

6.8 Parks and Recreation

Parks and Recreation amenities in the County are provided and managed by numerous entities. The County Department of Parks and Recreation maintains eighteen facilities countywide that offer sports, recreation and cultural activities for all ages. Curtis Park, Aquia Landing, Willowmere Park, Fritter Park, Duff McDuff Green Park, and Smith Lake Park are the largest facilities, providing the greatest variety of recreational opportunities. Smaller, more specialized facilities are located throughout the County. The County charges a user fee for the use of some facilities, and at some sites, charges more for non-Stafford residents. An 18-hole golf course, The Gauntlet, operated by Golf Course Specialists, Inc., is located at Curtis Park. Private organizations provide recreation facilities to their members. In addition to County facilities, the Fredericksburg and Spotsylvania National Military Park is located at Chatham Manor on River Road. Figure 6.9 shows the location of parks and recreation resources in the County.

In November 2009, County voters approved a bond referendum for \$29 million in General Obligation Bonds for park and recreation improvements and acquisitions. The specific facilities in the referendum include:

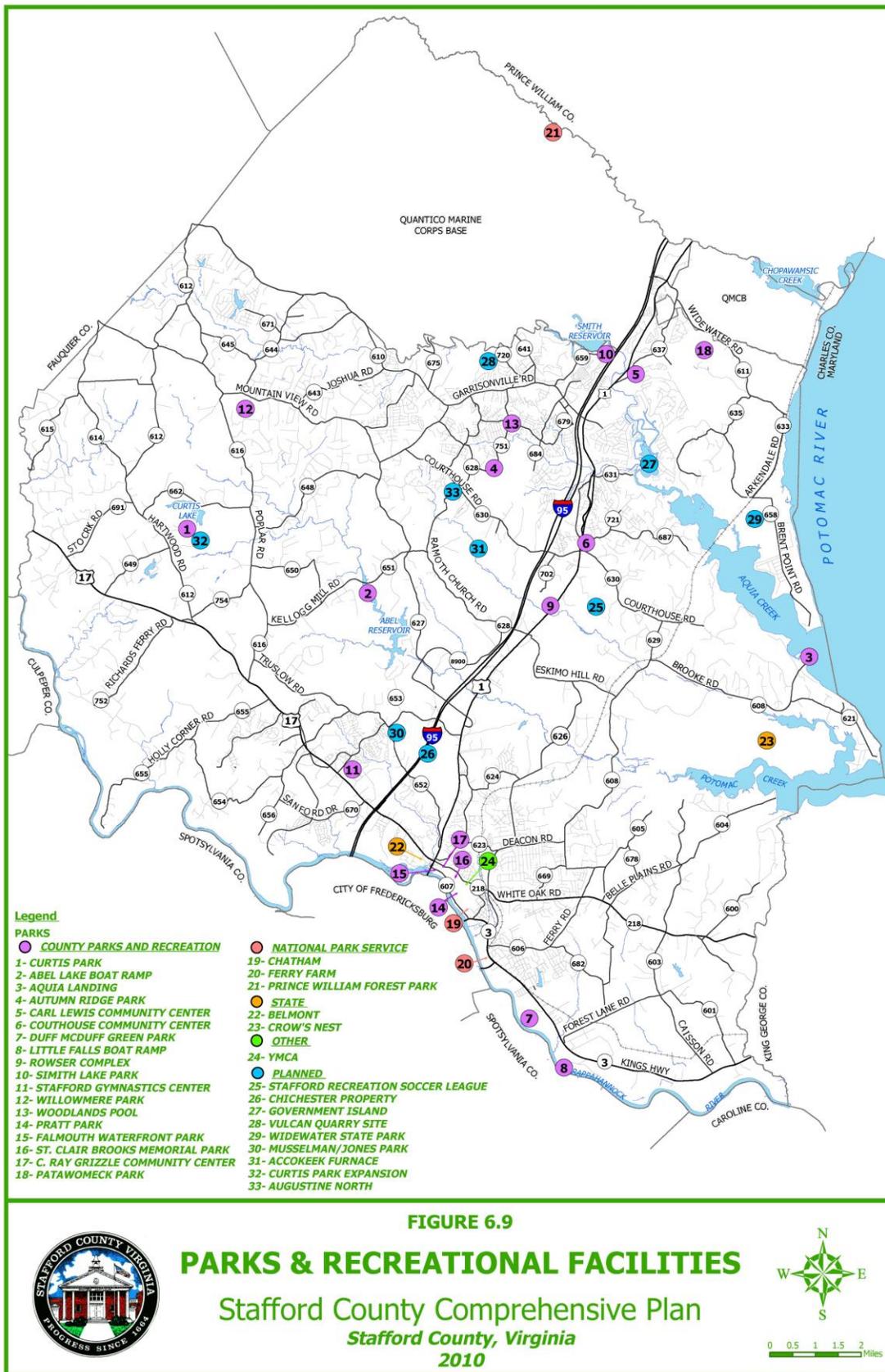
- Development of three (3) new park facilities
- Development of three (3) new trail systems
- Renovations at several parks
- Land acquisition for future parks

Bond referendums have been approved in the past for parks. In November, 1993, County voters approved a bond referendum for \$3.8 million in General Obligation Bonds for park facilities. The County issued the bonds during fiscal year 1995. Plans included the design and construction at Willowmere Park, Duff McDuff Green Park, and Woodlands Pool, and the design of Smith Lake Park. Development of these parks has greatly enhanced the array of facilities available within the County. In November, 2002, voters approved another bond referendum for \$11 million for additional park facilities.

Table 6.23: Facilities Managed by the Department of Parks and Recreation

<u>Abel Lake Reservoir</u>		<u>Curtis Park</u>		<u>Rowser Complex</u>	
1	Boat Ramp	1	Boat Ramp		Restrooms
		1	Fishing Pier	1	Kitchen
		1	18-Hole Golf Course	1	Meeting Room
<u>Aguia Landing</u>		10	Mile Hiking Trails	1	Soccer Field
1/4	Linear Beach	5	Mile Jogging Trails	1	Little League Field
15	Picnic Tables	1	Swimming Pool	1	Gymnasium
1	Open Play Area	100	Picnic Tables		
1	Concession Building	1	Playground	<u>Smith Lake Park</u>	
3	Restroom Facilities	6	Tennis Courts	1	Open Play Area
2	Picnic Shelters	2	Volleyball Courts	1	Tot Lot / Playground
		1	Amphitheater	3	Soccer Fields
<u>Autumn Ridge Park</u>		1	Softball Field	3	Baseball/Softball Fields
<u>1</u>	<u>Soccer Field</u>	1	Multipurpose Field	2	Restrooms
<u>1</u>	<u>Baseball Field</u>	8	Picnic Shelters	35	Parking Spaces
<u>1</u>	<u>Picnic Shelter</u>		Restrooms		
<u>1</u>	<u>Tot Lot</u>			<u>Stafford Gymnastics Center</u>	
<u>1</u>	<u>Basketball Court</u>	<u>Duff McDuff Green Park</u>		1	Gymnasium
			Scenic River Overlook		Restrooms
		1	Open Play Area		
<u>Carl Lewis Field and Community Building</u>		2	Soccer Fields	<u>Willowmere Park</u>	
2	Little League Fields	3	Baseball/Softball	3	Soccer Fields
1	Soccer Field	2	Restrooms	3	Baseball Fields
1	Meeting Room	25	Parking Spaces	1	Restrooms/
1	Kitchen	2	Miles Hiking Trails		Concession Bldg
	Restrooms	4	Picnic Shelters	2	Picnic Shelters
				2	Miles Walking Trail
				1	Open Play Area
<u>Courthouse Community Center</u>		<u>Falmouth Waterfront Park</u>			
1	Gymnasium		Beach	<u>Woodlands Pool</u>	
	Restrooms	1	Restroom Facility	1	Indoor/Outdoor Pool
				1	Bath House
<u>St. Clair Brooks Memorial Park</u>		<u>Little Falls Boat Ramp</u>			
5	Miles of Hiking Trail	1	Boat Ramp	<u>Patawomack Park</u>	
1	Playgrounds				
4	Basketball Courts	<u>John L. Pratt Park</u>			
1	Lighted Baseball Field	0.35	Miles of Hiking Trail		
1	Lighted Little League Field	2	Playgrounds		
1	Lighted Softball Field	2	Tennis Courts		
1	Multipurpose Field	2	Basketball Courts		
3	Picnic Shelters	2	Picnic Shelters		
1	Restroom Facilities	1	Restroom Facilities		
				<u>C. Ray Grizzle Community Center</u>	

Source: Stafford County Department of Parks and Recreation



School Maintained Recreation Facilities

The County School Board maintains the playfields and other facilities at the County schools. Although these facilities were developed and primarily intended for the use of students, some of the fields, gymnasiums, and other facilities are available for public use. The County Parks and Recreation Department coordinates recreational programs in several sports which take place on School Board property.

Table 6.24 School Board Owned Recreational Facilities

School	Recreational Facilities
Elementary Schools (PK-Grade 5)	
Anthony Burns	1 Playground
Conway	1 Playground, 1 Basketball Court
Falmouth	2 baseball fields, 2 playgrounds, 1 soccer field, 2 basketball courts
Ferry Farm	1 playground, 1 little league field, 1 soccer field
Garrisonville	1-1/4 mile fitness trail, 2 playgrounds, 2 soccer fields, 1 little league field, 1 gymnasium
Grafton Village	1 playground, 1 soccer field
Hampton Oaks	1 Playground, 1 soccer field
Hartwood	1 playground, 2 softball fields, 1 football field, 2 basketball courts
Kate Waller Barrett	1 playground
Margaret Brent	1 playground
Anne E. Moncure	1 playground, 1 little league field
Park Ridge	1 playground, 1 soccer field 1 baseball field
Rockhill	1 playground
Rocky Run	1 soccer/softball field
Stafford	1 baseball field, 1 practice field, 2 soccer fields
Widewater	1 little league field, 2 soccer fields, 1 practice field
Winding Creek Elementary	1 playground, 1 softball/soccer field
Middle Schools (Grades 6-8)	
Dixon-Smith	1 gymnasium, 1 football field, 1 softball field, 1 soccer field, 4 tennis courts, ¼ mile track, auxiliary gym
Edward E. Drew	1/4mile track, 1 softball field, 1 football field, 4 tennis courts, 1 gymnasium, 1 indoor basketball court, 1 soccer field
T. Benton Gayle	1/4miletrack, 2 baseball/softball fields, 1 football field, 2 soccer fields, 1 gymnasium
H. H. Poole	1 softball field, 1 baseball field, 1 football field, 2 soccer fields, 1 open field, ¼ mile track, 1 gymnasium
Rodney Thompson	1 gymnasium, 1 auxiliary gym, 1 football field, 4 multi-purpose fields, ¼ mile track
Stafford	1 baseball field, 1 dual purpose field, 1 practice field, 1 playground, ¼ mile track, 1 indoor basketball court, 1 gymnasium
A. G. Wright	1 softball fields, 1 football fields
High Schools (Grades 9-12)	
Brooke Point	2 baseball fields, 1 softball field, 1 gymnasium, 1 football field, 2 soccer fields, 2 practice fields, ¼ mile track
Colonial Forge	1 gymnasium, 6 lighted multi-purpose fields, 1 lighted baseball field, 1lighted softball field, 3 softball/baseball fields, 5 soccer/field hockey fields, 6 tennis courts, 1 auxiliary gym
Mountain View	1 gymnasium, 1 lighted multi-purpose field, 1 lighted softball field, 1 baseball field, 5 soccer/field hockey fields, 6 tennis courts, 1 auxiliary gym
North Stafford	2-mile hiking trail, 1 baseball field, 1 softball field, 1 lighted multi-purpose field, 6 tennis courts, 2 practice fields, 1 gymnasium, ¼ mile track
Stafford	2-mile fitness trail, ¼ mile track, 1 lighted baseball field, 1 softball field, 1 lighted dual purpose field, 6 tennis courts, 1 gymnasium

Source: Stafford County Parks and Recreation Department

6.8.1 *National Parks*

Chatham Manor

Chatham Manor is the Fredericksburg and Spotsylvania National Military Park headquarters located at 120 Chatham Lane overlooking Fredericksburg. Chatham Manor is a former hospital for Union soldiers during the Civil War.

6.8.2 *Other Recreational Facilities and Organizations*

In addition to the recreation facilities that are owned and operated by Stafford County or the Stafford County School Board, there are other recreational resources that are available to residents. These include local creeks and rivers, hunting acreage on the Quantico Marine Base, various golf courses and marinas, recreation centers, and community swimming pools. Private organizations such as the American Legion, Girl Scouts of America and YMCA maintain private facilities. In addition, youth sports are organized by private organizations such as the Stafford Baseball League, Stafford Area Soccer Association, and the Stafford Youth Football Coaches Association.

6.8.3 *Future Park Facilities*

Stafford County has realized the importance of developing new parks as its population grows and the needs of its residents change. There are properties that the County has acquired or is pursuing in order to actively transform them into viable public parks. They include:

- Chichester Property,
- Crows Nest,
- Government Island,
- Musselman/Jones Property,
- proffered site on the Vulcan Quarry property.

In addition, there are properties owned by other entities that are proposed for park development or preservation of natural resources. These include:

- Stafford Recreational Soccer League property on Courthouse Road,
- Widewater State Park, and
- City of Fredericksburg owned riparian land along the Rappahannock River.

Stafford County is a fast growing community. There is a need for more parks in order to meet the population demands. Acquiring new park land is difficult but important to meet the changing recreational and athletic needs of county residents. The cost of property in Stafford County is increasing rapidly. Buying large (i.e. 100-200+ acres) parcels may be no longer financially feasible. It is recommended that smaller parcels be purchased (between 20-50 acres). These parcels should be designed as neighborhood parks that pedestrians can readily access without having to drive to the facility. The parcels should be located in the northern and southern ends of the County, but it is essential that they be close to Interstate 95 so residents can access them easily.

6.8.4 *Potomac Heritage National Scenic Trail*

In December 2006, the National Park Service designated three trails in Stafford as part of the Potomac Heritage National Scenic Trail. The Potomac National Scenic Trail is a 425-mile corridor between the Chesapeake Bay and the Allegheny Highlands. The National Park Service administers, designates and coordinates the trail and local jurisdictions manage their sections of the trail. The selected trails are expected to help boost tourism in the County, since they will be included in National Park Service literature and maps and promoted through the Service's website. The Stafford trails are:

- Government Island Trail – 1.5 miles in length on Government Island highlighting historic quarries, building foundation, roadbed and canal; stone quarried here was used to construct some of the nation's most prominent buildings, including the White House and US Capitol Building. The Trail will be completed in 2010.
- Belmont-Ferry Farm Trail – When it is finished, the Trail will connect Belmont to Chatham and Ferry Farm as well as the Historic Port of Falmouth and the Moncure Conway House which is designated in the National Underground Railroad Network to Freedom. The first 1.5 miles of trail were completed in 1998. There are 3.5 miles yet to be developed. That should happen in the next several years.
- Aquia Creek Water Trail – This trail, which is yet to be developed, will celebrate the unique Civil War history of the creek as well as the transportation history of Aquia Landing.

6.8.5 *Parks Analysis*

Area guidelines are used to determine the number of acres of recreational and park lands that are needed by a locality. The 2002 Virginia Outdoors Plan provides an area guideline for recreation and park sites in Virginia of 10 acres per 1,000 people in the population. This figure represents a minimum acreage that should be provided whenever possible. County-wide, the 10 acres per 1,000 population model is used.

Virginia's state guideline for parkland is 10 acres per 1,000 of population. However, Stafford's Parks and Recreation Commission has adopted a standard of twice this level, or 20 acres per 1,000 residents. Based upon this standard, Stafford should have approximately 2,360 acres of recreation and park space. Residents currently have access to 1,610 acres of County-owned and operated parkland. While this figure meets the needs of the existing population under the Virginia standard, it does not meet the Stafford standard. Additionally, the population is growing rapidly and additional park space will be needed in the near future.

6.8.6 Findings

- Stafford residents have access to a wide variety of recreation facilities, both publicly and privately owned and operated
- Additional parkland will be required to meet the needs of Stafford's growing population
- There are eighteen County-owned recreational facilities within Stafford County
- Stafford County Board of Education's recreation facilities are also available to be used for community recreational programs
- The Parks and Recreation Department is currently updating its Comprehensive Countywide Facilities Master Plan which will address infrastructure concerns at existing facilities and create a maintenance plan to assure their continued use
- A number of potential future parks and recreation facilities have been identified
- Several private and nonprofit organizations also sponsor sports programs for youths in Stafford County

6.9 Natural Resources

Stafford County is characterized by a rolling landscape cut by winding streams and creeks. Bordered to the east by the Potomac River and to the south by the Rappahannock River, surface water is a significant natural feature in the County. In addition, the County's forestlands provide habitat for many different wildlife species. This natural environment provides a desirable place to live, for wildlife and residents.

The County's continued population growth and intense development pressures are threatening the natural resources. Development has caused increases in impervious surfaces, loss of forestlands, open space and farmland and increased transportation pressures. These development factors lead to increases in runoff, decreases in groundwater recharge, increases in carbon dioxide releases, displacement of wildlife and non-point source pollution.

The following section provides a basic understanding of what natural resources exist in the County and how they fit together to form the overall natural environment. This information can help guide efforts to maintain the air and water quality, preserve wildlife habitats and minimize the risk of natural hazards. A map on page 6-68 shows the County's natural resources and another on page 6-72 shows the watersheds.

6.9.1 Land Resources

Topography

The topography details the different elevations and describes the overall shape of the land. This information is relevant to understanding the flow of water across the land and determining appropriate land uses.

The topography of Stafford County generally consists of rolling hills with most slopes occurring at the County's rivers, streams and creeks. The elevation ranges from sea level to about 450 feet with higher elevations towards the western part of the County. The County's highest elevation is located at the northern tip of the County.

Geology

The geology of Stafford County describes earth's composition below the surface of the land. Knowledge of the geological makeup of the County is important to understanding how development will affect the land.

The geology of the County includes two physiographic provinces, the Piedmont province and the Coastal Plain province. These provinces are landform regions that have similar terrain and have been shaped by a common geological history. Figure 6.13 identifies the location of the geologic zones.

The Piedmont province is located in the western portion of the County, generally west of Interstate 95. This province has a generally rolling terrain

The People and the Place

that consists of bedrock that is made up of hard igneous and metamorphic rock. In the eastern portion of the County is the Coastal Plain, a terraced landscape consisting of unconsolidated sediments that are relatively soft compared to the igneous and metamorphic rock of the Piedmont province. These two provinces are separated by the Fall Line, a low east-facing cliff that extends from New Jersey to the Carolinas.

Several mining operations are present in the County, including sand and gravel, generally in the southeastern part of the County and a type of granite material in the northwestern portion of the County. Figure 6.14A identifies the location and type of mineral resources in the County. Figure 6.14B is the legend associated with the map that describes the resources. The data is from the Virginia Department of Mines, Minerals, and Energy.

Soils

A familiarity with the soil composition is necessary to determine the suitability of various land uses such as farming, construction or septic systems. The compatibility with different land uses depends on several different soil characteristics including drainage and erodibility. Within Stafford County, there are 126 classifications of soil from the National Cooperative Soil Survey of the National Resource Conservation Service (NRCS), each with varying characteristics. The following soil information, gathered from the NRCS, gives a general review of the soil properties in the County as well as the compatible land uses with the County's soil.

The drainage of the soils depends on the percolation capacity of the soil, the topography of the land and the proximity to surface and groundwater discharge. It is important to look at soil drainage because it affects the transport of pollutants and the ability for plants to grow. If a soil drains rapidly, precipitation or irrigation water transports water-soluble pollutants through the soil, potentially affecting the quality of groundwater. Soils that are not drained well may become saturated making it difficult for plants to survive because the roots don't get enough oxygen. The NRCS data shows that though the majority of the County, 64%, is well drained, 12% of the land area of the County is classified as very poorly drained. The majority of this poorly drained area is located just west of the Interstate 95 as it travels through the northern portion of the County.



Table 6.25 Soil Drainage Capacity

Capacity	Acres	Percent
Somewhat Excessively Drained	3,689	2.0%
Well Drained	115,928	63.8%
Moderately Well Drained	21,304	11.7%
Somewhat Poorly Drained	3,981	2.2%
Poorly Drained	22,058	12.1%
Very Poorly Drained	1,340	0.7%
Not Rated	13,380	7.4%

Source: National Cooperative Soil Survey,
National Resource Conservation Service,
United States Department of Agriculture &
design based planning, inc.

Erosion is the transport of soil by wind or water. Susceptibility of a type of soil to erosion is based on the composition of the soil as well as the slope and the vegetative cover of the land. Soil erosion can cause a loss of topsoil and create ruts and gullies in the land. Erosion also causes problems with the transport of materials, polluting downstream waters, clogging creeks, streams and other bodies of water as well as clogging drainage ditches.

Over ¾ of the County is either highly erodible or potentially highly erodible. This figure shows that soil erosion is a significant issue in the County and should be considered as development occurs.

Table 6.26 Soil Erodibility

Erodibility	Acres	Percent
Not Highly Erodible Land	28,508	15.7%
Potentially Highly Erodible	73,049	40.2%
Highly Erodible Land	69,865	38.5%
Not Rated	10,259	5.6%

Source: National Cooperative Soil Survey,
National Resource Conservation Service,
United States Department of Agriculture
& design based planning, inc.

In addition to the soil characteristics, the following information from the NRCS provides what percentage of the County is suitable for dwellings, farming or septic systems. Land use suitability for dwellings, farming and septic systems are all determined by the NRCS based on a number of factors that affect these land uses. For example, suitability for septic systems is based on several factors including flooding, bedrock depth, slope, saturated hydraulic conductivity and other measures compiled for an overall measure of whether or not the area is suitable for traditional septic systems. The figures show that nearly all of the land is limited in some way; this causes potential competition for suitable lands.

Only a small portion of the County, 11%, is classified as not limited suitability for dwellings with basement. In addition, most of the County's soil is either somewhat limited or very limited for septic system suitability. Furthermore, east of the Fall Line most of the soil is very limited for septic system suitability. This area east of the Fall Line is also where there is little prime farmland.

Because the County has such a limited amount of land suitable for septic systems, an alternative type of septic system is being utilized to deal with land with this limitation. This alternative septic system uses a two-step process rather than the traditional one-step process.

Table 6.27 Land Use Suitability

Suitability for Dwellings (with basement)	Acres	Percent
Not Limited	20,668	11.4%
Somewhat Limited	65,277	35.9%
Very limited	82,356	45.3%
Not Rated	13,380	7.4%
Farming Soils	Acres	Percent
Areas of Prime Farmland	34,788	19.1%
Farmland of Statewide Importance	50,141	27.6%
Prime Farmland if Drained	2,308	1.3%
Not Prime Farmland	94,444	52.0%
Suitability for Traditional Septic Systems	Acres	Percent
Somewhat Limited	53,347	29.4%
Very Limited	100,496	55.3%
Not Rated	27,838	15.3%

Source: National Cooperative Soil Survey,
National Resource Conservation Service,
United States Department of Agriculture &
design based planning, inc.

Another soil characteristic in the County is the acidity of the soils. The range for the median pH level is 4.3 to 6.8 showing that the soil is generally acidic. This is an important factor in development because the excavation of acidic soil can cause acidic levels in streams to rise, disturbing the stream ecosystem, as a result of runoff from the acidic soils entering the stream. Also, in highly acidic soils, vegetation is not able to grow and utility lines corrode.

The most important precaution for acidic soils is the knowledge that they exist in an area. This can be accomplished by testing for acidic soils before development occurs. Testing the soil can help prevent environmental disasters such as that of the County's airport where highly acidic soil that was excavated from the site was spread as fill for the site, preventing vegetation growth and damaging the local stream. Although the soil that is below the earth's surface a distance that doesn't reach full acidity until it is excavated, a sulfur test can be conducted to predict the acidity of the covered soil. This

knowledge can prevent the excavation and spread of acidic soils, benefiting both the environment and developers.

6.9.2 *Water Resources*

Watersheds

A watershed is an area of land where water drains downhill to a body of water. A watershed may include several sub-watersheds that drain into a larger watershed. In Stafford there are numerous sub-watersheds of both the Potomac River and Rappahannock River.

The Stafford County, Virginia Rappahannock Tributaries Watershed Planning Study found that “runoff from impervious cover and agricultural cover is the primary determinants of water quality in the tributaries (of the Rappahannock), and consequently, the primary parameters through which to address watershed management actions.” As a rapidly developing County, the Watershed Planning Study shows that the most pertinent watershed issue is the increasing amounts of impervious surfaces. Impervious surfaces are impermeable surfaces that include rooftops, parking lots, driveways, sidewalks, roads and other surfaces that prevent water infiltration and groundwater recharge. Also, instead of allowing precipitation to penetrate into the ground, impervious surfaces cause runoff to travel across the land collecting sediments, nutrients and toxics that are carried to streams and creeks of the watershed.

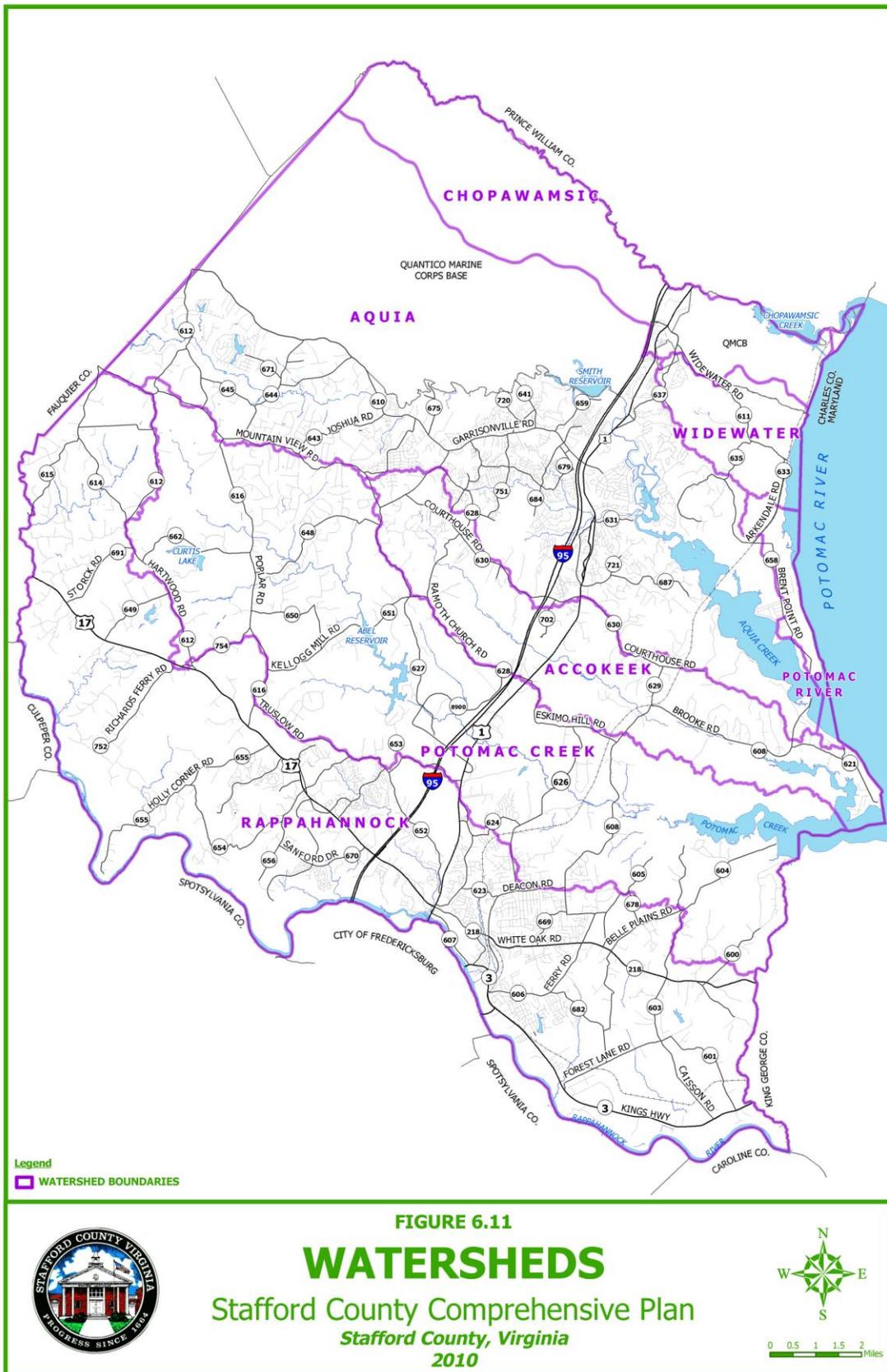


FIGURE 6.11
WATERSHEDS
Stafford County Comprehensive Plan
Stafford County, Virginia
2010



Table 6.28 Stafford Watershed System

ID#	Major Water Shed	Minor Water Shed	Acres
2	Chopawamsic		12,903
3	Aquia	Beaverdam	11,066
4	Aquia		34,846
5	Potomac River	Potomac River	171
6	Widewater		2,656
7	Widewater	Tank	821
8	Rappahannock	Alcotti Run	4,560
9	Rappahannock	Deep Run	2,586
10	Potomac Creek	Potomac Run	6,719
11	Widewater	Potomac River	748
12	Aquia	Whitsons Run	1,493
13	Aquia	Austin Run	5,239
14	Accokeek		14,539
15	Potomac Creek	Long Branch	9,595
16	Potmac River	Potomac River	1,911
17	Rappahannock	Richland Run	3,979
18	Potomac Creek		20,547
19	Rappahannock	Rappahannock	15,922
20	Rappahannock	Horsepen Run	4,920
21	Rappahannock	Falls Run	4,209
22	Rappahannock	Rocky Pen Run	3,444
23	Accokeek	Potomac River	390
24	Rappahannock	Claiborne Run	4,242
25	Potomac Creek	Beaver Dam Run	2,036
26	Potomac Creek	Black Swamp Creek	852
27	Rappahannock	White Oak Run	5,238
28	Rappahannock	Little Falls Run	3,662

Source: Stafford County and design based planning, inc.

The level of stream impact relates to the percent of impervious cover in the watershed. An area with between 0 to 10% of watershed impervious area relates to low stream impact, an area between 10 to 25% of watershed impervious area relates to moderate stream impact, and an area 25% and higher of watershed impervious area relates to high stream impact. (EPA Center for Watershed Protection, 2005) Therefore, the protection of watersheds is essential to the preservation of water quality.

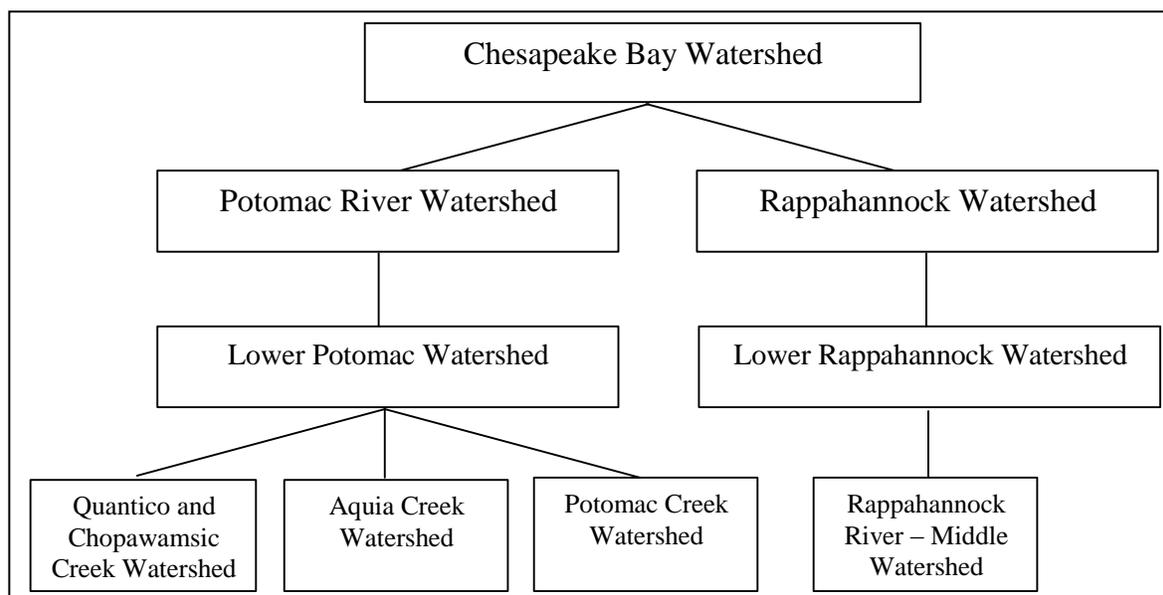
The sub-watersheds of the Potomac River, which consist of 70% of the land area in Stafford, are part of a much larger watershed that stretches across Maryland, Pennsylvania, Virginia and West Virginia covering about 14,679 square miles.

The range of undisturbed land in the County's sub-watersheds of the Lower Potomac River Watershed was reported in the County's Wildlife Habitat Protection Plan, published in 2000 and based upon 1995 data. The Plan stated that less than 50% of the Aquia Creek Watershed is undisturbed, less than 50% of the Accokeek Creek Watershed is undisturbed, 50 to 70% of the Potomac Creek Watershed is undisturbed and 70% of the Widewater Creek/Chopawamsic Creek Watershed (sub-watersheds of the Quantico and Chopawamsic Creeks Watershed) is undisturbed. Though the Widewater Creek/Chopawamsic Creek Watershed is the watershed with the greatest amount of undisturbed land, this is also where the Quantico Marine Corps Combat Development Command is located.

The sub-watersheds of the Rappahannock River are part of a larger watershed that crosses the southwestern edge of the County. The Rappahannock Watershed is much smaller than the Potomac River Watershed and is entirely in the State of Virginia traveling from the Blue Ridge Mountains to the Chesapeake Bay. The Watershed covers 2,715 square miles of land. According to the Chesapeake Bay Program, there is only one sub-watershed of the Rappahannock River in Stafford County, the Rappahannock River - Middle Watershed, which is part of the Lower Rappahannock Watershed. Sub-watersheds of the Rappahannock River - Middle Watershed include Horsepen Run, Alcott Run, Falls Run, Richland Run, Claiborne Run, England Run, Rocky Pen Run, Little Falls Run, White Oak Run and Muddy Creek.

Both the Potomac and the Rappahannock River Watersheds are part of the Chesapeake Bay Watershed, an expansive watershed that travels through six states. The watershed drains into the Chesapeake Bay, the largest estuary in the Country supporting 3,600 species of fish, animals and plants. The Chesapeake Bay Watershed is made up of eight sub-watersheds, with two of these sub-watersheds, the Potomac River Watershed and the Rappahannock Watershed, within Stafford County. The chart in Table 6.29 includes a hierarchy of the watersheds of the County.

Table 6.29 Major Watersheds Stafford County, VA



Source: Watershed Profiles, Chesapeake Bay Program (<http://www.chesapeakebay.net/>)

As part of the Chesapeake Bay Watershed, the County’s water impacts have repercussions to the water quality of the Chesapeake Bay. In 1988, the State of Virginia enacted the Chesapeake Bay Preservation Act to help improve the quality of the water in the Bay. Stafford County is included in the Chesapeake Bay Preservation Areas of the Act in which local governments are required to adopt programs “requiring the use of effective conservation planning and pollution prevention practices when using and developing environmentally sensitive lands.” The main goal of the Chesapeake Bay Preservation Act is to reduce nonpoint source pollution.

Nonpoint source pollution is a major threat to waterways. The source of this type of pollution is mainly stormwater runoff from a multitude of common urban, suburban and rural sites. The problem is that the runoff from these areas contains toxics, pathogens, nutrients and sediments that contaminate the water. This type of pollution is especially difficult to deal with because it comes from so many different sources, requiring the need for sound land use planning throughout the watershed.

Impacts from non-point sources of pollution include phosphorus pollution from fertilizers used by farmers and residents, e.coli contamination from poor agricultural practice and low pH levels when soils with low acidity are exposed during development.

6.9.3 *Floodplain*

A floodplain is an area that is susceptible to full and partial water inundation. Floodplains provide natural flood and erosion control, protect the water quality, offer areas for groundwater recharge and serve as a fish and wildlife habitat. Increased development in a floodplain can cause more severe natural disasters.

Within Stafford County, 12% of the land (20,918 acres) is in a 100-year flood hazard area. According to the Federal Emergency Management Agency (FEMA), the 100-year flood is the flood elevation that has a 1% chance of a flood being equaled or exceeded each year. The County regulates development activities in the flood way, the flood fringe and the 100-year floodplain to minimize natural hazards and development impacts. In addition, Stafford County entered the National Flood Insurance Program, a program of the FEMA. By actively protecting the floodplain, Stafford County is able to provide residents the ability to purchase flood insurance through the FEMA program that is administered by the United State Department of Housing and Urban Development. Residents within the 100-year floodplain are required to have flood insurance. This requirement applies to a just over 1,000 residential structures located within the County's 100-year floodplain.

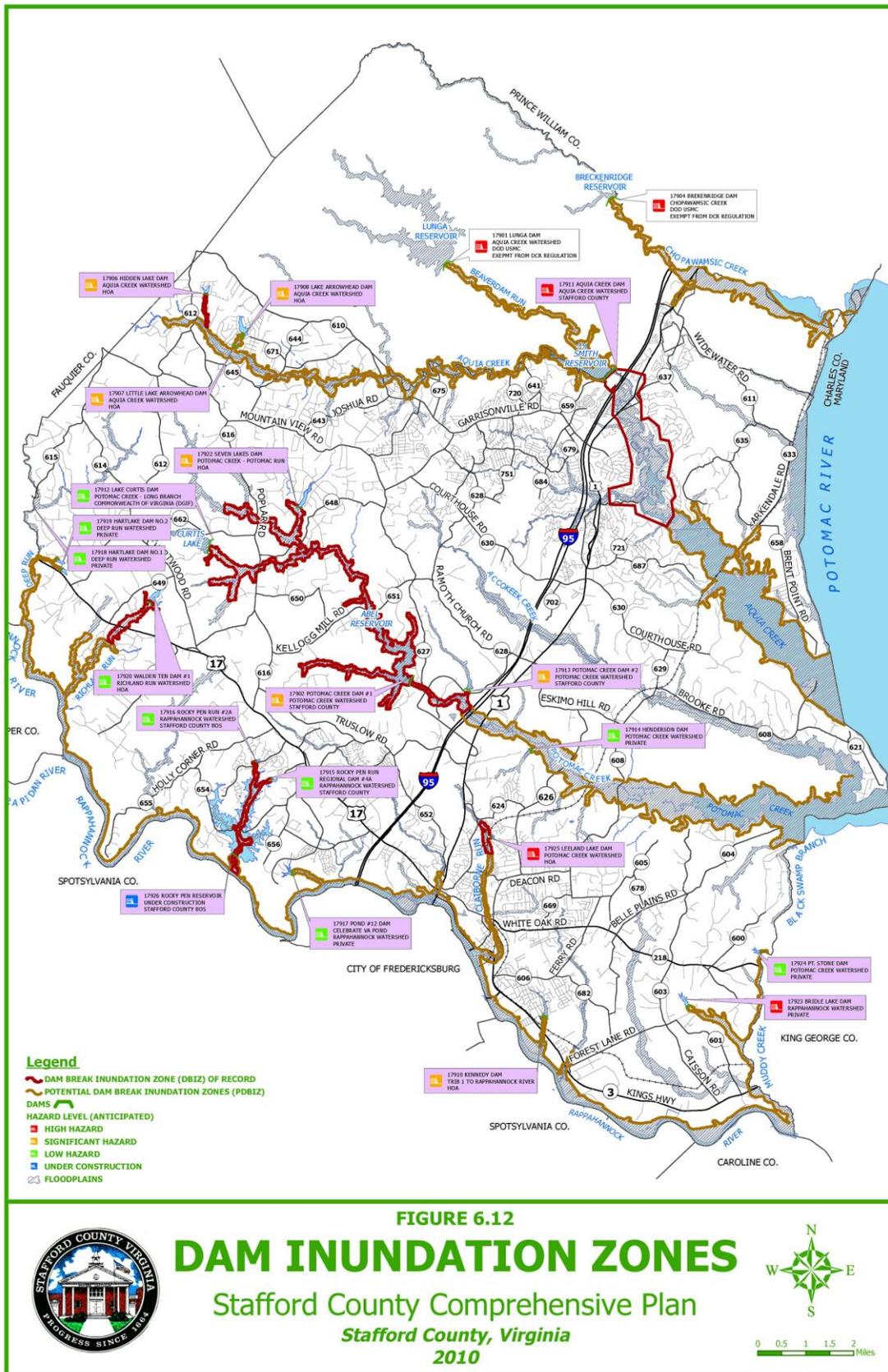
6.9.4 *Dam Inundation Zones*

A dam is a man-made structure, across or outside of a watercourse, used or to be used to retain or store waters or other material. The term includes (i) all dams that are 25 feet or greater in height and impound more than 15 acre-foot of water, and (ii) all dams that are six feet or greater in height and impound more than 50 acre-foot of water. A Dam Break Inundation Zone is the area downstream of a dam likely to be inundated or otherwise directly affected because of a dam failure. Any proposal to encroach the Dam Break Inundation Zone shall meet the requirements set forth in Sections 10.1-606.2 and 10.1-606.3 of the Code of Virginia.

There are 22 listed dams in Stafford County, of which 20 are subject to Department of Virginia Conservation and Recreation (DCR) regulations. Two dams located on the Quantico Marine Base are federally owned and not subject to DCR regulation. The list of dams is provided in Table 6.29 and the location of these dams and potential impact areas are identified in Figure 6.12.

Table 6.30 Regulated Dams in Stafford County

No.	DCR Dam No.	Name of Dam	Hazard Potential Classification
1	17901	Lunga Dam	High
2	17902	Potomac Creek Dam #1	Significant
3	17904	Breckinridge Dam	High
4	17906	Hidden Lake Dam	Significant
5	17907	Little Lake Arrowhead Dam	Significant
6	17908	Lake Arrowhead Dam	Significant
7	17910	Kennedy Dam	Significant
8	17911	Aquia Creek Dam	High
9	17912	Lake Curtis Dam	Low
10	17913	Potomac Creek Dam #2	Significant
11	17914	Henderson Dam	Low
12	17915	Rocky Pen Run Regional Pond #4 Dam	Low
13	17916	Rocky Pen Run #2A Dam	Low
14	17917	Celebrate VA Pond #12 Dam	Low
15	17918	Hartlake #1 Dam	Significant
16	17919	Hartland #2 Dam	Significant
17	17920	Walden Ten # 1 Dam	Low
18	17922	Seven Lakes Dam	Significant
19	17923	Bridle Lake Dam	High
20	17924	Pt. Stone Dam	Low
21	17925	Leeland Lake Dam	High
22	17926	Rocky Pen Run Reservoir Dam	High



6.9.5 *Wetlands*

According to the U.S. Army Corps of Engineers wetlands are “those areas that are inundated or saturated by surface or ground water 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 soil conditions. Wetlands generally include swamps, marshes, bogs, wet meadows and similar areas.” Wetlands provide important water quality controls by filtering pollutants, providing flood control and providing flood and sediment control. Wetlands also provide wildlife habitats.

The County has 17,450 acres of wetlands, about 10% of the County’s land area. Both tidal and non-tidal wetlands are located within the County. The County’s tidal wetlands are affected by the ebb and flow of the tide of the Atlantic Ocean by way of the Chesapeake Bay. The non-tidal wetlands occur inland along streams, lakes and ponds.

6.9.6 *Groundwater*

Groundwater is an available natural resource serving the County. The groundwater is recharged through the percolation of water through soil or through aquifer recharge areas. The quality and quantity of groundwater in Stafford County relate specifically to the two physiographic provinces. In the Piedmont province the groundwater supply relies on fractures in the bedrock. This source of groundwater is generally protected from surface impacts of pollution and runoff. Yet, a major issue for this source of groundwater is deep pumping and drought.

In the Coastal Plain province the groundwater supply relies on precipitation recharge and permeability of sands and gravels for storage. The groundwater of the Coastal Plain province is not as impacted by deep pumping and drought as in the Piedmont province, yet surface impacts such as pollution and runoff are a much greater threat in this area. The pollution of groundwater is especially harmful because, while surface water can somewhat be treated, once the groundwater is polluted it cannot be treated.

An important part of the County’s groundwater sources is the Coastal Plain Aquifer Recharge Area, which is also known as the Fall Zone. In this area the layers that make up the Coastal Plain aquifers slope upward to intersect the surface and the majority of the groundwater recharge occurs. The Aquifer Recharge Area, which is generally located along Interstate 95, is particularly at risk of contamination from surface impacts such as pollution and runoff as well as a decrease in recharge from increases in impervious surfaces. Also located over the Aquifer Recharge Area is the designated County Growth Area. This presents a major environmental issue because, while the purpose of the Growth Area is to condense growth and minimize the impacts of development on the land and the community, the location over the Aquifer Recharge Area

clusters growth and land cover over an area that should be preserved for the protection of groundwater.

The County's Groundwater Protection Plan provides recommendations of well protection prioritization such as protecting wells far removed from the water system while making wells in proximity to the water system less of a priority. The Plan also emphasizes the need to protect the groundwater recharge from pollution.

Potential mitigation tools the Plan mentions include identifying existing sources of potential pollution and ensuring that essential spill prevention and cleanup measures are in place as well as applying an overlay zoning district to ensure site plans for new development incorporate adequate pollution prevention measures. These measures have not yet been adopted by the County.

6.9.7 Forest and Wildlife Resources

Forestland

In addition to being an important natural resource, the forestland of Stafford County is an essential part of protecting the environmental quality of the whole community. The forestland provides a habitat, nesting ground and food source for the area's wildlife. Forestland also provides an area for water recharge, prevents runoff and soil erosion and filters pollution, playing a prime role in the prosperity of Stafford's natural environment. An economic benefit from the forestland is the renewable resource it provides. The County forests harvest deciduous hardwoods, mixed soft woods and pine.

The majority of the County's forested lands are located on private lands. According to Stafford County's Wildlife Habitat Protection Plan using a 1985 report entitled "The Forest Resources of Stafford County", it is estimated that from 1985 to 2000 the County has lost 20,200 acres of forestland. The Wildlife Habitat Protection Plan also states that in 2000 the County was estimated to have 100,000 acres of forestland, 21,876 of which is located in Quantico Marine Corps Combat Development Command's boundaries. In just two years, from 1999 to 2001 the County lost about 1,400 acres of forested lands as a result of development. With the County's continued development, the current amount of forestland is likely to be substantially lower than the 100,000 acres estimate of the 2000 Wildlife Habitat Protection Plan.

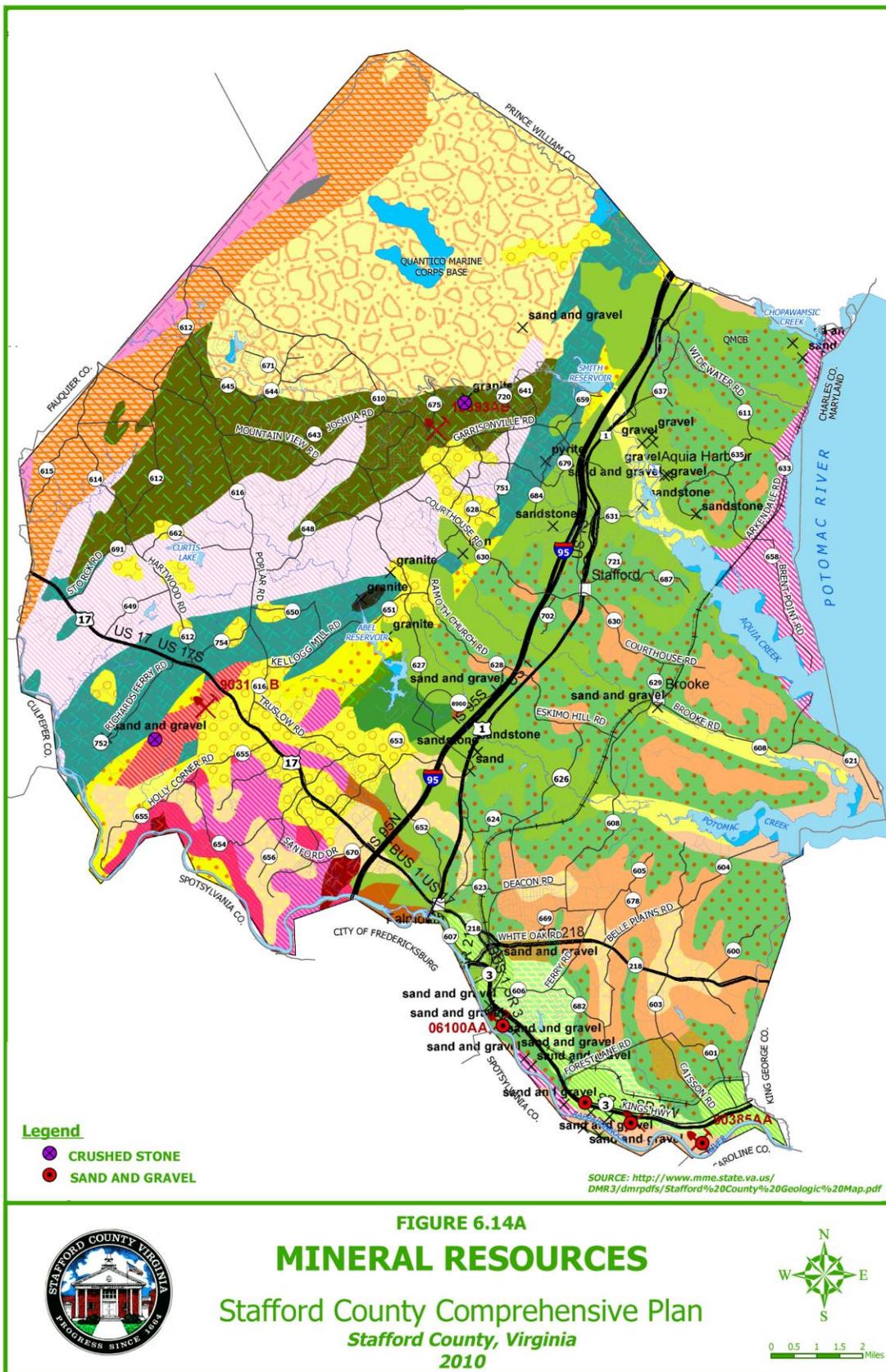
Wildlife Habitat

Within Stafford County, the Virginia Department of Game and Inland Fisheries identifies about 242 wildlife species. The wildlife is dispersed throughout the community finding shelter in different habitats of the County. Of the County's wildlife species, 101 are listed as wetland species, 26 are listed as beach species, 90 are listed as riparian area species, 108 are listed as water species and 80 are listed as urban area species (some species are listed in more than one area). The County is also home to a number of Federal and State listed endangered species.

In order to maintain the wildlife habitat the County needs to maintain the overall quality of natural resources. A successful wildlife habitat means protection of forestlands and water quality which means maintaining quality soils, floodplains, wetlands, etc. Overall protecting the wildlife habitat means minimizing impacts of development.

6.9.8 Findings

- Stafford County consists of a rolling landscape with slopes along the County's waterways
- The County is made of two geological provinces, the hard bedrock of the Piedmont province and the soft sediments of the Coastal Plain, which are separated by the Fall Line that crosses the County generally along Interstate 95
- Stafford County is a Chesapeake Bay Preservation Area, meaning that the County must adopt programs that protect the quality of water through land use regulations
- 12% of the County's land area is located in a 100-year flood hazard area
- 10% of the County's land area is a tidal or non-tidal wetland
- The County has a substantial amount of groundwater resources east of Interstate 95, but this area is very susceptible to contamination. West of Interstate 95 the groundwater sources are less abundant, but are not as susceptible to contamination
- The Coastal Plain Aquifer Recharge Area, located along Interstate 95, is where most of the County's groundwater recharge occurs and where the groundwater is most susceptible to pollution
- The County's Growth Area is located over the Coastal Plain Aquifer Recharge Area
- From 1985 to 2000 the County lost 20,000 acres of forestlands
- The County has 242 wildlife species that depend on the natural resources



GEOLOGY AND MINERAL RESOURCES OF STAFFORD COUNTY, VIRGINIA

Mineral Resources

-  Active Mine (permit #)
-  Mineral Occurrence (commodity)

Key

-  City or Town
-  Interstate
-  Primary roadway
-  Railway
-  water

Geology (see expanded explanation)

Piedmont

-  my - mylonite
-  PMf - Falmouth Intrusive Suite
-  Sf - Falls Run Granite Gneiss
-  Oq - Quantico Formation, slate and schist
-  Oqq - Quantico Formation, micaceous quartzite
-  OCgg - Goldvein pluton
-  OCpg - plagioclase tonalite
-  OCu - metasedimentary rocks, undivided
-  OCp - phyllite
-  Cl - Lunga Reservoir Formation, metadiamictite
-  OCTj - trondhjemite
-  Ccv - Chopawamsic Formation
-  Cta - Ta River Metamorphic Suite
-  Cg - amphibole metagabbro
-  CZg - Garrisonville Mafic Complex, amphibolite, etc.
-  CZh - Holly Corner Gneiss
-  dgn - quartz diorite gneiss
-  Ymd - porphyroblastic garnet-biotite gneiss

Coastal Plain

-  al - alluvium (Holocene)
-  Qt - Tabb Formation
-  Qsh - Shirley Formation
-  Qcc - Charles City Formation
-  QTW - Windsor Formation
-  Tb1 - Bacons Castle Formation
-  Tc - Chesapeake Group
-  psg - sand and gravel (Pliocene)
-  msg - sand and gravel (Miocene)
-  Tl - Lower Tertiary deposits
-  Kp - Potomac Formation

Data Sources:

Geology: Virginia Division of Mineral Resources (DMR), 2003, Publication 174, Digital Representation of the 1993 Geologic Map of Virginia, scale 1:500,000.

Active Mine Locations: Virginia Division of Mineral Mining, scale 1:24,000.

Mineral Occurrences: DGMR Mineral Resources of Virginia database, scale 1:24,000.

Virginia Department of Mines, Minerals, and Energy
Division of Geology and Mineral Resources
Charlottesville, VA
06 October 2008

Figure 6.14B – Mineral Resources Legend

6.10 Transportation

The movement of people and goods around a community is determined by the effectiveness of its transportation network. To assess the existing transportation network in Stafford County and identify areas of deficiency, the following elements were examined: roads; bus service; rail service; air service; and bicycle and pedestrian circulation. Figure 6.15 on the following page shows the existing transportation network and street classifications. Figure 6.16 shows other transportation facilities in the County.

6.10.1 Road Network

Interstates

Interstate 95 passes through Stafford County. I-95 is a major north-south corridor along the east coast which stretches from New England to Florida. More regionally, I-95 provides access to Washington, DC and the state capital of Richmond. I-95 can be accessed at four interchanges in the County located at Garrisonville Road, Courthouse Road, Centreport Parkway and Warrenton Road.

US Routes

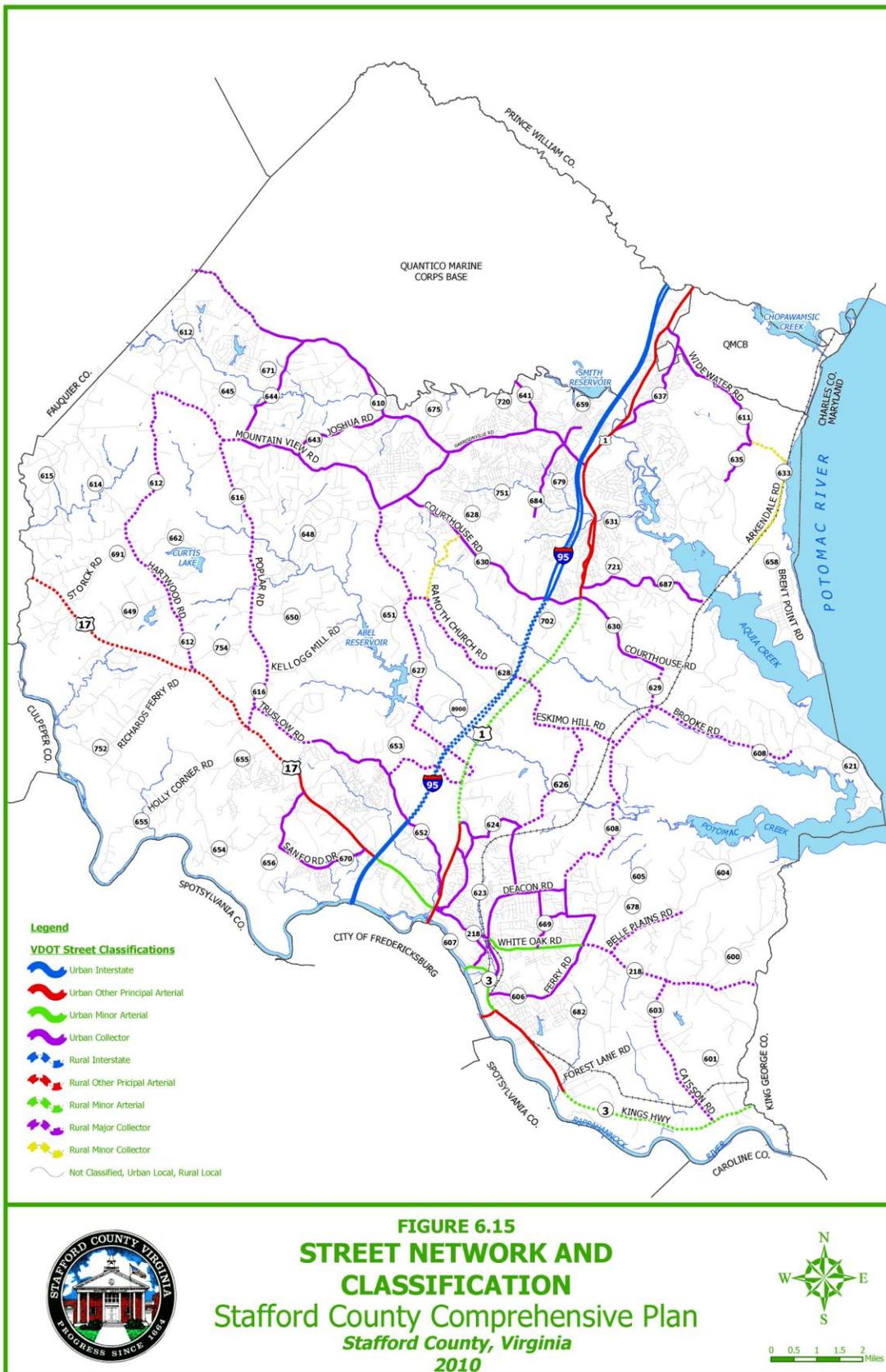
Jefferson Davis Highway / Cambridge Street (US-1) is a major north-south arterial which runs parallel to I-95 through the center of the County. Warrenton Road is a major east-west arterial that runs along the southwest boundary of the County north of Jefferson Davis Highway. Warrenton Road joins Jefferson Davis Highway / Cambridge Street as it exits the County into Fredericksburg.

Major State Routes

There are several state routes in Stafford County that provide connections to other counties, as well as function as arterials within the County. Kings Highway travels along the southern boundary of the County from just outside of the Falmouth area to King George County. The Butler Road / White Oak Road corridor is another east-west connection between Falmouth and King George County. Garrisonville Road is an east-west corridor along the northern boundary of the County that provides access between the interstate and Fauquier County.

Remaining Road Network

The remaining road network is made up of roads serving as collectors, and local roads in subdivisions. Collector roads often connect a number of local roads to arterials and help to form the major road network. These roads are primarily narrow roads and as traffic volumes increase, they often experience safety and traffic capacity problems.



6.10.2 Roadway Jurisdiction

The Virginia Department of Transportation (VDOT) has the primary responsibility for maintaining all public roads in Stafford County. The County works with VDOT to identify necessary road improvements.

6.10.3 Traffic Volume

Based on 2009 road counts from VDOT, I-95 carries between 136,000 and 147,000 vehicles daily through Stafford County. Jefferson Davis Highway carries between 13,000 and 29,000 vehicles on an average day. Depending on the section, Warrenton Road carries between 18,000 and 40,000 vehicles daily. Near the I-95 interchange, Garrisonville Road moves as many as 52,000 vehicles each day. Courthouse Road carries as many as 16,000 vehicles per day near the I-95 interchange. Near Shelton Shop Road, Courthouse Road carries 10,000 vehicles per day.

6.10.4 Traffic Safety

Traffic accident records are kept by the Stafford County Sheriff's Office. Each accident is recorded using a Global Positioning System (GPS) to identify its location. When these points are plotted on a map, areas where there are high frequencies of accidents can be recognized.

Roadway Management and Improvement

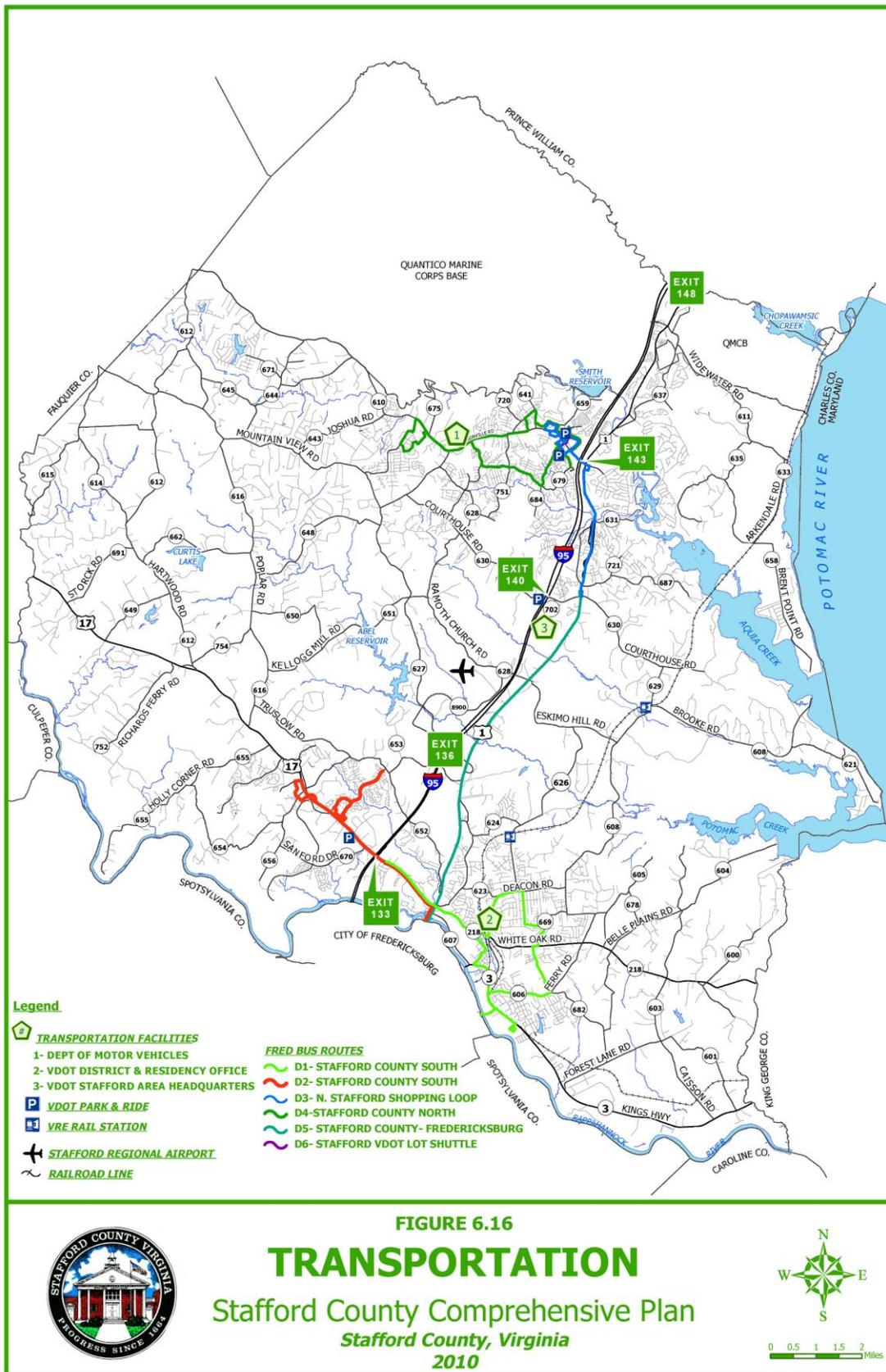
Stafford County actively coordinates with VDOT to promote access management for development. The County also works with FAMPO, our local Metropolitan Planning Organization, and the state to identify funding opportunities for transportation improvements. Stafford County seeks to work with new developers to reduce impacts to the roadway network and through proffers and impact fees to help off-set the cost of new development.

6.10.5 Bus Service

The FREDericksburg Regional Transit (FRED) provides bus service to Stafford, Fredericksburg, and the surrounding area. Connections to Washington, D.C. are by private commuter bus.

6.10.6 Rail Service

The Virginia Railway Express (VRE) operates two rail lines that carry commuters to Washington, D.C. The Fredericksburg Line extends from Fredericksburg to Washington, serving Stafford County. The Fredericksburg Line has two stops in Stafford County at Leeland Road and at Brooke Road. Commuters can also access the VRE at Fredericksburg and Quantico, just outside of the County. Park & Ride facilities are located at all of the stations.



6.10.7 Commuter Lots

There are six commuter lots located within Stafford County. Two of them are operated by the Virginia Railway Express (VRE) in conjunction with the rail stations. The other four are maintained by VDOT and are in close proximity to Interstate 95. From these lots, people can take a train, bus, or car pool.

The two VDOT Park and Ride lots along Garrisonville Road are over capacity with limited ability for expansion. As several of the other lots are nearing capacity, it is clear that additional commuter parking capacity will be needed to meet the needs of the County over the next 20 years. This may be accommodated through the expansion of existing lots or development of new sites. To date, locations for new commuter lots have not been identified.

6.10.8 Air Service

Stafford County has its own regional airport and is within a short drive from two major airports.

Stafford Regional Airport is centrally located in the County. An independent authority operates the airport with representatives from Stafford, Prince William, and the City of Fredericksburg. The facility is 550 acres with a 5,000-foot airstrip. The runway can accommodate private and business class jets with wingspans of up to 80 feet. There is no passenger service at this airport. The airport was built to accommodate up to 75,000 operations per year and is currently receiving an average of 800 aircraft a month (performing more than 2,500 flights), a third of which is corporate traffic.

6.10.9 Bicycle and Pedestrian Facilities

According to the 1996 Bicycle/Pedestrian Facilities Plan, Stafford County is lacking adequate facilities for bicycle and pedestrian transportation and recreation. Many of the roadways in the County are considered unsafe for bicycle and pedestrian needs due to width and line of sight. Some trails are available in County parks. The County is working toward establishing a countywide network of trails for bicycle and pedestrian use. The County is also working with the Fredericksburg Area Metropolitan Planning Organization (FAMPO) to create a regional network.

6.10.10 Findings

- There are four interchanges on I-95 in Stafford County
- Increasing population negatively effects the existing roads network
- Safety is an issue on many of the narrow, winding roads
- The County works closely with many partners to provide funding for facility improvements.
- Bus service for Stafford County is provided by FREDericksburg Regional Transit (FRED)

- Rail service is available in the County and Quantico for commuters traveling to Northern Virginia and Washington D.C. on VRE
- The commuter lots in Stafford County are at or have exceeded their capacity.
- The County is served by a regional airport
- The County lacks a sufficient network for bicycle and pedestrian circulation.

