	None
Holston River	Washington	32.4	32.42	0	427	986	1413	Culvert
Holston River	Washington	34.3	Greever Branch	529	299	574	1402	Culvert
Holston River	Smyth	35.0	Middle Fork Holston River	7727	272	28705	36703	Bridge
Holston River	Smyth	35.5	35.511	1268	382	256	1906	Culvert
Holston River	Smyth	36.7	Tattle Branch	722	28	2410	3159	Culvert
Holston River	Smyth	37.2	37.265	0	135	401	536	Culvert
Holston River	Smyth	38.9	38.957	2734	250	0	2984	Culvert
Holston River	Smyth	41.3	41.350	0	0	112	112	None
Holston River	Smyth	42.6	Laurel Springs Creek	615	355	615	1585	Culvert
Holston River	Smyth	45.7	Hooks Branch	1101	165	946	2213	Culvert
Holston River	Smyth	45.8	Staley Creek	1237	293	1036	2565	Culvert
Holston River	Smyth	46.5	46.517	0	665	0	665	Culvert
Holston River	Smyth	46.9	46.96	0	384	114	498	Culvert

Table 3-12 Perennial Streams: I-81 Study Area (Cont'd)

Watershed	County	Mile Post	Stream Name	Linear Footage in Study Area East	Median	West	Total	Road Crossing
Holston River	Smyth	47.4	47.432	523	198	1213	1934	Culvert
Holston River	Smyth	49.0	Hutton Branch	584	293	413	1290	Culvert
Holston River	Smyth	49.3	Arney Hollow	1604	193	776	2573	Culvert
Holston River	Smyth	51.0	Nicks Creek	1078	160	1042	2280	Bridge
Holston River	Smyth	51.6	Shupe Hollow	430	363	452	1245	Culvert
Holston River	Smyth	52.4	52.464	545	298	525	1368	Culvert
Holston River	Smyth	53.8	Crow Hollow	2705	192	590	3487	Culvert
Holston River	Smyth	55.0	Dry Run	780	374	1250	2404	Culvert
Holston River	Smyth	56.2	56.219	0	0	681	681	None
New River	Wythe	59.5	Mill Creek	5800	876	10438	17113	Bridge
New River	Wythe	60.8	60.887	1029	575	1259	2863	Culvert
New River	Wythe	63.5	63.508	1676	286	422	2383	Culvert
New River	Wythe	65.0	Pine Run	4822	200	2984	8007	Culvert
New River	Wythe	68.3	Reed Creek	2350	481	7034	9865	Bridge
New River	Wythe	69.4	69.409	624	266	488	1378	Culvert
New River	Wythe	76.0	Muskrat Branch	537	258	1852	2647	Culvert
New River	Wythe	79.6	79.694	7478	0	0	7478	None
New River	Wythe	80.9	80.957	3777	458	1015	5249	Culvert
New River	Wythe	81.2	81.29	424	679	400	1503	Culvert
New River	Wythe	86.6	86.622	1633	0	0	1633	None
New River	Wythe	87.0	Little Pine Run	467	259	493	1219	Culvert
New River	Pulaski	87.5	87.510	1262	0	0	1262	None
New River	Pulaski	91.4	Sloan Branch	2452	313	434	3199	Culvert
New River	Pulaski	92.0	Dark Hollow	466	0	0	466	Culvert
New River	Pulaski	92.3	92.337	497	424	393	1314	Culvert
New River	Pulaski	94.1	94.115	430	0	0	430	None
New River	Pulaski	96.0	Peak Creek	575	74	535	1183	Bridge
New River	Pulaski	97.5	Goose Creek	5483	826	2867	9176	Culvert
New River	Pulaski	102.8	102.576	756	2137	2062	4955	Culvert
New River	Pulaski	105.8	New River	534	163	528	1226	Bridge
New River	Montgomery	111.1	111.182	475	0	0	475	None
New River	Montgomery	112.1	Meadow Creek	2933	260	576	3770	Culvert
New River	Montgomery	115.6	115.654	281	0	0	281	None
Roanoke River	Montgomery	120.9	Den Creek	413	1195	533	2141	Culvert
Roanoke River	Montgomery	125.0	125.025	512	0	0	512	None
Roanoke River	Montgomery	127.6	127.649	2359	0	0	2359	None
Roanoke River	Montgomery	128.3	128.374	1497	0	0	1497	None
Roanoke River	Montgomery	128.6	128.600	505	0	0	505	None
Roanoke River	Montgomery	128.6	North Fork Roanoke River	5815	146	833	6794	Bridge
Roanoke River	Montgomery	129.9	129.923	372	448	435	1255	Culvert
Roanoke River	Roanoke	132.1	132.107	1021	0	0	1021	None
Roanoke River	Roanoke	132.3	132.303	862	575	901	2338	Culvert
Roanoke River	Roanoke	133.5	Callahan Branch	783	355	653	1792	Culvert
Roanoke River	Roanoke	134.7	Little Bear Rock Branch	1119	174	767	2060	Culvert

Table 3-12 Perennial Streams: I-81 Study Area (Cont'd)

Watershed	County	Mile Post	Stream Name	Linear Footage in Study Area East	Median	West	Total	Road Crossing
Roanoke River	Roanoke	134.8	Stypes Branch	0	0	359	359	None
Roanoke River	Roanoke	135.4	Big Bear Rock Branch	496	192	528	1215	Culvert
Roanoke River	Roanoke	135.6	135.657	325	314	505	1145	Culvert
Roanoke River	Roanoke	136.2	136.275	634	248	575	1458	Culvert
Roanoke River	Roanoke	136.7	Paint Bank Branch	940	419	528	1888	Culvert
Roanoke River	City of Salem	137.3	Horners Branch	936	483	865	2284	Culvert
Roanoke River	Roanoke	138.8	138.797	1466	245	0	1711	Culvert
Roanoke River	Roanoke	139.0	139.061	515	176	0	691	Culvert
Roanoke River	Roanoke	139.9	139.936	540	190	0	731	Culvert
Roanoke River	Roanoke	140.3	Gish Branch	1431	269	785	2485	Culvert
Roanoke River	Roanoke	141.3	141.389	3248	0	0	3248	None
Roanoke River	Roanoke	141.3	Mason Creek	499	190	499	1188	Bridge
Roanoke River	Roanoke	142.1	Peter's Creek	641	299	0	939	Culvert
Roanoke River	Roanoke	143.3	143.382	604	222	132	958	Culvert
Roanoke River	Roanoke	144.0	144.09	1126	483	979	2589	Culvert
Roanoke River	Roanoke	147.0	Carvin Creek	610	63	585	1258	Culvert
Roanoke River	Botetourt	148.2	148.24	1650	909	211	2769	Culvert
Roanoke River	Botetourt	149.8	Tinker Creek	573	186	737	1496	Bridge
Roanoke River	Botetourt	150.7	150.738	407	0	0	407	None
Roanoke River	Botetourt	150.7	Buffalo Creek	2561	1133	3195	6889	Bridge
James River	Botetourt	154.0	154.079	2295	189	52	2536	Culvert
James River	Botetourt	154.6	154.608	2516	90	41	2647	Culvert
James River	Botetourt	156.9	156.954	0	185	2991	3176	Culvert
James River	Botetourt	157.9	Beckner Branch	10157	558	1625	12339	Culvert
James River	Botetourt	163.6	Long Run	2021	397	2554	4971	Culvert
James River	Botetourt	165.4	James River	530	105	534	1168	Bridge
James River	Botetourt	167.7	167.711	528	0	0	528	Culvert
James River	Botetourt	167.7	Purgatory Creek	4366	220	2550	7137	Bridge
James River	Botetourt	168.4	168.426	0	0	5778	5778	None
James River	Botetourt	170.8	170.862	504	169	96	769	Culvert
James River	Botetourt	171.6	Renick Run	2952	232	394	3577	Culvert
James River	Botetourt	173.0	173.001	646	0	0	646	None
James River	Botetourt	173.6	173.643	569	271	583	1423	Culvert
James River	Rockbridge	174.9	Roaring Run	2353	49	667	3070	Culvert
James River	Rockbridge	177.3	Cedar Creek	1418	119	558	2095	Bridge
James River	Rockbridge	178.8	Poague Run	2647	0	0	2647	None
James River	Rockbridge	181.0	181.06	1055	1063	0	2118	Culvert
James River	Rockbridge	188.0	Harrison Run	0	0	11290	11290	None
James River	Rockbridge	190.6	Gordon's Run	496	282	2201	2979	Culvert
James River	Rockbridge	190.8	Maury River	543	176	606	1326	Bridge
James River	Rockbridge	196.5	196.535	0	0	2112	2112	None
James River	Rockbridge	200.0	Whitesides Run	688	0	0	688	None
James River	Rockbridge	201.3	Marlbrook Creek	1266	42	1365	2673	Culvert
James River	Rockbridge	204.4	204.454	508	0	0	508	None

Table 3-12 Perennial Streams: I-81 Study Area (Cont'd)

Watershed	County	Mile Post	Stream Name	Linear Footage in Study Area East	Median	West	Total	Road Crossing
James River	Rockbridge	205.8	Moores Creek	1263	54	1317	2634	Culvert
James River	Augusta	207.3	207.397	510	256	0	766	Culvert
James River	Augusta	208.6	South River	7248	311	105	7664	Culvert
Potomac-Shenandoah Rivers	Augusta	210.7	210.749	747	303	489	1540	Culvert
Potomac-Shenandoah Rivers	Augusta	211.3	211.317	419	391	0	810	Culvert
Potomac-Shenandoah Rivers	Augusta	212.6	Christians Creek	798	135	739	1672	Culvert
Potomac-Shenandoah Rivers	Augusta	213.3	213.353	602	395	642	1639	Culvert
Potomac-Shenandoah Rivers	Augusta	219.4	Folly Mills Creek	638	242	490	1369	Culvert
Potomac-Shenandoah Rivers	Augusta	222.0	222.044	1007	0	0	1007	None
Potomac-Shenandoah Rivers	Augusta	222.2	222.291	1205	340	0	1545	Bridge
Potomac-Shenandoah Rivers	Augusta	222.9	222.931	1292	0	0	1292	None
Potomac-Shenandoah Rivers	Augusta	224.6	224.664	1151	404	0	1555	Culvert
Potomac-Shenandoah Rivers	Augusta	225.6	Lewis Creek	689	236	624	1549	Bridge
Potomac-Shenandoah Rivers	Augusta	225.6	225.69	2784	0	0	2784	None
Potomac-Shenandoah Rivers	Augusta	226.2	Poague Run	898	582	648	2129	Culvert
Potomac-Shenandoah Rivers	Augusta	227.6	227.651	837	0	0	837	None
Potomac-Shenandoah Rivers	Augusta	228.1	228.194	890	59	693	1641	Culvert
Potomac-Shenandoah Rivers	Augusta	228.6	228.675	855	370	481	1705	Culvert
Potomac-Shenandoah Rivers	Augusta	228.6	Middle River	732	50	623	1406	Bridge
Potomac-Shenandoah Rivers	Augusta	229.6	229.606	577	457	0	1034	Culvert
Potomac-Shenandoah Rivers	Augusta	230.2	230.223	634	444	0	1078	Culvert
Potomac-Shenandoah Rivers	Augusta	231.4	231.425	500	0	0	500	Culvert
Potomac-Shenandoah Rivers	Augusta	232.2	232.216	251	0	0	251	None
Potomac-Shenandoah Rivers	Augusta	232.7	232.798	467	353	477	1297	Culvert
Potomac-Shenandoah Rivers	Augusta	234.5	Broad Run	520	260	495	1275	Culvert
Potomac-Shenandoah Rivers	Augusta	237.2	Naked Creek	588	152	589	1330	Bridge
Potomac-Shenandoah Rivers	Rockingham	238.9	238.924	510	237	0	747	Culvert
Potomac-Shenandoah Rivers	Rockingham	239.7	North River	2701	131	591	3423	Bridge
Potomac-Shenandoah Rivers	City of Harrisonburg	242.8	Blacks Run	1261	71	2528	3860	Bridge
Potomac-Shenandoah Rivers	City of Harrisonburg	245.3	245.38	0	0	1796	1796	None
Potomac-Shenandoah Rivers	Rockingham	255.2	Dry Fork	2556	340	1448	4344	Culvert
Potomac-Shenandoah Rivers	Rockingham	256.8	Lacey Spring	419	287	0	706	Culvert
Potomac-Shenandoah Rivers	Rockingham	256.8	Smith Creek	1154	0	0	1154	None
Potomac-Shenandoah Rivers	Rockingham	257.8	257.823	853	104	144	1101	Culvert
Potomac-Shenandoah Rivers	Shenandoah	269.4	North Fork Shenandoah River	2995	46	536	3577	Bridge
Potomac-Shenandoah Rivers	Shenandoah	269.4	Holmans Creek	0	0	780	780	None
Potomac-Shenandoah Rivers	Shenandoah	271.4	271.444	620	49	106	775	Culvert
Potomac-Shenandoah Rivers	Shenandoah	272.8	Mill Creek	527	213	543	1283	Bridge
Potomac-Shenandoah Rivers	Shenandoah	276.0	276.06	625	34	654	1313	Culvert
Potomac-Shenandoah Rivers	Shenandoah	280.0	Stony Creek	756	229	1139	2124	Bridge
Potomac-Shenandoah Rivers	Shenandoah	282.3	Narrow Passage Creek	1559	253	617	2429	Bridge
Potomac-Shenandoah Rivers	Shenandoah	287.2	Pughs Run	1813	250	709	2771	Bridge
Potomac-Shenandoah Rivers	Shenandoah	289.9	Jordan Run	998	331	603	1931	Culvert
Potomac-Shenandoah Rivers	Shenandoah	291.1	Toms Brook	1056	187	700	1944	Culvert

Table 3-12 Perennial Streams: I-81 Study Area (Cont'd)

Watershed	County	Mile Post	Stream Name	Linear Footage in Study Area East	Median	West	Total	Road Crossing
Potomac-Shenandoah Rivers	Shenandoah	292.7	292.785	127	35	121	283	Culvert
Potomac-Shenandoah Rivers	Shenandoah	293.9	293.993	623	157	134	915	Bridge
Potomac-Shenandoah Rivers	Shenandoah	294.5	Tumbling Run	545	330	605	1479	Culvert
Potomac-Shenandoah Rivers	Shenandoah	296.5	296.558	502	328	0	830	Culvert
Potomac-Shenandoah Rivers	Shenandoah	299.7	Cedar Creek	600	110	665	1374	Bridge
Potomac-Shenandoah Rivers	Frederick	305.4	305.473	0	0	411	411	None
Potomac-Shenandoah Rivers	Frederick	305.4	West Run	449	398	438	1285	Culvert
Potomac-Shenandoah Rivers	Frederick	307.5	Stephens Run	516	214	496	1226	Culvert
Potomac-Shenandoah Rivers	Frederick	309.8	Opequon Creek	692	162	651	1505	Bridge
Potomac-Shenandoah Rivers	Frederick	311.6	Hoge Run	709	46	1278	2033	Bridge
Potomac-Shenandoah Rivers	Frederick	313.0	Buffalo Lick Run	595	314	590	1499	Culvert
Potomac-Shenandoah Rivers	Frederick	314.6	Abrams Creek	584	47	608	1239	Bridge
Potomac-Shenandoah Rivers	City of Winchester	315.5	315.593	0	0	502	502	None
Potomac-Shenandoah Rivers	Frederick	316.6	316.643	606	207	0	813	Culvert
Potomac-Shenandoah Rivers	Frederick	317.7	Redbud Run	729	60	685	1474	Bridge
Potomac-Shenandoah Rivers	Frederick	319.4	Hiatt Run	1138	110	759	2007	Bridge
Potomac-Shenandoah Rivers	Frederick	321.8	Clearbrook Run	956	233	543	1732	Culvert
Potomac-Shenandoah Rivers	Frederick	324.2	Duncan Run	589	125	589	1303	Bridge

Lakes and Impoundments

Claytor Lake, an artificial reservoir encompassing 4,475 acres, is the most conspicuous open-water feature near I-81. It is within the New River Valley in Pulaski County. Originally constructed as a hydroelectric project in 1939, the main body of the 21-mile long impoundment is approximately one-half to two miles south of I-81, paralleling the interstate. A finger of the lake (Peak Creek) is within the I-81 study area, and crosses I-81 near Milepost 96. Just south of the City of Radford, the New River resumes flowing within its channel roughly one mile south of I-81 at the outfall from the Claytor Lake Dam.

Carvin Cove Reservoir, north of the City of Roanoke, is just outside the I-81 study area, with Carvin Creek crossing I-81 at Interchange 147 north of the I-81/I-581 Interchange.

The I-81 study area contains a large number of relatively small, open-water farm ponds associated primarily with agricultural and livestock operations. Some of the ponds are stormwater management basins with minimal or non-existent fringe of hydrophytic vegetation. A few abandoned rock quarries functioning as deep-water ponds are also present. Open-water systems were identified using National Wetland Inventory (NWI) mapping for Wetlands with Unconsolidated Bottoms (PUB) based on the Cowardin classification system. Totaling 86 acres, these ponds are distributed uniformly along the I-81 study area, and individually range from 0.25 to 20 acres. The average size is 0.38 acres. The largest amount is found within Rockingham and Shenandoah Counties, each with approximately 11 acres of ponds. More detailed information on each pond is provided in Table 3-13.

Table 3-13 Open Water Ponds: I-81 Study Area

Watershed	County	Wetland ID	Milepost	NWI/New Wetland[1]	Location in ROW	Size (acres)
Holston River	City of Bristol	S-259	7.9	New	West	0.11
Holston River	Washington	S-1	8.6	NWI	East	0.24
Holston River	Washington	S-2	8.6	NWI	East	0.75
Holston River	Washington	S-143	9.2	NWI	West	0.39
Holston River	Washington	S-144	9.5	NWI	West	0.34
Holston River	Washington	S-4	9.7	NWI	East	1.86
Holston River	Washington	S-260	11.4	New	West	0.02
Holston River	Washington	S-145	12.3	NWI	West	0.34
Holston River	Washington	S-139	13.6	New	East	0.15
Holston River	Washington	S-68	21.6	New	East	0.23
Holston River	Washington	S-256	23.7	New	West	0.07
Holston River	Washington	S-146	24.6	NWI	West	0.68
Holston River	Washington	S-69	25.3	New	East	0.17
Holston River	Washington	S-147	25.8	NWI	West	0.18
Holston River	Washington	S-148	26.4	NWI	West	0.11
Holston River	Washington	S-70	28.2	New	East	0.77
Holston River	Washington	S-255	30.2	New	West	0.01
Holston River	Washington	S-254	31.4	New	West	0.08
Holston River	Washington	S-7	32.0	NWI	East	1.72
Holston River	Smyth	S-149	35.1	NWI	West	2.30
Holston River	Smyth	S-80	37.9	New	East	0.65
Holston River	Smyth	S-84	39.2	New	East	0.78
Holston River	Smyth	S-150	39.8	NWI	West	0.20
Holston River	Smyth	S-151	40.2	NWI	West	0.80
Holston River	Smyth	S-10	42.4	NWI	East	0.19
Holston River	Smyth	S-250	46.0	New	West	0.08
Holston River	Smyth	S-251	46.1	New	West	0.07
Holston River	Smyth	S-142	47.3	New	East	1.94
Holston River	Smyth	S-11	51.8	NWI	East	0.34
Holston River	Smyth	S-12	52.1	NWI	East	0.24
Holston River	Smyth	S-13	52.9	NWI	East	0.13
Holston River	Smyth	S-106	55.1	New	East	1.49
Holston River	Smyth	S-152	55.7	NWI	West	0.25
Holston River	Smyth	S-153	57.0	NWI	West	0.09
Holston River	Wythe	S-154	57.7	NWI	West	0.10
New River	Wythe	S-240	67.1	New	West	0.45
New River	Wythe	S-17	73.0	NWI	East	0.35
New River	Wythe	S-113	73.2	New	East	2.28
New River	Wythe	S-161	73.4	NWI	West	0.21
New River	Wythe	S-14	76.7	NWI	East	0.17

Table 3-13 Open Water Ponds: I-81 Study Area (Continued)

Watershed	County	Wetland ID	Milepost	NWI/New Wetland[1]	Location in ROW	Size (acres)
New River	Wythe	S-157	77.7	NWI	West	0.60
New River	Wythe	S-238	77.8	New	West	0.10
New River	Wythe	S-158	79.4	NWI	West	0.23
New River	Wythe	S-237	79.4	New	West	0.11
New River	Wythe	S-15	79.5	NWI	East	0.07
New River	Wythe	S-236	79.9	New	West	0.07
New River	Wythe	S-118	81.1	New	East	0.06
New River	Wythe	S-160	83.1	NWI	West	0.70
New River	Wythe	S-162	86.5	NWI	West	0.93
New River	Wythe	S-122	86.6	New	East	0.26
New River	Pulaski	S-235	87.5	New	West	0.23
New River	Pulaski	S-18	88.6	NWI	East	0.12
New River	Pulaski	S-234	88.9	New	West	3.38
New River	Pulaski	S-233	90.2	New	West	0.15
New River	Pulaski	S-127	90.7	New	East	0.27
New River	Pulaski	S-128	92.9	New	East	0.01
New River	Pulaski	S-21	97.6	NWI	East	0.35
New River	Pulaski	S-229	97.8	New	West	0.17
New River	Pulaski	S-22	103.3	NWI	East	0.14
New River	Montgomery	S-223	107.2	NWI	West	0.28
New River	Montgomery	S-26	107.2	NWI	East	0.11
New River	Montgomery	S-27	107.3	NWI	East	0.19
New River	Montgomery	S-25	107.7	NWI	East	2.17
New River	Montgomery	S-166	108.6	NWI	West	0.11
New River	Montgomery	S-222	109.4	NWI	West	0.08
New River	Montgomery	S-165	109.7	NWI	West	0.11
New River	Montgomery	S-28	112.7	NWI	East	0.22
New River	Montgomery	S-29	112.9	NWI	East	0.21
New River	Montgomery	S-31	116.6	NWI	East	0.67
New River	Montgomery	S-32	116.6	NWI	East	1.02
New River	Montgomery	S-135	117.1	New	East	1.53
Roanoke River	Montgomery	S-33	119.1	NWI	East	0.19
Roanoke River	Montgomery	S-35	119.8	NWI	East	0.08
Roanoke River	Montgomery	S-219	123.3	New	West	0.34
Roanoke River	Montgomery	S-137	123.9	New	East	0.01
Roanoke River	Montgomery	S-170	128.3	NWI	West	0.08
Roanoke River	Roanoke	S-172	130.8	NWI	West	0.28
Roanoke River	Roanoke	S-36	134.8	NWI	East	0.05
Roanoke River	Roanoke	S-37	135.6	NWI	East	0.21
Roanoke River	Roanoke	S-38	135.6	NWI	East	0.45
Roanoke River	City of Salem	S-39	139.4	NWI	East	1.11
Roanoke River	Roanoke	S-173	140.0	NWI	West	0.25
Roanoke River	City of Salem	S-40	140.1	NWI	East	0.17
Roanoke River	Roanoke	S-41	142.1	NWI	East	0.35
Roanoke River	Roanoke	S-42	142.9	NWI	East	0.45
Roanoke River	Roanoke	S-174	146.8	NWI	West	0.59
Roanoke River	Roanoke	S-175	146.8	NWI	West	0.45

Table 3-13 Open Water Ponds: I-81 Study Area (Continued)

Watershed	County	Wetland ID	Milepost	NWI/New Wetland[1]	Location in ROW	Size (acres)
Roanoke River	Botetourt	S-43	149.3	NWI	East	0.60
Roanoke River	Botetourt	S-176	149.8	NWI	West	0.56
Roanoke River	Botetourt	S-50	151.1	New	East	0.23
Roanoke River	Botetourt	S-177	151.8	NWI	West	0.08
Roanoke River	Botetourt	S-44	151.9	NWI	East	0.10
James River	Botetourt	S-178	153.5	NWI	West	0.16
James River	Botetourt	S-179	153.9	NWI	West	0.26
James River	Botetourt	S-212	154.2	New	West	0.20
James River	Botetourt	S-52	157.1	New	East	0.07
James River	Botetourt	S-211	157.7	New	West	0.25
James River	Botetourt	S-180	158.5	NWI	West	0.12
James River	Botetourt	S-45	162.8	NWI	East	0.18
James River	Botetourt	S-181	162.8	NWI	West	0.31
James River	Botetourt	S-182	163.7	NWI	West	0.33
James River	Botetourt	S-46	164.8	NWI	East	0.04
James River	Botetourt	S-183	171.6	NWI	West	0.15
James River	Rockbridge	S-186	188.4	NWI	West	2.31
James River	Rockbridge	S-59	188.6	New	East	0.15
James River	Rockbridge	S-187	195.0	NWI	West	0.53
James River	Rockbridge	S-188	196.5	NWI	West	0.47
James River	Rockbridge	S-201	196.5	New	West	0.02
James River	Rockbridge	S-189	197.3	NWI	West	0.36
James River	Rockbridge	S-193	198.7	NWI	West	0.37
James River	Rockbridge	S-65	205.8	New	East	0.14
James River	Augusta	N-124	207.8	NWI	West	0.25
Potomac-Shenandoah Rivers	Augusta	N-1	208.7	NWI	East	1.64
Potomac-Shenandoah Rivers	Augusta	N-125	214.3	NWI	West	0.19
Potomac-Shenandoah Rivers	Augusta	N-7	214.8	NWI	East	0.40
Potomac-Shenandoah Rivers	Augusta	N-126	216.1	NWI	West	0.68
Potomac-Shenandoah Rivers	Augusta	N-112	216.6	New	East	0.06
Potomac-Shenandoah Rivers	Augusta	N-128	217.4	NWI	West	0.25
Potomac-Shenandoah Rivers	Augusta	N-8	220.4	NWI	East	0.16
Potomac-Shenandoah Rivers	Augusta	N-129	221.8	NWI	West	0.33
Potomac-Shenandoah Rivers	City of Staunton	N-402	224.3	New	West	0.20
Potomac-Shenandoah Rivers	Augusta	N-11	225.0	NWI	East	0.19
Potomac-Shenandoah Rivers	Augusta	N-64	226.1	New	East	0.24
Potomac-Shenandoah Rivers	Augusta	N-398	226.4	New	West	0.83
Potomac-Shenandoah Rivers	Augusta	N-65	226.9	NWI	East	0.25
Potomac-Shenandoah Rivers	Augusta	N-12	227.0	NWI	East	0.04
Potomac-Shenandoah Rivers	Augusta	N-68	227.6	NWI	East	0.14
Potomac-Shenandoah Rivers	Augusta	N-13	227.9	NWI	East	0.17
Potomac-Shenandoah Rivers	Augusta	N-133	229.6	NWI	West	0.22
Potomac-Shenandoah Rivers	Augusta	N-15	229.8	NWI	East	0.26
Potomac-Shenandoah Rivers	Augusta	N-70	230.2	New	East	0.10
Potomac-Shenandoah Rivers	Augusta	N-407	232.2	New	West	0.62
Potomac-Shenandoah Rivers	Augusta	N-388	232.2	New	West	0.14
Potomac-Shenandoah Rivers	Rockingham	N-135	238.8	NWI	West	0.32

Table 3-13 Open Water Ponds: I-81 Study Area (Continued)

Watershed	County	Wetland ID	Milepost	NWI/New Wetland[1]	Location in ROW	Size (acres)
Potomac-Shenandoah Rivers	Rockingham	N-136	238.9	NWI	West	0.22
Potomac-Shenandoah Rivers	Rockingham	N-21	241.3	NWI	East	0.22
Potomac-Shenandoah Rivers	Rockingham	N-22	241.7	NWI	East	0.41
Potomac-Shenandoah Rivers	Rockingham	N-76	242.5	New	East	0.24
Potomac-Shenandoah Rivers	Rockingham	N-77	242.8	New	East	0.05
Potomac-Shenandoah Rivers	City of Harrisonburg	N-385	243.4	New	West	0.05
Potomac-Shenandoah Rivers	City of Harrisonburg	N-140	246.6	NWI	West	4.10
Potomac-Shenandoah Rivers	City of Harrisonburg	N-79	247.8	New	East	0.19
Potomac-Shenandoah Rivers	City of Harrisonburg	N-80	247.9	New	East	0.97
Potomac-Shenandoah Rivers	Rockingham	N-23	251.0	NWI	East	0.78
Potomac-Shenandoah Rivers	Rockingham	N-120	252.5	New	East	0.02
Potomac-Shenandoah Rivers	Rockingham	N-24	252.6	NWI	East	0.16
Potomac-Shenandoah Rivers	Rockingham	N-25	253.4	NWI	East	0.21
Potomac-Shenandoah Rivers	Rockingham	N-143	253.4	NWI	West	0.09
Potomac-Shenandoah Rivers	Rockingham	N-144	253.4	NWI	West	0.08
Potomac-Shenandoah Rivers	Rockingham	N-82	253.9	New	East	0.14
Potomac-Shenandoah Rivers	Rockingham	N-145	254.1	NWI	West	0.05
Potomac-Shenandoah Rivers	Rockingham	N-26	254.2	NWI	East	0.07
Potomac-Shenandoah Rivers	Rockingham	N-83	254.2	New	East	0.14
Potomac-Shenandoah Rivers	Rockingham	N-27	254.4	NWI	East	0.20
Potomac-Shenandoah Rivers	Rockingham	N-146	256.6	NWI	West	0.20
Potomac-Shenandoah Rivers	Rockingham	N-374	257.7	New	West	0.77
Potomac-Shenandoah Rivers	Rockingham	N-147	259.1	NWI	West	0.25
Potomac-Shenandoah Rivers	Rockingham	N-86	259.3	New	East	0.05
Potomac-Shenandoah Rivers	Rockingham	N-29	259.5	NWI	East	0.07
Potomac-Shenandoah Rivers	Rockingham	N-88	259.5	New	East	0.04
Potomac-Shenandoah Rivers	Rockingham	N-89	260.0	New	East	0.04
Potomac-Shenandoah Rivers	Rockingham	N-148	261.2	NWI	West	0.26
Potomac-Shenandoah Rivers	Rockingham	N-91	263.4	New	East	0.03
Potomac-Shenandoah Rivers	Rockingham	N-149	263.8	NWI	West	0.28
Potomac-Shenandoah Rivers	Shenandoah	N-93	266.1	New	East	0.06
Potomac-Shenandoah Rivers	Shenandoah	N-150	267.8	NWI	West	0.28
Potomac-Shenandoah Rivers	Shenandoah	N-151	268.5	NWI	West	0.50
Potomac-Shenandoah Rivers	Shenandoah	N-31	268.7	NWI	East	0.32
Potomac-Shenandoah Rivers	Shenandoah	N-371	269.8	New	West	0.11
Potomac-Shenandoah Rivers	Shenandoah	N-94	270.2	New	East	0.02
Potomac-Shenandoah Rivers	Shenandoah	N-370	270.7	New	West	1.35
Potomac-Shenandoah Rivers	Shenandoah	N-369	271.3	New	West	0.96
Potomac-Shenandoah Rivers	Shenandoah	N-42	271.9	NWI	East	0.37
Potomac-Shenandoah Rivers	Shenandoah	N-158	272.4	NWI	West	0.18
Potomac-Shenandoah Rivers	Shenandoah	N-159	273.9	NWI	West	0.19
Potomac-Shenandoah Rivers	Shenandoah	N-43	274.2	NWI	East	0.01
Potomac-Shenandoah Rivers	Shenandoah	N-95	274.2	New	East	0.21
Potomac-Shenandoah Rivers	Shenandoah	N-45	274.9	NWI	East	0.38
Potomac-Shenandoah Rivers	Shenandoah	N-99	277.0	New	East	0.11
Potomac-Shenandoah Rivers	Shenandoah	N-163	277.5	NWI	West	2.09
Potomac-Shenandoah Rivers	Shenandoah	N-164	278.3	NWI	West	0.18

Table 3-13 Open Water Ponds: I-81 Study Area (Continued)

Watershed	County	Wetland ID	Milepost	NWI/New Wetland[1]	Location in ROW	Size (acres)
Potomac-Shenandoah Rivers	Shenandoah	N-166	279.0	NWI	West	0.24
Potomac-Shenandoah Rivers	Shenandoah	N-46	279.3	NWI	East	0.19
Potomac-Shenandoah Rivers	Shenandoah	N-167	280.4	NWI	West	0.06
Potomac-Shenandoah Rivers	Shenandoah	N-47	280.6	NWI	East	0.38
Potomac-Shenandoah Rivers	Shenandoah	N-169	281.1	NWI	West	0.19
Potomac-Shenandoah Rivers	Shenandoah	N-366	281.9	New	West	0.09
Potomac-Shenandoah Rivers	Shenandoah	N-49	285.6	NWI	East	0.06
Potomac-Shenandoah Rivers	Shenandoah	N-170	285.8	NWI	West	0.13
Potomac-Shenandoah Rivers	Shenandoah	N-52	287.7	NWI	East	0.10
Potomac-Shenandoah Rivers	Shenandoah	N-51	287.7	NWI	East	0.03
Potomac-Shenandoah Rivers	Shenandoah	N-54	289.6	NWI	East	0.35
Potomac-Shenandoah Rivers	Shenandoah	N-408	290.8	NWI	West	0.15
Potomac-Shenandoah Rivers	Shenandoah	N-173	292.3	NWI	West	0.31
Potomac-Shenandoah Rivers	Shenandoah	N-174	292.3	NWI	West	0.34
Potomac-Shenandoah Rivers	Shenandoah	N-103	292.5	New	East	0.03
Potomac-Shenandoah Rivers	Shenandoah	N-55	293.0	NWI	East	0.27
Potomac-Shenandoah Rivers	Shenandoah	N-409	293.6	NWI	West	0.19
Potomac-Shenandoah Rivers	Shenandoah	N-365	297.3	New	West	0.04
Potomac-Shenandoah Rivers	Shenandoah	N-58	297.3	NWI	East	0.08
Potomac-Shenandoah Rivers	Shenandoah	N-57	298.1	NWI	East	0.56
Potomac-Shenandoah Rivers	Shenandoah	N-178	298.1	NWI	West	0.19
Potomac-Shenandoah Rivers	Shenandoah	N-56	299.1	NWI	East	0.02
Potomac-Shenandoah Rivers	Shenandoah	N-175	299.1	NWI	East	0.02
Potomac-Shenandoah Rivers	Warren	N-213	300.0	New	East	0.11
Potomac-Shenandoah Rivers	Warren	N-176	300.5	NWI	West	0.28
Potomac-Shenandoah Rivers	Warren	N-214	300.9	New	East	0.87
Potomac-Shenandoah Rivers	Frederick	N-417	301.5	NWI	West	0.28
Potomac-Shenandoah Rivers	Frederick	N-179	301.9	NWI	West	0.59
Potomac-Shenandoah Rivers	Frederick	N-180	302.0	NWI	West	0.39
Potomac-Shenandoah Rivers	Frederick	N-181	302.6	NWI	East	0.24
Potomac-Shenandoah Rivers	Frederick	N-339	303.6	New	West	1.62
Potomac-Shenandoah Rivers	Frederick	N-183	304.5	NWI	West	0.15
Potomac-Shenandoah Rivers	Frederick	N-184	304.7	NWI	West	0.09
Potomac-Shenandoah Rivers	Frederick	N-186	305.6	NWI	West	0.27
Potomac-Shenandoah Rivers	Frederick	N-185	305.6	NWI	East	0.16
Potomac-Shenandoah Rivers	Frederick	N-321	306.7	New	West	0.03
Potomac-Shenandoah Rivers	Frederick	N-188	309.7	NWI	West	0.11
Potomac-Shenandoah Rivers	Frederick	N-310	310.4	New	West	0.08
Potomac-Shenandoah Rivers	Frederick	N-189	310.8	NWI	East	0.47
Potomac-Shenandoah Rivers	Frederick	N-411	311.8	New	West	0.50
Potomac-Shenandoah Rivers	Frederick	N-191	315.1	NWI	East	0.30
Potomac-Shenandoah Rivers	Frederick	N-192	319.2	NWI	East	0.20
Potomac-Shenandoah Rivers	Frederick	N-410	319.4	New	East	0.17
Potomac-Shenandoah Rivers	Frederick	N-297	322.5	New	East	0.04
Potomac-Shenandoah Rivers	Frederick	N-194	323.0	NWI	East	0.27

[1] Classified as Palustrine Wetlands with Unconsolidated Bottoms (PUB)

Surface Water Quality

Detailed observations of water quality and water sampling were beyond the level of detail appropriate for this Tier I EIS. However, field technicians did note both high and low-quality conditions based on cursory examinations of the flowing water, bank and channel conditions, and adjacent floodplain and riparian vegetation. Examples of high-quality stream environments were those with the following conditions:

- Visible seepage or spring inputs;
- Stable bank and bed conditions;
- Well-integrated floodplain;
- Lack of visible contamination; and
- Abundance of aquatic life.

Low-quality sites were often found in pastureland areas where the stream is afforded no protection from livestock, resulting in bank failure, turbid water, and visible contamination from animal waste. Low-quality streams in urban watersheds were occasionally characterized by the following conditions:

- Channelized flow or entrenchment;
- Bed and bank erosion;
- Excessive sedimentation;
- Trash and litter; and
- Lack of aquatic life.

In an effort to evaluate chemical, biological, and physical conditions in state surface waters on a regional scale, the DEQ coupled probabilistic monitoring with an existing biological monitoring program in 2001. Using results from randomly selected monitoring stations and a statistical methodology, conditions in unsampled streams could be determined with 95 percent accuracy (DEQ, 2004a). Monitored chemical parameters include pH, dissolved oxygen, temperature, specific conductance, hardness, turbidity, nitrate, total phosphorous, and fecal coliform bacteria. Biological parameters include such benthic metrics such as taxa richness and EPT index. EPT index refers to aquatic insects of the groups *Ephemeroptera*, *Plecoptera*, and *Trichoptera*, considered some of the most sensitive indicators of biotic integrity in flowing water ecosystems (INHS, 2004). Finally, physical habitat attributes include channel alteration, in-stream condition, riparian vegetation, and sedimentation.

In order to broadly assess surface water quality across Virginia, the DEQ grouped sampling stations and their data by ecoregion, areas of "relative homogeneity, of similar land surface form, soils, land uses, and potential natural vegetation" (DEQ, 2004a). Streams within the I-81 study area fall into the Central Appalachian Ridges and Valleys (CARV) ecoregion, roughly equivalent to the Valley and Ridge physiographic province.

Results of sampling conducted in 2001 determined that no anomalous water quality conditions existed in the CARV ecoregion, though hardness and specific conductance were somewhat higher in the western third of the state. Waters of the CARV ecoregion are typically basic – a reflection of the calcareous bedrock over which many of them flow – yet still lower than the upper threshold of the state's water quality standard of a pH equal to 9. Dissolved oxygen levels in the I-81 corridor are generally favorable, as stream gradient tends to encourage re-aeration. Temperatures tend to be lower in the CARV region due to the rural or forested nature of the streams and relatively high natural input. High counts for fecal coliform bacteria are found in the middle and western portions of Virginia. Stream impairment within the I-81 study area can largely be attributed to high occurrences of fecal coliform (see below).

In terms of biological indicators of stream health, both taxa richness and EPT index were highest in the CARV, Blue Ridge Mountains, and Piedmont ecoregions. This suggests higher water quality than the state average, likely a result of relatively minor or non-existent industrial impacts and plentiful springwater discharge. The DEQ report did find areas of low taxonomic diversity in the southwestern part of the state, possibly resulting from land-clearing activities such as mining and logging. As streams in the CARV represent important habitat, sources of drinking water, and recreational foci, development in their watersheds must be conducted with due regard to potential impacts to all resources.

Impaired Streams

As required by Section 303(d) of the Clean Water Act and EPA regulation 40 CFR Section 130.7(d), each state must provide water quality assessments for all surface waters capable of providing some beneficial use (*e.g.*, drinking water, recreation, habitat, industrial consumption). Comprehensive lists of impaired streams are submitted to the EPA, along with the recommended Total Maximum Daily Load (TMDL), or effective limit on the discharge of pollutants into the stream or water body in order to satisfy state water quality requirements. Water quality assessments for Virginia were based on data provided by various government agencies, including the DEQ as well as private citizens, fish and shellfish consumption actions, and applications submitted in accordance with the Virginia Pollutant Discharge Elimination System (VPDES) (DEQ, 2004b).

Impaired streams within the I-81 study area are degraded by both wastewater from nearby developments or pasturelands or by insufficient or absent water treatment measures (*e.g.*, fecal coliform bacteria) or are partially or fully impaired due to natural causes (chiefly temperature). Table 3-14 contains the list and location of impaired streams encountered within the I-81 study area. The source of the impairment is also listed.

Table 3-14 Impaired Streams: I-81 Study Area

Stream Name	County	Milepost	Type of Impairment
Little Creek	City of Bristol	MP 3.4	FC
Beaver Creek	City of Bristol	MP 5.9	FC, GS
Cedar Creek	Washington	MP 24.6	FC, GS
Hall Creek	Washington	MP 28.1	FC, GS
Hutton Creek	Washington	MP 32.1	FC, GS
Middle Fork Holston River	Smyth	MP 35.0	FC
Mason Creek	Roanoke	MP 141.3	FC
Peter's Creek	Roanoke	MP 142.1	FC
Carvin Creek	Roanoke	MP 147.0	FC
Tinker Creek	Botetourt	MP 149.8	FC, Temp
Cedar Creek	Rockbridge	MP 177.3	FC
South River	Augusta	MP 208.6	FC, TP
Christians Creek	Augusta	MP 212.6	FC, TP
Lewis Creek	Augusta	MP 225.6	FC, GS
Naked Creek	Augusta	MP 237.2	FC
North River	Rockingham	MP 239.7	FC, TP, GS
Blacks Run	City of Harrisonburg	MP 242.8	FC, GS
Lacey Spring	Rockingham	MP 256.8	GS
North Fork Shenandoah River	Shenandoah	MP 269.4	FC
Holmans Creek	Shenandoah	MP 269.4	FC, GS
Mill Creek	Shenandoah	MP 272.8	FC, GS
Stony Creek	Shenandoah	MP 280.0	FC
Narrow Passage Creek	Shenandoah	MP 282.3	FC
Toms Brook	Shenandoah	MP 291.1	GS
Opequon Creek	Frederick	MP 309.8	FC, TP
Abrams Creek	Frederick	MP 314.6	FC, GS

Impairments: FC – fecal coliform; GS – general standard; TP – total phosphorus; Temp – adverse temperature

Groundwater

The Valley and Ridge physiographic province within which I-81 traverses is floored by folded and faulted permeable sedimentary rocks. The Great Valley, bounded by the Blue Ridge Mountains to the east and the Cumberland Escarpment to the west, is underlain primarily by shale and by a thick sequence of carbonate rocks that act as highly productive aquifers. Water yields range from 150 to 1,000 gallons per minute (USGS, 2004). Such high yields are a product of dissolution cavities within the geologic unit. Acidic groundwater dissolves and widens underground fractures and channels in carbonate rocks, resulting in low residence time. This is commonly referred to as karst drainage. Karst topography is a landscape pockmarked with sinkholes, depressional features representing a surface connection to an underground conduit or larger cave system where the roof of the cavity has collapsed.

While groundwater is abundant in the Great Valley as a result of the many carbonate aquifers, the interconnected nature of their subterranean drainage network is inherently susceptible to groundwater contamination from the infiltration of accidental spillages or unmediated surface runoff, particularly at sinkholes. Using available data for Washington,

Smyth, and Wythe Counties alone, 238 sinkholes were identified by the Virginia Department of Mines, Minerals, and Energy in the I-81 study area.

3.2.2 Rail Study Area

Perennial Streams

Many small stream features bisect the rail study area. In addition, two rail improvement sections cross major perennial streams, the Middle Fork of the Holston River in Smyth County and the Banister River in Pittsylvania County. No streams are within the Prince William County rail improvement section. In total, approximately 30 perennial streams bisect the study area as listed in Table 3-15.

Most of the stream features are relatively minor first and second order systems draining farmlands and open pastures, as well as mountain passages and hollows along the Shenandoah line. The highest frequency of stream segments (stream density) occurs in the Holston River watershed. The rail improvement sections in the Holston River Basin and the New River Basin are relatively short and, as a result, affect the least linear footage of streams despite containing the highest stream density. The Piedmont Line, within the Potomac-Shenandoah River Basin, has the highest linear footage of streams affected despite containing the lowest stream density. This watershed has the longest extent of rail improvement concepts and many of the streams parallel those concept areas. Most notably is Goose Creek for 2.9 miles and Broad Run for 1.2 miles.

The greatest stream density occurs in the rail improvement sections in Pittsylvania, Pulaski, Washington, Smyth, and Wythe Counties. The steeper topography and resulting trellis drainage pattern in these counties produce high stream density.

Table 3-15 Perennial Streams: Rail Study Area

Watershed	County	Rail Section	Stream Name	Linear Footage in Study Area East	West	Total	Stream ID
Holston River	Washington	1	RS-34	0	552	552	RS-34
Holston River	Washington	1	Richardson Branch	276	801	1077	RS-33
Holston River	Washington	1	East Fork Hall Creek	448	221	669	RS-32
Holston River	Smyth	2	RS-31	10	0	10	RS-31
Holston River	Smyth	2	RS-30	0	186	186	RS-30
Holston River	Smyth	2	Middle Fork Holston River	2002	2462	4464	RS-29
New River	Wythe	3	RS-28	0	1911	1911	RS-28
New River	Wythe	4	Beaverdam Creek	745	0	745	RS-27
New River	Pulaski	4	RS-26	0	171	171	RS-26
New River	Wythe/Pulaski	4	Indian Grave Creek	1243	5721	6964	RS-25
Roanoke River	Pittsylvania	13	RS-24	593	788	1381	RS-24
Roanoke River	Pittsylvania	13	RS-23	668	644	1312	RS-23
Roanoke River	Pittsylvania	13	RS-22	435	929	1364	RS-22
Roanoke River	Pittsylvania	13	Fall Creek	0	1870	1870	RS-21
Roanoke River	Pittsylvania	13	RS-20	3923	9216	13139	RS-20
Roanoke River	Pittsylvania	13	RS-19	2377	0	2377	RS-19
Roanoke River	Pittsylvania	13	RS-18	0	572	572	RS-18
Roanoke River	Pittsylvania	13	White Oak Creek	3032	727	3759	RS-17
Roanoke River	Pittsylvania	13	Banister River	518	533	1051	RS-16
Roanoke River	Pittsylvania	13	RS-15	1856	449	2305	RS-15
Roanoke River	Pittsylvania	13	Cherrystone Creek	446	933	1379	RS-14
Potomac-Shenandoah Rivers	Prince William	11	RS-13	396	641	1037	RS-13
Potomac-Shenandoah Rivers	Prince William	11	Catletts Branch	471	583	1054	RS-12
Potomac-Shenandoah Rivers	Fauquier	11	Trapp Branch	0	332	332	RS-11
Potomac-Shenandoah Rivers	Fauquier/Prince William	11	Broad Run	0	5850	5850	RS-10
Potomac-Shenandoah Rivers	Fauquier	10	RS-9	0	2591	2591	RS-9
Potomac-Shenandoah Rivers	Fauquier	10	RS-8	206	2094	2300	RS-8
Potomac-Shenandoah Rivers	Fauquier	9	RS-7	492	637	1129	RS-7
Potomac-Shenandoah Rivers	Fauquier	9	RS-6	378	309	687	RS-6
Potomac-Shenandoah Rivers	Fauquier	8 and 9	Goose Creek	5022	10216	15238	RS-5
Potomac-Shenandoah Rivers	Warren	8	RS-4	3855	1020	4875	RS-4
Potomac-Shenandoah Rivers	Warren	8	RS-3	416	758	1174	RS-3
Potomac-Shenandoah Rivers	Warren	7	Happy Creek	350	0	350	RS-2
Potomac-Shenandoah Rivers	Clarke	5	Buck Marsh Run	554	461	1015	RS-1

Lakes and Impoundments

No lakes are found within the rail improvement sections. The rail study area does contain several open water ponds including stormwater management ponds, farm ponds with a minimal or non-existent fringe of hydrophytic vegetation, and ponds associated with water treatment facilities. These total approximately 24 acres. The majority of these, over 17 acres, are located in the Piedmont line sections from Front Royal to Manassas (rail sections 9, 10, 11, and 12).

Table 3-16 Open Water Ponds: Rail Study Area

Watershed	County	Wetland ID	Rail Section	NWI/New Wetland[1]	Location in ROW	Size (Acres)
Roanoke River	Pittsylvania	R-1	13	NWI	West	0.19
Roanoke River	Pittsylvania	R-2	13	NWI	East	1.46
Roanoke River	Pittsylvania	R-3	13	NWI	West	0.23
Roanoke River	Pittsylvania	R-4	13	NWI	West	0.52
Roanoke River	Pittsylvania	R-5	13	NWI	West	0.31
Roanoke River	Pittsylvania	R-6	13	NWI	West	0.12
Roanoke River	Pittsylvania	R-21	13	New	East	0.25
Roanoke River	Pittsylvania	R-12	13	NWI	West	0.61
Roanoke River	Pittsylvania	R-13	13	NWI	East	0.24
Roanoke River	Pittsylvania	R-14	13	NWI	East	0.25
Holston River	Washington	R-15	1	NWI	West	0.15
New River	Wythe	R-18	3	NWI	East	0.34
New River	Wythe	R-22	3	New	East	0.52
Potomac-Shenandoah Rivers	Prince William	R-28	12	NWI	West	0.67
Potomac-Shenandoah Rivers	Prince William	R-36	11	NWI	West	0.45
Potomac-Shenandoah Rivers	Prince William	R-52	11	NWI	West	1.86
Potomac-Shenandoah Rivers	Prince William	R-56	11	NWI	West	0.36
Potomac-Shenandoah Rivers	Prince William	R-59	11	NWI	West	0.14
Potomac-Shenandoah Rivers	Prince William	R-63	11	NWI	East	0.44
Potomac-Shenandoah Rivers	Prince William	R-66	11	NWI	East	2.14
Potomac-Shenandoah Rivers	Fauquier	R-83	10	NWI	East	0.33
Potomac-Shenandoah Rivers	Fauquier	R-88	10	NWI	East	0.47
Potomac-Shenandoah Rivers	Fauquier	R-96	10	NWI	East	0.40
Potomac-Shenandoah Rivers	Fauquier	R-95	10	NWI	East	0.55
Potomac-Shenandoah Rivers	Fauquier	R-100	10	NWI	East	0.44
Potomac-Shenandoah Rivers	Fauquier	R-116	9	NWI	East	7.01
Potomac-Shenandoah Rivers	Fauquier	R-117	9	NWI	East	0.04
Potomac-Shenandoah Rivers	Fauquier	R-121	9	NWI	East	1.17
Potomac-Shenandoah Rivers	Fauquier	R-123	9	NWI	East	0.32
Potomac-Shenandoah Rivers	Fauquier	R-124	9	NWI	East	0.33
Potomac-Shenandoah Rivers	Clarke	R-137	5	NWI	East	0.06
Potomac-Shenandoah Rivers	Clarke	R-138	5	NWI	West	0.94

[1] Classified as Palustrine Wetlands with Unconsolidated Bottoms (PUB)

Surface Water Quality

Streams within the rail study area fall into the following ecoregions (DEQ, 2004a):

- Shenandoah line: Central Appalachian Ridges and Valleys (CARV),
- Piedmont line in southern Virginia: Piedmont,
- Piedmont line in northern Virginia: Northern Piedmont, Blue Ridge Mountains, and CARV.

As the Shenandoah line crosses the same region as the I-81 corridor (CARV), refer to Section 3.2.1 for a discussion of water quality results in this ecoregion.

Results of sampling conducted in 2001 determined that, contrary to the CARV, streams flowing in the Piedmont ecoregion tend to be more acidic. Also, in the Piedmont ecoregions, median temperatures were higher, promoting lower dissolved oxygen (DO) concentrations due to the lower DO solubility.

In terms of biological indicators of stream health, both taxa richness and EPT index were highest in the CARV, Blue Ridge Mountains, and Piedmont ecoregions. Again, this suggests higher water quality than the state average in areas traversed by the rail improvement sections.

Impaired Streams

Impaired streams within the rail study area are degraded by both wastewater from nearby developments or pasturelands or by insufficient or absent water treatment measures (*e.g.*, fecal coliform bacteria). Table 3-16 summarizes impaired streams within the rail study area.

Table 3-17 Impaired Streams: Rail Study Area

Stream Name	Rail Section	Type of Impairment	County
Broad Run	11	FC	Fauquier, Prince William
Goose Creek	8, 9, and 10	FC	Fauquier
Happy Creek	7 and 8	FC	Warren
Cherrystone Creek	13	FC	Pittsylvania
Fall Creek	13	FC	Pittsylvania
Middle Fork Holston River	2	FC	Smyth

FC – fecal coliform

4

Potential Impacts & Conceptual Mitigation

This chapter discusses the potential impacts to wetlands and streams for the No-Build and "Build" concepts. Potential impacts were also grouped per watershed to provide a first approximation of the geographic distribution of potential mitigation requirements that would need to be addressed in later stages of project development if a "Build" concept (or portion of a "Build" concept) is advanced.

4.1 No-Build Concept

The No-Build Concept would generally maintain the existing roadway conditions on I-81 with the exception of the sixteen fully-funded minor roadway improvements described in the *I-81 Corridor Improvement Study Tier 1 Draft Environmental Impact Statement*. Three of these roadway improvements involve widening of existing bridges over streams:

- Bridge over Buffalo Creek at Milepost 185 in Rockbridge County
- Bridge over Maury River at Milepost 191 in Rockbridge County
- Bridge over Abram's Creek at Milepost 313 in Frederick County

Based on the data used for the *I-81 Corridor Improvement Study*, it is anticipated that widening of the above noted bridges may potentially impact jurisdictional wetlands and waters of the United States through the placement of fill in these areas. However, since they involve federal funding, potential impacts to wetlands and streams associated with these improvements have either been addressed or will be addressed in NEPA documents prepared independently of the *I-81 Corridor Improvement Study*.

4.2 "Build" Concepts

Perennial streams and wetlands are considered waters of the United States, and the federal and state laws enacted to protect these resources and regulate development in their vicinity are discussed in Chapter 1. Each of the "Build" concepts would potentially impact wetlands and water resources as described below. Potential impacts to wetlands and perennial streams per individual road section (from interchange to interchange) and rail improvement section are included in Appendix A of this technical report (with Figures A-1 and A-2, respectively).

The following sections describe the potential impacts to perennial streams and wetlands by the "Build" concepts primarily as a result of filling, reduction in functional values, dewatering or inundation. It is important to note that the results provided do not distinguish between temporary and permanent impacts, but simply provide an indication of the combined total potential impact. The potential impact totals are combined temporary and permanent impacts as it is not possible at this stage to segregate the two.

Bridges are a common feature along the interstate where the roadway crosses larger stream/wetland complexes. Bridging offers the opportunity to minimize the complete loss of wetlands that would otherwise result from the use of fill material. In reality, the method of stream crossing currently in use for a particular stream and/or wetland would likely be reemployed for each "Build" concept, resulting in temporary impacts related to construction. Relatively minor streams presently flowing through culverts or pipes would continue to be conveyed as such, whereas larger bridged streams would be spanned similarly. However, the conversion of scrub-shrub or forested habitats to an emergent (early successional) vegetative stage may occur at these locations depending on the height of the bridge and/or the need to maintain an unforested area under the span. Potential temporary wetland impacts may also occur during construction such as clearing and grubbing areas adjacent to wetlands, temporary dewatering, and temporary equipment staging or access. Determining this type of impact is not practicable at the Tier 1 level of analysis.

If a "Build" concept (or portion of a "Build" concept) is advanced, detailed Tier 2 investigations would segregate temporary and permanent stream impacts and may recommend that streams that were culverted or otherwise channelized during the initial construction of I-81 be spanned by a bridge and restored (*e.g.*, cold-water trout streams).

4.2.1 Potential Wetland Impacts

Potential wetland impacts were approximated by overlaying wetland GIS data over the footprints described in Chapter 2. The average impact size per wetland is relatively small, from 0.13 to 0.20 acres.

Because the majority of the existing I-81 right-of-way (ROW) has been disturbed and manipulated for purposes of improved drainage and ease of maintenance, few large wetland systems remain along I-81. For the most part, wetlands within the I-81 ROW occur as either narrow drainage patterns, man-made swales, ditches, or small depressional areas. Larger

expanses of wetland areas and ponds occur outside of the ROW. For this reason, the total amounts for wetlands potentially impacted by improvements within the I-81 study area are small considering the length of I-81 in Virginia. Combined potential impacts to emergent, forested, and scrub-shrub wetlands are summarized in Table 4-1.

Table 4-1 Potential Wetland Impacts

"Build" Concept	Total No. of Impacted Wetlands	Total Impacts (Acres)
Minimum Width	230	33
Maximum Width	281	51
Add 2-Lanes	246	33
Add 8- Lanes	461	62
Rail Concept 3	41	8

Regardless of "Build" concept, the highest concentration of potential wetland impacts along the I-81 corridor occurs between Exits 300 and 313, between the I-66 Interchange and Stephens City. The headwaters of numerous streams lie along this portion of the interstate, including Catlett Run, Molly Booth Run, Dry Run, West Run, and Stephens Run. Within this 12-mile span, the Minimum Width footprint potentially impacts 10 acres and the Maximum Width footprint potentially impact 14 acres.

Rail improvements would potentially impact a total of eight additional acres of wetlands, mostly in Fauquier and Prince William Counties. Unlike the I-81 right-of-way, larger wetland systems are found within the existing rail right-of-way. In some cases, the raised rail bed traverses forested or emergent wetlands systems along rivers and floodplains.

Potential Wetland Impacts by Type

Because they are the most common wetlands found along I-81, over 75 percent of potential impacts to wetlands would occur to emergent systems, regardless of "Build" concept (see Table 4-2). Many of these are small emergent wetland fringes around the edges of ponds, and in ditches and swales. These systems have relatively low functional value. In fact, based on the preliminary evaluation of wetland functional values done for Tier 1, potential impacts to wetlands that appear to have relatively high functional value are very small:
2 acres for the Minimum Width footprint and 5 acres for the Maximum Width footprint.

Overall, impacts to forested and scrub-shrub wetland systems are relatively minor along I-81 for all "Build" concepts.

Table 4-2 Potential Wetland Impacts by Type

	PEM		PFO		PSS		Total
"Build" Concept	Acres	%	Acres	%	Acres	%	(acres)
Minimum Width	26	80%	3.3	10%	3.4	10%	33
Maximum Width	39	76%	6.6	13%	4.9	10%	51
Add 2-Lanes	26	79%	3.2	10%	3.4	10%	33
Add 8- Lanes	47	76%	7.8	13%	5.8	9%	62
Rail Concept 3	2.9	35%	5.3	65%	0	0%	8.2

PEM – Emergent Wetlands; PFO – Forested Wetlands; PSS – Scrub-Shrub Wetlands (including PSS/PEM wetlands)

Table 4-3 provides additional information on the amount of potential wetland impacts associated with each of the rail improvement sections. The potential wetland impacts associated with rail improvements along the Shenandoah line (Sections 1, 2, 3, and 4) are negligible (<0.1 acre). The vast majority of potential wetland impacts occur along the Piedmont Line, in Fauquier and Prince William Counties. The potential impacts are primarily to forested wetlands. Although the total acreage of potential impacts in the rail corridor is much smaller than the I-81 total, all of the potentially impacted wetlands in the rail corridor were preliminarily identified as having relatively high functional values.

Table 4-3 Potential Wetland Impacts: Rail Improvements

Rail Section # - County	Type of Wetland	Acres	Total Acres	Rail Section # - County	Type of Wetland	Acres	Total Acres
1 – Washington	PEM	0		8 – Warren/ Fauquier	PEM	0.3	
	PFO	0			PFO	0.1	
	PSS	0			PSS	0	
			0				0.4
2 – Smyth	PEM	0		9 – Fauquier	PEM	1.2	
	PFO	0			PFO	0.5	
	PSS	0			PSS	0	
			0				1.7
3 – Wythe	PEM	0.03		10 – Fauquier	PEM	0.2	
	PFO	0			PFO	0	
	PSS	0			PSS	0	
			0.03				0.2
4 – Wythe/Pulaski	PEM	0		11 – Fauquier/ Prince William	PEM	0.5	
	PFO	0			PFO	1.4	
	PSS	0			PSS	0	
	PUB	0	0				1.9
5 – Clarke	PEM	0.5		12 – Prince William	PEM	0.02	
	PFO	0			PFO	3.3	
	PSS	0			PSS	0	
			0.5				3.3
6 – Warren	PEM	0		13 – Pittsylvania	PEM	0.1	
	PFO	0			PFO	0	
	PSS	0			PSS	0	
			0				0.1
7 – Warren	PEM	0					
	PFO	0					
	PSS	0					
			0	Total			8.2

PEM – Emergent Wetlands; PFO – Forested Wetlands; PSS – Scrub-Shrub Wetlands

Potential Wetland Impacts by Watershed

Federal and state regulations require that mitigation for unavoidable stream and wetland impacts be sought as close to the source of impact as possible and under most circumstances within the same watershed. As such, it is useful to consider wetland impacts in terms of the five major watersheds (Table 4-4).

Within the I-81 corridor, the Potomac-Shenandoah Rivers drainage basin is traversed most by the interstate, containing roughly 36 percent of the road segments by mileage and roughly 67 percent of the wetlands mapped within the I-81 study area. The same is true for the rail corridor, as seven of the 13 rail improvement sections lay within this same watershed. Almost all of the acreage of potential wetland impacts found along the rail line occurs in this

watershed. Potential wetland impacts within the I-81 study area are also highest within the Potomac-Shenandoah watershed.

Though the New River basin contains the second highest linear distance of I-81, the Holston River basin actually ranks second in terms of potential impacts. This is due primarily to a landscape setting that promotes wetland development. The southern portion of I-81 follows broad river valleys such as the Middle Fork of the Holston River.

Table 4-4 Potential Wetland Impacts by Watershed

"Build" Concept	Holston River (acres)	New River (acres)	Roanoke River (acres)	James River (acres)	Potomac-Shenandoah Rivers (acres)
Minimum Width	7.7	2.1	0.7	1.0	22
Maximum Width	7.7	3.1	1.6	5.1	33
Add 2-Lanes	7.7	2.1	0.7	7.7	21
Add 8- Lanes	12.7	5.3	1.6	12.7	35
Rail Concept 3	0	0.03	0.1	0	8

4.2.2 Potential Stream Impacts

Potential impacts to perennial streams were calculated by superimposing the "Build" concept footprints on top of the GIS layer that was created for perennial streams. The results of this analysis are presented in Table 4-5. This analysis does not include potential impacts to intermittent streams or features that were labeled "unknown" in the field. For purposes of this study, where the improvement concept footprints and stream layer overlapped, a potential impact was assumed. These impacts may increase or decrease based on more refined engineering efforts that would occur during Tier 2 studies, if a "Build" concept (or portion of a "Build" concept) is advanced.

Table 4-5 Potential Perennial Stream Impacts

"Build" Concept	Total Impacts (Linear Feet)	Total Impacts (Miles)
Minimum Width	122,082	23.1
Maximum Width	153,870	29.1
Add 2-Lanes	123,668	23.4
Add 8- Lanes	184,069	34.9
Rail Concept 3	7,244	1.4

Table 4-6 provides additional information on the amount of potential stream impacts associated with each of the rail improvement sections. Most of these potential impacts occur at rail improvement section 8 in Warren and Fauquier Counties, where Goose Creek and a tributary of the Shenandoah River parallel the existing rail line.

Table 4-6 Potential Stream Impacts: Rail Concept 3

Rail Line	Rail Section Number	County	Linear Footage of Impacted Streams
Shenandoah	1	Washington	102
Shenandoah	2	Smyth	166
Shenandoah	3	Wythe	0
Shenandoah	4	Wythe/Pulaski	407
Piedmont	5	Clarke	101
Piedmont	6	Clarke/Warren	0
Piedmont	7	Warren	0
Piedmont	8	Warren/Fauquier	4,619
Piedmont	9	Fauquier	229
Piedmont	10	Fauquier	0
Piedmont	11	Fauquier/Prince William	212
Piedmont	12	Prince William	0
Piedmont	13	Pittsylvania	1,408
		Total	7,244

Potential Stream Impacts by Watershed

An analysis of potential stream impacts by watershed determined that no drainage basin would bear substantially higher impacts than another. Data are presented in Table 4-7.

Table 4-7 Potential Stream Impacts by Watershed

"Build" Concept	Holston River (Linear Feet)	New River (Linear Feet)	Roanoke River (Linear Feet)	James River (Linear Feet)	Potomac-Shenandoah Rivers (Linear Feet)	Total (Linear Feet)
Minimum Width	24,758	25,829	20,494	29,001	22,000	122,083
Maximum Width	26,116	31,038	29,012	37,099	30,604	153,870
Add 2-Lanes	28,383	25,482	20,083	28,580	21,141	123,668
Add 8- Lanes	44,420	33,015	29,069	45,521	32,100	184,069
Rail Concept 3	414	407	1,408	0	5,015	7,244

For all "Build" concepts, the greatest potential stream impacts lie within the James River watershed. Rail Concept 3 would have substantially greater potential impacts within the Potomac-Shenandoah Rivers basin, as a result of the rail improvements in northern Virginia.

In the southern portion of the I-81 corridor, particularly in Washington, Smyth, and Wythe Counties, a number of streams run adjacent to the current alignment for appreciable distances (*e.g.*, Middle Fork of the Holston River). Wider construction footprints may, therefore, overlap long stream reaches, resulting in far greater potential impacts to these streams. During Tier 2 investigations, if a "Build" concept (or portion of a "Build" concept) is advanced, additional engineering measures would be considered to shift the I-81 centerline landward to avoid and minimize impacts to these streams in accordance with future permitting requirements (see *Permit Issues* below).

4.2.3 Permit Issues

Each of the "Build" concepts would result in temporary and permanent impacts to wetlands and waters of the U.S. caused by either roadway or rail construction as previously discussed. The potential impacts presented herein are preliminary estimates and are not based on approved jurisdictional determinations made by any regulatory agency. During Tier 2 investigations, the extent of jurisdictional wetlands and waters of the United States would be confirmed if a "Build" concept (or portion of a "Build" concept) is advanced. Potential impacts may be overestimated or underestimated as a result of several factors. For example, ponds within the corridor classified as palustrine wetlands with unconsolidated bottoms (PUB) may or may not qualify as jurisdictional areas, depending in large part on whether they were constructed in uplands. In addition, regulatory agencies may take jurisdiction over other water features, such as roadside ditches.

Perennial streams and wetlands are considered jurisdictional waters of the United States as discussed in Chapter 1. Because each "Build" concept entails potential impacts to wetlands and streams, a variety of wetland and water quality permits would be required prior to construction, if a "Build" concept is advanced. These may include permits issued by the United States Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act for the placement of fill in wetlands, Section 401 water quality certification from the Virginia Department of Environmental Quality (DEQ) carried out through the Virginia Water Protection Permit Program (VWPP), and Section 10 permits. Since many of the larger streams within the road and rail corridor are considered "navigable waters", they would also be regulated under Section 10 of the Rivers and Harbors Act. Potential impacts to open-water bodies such as Claytor Lake would require a VWPP permit from the DEQ as well as a Subaqueous Lands permit from the Virginia Marine Resources Commission (VMRC) for those potential impact areas that were part of the original stream channel.

Because the Holston River watershed is within the larger Tennessee River watershed, the southern portion of I-81 is also under the purview of the Tennessee Valley Authority (TVA). Permits would also be required for activities that affect navigation, flood control or

public lands along the shoreline of the Tennessee River of its tributaries in accordance with Section 26a of the Tennessee Valley Authority Act of 1933.

If a "Build" concept (or portion of a "Build" concept) is advanced into Tier 2, the specific type of permits needed for construction would be identified.

In addition, Tier 2 analyses would evaluate avoidance and minimization measures if a "Build" concept is advanced. Unavoidable impacts to jurisdictional waters of the United States (including wetlands) would require compensatory mitigation. Compensatory mitigation can occur at the site of the impacts (on-site mitigation) or removed in distance from the impact site (off-site), typically in the same watershed. For areas within the larger Chesapeake Bay watershed, impacts would be mitigated within the Chesapeake Bay watershed in accordance with the Code of Virginia (§62.1-44.15:5). Mitigation can be in the form of 'in-kind" (mitigate with same kind of wetland being impacted) or "out-of-kind" where the impacted wetland is replaced with a different kind of wetland.

A variety of options exist for providing compensatory mitigation including:

- the purchase of credits at a wetland mitigation bank;
- in lieu fee contributions to the Wetland Trust Fund;
- joint partnerships for mitigation;
- wetland/stream preservation, enhancement, or restoration; and
- wetland creation.

While all of these options would be further explored during subsequent stages of project development if a "Build" concept (or portion of a "Build" concept) is advanced, a cursory evaluation of potential stream and wetland mitigation sites was performed for this study.

While all of these options would be further explored during subsequent stages of project development if a "Build" concept is advanced, a cursory evaluation of potential stream and wetland mitigation sites was performed for this study. The following section describes potential mitigation at a conceptual level appropriate for a Tier 1 analysis.

4.2.4 Conceptual Mitigation

An evaluation of potential stream and wetland mitigation sites was carried out both in the field during the windshield survey and via telephone interviews with representatives of the Natural Resources Conservation Service (NRCS) in field offices serving the road and rail study areas. Potential restoration sites identified during the windshield survey were selected based on observable characteristics alone. No attempt was made to determine if the landowner is amenable to mitigation efforts on his/her property. The purpose of this evaluation was to assess the general availability of potentially suitable mitigation opportunities as described below.

Stream Restoration

Approximately 30 potential stream restoration sites were identified within the study areas, each of which had an estimated restorable length of greater than 500 feet. Within the study area alone, these streams totaled 38,347 linear feet in length, or approximately 30 percent of the minimum amount of mitigation required for any of the "Build" concepts. It is important to note that stream bank instabilities observed in most of these streams continued well beyond the study area. Extrapolating to the watershed level, these results suggest that substantial restoration potential is available. Consultations with NRCS officials confirmed this finding.

Within the Holston River watershed, exceptional stream restoration potential lies within Washington and Smyth Counties, with 10 to 15 miles available in each and a number of landowners willing to be involved in the process. In the New River watershed, a conservative estimate of 100 miles was cited by NRCS staff, providing landowners are amenable. Proposed channel alignment and buffer width would have the most affect on landowner cooperation, as agricultural land is limited by topography. A conservative estimate of stream restoration in the Roanoke River watershed is 5 miles. A previous site search and feasibility investigations within Charlotte County identified excellent stream restoration opportunities in that one county alone. Conditions in the James River watershed are also favorable. In Rockbridge County (including the cities of Buena Vista and Lexington) and Botetourt County, roughly 5 miles of potential stream restoration was suggested for each by NRCS staff. Landowner participation is anticipated to be high, since flooding has caused appreciable property damage in river bottoms over the past 20 years. Numerous candidate sites were suggested by NRCS staff in the Potomac-Shenandoah watershed, including chief tributaries of the South Fork of the Shenandoah River. NRCS officials are currently protecting approximately 33 miles of stream channel as part of the Conservation Reserve Enhancement Program, and project to continue at this rate for the foreseeable future. In Frederick, Warren, and Clark Counties, suitable sites for stream restoration are estimated to total 15 miles.

The streams identified during the windshield survey as potential stream restoration sites are included in Table 4-8, coupled with linear distance estimates and key stream names provided by the NRCS. The total distance of compensation derived greatly exceeds the potential impacts in each watershed except for the James River. More detailed site searches would almost certainly produce adequate compensation in this watershed as well.

Table 4-8 Potential Stream Restoration Sites by Watershed

	Potential Restoration Sites		Estimated Length of Potential Restoration (miles)	
Watershed	Field Survey	NRCS	Field Survey	NRCS
Holston River	Greever Branch Hall Creek Tattle Branch Unnamed (2)	Beaver Creek Cedar Creek Hutton Creek Spring Creek Wolf Creek	1.5	10 - 15
New River	Goose Creek Meadow Creek Mill Creek Pine Run Sloan Branch Unnamed (3)	N/A	2.7	0 - 100
Roanoke River	North Fork Roanoke River	N/A	0.2	0 - 5*
James River	Moores Creek Renick Run	Big Calf Pasture River Little Calf Pasture River Maury River South River	0.5	0 - 10
Potomac / Shenandoah Rivers	Blacks Run Road Run Byers Branch Jordan Run Naked Creek Poague Run Pughs Run South Fork South River Town Run Unnamed (5)	Back Creek Middle River North River Opequon Creek South River	2.5	15 - 30
Total			7.4	25 - 160

* Estimate for Roanoke River watershed based on previous studies in Charlotte County

Wetland Creation, Restoration, Enhancement, and Preservation

According to NRCS officials, opportunities for wetland mitigation within the Holston and New River watersheds are more difficult to assess due to the relatively steep topography, narrow floodplains, and prevailing landowner attitudes. Many farmers are reluctant to convert rare and valuable agricultural land to suitable mitigation sites. A mitigation site of 3 acres would be considered large in the New River basin. Former floodplains downstream of Claytor Lake are rarely flooded, remaining highly productive farmland. Rather then finding one large site, compensation may have to be in the form of numerous small sites, such as several small sinkhole areas commonly found in Giles County. Nevertheless, there are several

sizable, privately-owned wetland sites (20-40 acres) participating in the Wetlands Reserve Program in Smyth County.

Previous feasibility studies in Charlotte County determined that large amounts of acreage are potentially available for wetland mitigation. A conservative estimate of available wetland acreage for the Roanoke River watershed would be 20 to 30 acres. Within the James River watershed, up to 50 acres are available in Rockbridge County alone, including the cities of Buena Vista and Lexington. Similar estimates were provided for Botetourt County. In both cases, land cover is 70 to 80 percent pasture, while 20 to 30 percent is cropped in hay. Large amounts of mitigation acreage were also estimated by NRCS officials for the Potomac-Shenandoah drainage basin. A conservative estimate of the total prior-converted (PC) cropland available is 300 acres in Augusta County alone. Based on current knowledge of landowner interest, 80 to 100 acres of this amount is available for wetland creation. Many PC tracts along the first terrace of the South River are ideal for wetland creation, ranging in size from 15 to 40 acres. Other potential sites lie on the Middle River and Calf Pasture River. Finally, at least 100 acres of suitable wetland mitigation lie within the northern counties of the Potomac-Shenandoah watershed, roughly broken into 40 percent in Frederick County, 30 percent in Warren County, and 30 percent in Clarke County.

During the windshield survey, nine sites deemed suitable for wetland mitigation were identified based on observable characteristics alone. Seven of the nine sites were classified as having between 5 and 20 acres of potential mitigation onsite or in lands immediately adjacent to an existing wetland. The remaining two sites were classified as having less than 5 acres of potential. This suggests between 45 and 140 acres suitable for compensation within the study area alone.

Each wetland was described in terms of the compensation opportunity it represents. These include wetland creation, restoration, enhancement, and preservation. The former two options usually result in both compensatory acreage and increases in functional values, whereas the latter two result an increase in functional values alone. As such, one acre of wetland enhancement and preservation does not typically result in one unit of compensatory mitigation. Of the nine wetlands identified within the I-81 corridor, it is estimated that 26 to 100 acres could be created or restored, producing the same number of credit acres. Between 21 and 80 acres of enhancement and preservation could be generated, each of which likely worth less than one credit acre.

Table 4-9 summarizes the estimates of potential wetland mitigation acreage. These preliminary results suggest that acquiring sufficient property for wetland compensation is possible within the impacted watersheds.

Table 4-9 Potential Wetland Mitigation Acreage by Watershed

	Windshield Survey			NRCS
Watershed	Sites Identified	Creation/ Restoration Acreage	Enhancement/ Preservation Acreage	Total Acreage
Holston River	3	8 – 30	8 – 30	20 – 40
New River	2	7 – 26	4 – 14	5 – 20
Roanoke River	0	0	0	20 – 30[1]
James River	1	5 – 20	0	0 – 50
Potomac-Shenandoah Rivers	3	6 – 24	9 - 36	100 – 300
Total	9	26 – 100	21 – 80	145 – 440

1 Estimate for Roanoke River watershed based on previous studies in Charlotte County

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