3 Summary of Watershed Conditions

Accotink Creek is approximately 52 square miles and is the second largest watershed in the County. It is a long, narrow watershed located in the center of the County and drains to Accotink Bay, and then into Gunston Cove and the Potomac River. Major roads within the watershed include Interstate 95, Interstate 66, Arlington Boulevard (US 50), Lee Highway (US 29-211), Richmond Highway (US 1) and Little River Turnpike (Route 236). A portion of the Capital Beltway (Interstate 495) runs through the northeastern part of the watershed and the Norfolk Southern Railroad and the CSX Railroad traverse the southern portion. The location of the watershed is shown on Map 3-1.

Approximately 11.7 square miles (23 percent) of the watershed are located in areas outside of the County jurisdiction in the City of Fairfax (11 percent) and Fort Belvoir Military Reservation (12 percent). The portions of Mainstem 1, Crook Branch and Long Branch South and the entire Daniels Run WMAs lie within the City of Fairfax and was not assessed in this planning effort. The Potomac and portions of Mainstem 6, 7 and 8 WMAs are within the boundaries of Fort Belvoir Military Reservation and were also not assessed during this study. It is important to note that future development and redevelopment of Fort Belvoir may impact the overall quality of watershed.

The Accotink Creek watershed is part of the Potomac River Basin and contains 111 miles of streams divided among the 16 WMAs listed in Table 3-1, below.

Table 3-1: Accotink Area and Stream Length by WMA

WMA	WMA Area (ac)	WMA Area (sq mi)	Stream Length (mi)
Bear Branch	1,392	2.2	5.9
Crook Branch	1,099	1.7	3.0
Daniels Run	1,209	1.9	2.6
Hunters Branch	1,202	1.9	3.2
Long Branch Central	2,429	3.8	8.0
Long Branch North	1,487	2.3	3.9
Long Branch South	3,121	4.9	7.6
Mainstem 1	3,653	5.7	11.3
Mainstem 2	2,069	3.2	9.1
Mainstem 3	3,128	5.1	13.3
Mainstem 4	1.812	2.6	6.7
Mainstem 5	2,445	3.8	8.4
Mainstem 6	1,532	2.4	8.4
Mainstem 7	2,391	3.7	9.2
Mainstem 8	3,233	5.1	12.0
Potomac	480	0.8	0.8
Total Watershed	**32,682**	**51.1**	**111.3**

The mainstem (or principal watercourse) of Accotink Creek flows for 23 miles in a southeasterly direction from the City of Fairfax to Accotink Bay near Fort Belvoir. The principal tributaries to Accotink Creek are Long Branch South, which drains into Accotink Creek in Fort Belvoir; Long Branch Central, which drains just downstream of Braddock Road; Long Branch North, which drains upstream of Prosperity Avenue; Crook Branch; Bear Branch; Hunters Branch; and Daniels Run which lies entirely within the City of Fairfax. These principal tributaries are the basis for the naming of each of the WMAs shown in Table 3-1. Lake Accotink is located in the center

of the watershed. It has a surface area of 68 acres and exerts significant influence on the drainage characteristics of the watershed. See Map 3-2 and Map 3-3 for WMA boundaries.

Map 3-1: Accotink Creek Watershed Location

0 2.5 5 Miles

Accotink Creek Watershed
County Watersheds
Areas Outside of County Jurisdiction
Waterbodies

Map 3-1
Watershed Location Map
Accotink Creek Watershed

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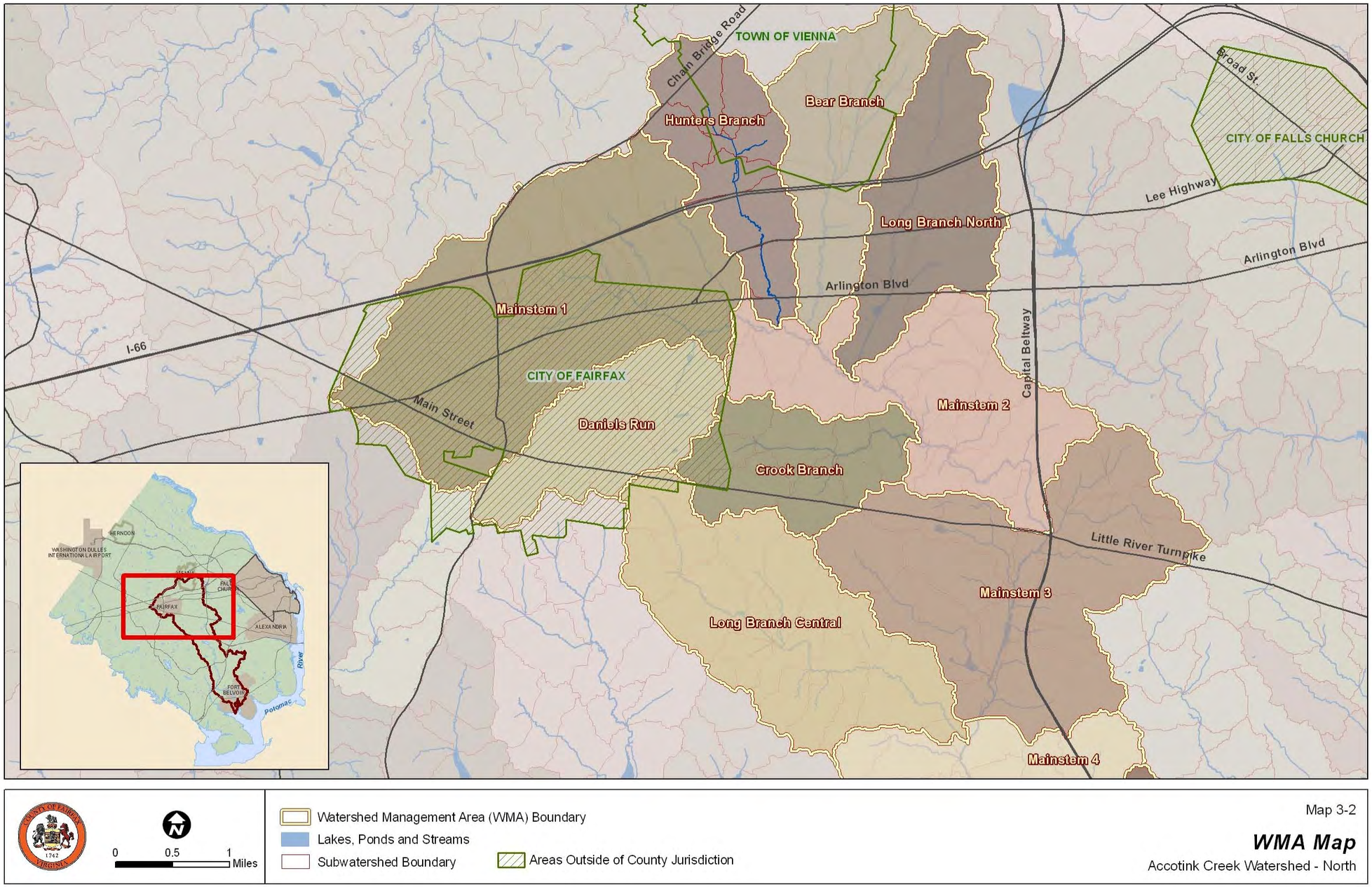
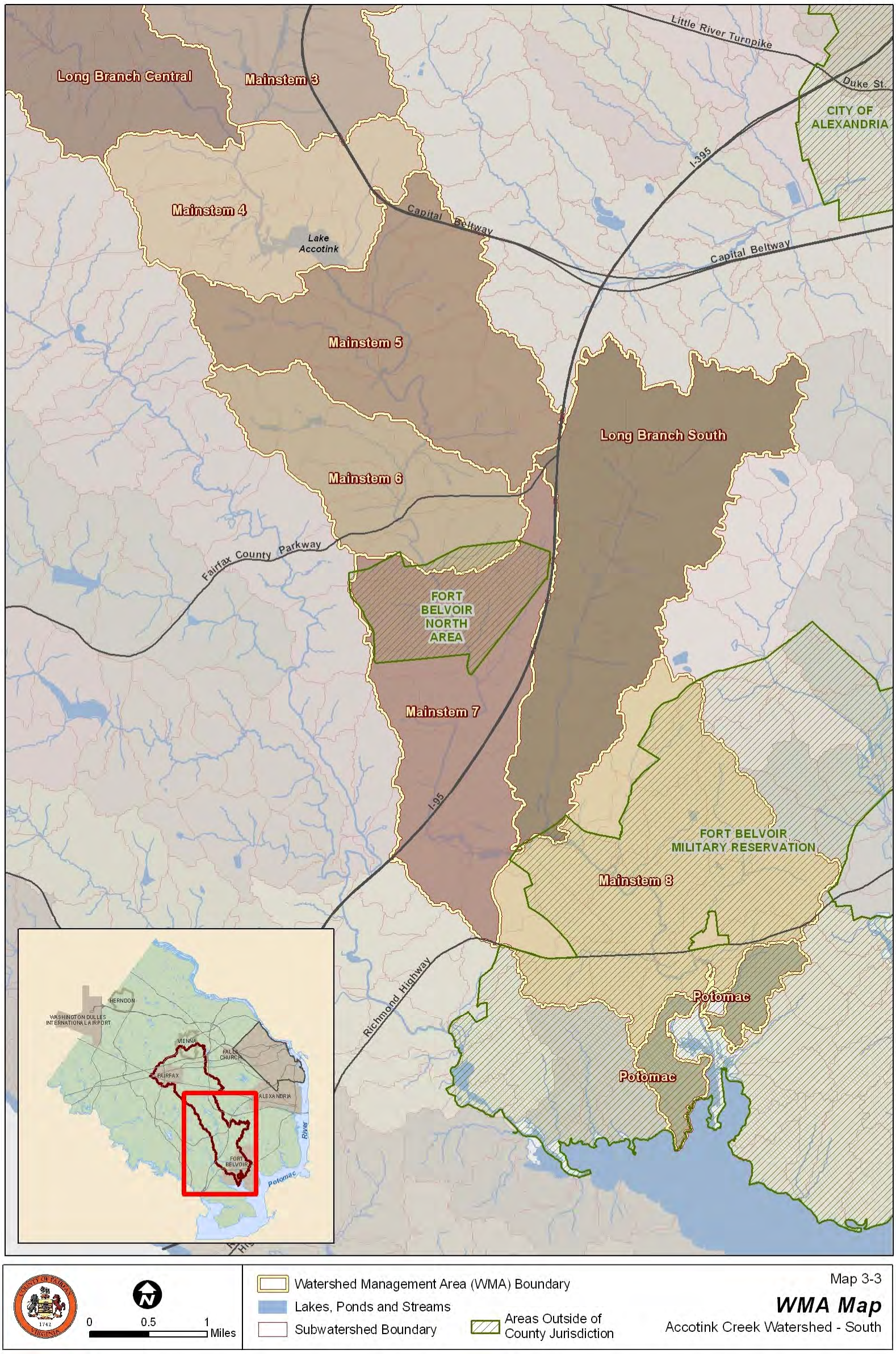
Map 3-2: Accotink Creek North WMA Map



Map 3-3: Accotink Creek South WMA Map



3.1 Watershed Land Use

Current land use mapping shows that the watershed is 87 percent developed, with 13 percent remaining as either open space or water. Map 3-4 and Map 3-5 show the land use distribution throughout the Accotink Creek watershed. Thirty-nine percent of the watershed is residential and 21 percent is in industrial, commercial or transportation land uses. Fourteen percent of the watershed is in institutional uses; the majority of this area consists of Fort Belvoir and the Fort Belvoir North Area (previously called the Engineer Proving Ground), with the remainder in public uses such as schools, churches, libraries and government office buildings. The City of Fairfax makes up another 11 percent of the watershed area; primarily in residential, commercial and industrial uses. Additionally, according to National Wetland Inventory (NWI) data, the watershed contains 1,043 acres of wetlands. Of this, approximately 880 acres are freshwater emergent and forested wetlands.

Undeveloped and forested areas in the watershed lie primarily in parkland along stream corridors or within the boundaries of Ft. Belvoir and the North Area. Roadways and development have effectively fragmented much of the remaining forest, compromising its ability to provide viable habitat. Stream corridors and the associated Chesapeake Bay Resource Protection Areas (RPAs), a 100-foot forested riparian buffer around all perennial streams in the County, provide some connection between forest cover and stream valleys, however upland forest cover does not have direct connectivity in most parts of the watershed.

The watershed is essentially built out with only 4 percent of the land use, or 1,247 acres, forecast to change through redevelopment and conversion of open space to high-intensity commercial land use.

3.2 Watershed Imperviousness

Overall, the watershed is 27 percent impervious. Imperviousness among the WMAs in the watershed ranges from three percent in the Potomac WMA to 41 percent impervious in the Long Branch North WMA. Imperviousness across the watershed is expected to increase by approximately 1.5 percent from future development.

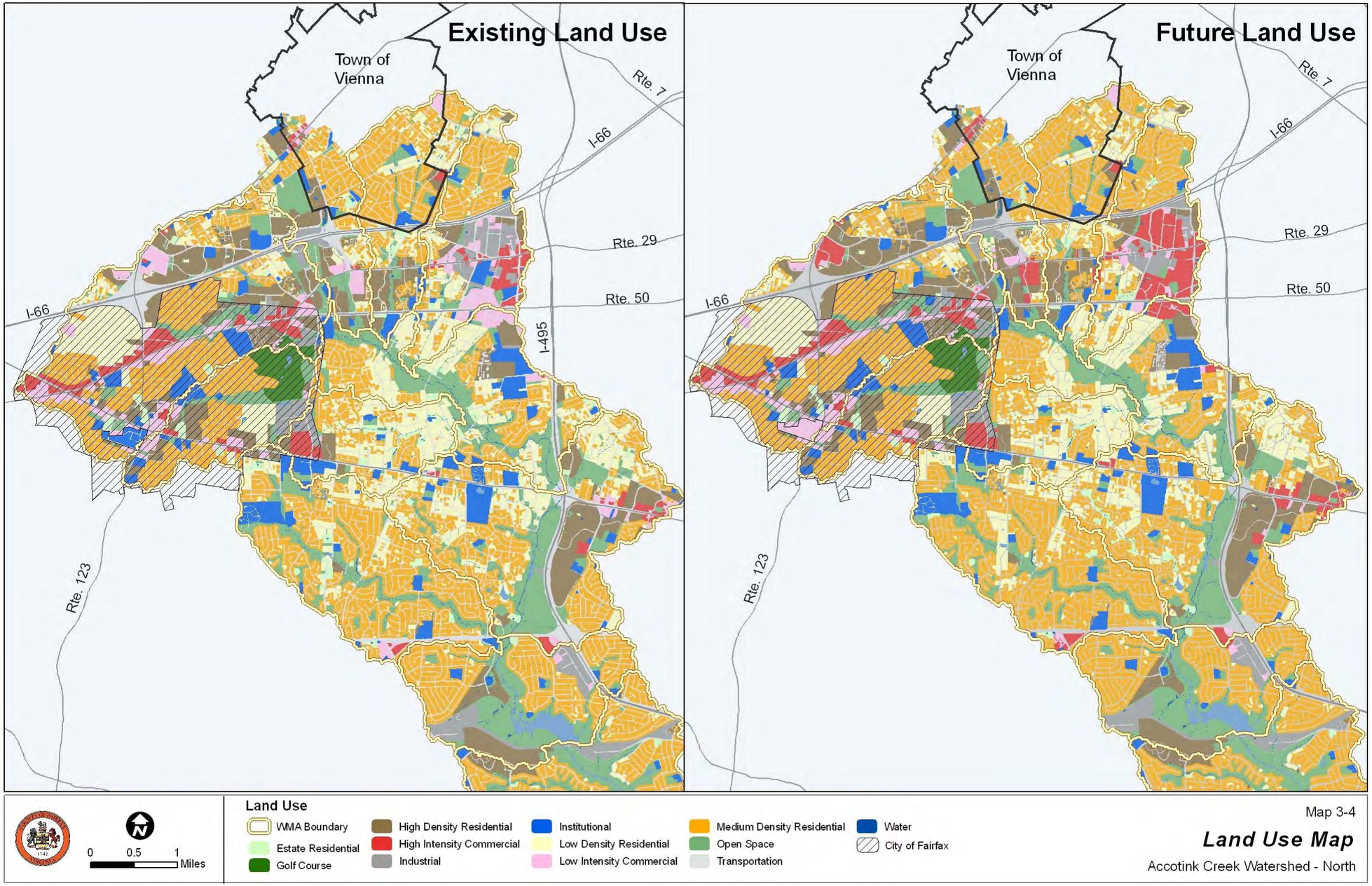
The acres of impervious surface in the watershed by WMA are shown in Table 3-2 and were calculated from geographic information system (GIS) planimetric layers provided by the County. Impervious surfaces include roads, parking lots, buildings, sidewalks and driveways.

Table 3-2: WMA Imperviousness

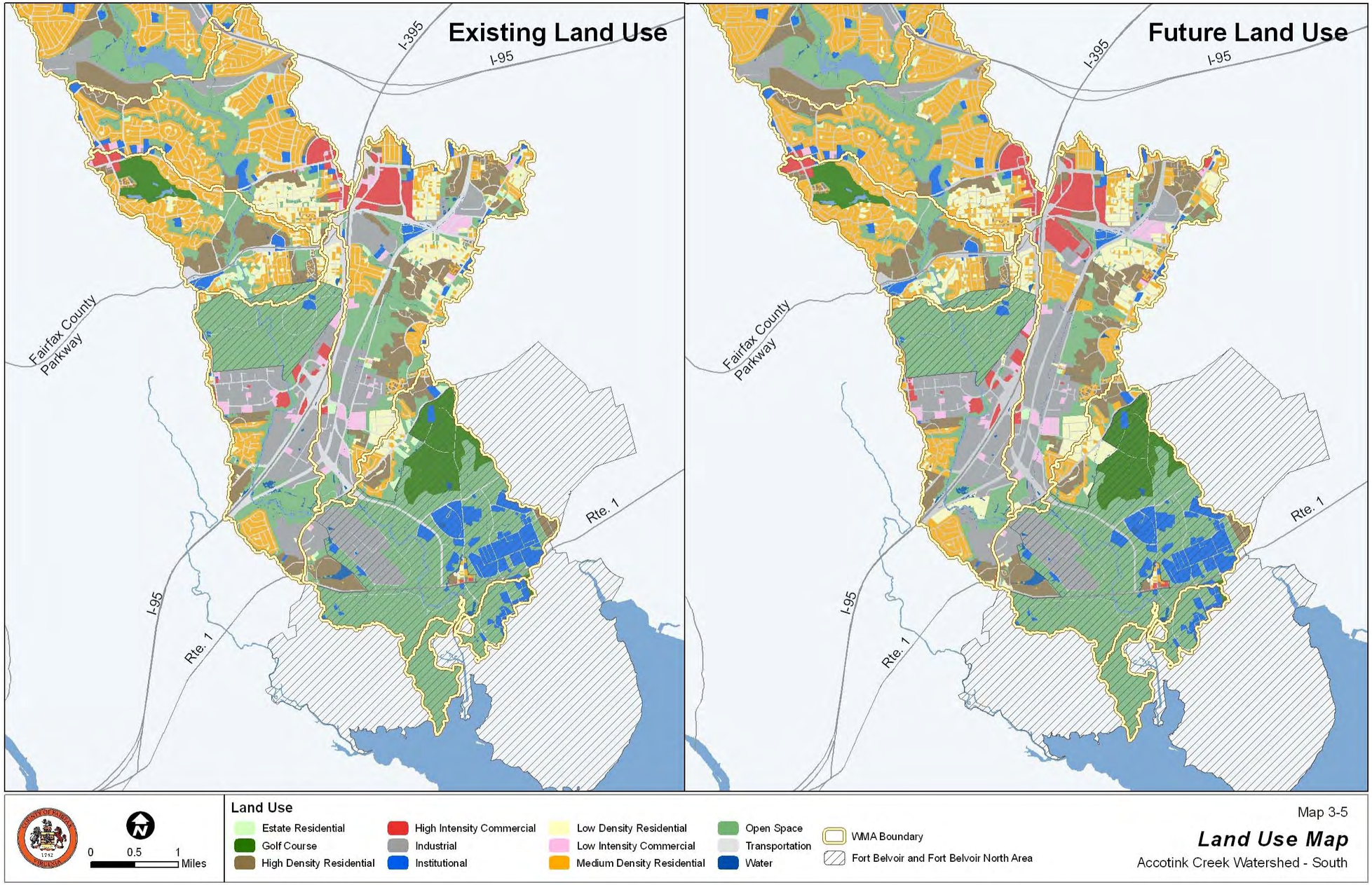
WMA	Total Area (ac)	Impervious Area (ac)	Percent Impervious
Bear Branch	1,392	397	29
Crook Branch	1,099	274	25
Daniels Run	1,209	260	22
Hunters Branch	1,202	444	37
Long Branch Central	2,429	640	26
Long Branch North	1,487	610	41
Long Branch South	3,121	1,025	33
Mainstem 1	3,653	1,421	39
Mainstem 2	2,069	434	21
Mainstem 3	3,128	841	26

WMA	Total Area (ac)	Impervious Area (ac)	Percent Impervious
Mainstem 4	1.812	582	35
Mainstem 5	2,445	694	28
Mainstem 6	1,532	378	25
Mainstem 7	2,391	651	27
Mainstem 8	3,233	304	9
Potomac	480	16	3
Total Accotink Creek Watershed	**32,682**	**8,971**	**27**

Map 3-4: Accotink Creek North Land Use Map



Map 3-5: Accotink Creek South Land Use Map



3.3 Stream Monitoring

There were 12 sampling sites within the Accotink Creek in the Stream Protection Strategy 2001 Baseline Study. The sites are shown on Figure 3-1 and listed in Table 3-3, generally from upstream to downstream. There was a lack of fish diversity and only a few insects collected were intolerant to degraded conditions.

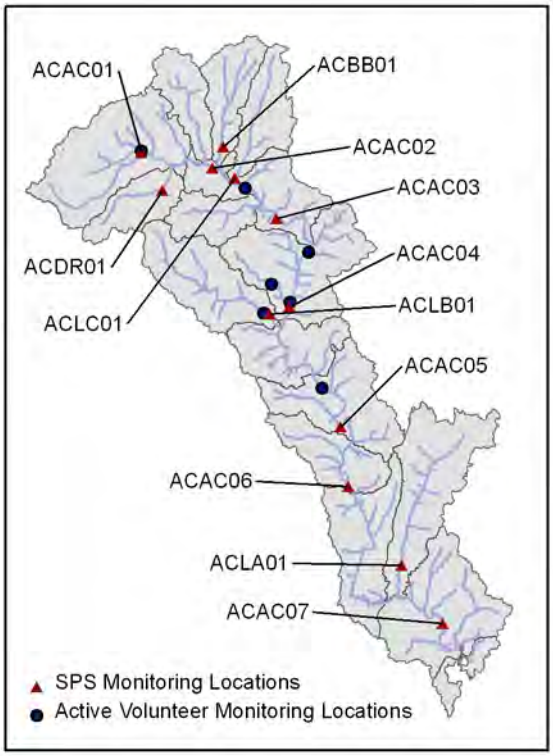


Figure 3-1: SPS and Volunteer Monitoring Locations

Geomorphological assessments indicated poor conditions throughout most of the watershed, with severely incised stream channels and active stream widening in most of the smaller tributaries. Unstable habitat and sediment bars, eroded banks, tree falls and log jams were widespread throughout. The poor and very poor overall rankings of the sites in Table 3-3 are consistent with the fact that many of the streams flow through heavily urbanized areas with greater than 25 percent imperviousness.

In addition to monitoring conducted by the County, the Northern Virginia Soil and Water Conservation District (NVSWCD) maintains a volunteer monitoring program throughout Fairfax County. All seven active volunteer monitoring sites in the Accotink Creek watershed received ratings of unacceptable in 2006. Five of these monitoring sites were located on the mainstem of Accotink Creek. Two additional sites were located on tributaries that flow into the mainstem; one tributary in southern Long Branch Central WMA and one tributary in southwestern Mainstem 3 WMA.

Table 3-3: Stream Protection Strategy Baseline Data Summary

Site Code and Stream Name	Composite	Environmental Variables		
	Site Condition Rating	Index of Biotic Integrity	Habitat Score	Fish Taxa Richness
ACAC01- Accotink Creek 1	Very Poor	Poor	Very Poor	Low
ACDR01- Daniels Run	Very Poor	Very Poor	Poor	Very Low
ACAC02- Accotink Creek 2	Very Poor	Fair	Very Poor	Moderate
ACBB01- Bear Branch	Very Poor	Very Poor	Poor	Low
ACLC01- Long Branch North	Very Poor	Very Poor	Poor	Low
ACAC03- Accotink Creek 3	Very Poor	Poor	Poor	Moderate
ACAC04- Accotink Creek 4	Poor	Poor	Poor	Moderate
ACLB01- Long Branch Central	Poor	Poor	Fair	Moderate
ACAC05- Accotink Creek 5	Poor	Very Poor	Good	Moderate
ACAC06- Accotink Creek 6	Poor	Poor	Good	Moderate
ACLA01- Long Branch South	Poor	Poor	Good	Low
ACAC07- Accotink Creek 7	Poor	Poor	Poor	Moderate

Source: SPS Baseline Study Report, 2001. Sites are generally ordered from upstream to downstream.

3.4 Stream Habitat and Geomorphology

To supplement the biological and habitat data collected by the Stream Protection Strategy Baseline Study, beginning in the fall of 2002, field crews conducted a detailed Stream Physical Assessment (SPA) on approximately 801 miles of streams throughout Fairfax County, including the Accotink Creek watershed. As part of the SPA, field crews completed a physical habitat assessment, a geomorphologic assessment and collected infrastructure information for all streams in the watershed with a drainage area greater than 50 acres. The results of the assessment were used in the watershed planning process to develop management strategies.

Habitat was assessed on 91 of the 111 miles of stream within the Accotink Creek watershed for the SPA study. In comparison with the rest of the County, the watershed is in the lower middle range of quality. Of the assessed reaches, four miles of stream was rated as excellent, 25 miles as good, 33 miles as fair, 26 miles as poor and three miles as very poor for habitat conditions. Geomorphological evaluations resulted in classifying 91 percent of the channels as unstable and experiencing severe bank erosion.

The SPA infrastructure inventory included all structures and conditions that may have potential impacts on the stream, such as sources of contamination or pipes, ditches, stream obstructions, dump sites, head cuts, utilities, erosion problem areas, stream crossings and areas of deficient buffer. Of the 1,211 inventory points, the most significant problems were deficient buffers, head cuts, exposed utility lines and erosion at pipe outfalls.

3.5 Water Quality

The streams of the Accotink Creek watershed are regulated by water quality standards set by the Virginia State Water Control Board (SWCB). Waters in the Accotink Creek watershed are designated as Class III waters (Nontidal Waters Coastal and Piedmont Zones), with regulated criteria for dissolved oxygen, pH and maximum temperature. Fecal coliform and *Escherichia coli,* a specific species of fecal coliform bacteria, are also regulated.

Fairfax County Sampling – Water quality data is collected through ongoing monitoring conducted by the County and various volunteer organizations. Available data for the Accotink Creek watershed, from June 1999 to March 2007 as part of the baseline SPS and continuing DPWES monitoring, indicate one site with a pH below the acceptable range of 6.0 and one site with dissolved oxygen below the acceptable range of 4 mg/L.

The Fairfax Department of Health's Division of Environmental Health conducted a water quality sampling program throughout Fairfax County from 1969 until 2002. For data collected between 2000 and 2002 at the 14 sampling sites in the Accotink Creek watershed, pH was outside of criteria limits for only one percent of over 700 samples. Criteria exceedance for dissolved oxygen and temperature were also low, with five percent of samples below the allowable dissolved oxygen limit and no sample above the allowable temperature. However, fecal coliform samples exceeded the maximum allowable limit of 200 colonies per 100 ml of water for 80 percent of the samples.

303(d) List and TMDLs - The Commonwealth of Virginia is required to monitor Waters of the State and submit a report to EPA and the public every two years. The Virginia Department of Environmental Quality (DEQ) prepares and submits the 305(b)/303(d) Water Quality Assessment Integrated Report, which combines general water quality information required under section 305(b) of the Clean Water Act (CWA) with a report on impaired waters that do not meet water quality standards required under Section 303(d).

The list of impaired waters in the Integrated Report (often referred to as the 303(d) List) describes the locations of the listed water body and the cause and source of pollutants causing the impairment. Once a water body is listed as impaired, a plan is developed to restore the water. This plan takes into account the total amount of pollution a water body can assimilate, or a total maximum daily load (TMDL). The restoration plan is often referred to as a TMDL and is accompanied by a target year for restoration (referred to as a schedule). Impaired waters for which a TMDL is required are listed under Category 5 in the Impaired Waters Report. For more information on Virginia's monitoring program, visit DEQ's page at www.deq.state.va.us/wqa/homepage.html. For more information on the TMDL program in Virginia, visit DEQ's page at www.deq.virginia.gov/tmdl/homepage.html.

DEQ listed portions of the streams in the Accotink Creek watershed as impaired waters, shown in Table 3-4.

Table 3-4: Impaired Water Bodies

Impairment Code	Location	Impairment	Year Listed	TMDL Schedule
A15L-01-HG	Lake Accotink	Mercury in fish tissue	2010	2022
A15L-01-PCB	Lake Accotink	PCBs in fish tissue	2010	2022
A15R-01-BAC	Begins at the confluence with Calamo Branch and continues downstream to the tidal waters of Accotink Bay.	Fecal Coliform, *Escherichia coli*	2004	2016
A15R-01-BEN	Begins at the outlet of Lake Accotink and continues downstream until the confluence of Calamo Branch	Benthic-Macroinvertebrate Bioassessments	2010	2022
A15R-01-BEN	Begins at the confluence with Calamo Branch and continues downstream to the tidal waters of Accotink Bay.	Benthic-Macroinvertebrate Bioassessments	1996	Draft benthic TMDL was prepared to control stormwater flow. Public comment period ended 8/20/2010.
A15R-01-PCB	Begins at the confluence with Calamo Branch and continues downstream to the tidal waters of Accotink Bay.	PCBs in fish tissue	2010	2022

Impairment Code	Location	Impairment	Year Listed	TMDL Schedule
A15R-02-BAC	Begins at the confluence with Crook Branch, upstream from Route 846, and continues downstream until the start of Lake Accotink.	*Escherichia coli*	1998	A fecal coliform TMDL for Accotink Creek above Lake Accotink was approved May 31, 2002.
A15R-03-BAC	Segment starts at confluence of Daniels Run to Accotink Creek in the City of Fairfax and extends downstream to the confluence of Bear Branch to Accotink Creek.	*Escherichia coli*	2002	A fecal coliform TMDL for Accotink Creek above Lake Accotink was approved May 31, 2002.
A15R-04-BEN	Segment begins at the confluence with an unnamed tributary to Accotink Creek, located in the upstream corridor of Ranger Park, and continues downstream to the confluence with Daniels Run.	Benthic-Macroinvertebrate Bioassessments	2008	2020
A15R-04-BEN	Begins at the headwaters of Accotink Creek and continues downstream until the start of Lake Accotink.	Benthic-Macroinvertebrate Bioassessments	2010	2022
A15R-05-BEN	Begins at the confluence with an unnamed tributary to Long Branch, at the Route 651 (Guinea Road) bridge, and continues downstream until the confluence with Accotink Creek, at rivermile 14.32 just below Braddock Road.	Benthic-Macroinvertebrate Bioassessments	2008	2020
A15R-06-BAC	Begins at the headwaters of Long Branch and continues downstream until the confluence with Accotink Creek, at rivermile 4.41.	*Escherichia coli*	2008	2020

USGS Bacteria Source Tracking – In 1998, a 4.5-mile segment of Accotink Creek from the confluence of Crook Branch and Accotink Creek to the start of Lake Accotink was placed on the Section 303(d) list of impaired waters due to elevated levels of fecal coliform bacteria (A15R-02-BAC in Table 3-4). In order to develop a TMDL for this stream segment, a study was conducted by the United States Geological Survey (USGS) in cooperation with Virginia Department of Conservation and Recreation (DCR). This study was a bacteria source tracking (BST) study which would identify the sources of fecal coliform in the streams using genetic fingerprinting. This study showed that the most significant sources of fecal coliform bacteria were geese, humans, dogs, cats, sea gulls and raccoons.

The results of the BST study were used in combination with a watershed model to simulate streamflow and bacterial transport in the watershed. According to the results of this second study, in order for the watershed to meet state water quality standards and the associated TMDL, an 89 percent reduction in fecal coliform bacteria load would need to occur. The full report may be found at: http://pubs.usgs.gov/wri/wri034160/wrir03-4160.htm.

3.6 Field Reconnaissance and Investigations

Field reconnaissance was conducted to update and supplement existing Fairfax County geographic data so current field conditions were accurately represented. This information was used to update watershed GIS data for subsequent analysis. The reconnaissance effort included the identification of pollution sources, current stormwater management and potential restoration opportunities using the Center for Watershed Protection's Hotspot Site Investigation (HSI) and Neighborhood Source Assessment (NSA). These assessments are described in Manual No. 11 of the Center's Urban Subwatershed Restoration Manual Series and are available from the Center's website at www.cwp.org.

Hotspot Site Investigation- The Hotspot Site Investigation was conducted to evaluate the pollution-producing behaviors at commercial hotspots (such as gas stations, restaurants, industrial areas, etc.). The goal was to quickly identify areas where stormwater pollution is generated and identify ways to mitigate it. A subsample of potential hotspots within the watershed was assessed. At each site, field crews evaluated various site practices, including vehicle operations, outdoor material storage, waste management, condition of the building, parking and landscaped areas and stormwater infrastructure.

Neighborhood Source Assessment- The Neighborhood Source Assessment is used to evaluate the pollution-producing behaviors in residential areas. A subsample of neighborhoods within the watershed was assessed. Field crews used a windshield survey method to get a sense of general neighborhood characteristics, such as the location of downspouts, turf management, curb and gutter condition and the amount of forest canopy. Where needed, the neighborhood was split into multiple areas when one portion of the neighborhood had significantly different characteristics.

The Draft Watershed Workbook (Appendix A) presents detailed information from field assessments of streams and upland areas, water quality monitoring data and watershed preliminary modeling conducted for this plan. The information was used to rank problem areas and identify potential sites for improvements.

In 2009, field crews conducted 37 Hotspot Site Investigations and assessed 54 neighborhoods in the Accotink Creek watershed to determine potential runoff pollution sources and identify potential treatment practices. As a result of this investigation, there were nine confirmed hotspots and 22 potential hotspots identified. Some neighborhoods lacked stenciled storm drains and many would benefit from a lawn care education program. Table 3-5 provides a summary of the sites investigated for each WMA.

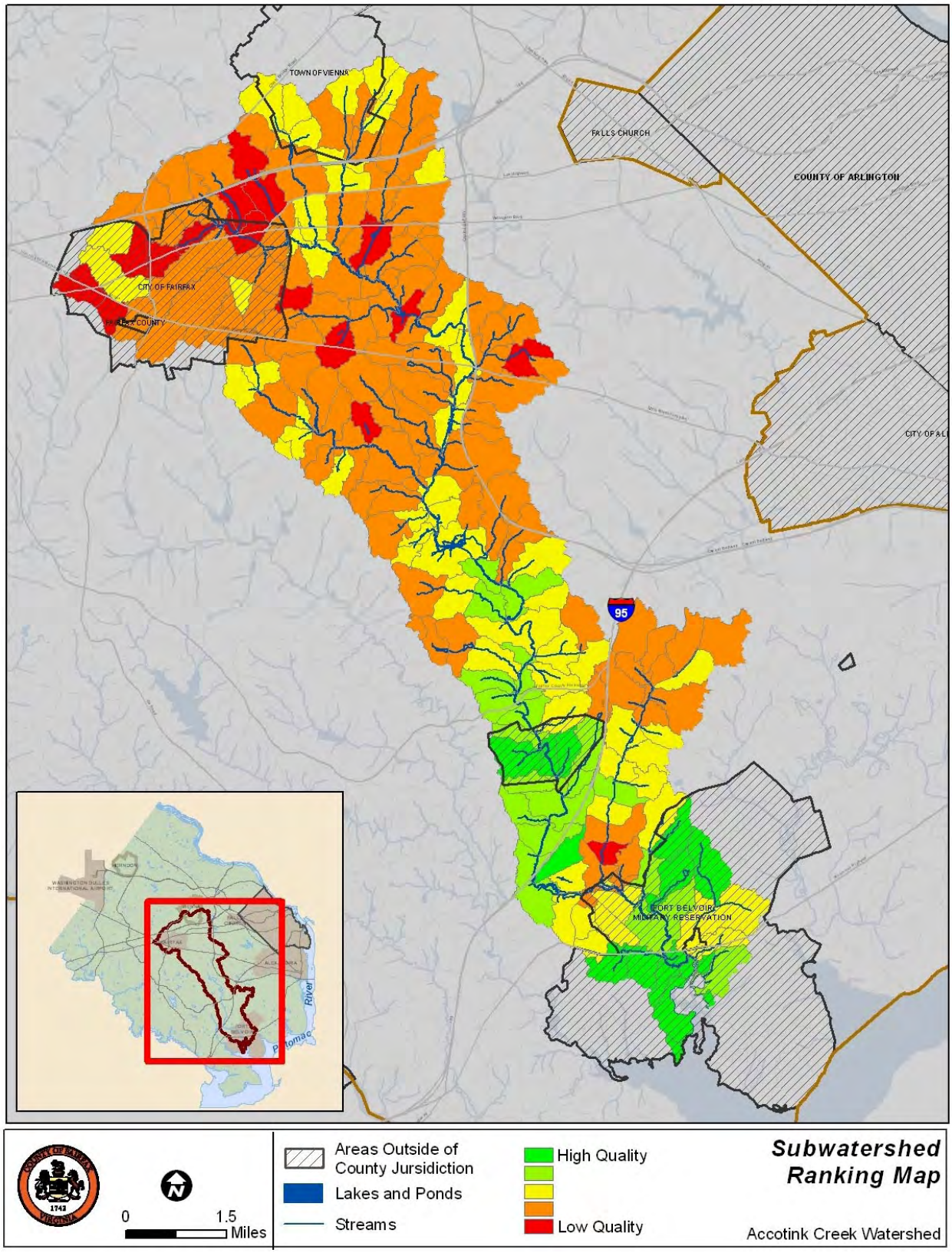
Table 3-5: Accotink Creek Watershed HSI/NSA Results

WMA	HSI	NSA	Confirmed Hotspots	Potential Hotspots	NSA Result
Bear Branch	n/a	1	n/a	n/a	Lacked stenciled storm drains
Crook Branch	n/a	2	n/a	n/a	Single family neighborhoods, lacked stenciled storm drains in some areas and lawn care education recommended.
Daniels Run	n/a	n/a	n/a	n/a	
Hunters Branch	1	n/a	0	0	
Long Branch Central	1	14	0	1	A few storm drains remain unstenciled. Lawn care education recommended.
Long Branch North	7	2	3	4	Neighborhoods generally in good condition.

WMA	HSI	NSA	Confirmed Hotspots	Potential Hotspots	NSA Result
Long Branch South	8	3	3	2	Recommend rain gardens/barrels and lawn care education.
Mainstem 1	1	1	0	1	Neighborhood generally in good condition.
Mainstem 2	n/a	2	n/a	n/a	
Mainstem 3	n/a	11	n/a	n/a	
Mainstem 4	2	2	0	1	Recommend better maintenance of common space and stenciling in some areas.
Mainstem 5	3	7	1	2	Recommend tree planting in open spaces and rain barrels in some areas.
Mainstem 6	6	2	0	6	Rain barrels/rain gardens recommended.
Mainstem 7	2	1	0	1	Storm drain stenciling, lawn care education and rain gardens recommended.
Mainstem 8	6	6	2	4	Better management of common space, better lawn care practices recommended.
Potomac	n/a	n/a	n/a	n/a	
Total	**37**	**54**	**9**	**22**	

Modeling – The pollutant load model (STEPL) showed an increase of pollutant loads from existing conditions to future conditions without projects for the entire Accotink Creek watershed of 1.4 percent for Total Suspended Solids, 4.6 percent for Total Nitrogen and 3.8 percent for Total Phosphorus. Individually, the Mainstem 7, Long Branch South, Potomac, Hunters Branch and Long Branch North WMAs have the largest modeled increases for these three pollutants. All other WMAs in the watershed increase less than 6 percent for all pollutants. Table 6-2 in the last section of this WMP summarizes the pollutant load modeling results by WMA for existing conditions and future conditions, as well future conditions with the proposed 10-year and 25-year projects. The Technical Memorandum for Task 3.6 (Model Analysis) in Appendix B provides more background on the modeling procedures.

3.7 Subwatershed Ranking

The subwatershed ranking procedure described in Section 2.3 was performed on the Accotink Creek watershed. **Map 3-6** shows the results of the ranking. In general, areas in better condition (green or yellow) are those with a substantial amount of open space. The value of the stream valley parks can be seen, in particular. The northern half of the watershed which shows up in lower quality condition is more intensely developed. Streams in this half of the watershed were generally in worse condition, with active erosion, incision, and widening. This process identified areas in most need of projects to reduce the effects of uncontrolled stormwater or to restore the integrity of the stream system.

Map 3-6: Subwatershed Ranking Map