APPENDIX D

NATURAL RESOURCES

NATURAL RESOURCES APPENDIX

The following Natural Resources appendix resources have been studied and documented to satisfy Virginia State Code Sec. 15.2-2224, Surveys and studies to be made in preparation of plan; implementation of plan, Sec. 15.2-2223.2, Comprehensive plan to include coastal resource management guidance, and 9VAC25-830-170, Comprehensive Plans, per the Chesapeake Bay Preservation Area Designation and Management Regulations. Additionally, the information is an educational resource for the community, offering valuable insights into environmental resources. It is also a critical resource for land use planning within Spotsylvania County.

PHYSIOGRAPHY

Spotsylvania County's total land area is approximately 407 square miles. The land surface is generally rolling and slopes gradually in a southeasterly direction to an irregular north/south line following the Interstate 95 corridor, where it drops slowly to a low flat plain. Elevations range from a high of about 450 feet above sea level in the western section of the County to sea level in the northeastern area along the Rappahannock River.

The most significant landform issue is the split of the county into two physiographic provinces; the Atlantic Coastal Plain and the Piedmont Plateau. The area of transition between the provinces, known as the fall line, marks the boundary between the free flowing rivers to the west and tidal to the east.

CLIMATE HAZARDS

Regional Hazard Mitigation Plan

The George Washington Regional Commission (GWRC) and its member localities in collaboration with The Berkley Group, led an effort to update the Regional Hazard Mitigation Plan in 2017. The Hazard Mitigation Plan is expected to be updated again within the Comprehensive Plan planning period.

Hazard Mitigation is the sum of the many actions that can be taken at the local and regional level in setting goals, developing strategies, and outlining tasks and schedules to reduce or eliminate long-term risk to human life and property from a variety of natural hazards. In preparing this plan, the GWRC and its member localities including: City of Fredericksburg; Caroline County; King George County; Spotsylvania County; Stafford County; Town of Bowling Green; Town of Port Royal, have identified natural hazards that pose a potential threat; determined the likely impacts of those hazards; assessed vulnerability to the studied hazards, as well as the Region's current capability to address those hazards; set mitigation goals; and determined and prioritized appropriate strategies that can lessen the potential impacts of hazard events.

The Plan serves two roles within the George Washington Region. First, it identifies natural hazards that pose a threat to the safety, health, and economy of the Region, as well as steps that can be taken to reduce the impact of these natural hazards in the future and helping communities get "back on their feet" and back to normal lives as quickly and easily as possible. The community can reduce both the impact and cost of natural disasters by being prepared in advance rather than acting only after disaster has struck. The Plan contains a comprehensive assessment of natural hazards, including assessing the types of

hazards, their risk to the region and localities, documentation of historic incidents, and identification of mitigation action strategies to help proactively plan for and address such incidents if and when they occur.

Second, the Plan ensures the Region's compliance with the Disaster Mitigation Act (DMA) of 2000, which requires that local governments develop natural hazard mitigation plans in order to qualify for both pre-disaster and post-disaster grant opportunities. The Disaster Mitigation Act of 2000 establishes the legal basis for this plan, and for the Federal government's overall nationwide efforts to reduce the cost of disasters in the United States. This act establishes the Pre-Disaster Mitigation Program (PDM), as well as new requirements for the post-disaster Hazard Mitigation Grant Program (HMGP), both serving to give greater responsibility for hazard mitigation planning to local governments. DMA 2000 requires local governments to develop natural hazard mitigation plans in order to qualify for both pre-disaster PDM grants and post-disaster HMGP grants. The Act requires that these plans demonstrate "a jurisdiction's commitment to reduce risk from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards", and must be updated every 5 years. The prior Regional Hazard Mitigation Plan update occurred in 2012, with Spotsylvania County Board of Supervisors endorsement of that plan having occurred on September 11, 2012.

Each of the Hazard Mitigation Plan chapters were reviewed and updated for 2017 to reflect currently available information and up to date local mitigation strategies. Changes include updates to the hazards that have occurred, review and revision of current capabilities, review and update of the previous plan's mitigation strategies, as well as reconsideration of locality specific and overall regional mitigation goals and strategies.

The updated 2017 Hazard Mitigation Plan was approved by the Federal Emergency Management Agency (FEMA) on September 25, 2017 and locally endorsed by resolution of the Spotsylvania County Board of Supervisors on October 10, 2017. The Hazard Mitigation Plan is expected to be updated again within the Comprehensive Plan planning period. The latest version of the approved Hazard Mitigation Plan is incorporated by reference into the Comprehensive Plan.

For more information about natural hazards and local mitigation strategies, the 2017 Regional Hazard Mitigation Plan is available online **HERE**.

Radon

As per the Virginia Department of Health, Radon is a naturally occurring, radioactive gas that you can't see, taste or smell. It is produced by the breakdown of uranium in soil, rock and water. Radon is usually most concentrated in the lowest level of the home. Radon may also be present in well water and can be released into the air in your home when water is used for showering and other household uses. Radon entering homes through water may be a small risk compared to radon entering though the soil. High levels of radon have been found in all 50 states.

Indoor radon is the second leading cause of lung cancer after smoking. Radon causes an estimated 7,000 to 30,000 lung cancer deaths each year. A combination of smoking and high levels of radon in your house increases your risk. Radon enters homes most commonly through:

- cracks in foundations;
- openings around sump pumps and drains;

- construction joints;
- cracks in walls;
- crawl spaces; and
- in some cases from well water.

An increased risk of lung cancer is the only known health effect associated with exposures to elevated radon levels. When radon decays within your lungs it releases energy that can damage lung tissue and lead to lung cancer over the course of your lifetime. Not everyone exposed to elevated levels of radon will develop lung cancer.

Your chances of getting lung cancer from radon depend mostly on:

- How much radon is in your home.
- The amount of time you spend in your home
- Whether you are a smoker or have ever smoked.

The EPA Radon risk map was released in 1994 (see Exhibit 1 below). Spotsylvania County is considered to be at HIGH risk (e.g Zone 1) for indoor radon levels. Considering potential concerns related to radon risk, the EPA recommends that all homes and apartments below the third floor be tested.

Radon test data is available from professional testers and several different vendors of radon test kits. There are many factors that can influence radon levels in a particular home that the only way to know for sure is to test. Houses next door to each other can have very different levels. If Radon is significant enough to warrant mitigation, a soil gas collection system using passive piping can be installed. Proper installation of such a system is thought to reduce the indoor radon level in the home by 50%.

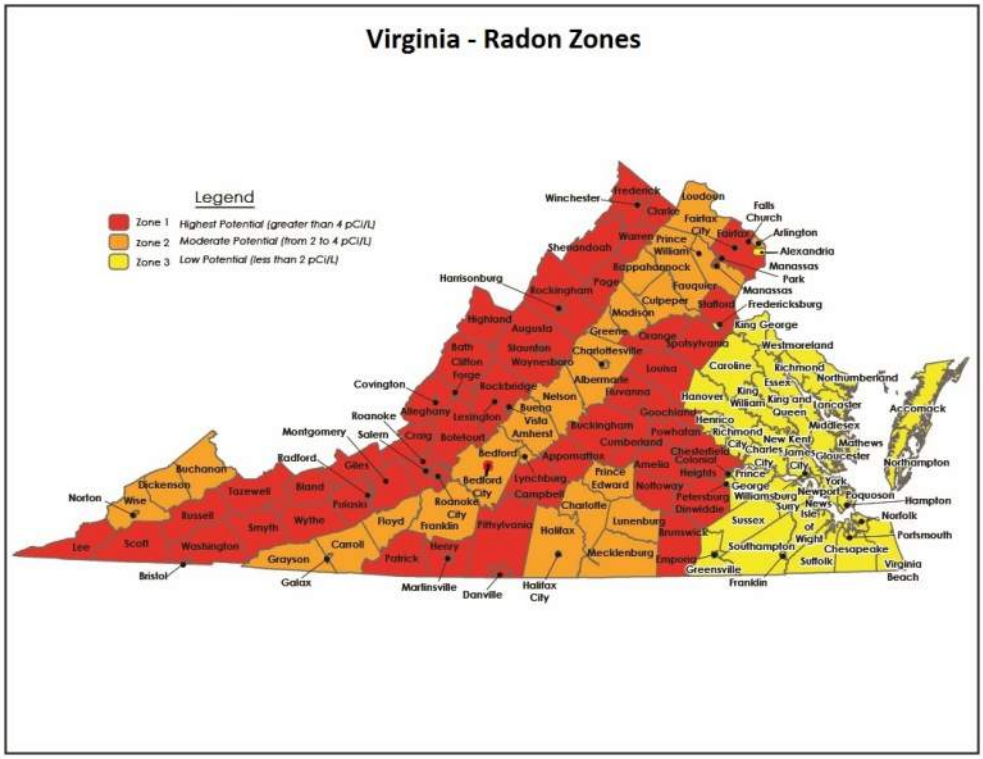

Exhibit 1: Virginia-wide Radon Zones

For more information concerning Radon and the Virginia Department of Health's Indoor Radon Program, **CLICK HERE.** Additionally, the United States Environmental Protection Agency has information available, **HERE.**

LIGHT POLLUTION

Light pollution results from atmospheric illumination caused by man- made lighting sources such as outdoor lighting fixtures that are not exclusively downward directed below a horizontal plane. The impacts of light pollution have been linked to negative health effects on humans and wildlife including birds and nocturnal animals. Light pollution inevitably leads to negative impacts the ability to star gaze and impacts areas intended to remain in their historically rural or agricultural character. In many ways outdoor lighting that beams out into outer space or anywhere above a horizontal plane is essentially viewed as inefficient or wasteful lighting because it doesn't serve a viable purpose when it comes to illuminating buildings or parking areas.

Beyond these impacts, light pollution has also been identified as problematic for flight operations associated with airports and military bases. Much of the northeast corner of Spotsylvania County falls within the Fort AP Hill approach fan, established for aerial approach to the base. Base representatives worked with County staff to provide input in the development of this proposed amendment. The 2014 Fort AP Hill Joint Land Use Study (JLUS) supported the Spotsylvania County outdoor lighting ordinance in consideration of light pollution impacts. As per the JLUS:

Fort A.P. Hill conducts night-time training operations that utilize night vision equipment. The success of night-time operational activities is dependent upon dark conditions that are affected by ambient light levels. Night vision training occurs at the Laser Range near U.S. Route 17 and at the ALZ and Drop Zone. As Spotsylvania County grows, the installation is concerned that new development within the county's growth area may generate night-time illumination that will compromise the installation's ability to implement its night-time training operations.

Adoption of a county-wide dark skies ordinance would put in place lighting controls and requirements on new development county-wide and would help alleviate the installation's concerns about increased light pollution. Fort A.P. Hill should work with the county to ensure adequate lighting requirements and standards are captured in the ordinance.

In order to reduce the impacts of light pollution and protect a clear night sky the County had an established a goal in both the 2008 and 2013 Comprehensive Plans to promote "dark-sky" or "night-sky" friendly lighting. Due to amendments to the Comprehensive Plan considering state legislation related to proffers, the Spotsylvania County Board of Supervisors approved amendments to the County Outdoor Lighting ordinance on September 13, 2016 in order to shift what had been a County goal to an ordinance format where consistent, measurable and enforceable outcomes can be assured. "Dark sky" or "night sky" lighting is used to represent outdoor lighting that is downward focused below a horizontal plane similar to the graphic below. The result minimizes the likelihood of illuminating the atmosphere above whereby the effect is the inability to see stars at night.

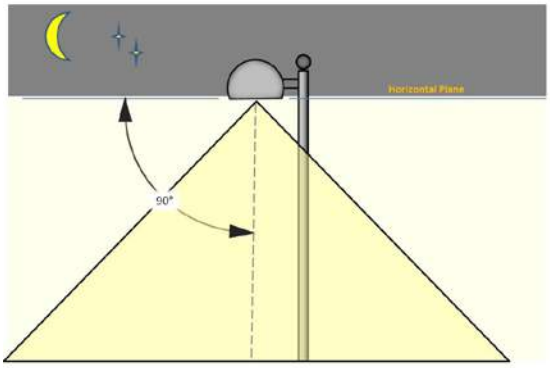

Exhibit 2: Downward directed lighting

The resulting outdoor lighting ordinance is meant to be simple and enforceable by the zoning enforcement office. The language, located in the Spotsylvania County Code Sec. 23-5.12 was developed with the assistance of lighting industry representatives, the zoning office and Fort AP Hill, and the Spotsylvania County Planning Commission. Staff wanted to ensure the ordinance was respectful of modern and emerging technologies and was therefore worded to accommodate flexibility.

PHYSICAL CONSTRAINTS TO DEVELOPMENT

A variety of factors can physically constrain or inhibit the extent of development feasible in a location. Naturally occurring constraints could include presence of wetlands, steep slopes, acid sulfate soils, septic suitability, groundwater availability, hydric soils, additional soils or underlying geological conditions. Established conservation lands in easement or ownership and regulatory protections such as the river protection overlay district, reservoir protection overlay district, floodplain overlay district, resource protection areas, zoning limitations and open space requirements, stormwater management infrastructure, limits of available public water and sewer all have the potential to physically constrain the extent of development. Many of these factors are explored in more detail in the pages that follow. The County GIS system includes map data on many of the aforementioned constraints and makes them available online **HERE**. Additionally, County GIS is developing a more extensive suite of soils related information for public access in the form of a new web application online to become accessible through the Spotsylvania Geohub site **HERE**.

GEOLOGY

The geology of the County is generally comprised of precambrian, cambrian, and paleozoic formations. The principal geologic units found within the county are indicated below in order of the youngest to the oldest:

Table 1: Geology	
System	**Unit**
Tertiary (Miocene, Eocene)	Calvert and Aquia Formations
Lowe Cretaceous	Patuxent Formation
Paleozoic and precambrian formations of uncertain age/relationship	Petersburg Granite
Formation of uncertain age	Granite, Granite Gneiss, Hornblende Gabbro, Metamorphosed Sedimentary Rocks, Quartz Diorite, and Metamorphosed Volcanic and Sedimentary Rocks

The Piedmont Plateau geology is dominated by granite gneiss, schist, and granite rocks, generally of the paleozoic and precambrian age. Small intrusive dikes of horneblende gabbro and similar rocks are also present.

Coastal Plain geology is dominated by patuxent, aquia, and calvert formations, and can be characterized by its veneer of sand, gravel and clay deposits.

Geology and Groundwater

The character and position of rocks and rocky formations control the collection, storage, transmission quality and yield of groundwater. Since groundwater is contained in and controlled by rocks, each rock formation or unit is profiled below with respect to groundwater potential.

Coastal Plain Province

In the Coastal Plain, the average well yields 11 gallons of water per minute at a 50-foot depth. Some yield as much as 50 to 60 gallons per minute. Many of the deeper wells produce water that contains objectionable minerals. To the southeast of the City of Fredericksburg, patuxent formations are found. Patuxent formations are the most prolific aquifers, yielding 20 to 50 gallons per minute from deep wells. There are no true aquifer recharge areas within the county; however, silty clay sediments within the Coastal Plain provide the most permeability and promise of recharge to artesian aquifers by means of vertical seepage.

Calvert Formation

This formation occurs within the southeastern portion of the Coastal Plain area and generally consists of green clay, and very fine white sand. The calvert formation is not an important aquifer although it does serve as a form of barrier confining water to the deep water-bearing sands.

Aquia Formation

This formation principally consists of fine-grained sands and moderate amounts of clay. No wells are known to produce from this formation within the county. The aquia formation is exposed above the patuxent formation.

Patuxent Formation

This formation occurs within the eastern most portion of the Coastal Plain area of the county and consists of white sand with lesser amounts of coarse gravel present. Clay lenses are common throughout the formation. The sands and gravel of the patuxent formation are the most prolific aquifers within Spotsylvania County. Wells, which have tapped water-bearing zones of the patuxent, which usually locate at a depth of 100 to 400 feet, have produced between 20 and 50 gallons per minute.

Piedmont Province

Within the Piedmont, small supplies of water are available near the surface where weathering has partially decomposed the rocks. Below the weathered zone, water occurs in fractures and along contacts between different rock types. Average wells extend to depths of 50 to 250 feet and yield from 5 to 15 gallons of water per minute, with some of the better wells yielding approximately 40 gallons per minute; this type of yield is suitable for domestic residential uses but little else. Most wells are shallow, as there is very little change of increasing well yields by drilling more than a few hundred feet due to the decrease in size and number of fractures in the rocks. In addition, objectionable minerals tend to increase with added depth.

Petersburg Granite

The Petersburg granite unit occurs within the northeastern portion of the Piedmont area of Spotsylvania County and is well exposed in the vicinity of the Rappahannock River. It is a coarse to fine grained pink granite intruded by fine-grained blue granite. Small supplies of water sufficient for domestic use are available from the weathered zone of these rocks where fractures are encountered, with yields greater than 20 gallons per minute possible.

Granite Gneiss Unit
The granite gneiss unit occurs within the southeastern portion of the Piedmont area of Spotsylvania County and consists of a gray medium to fine-grained granite gneiss with intrusions of light gray granite. Small to moderate supplies of water have been produced from these rocks. Yields ranging from 1.5 to 62 gallons per minute were produced from wells at Indian Acres. The depths of these wells range from 128 to 525 feet.

Granite
The granite unit occurs within the central and far western portion of the Piedmont area of Spotsylvania County and is primarily composed of gray biolite granite and quartz menozite. Small supplies of water have been produced from this unit with yields ranging from a few gallons per minute to 15 gallons per minute.

Horneblende Gabbro - Quartz Diorite
These units occur at several isolated locations as small elliptical bodies intruding the older rocks. Blue quartz is predominant in the quartz diorite, and the horneblende gabbro is composed chiefly of horneblende and other dark-colored minerals. These geologic units are poor sources of water with small accumulations of water occurring along the contact zones between these rocks and the surrounding formations.

Metamorphosed Sedimentary Rocks
These rocks occur in the north/south belts within the western portion of the Piedmont area of Spotsylvania County and consist of a combination of schists, phyllites, gneisses and quartzites interlayed with igneous rocks. Rocks included in this unit have been fairly good sources of water in most areas. The chance of obtaining substantial groundwater yields depends much on encountering fractured zones within the crystalline rocks. Yields range from a few gallons per minute to over 100 gallons per minute in a few cases. A number of wells constructed for domestic uses in the county have averaged over 30 gallons per minute.

Metamorphosed Volcanic and Sedimentary Rocks
These rocks occur in north/south belts within the western portion of the Piedmont area of the county and consist of quartzites, phyllites, gneisses and schists. Most wells developed in these rocks produce less than 20 gallons per minute although a few wells have produced higher yields. Insufficient groundwater is a problem for the majority of the county for purposes other than low density residential uses. As the drain on groundwater supplies grows more severe and as intensity of use increases, less water will remain in the aquifers. In the future, reductions in residential densities may be necessary to guard against over-taxing of aquifers. The amount of impervious cover of aquifers and recharge areas associated with development further reduces the quantity of groundwater. The requirements for groundwater supply regulate the density of residential development and the extent of commercial/ industrial expansion into areas not served by a central water supply system.

Spotsylvania County straddles the Fall Line, a geologic zone where the sediments of the coastal plain lap up onto the metamorphic and igneous rocks of the piedmont.

Piedmont Rocks: Igneous Rocks of the Western Piedmont

OCpg *plagiogranite tonalite* (Pavlides, 1990).

Includes leucocratic to mesocratic plagioclase- and quartz-rich metamorphosed intrusive rocks containing little or no potassium feldspar. Plagioclase is variably altered to epidote, white mica, and chlorite. Quartz, generally blue, forms granoblastic aggregates that locally have cores of coarse-grained quartz with wavy extinction. Garnet is present locally. Hornblende, generally a minor constituent, is particularly abundant in the southwest portion of the pluton. Many of the plagiogranitic rocks have undergone cataclasis and are protomylonitic to mylonitic.

Piedmont Rocks: Stratified Rocks of the Western Piedmont

Mine Run complex (OZI, OZII, OZIII; Pavlides, 1989; 1990)

OZI *mélange zone I* (Pavlides, 1989).

Fine-grained schist and phyllite matrix encloses coarse-grained metasandstone beds locally; contains exotic blocks of mafic and felsic metavolcanic rocks (vo) similar to metavolcanic rocks of the Chopawamsic Formation (Ccv). Blocks of blastomylonitic tonalite and granodiorite gneiss (gn) are present locally.

OZII *mélange zone II* (Pavlides, 1989).

Schist and phyllite matrix is more complexly deformed than the matrix of mélange zone I; contains metavolcanic blocks (vo) similar to Chopawamsic Formation rocks (Ccv), in addition to granitoid blocks of altered tonalite and granodiorite (gr); intruded by the Ellisville biotite granodiorite (SOe).

OZIII *mélange zone III* (Pavlides, 1989).

Phyllite and schist matrix contains abundant euhedral magnetite; many matrix rocks are highly deformed on a mesoscopic and microscopic scale. Mafic exotic blocks (mf) include amphibolite, ultramafic rocks, serpentinite, and talc; many mafic and ultramafic blocks are composite. Biotite gneiss blocks (gn) are also present. Metavolcanic olistoliths (vo) are rare.

Geophysical signature: Strong positive magnetic anomaly. This unit is intruded by the Ellisville biotite granodiorite (SOe).

OCu *metasedimentary rocks, undivided* (Pavlides, 1990).

Gray to green phyllite, gray to white metasiltstone and fine-grained quartzite, fine-grained mica schist, green slate and phyllite, and sparse granule quartzite and graywacke; may be coeval in part with Old Mill Branch Metasiltstone Member of the Popes Head Formation (OCpo).

SOe *Ellisville biotite granodiorite* (Pavlides, 1990).

Mesocratic, coarse- to medium-grained, equigranular to porphyritic, massive to strongly foliated granodiorite. Mineralogy: quartz + plagioclase + potassium feldspar + biotite; accessories include epidote, allanite, titanite, and apatite. Porphyritic rocks contain potassium feldspar megacrysts up to 1.5 cm across; myrmekite commonly occurs adjacent to potassium feldspar. Brownish-green, strongly pleochroic biotite is associated with, and in places poikilitically encloses epidote, allanite, titanite, and apatite. Subhedral epidote locally encloses euhedral titanite. Pleochroic

green amphibole and muscovite are minor constituents locally. The Ellisville has been dated at 440±8 Ma (Rb-Sr whole rock; Pavlides and others, 1982).

Rocks of the Central Virginia Volcanic-Plutonic Belt

PMf *Falmouth Intrusive Suite* (Pavlides, 1980).

Fine grained to pegmatitic granite, quartz monzonite, granodiorite, and tonalite; consists of dikes, sills and small plutons. Mineralogy: plagioclase + quartz + microcline + biotite + muscovite + hornblende ± garnet + epidote + apatite + titanite + opaque minerals; myrmekite common. The unit has been dated at 300-325 Ma (U-Pb zircon and Rb-Sr whole-rock; Pavlides and others, 1982). These rocks intrude the Ta River Metamorphic Suite (Cta), Falls Run Granite Gneiss (Sf), Holly Corners Gneiss (CZh), Quantico Formation (Oq) and porphyroblastic garnet-biotite gneiss (Ym; Po River Metamorphic Suite of Pavlides, 1980).

Sf *Falls Run Granite Gneiss* (Pavlides, 1980).

Pink to white, coarse-grained, strongly-foliated hornblende-biotite granite to monzonite gneiss. Mineralogy: microcline + plagioclase + quartz + biotite + muscovite ± hornblende; apatite, epidote, titanite, and magnetite-ilmenite are accessories; myrmekite is common. The Falls Run has been dated at 410 Ma (U-Pb zircon and Rb-Sr whole-rock; Pavlides and others, 1982); the gneiss intrudes Ta River Metamorphic Suite **(**Cta) and the Holly Corners Gneiss (CZh).

Quantico Formation (Oq, Oqq; Pavlides, 1980)

Oq *slate and porphyroblastic schist.*

Gray to black, graphitic, pyritic phyllite and slate (northern Piedmont); metamorphic grade increases to the southwest to produce porphyroblastic staurolite-, kyanite-, and garnet-biotite-muscovite schists. Locally the unit contains felsic metatuff, metagraywacke, and micaceous quartzite interbeds; thickness has been estimated at as much as 3000 feet (Pavlides, 1980). Mineralogy: quartz + muscovite + biotite ± garnet ± staurolite ± kyanite + opaque minerals; chlorite is a common secondary mineral. Geophysical signature: strike-elongated positive linear magnetic and radiometric anomalies. The unit was originally named Quantico Slate by Darton (1894), and modified to Quantico Formation by Pavlides (1980). An Ordovician age for the Quantico is indicated by fossils collected by Watson and Powell (1911) and more recently by Pavlides and others (1980). The Quantico unconformably overlies older units in the northeastern Piedmont, and is correlated with the Arvonia Formation to the southwest.

Oqq *micaceous quartzite.*

Light-gray, fine- to medium-grained quartzite and quartzose muscovite schist. Mineralogy: quartz + muscovite + plagioclase ± microcline. This lithology occurs as thin discontinuous lenses at the base of the Quantico; thin diopsidic calcsilicate layers are also found locally in the lower part of the Quantico (Pavlides, 1980).

Ccv *Chopawamsic Formation, undivided*, (Pavlides, 1981).

Includes laterally discontinuous lenses and tongues of metamorphosed felsic, intermediate, and mafic volcanic flows and volcanoclastic rocks, with interlayered quartzite, quartzose greywacke, schist, and phyllite. Volcanic flows are locally highly vesicular; fragmental breccia and tuff are common. Felsic flows are typically light-gray aphanitic rocks with phenocrysts of quartz and

feldspar; intermediate flows are dark-green amphibole-bearing rocks with fine-grained quartz-feldspar matrix; greenstone metabasalts contain blue green amphibole, chlorite, albitic plagioclase, and quartz. Geophysical signature: linear strike-elongate pattern of elevated magnetic anomalies.

The Chopawamsic is correlated with the James Run Formation in Maryland; the James Run has been dated at 570 to 530 Ma (U-Pb zircon; Tilton and others 1970). The Chopawamsic is unconformably overlain by the Late Ordovician Arvonia and Quantico Formations. Pavlides (1981 and subsequent works) has made the interpretation on the basis of geologic and geochemical data that the Chopawamsic and related plutons represent an ancient island-arc sequence.

Cta *Ta River Metamorphic Suite, (undivided)*.

Layered sequence consists dominantly of greenish-gray to black, medium- to coarse-grained, poorly to well-lineated, massive to well-layered amphibolite and amphibole-bearing gneiss and schist; includes interlayered ferruginous quartzite, and minor biotite gneiss, felsic volcanic rocks, gabbro and granite. Amphibolitic rocks commonly contain quartz-epidote lenses and veins. Proportion of biotite gneiss and schist increases from northeast to southwest along strike, as does grade of regional metamorphism. Mineralogy: (hornblende, tremolite-actinolite, and cummingtonite) + quartz + calcic oligoclase ± epidote ± biotite ± garnet. Geophysical signature: linear positive and negative magnetic and radiometric anomalies.

Pavlides (1981) correlated the Ta River with the Chopawamsic and James Run Formations, and considered the Ta to be a more oceanward facies of a Chopawamsic island arc sequence, on the basis of geologic and geochemical factors. The Quantico Formation generally overlies the boundary between the Chopawamsic and the Ta, obscuring the contact relationships.

Cg *amphibole metagabbro*.

Dark-greenish-gray, coarse-grained, massive, hornblende metagabbro. Mineralogy: plagioclase + hornblende + biotite + clinopyroxene + quartz; relict olivine and myrmekitic intergrowths of quartz in other minerals are characteristic. Geophysical signature: small circular areas marked by positive magnetic anomalies. Metagabbro intrudes Ta River Metamorphic Suite.

CZh *Holly Corner Gneiss* (Pavlides, 1980; 1990).

Dark- gray to black, fine- to medium-grained, strongly-foliated hornblende-biotite-rich gneiss. Mineralogy: hornblende + plagioclase + biotite + quartz + titanite; accessory minerals include zircon, epidote, microcline, chlorite; trace amounts of apatite, calcite, muscovite, and opaque minerals are present. Myrmekitic intergrowths are common.

Rocks of the Eastern Piedmont

PzYgr *granite gneiss* (Pavlides, 1990).

Fine- to medium-grained, light-gray to white granite to tonalite gneiss; composed of biotite, oligoclase, quartz, and porphyroblastic microcline, with accessory muscovite, epidote, titanite, and magnetite; hornblende occurs locally within diffuse compositional layering. Inclusions of biotite gneiss and amphibolite are present locally. Unit occurs as irregular lenticular to tabular masses within porphyroblastic biotite gneiss (Ymd).

PzYpm *quartzofeldspathic gneiss* (Bobyarchick and others, 1981).

Light-gray, fine- to coarse-grained, foliated, layered muscovite-bearing quartzofeldspathic gneiss; contains inter-calated quartz-muscovite schist. Mineralogy: quartz + plagioclase + microcline + garnet + muscovite + biotite.

Ya *amphibolite, amphibole gneiss, and schist*.

Melanocratic, fine- to coarse-grained, weakly to strongly foliated, irregularly layered amphibole-rich gneiss and schist. Mineralogy: hornblende + clinopyroxene + plagioclase + magnetite + biotite ± scapolite ± garnet ± quartz ± epidote. Geophysical signature: narrow, strike-elongate, positive magnetic anomaly. Lenses and layers of amphibolite and amphibole gneiss are interlayered with porphyroblastic garnet-biotite gneiss (Ymd). The mafic rocks constitute 50 percent or more of the section in a zone about 0.62 mile wide surrounding outcrop areas of State Farm gneiss (Ysf); farther away from the State Farm contact, lenses and layers of amphibolite and amphibole gneiss are more widely scattered, but are laterally persistent and outline map-scale structures (Marr, 1985). Amphibolite and interlayered biotite gneiss adjacent to the State Farm gneiss were named the Sabot amphibolite by Poland (1976), who characterized the formation as a tabular sheet 0.7 to 1.0 km thick. He and Goodwin (1970) interpreted these amphibolites as metamorphosed mafic volcanic or pyroclastic rocks. Glover and others (1989 and references therein) report a low-angle regional discordance between the base of the Sabot and the compositional layering in the underlying State Farm Gneiss.

Ymd *porphyroblastic garnet-biotite gneiss.*

Heterogeneous layered sequence is dominantly garnetiferous biotite gneiss and porphyroblastic gneiss, migmatitic in part, with subordinate interlayered amphibolite and amphibole gneiss (Ya), pelitic-composition gneiss, calcsilicate gneiss, biotite-hornblende-quartz-plagioclase gneiss, and garnetiferous leucogneiss. These lithologies contain amphibolite-facies metamorphic mineral assemblages consistent with rock chemistry. Farrar (1984) reports relict granulite-facies assemblages in some rocks. This unit underlies a wide area that surrounds the State Farm antiform (Poland, 1976; Reilly, 1980; Farrar, 1984) and two subsidiary antiforms to the northeast; the unit includes the Maidens gneiss and portions of the Sabot amphibolite of Poland (1976), the eastern gneiss complex and Boscobel granodiorite gneiss of Bobyarchick (1976), and the Po River Metamorphic Suite of Pavlides (1980). Poland (1976) and Reilly (1980) proposed that the Maidens gneiss and Sabot amphibolite were a Late Precambrian- to Early Paleozoic-age volcanic-sedimentary cover sequence unconformably overlying the State Farm gneiss. Farrar (1984) interpreted relict granulite-facies mineral assemblages to have equilibrated during Grenville-age regional metamorphism; this contributed to his conclusion that the Sabot and Maidens, in addition to the State Farm, are Grenville or pre-Grenville in age. Porphyroblastic garnet-biotite gneiss (Ymd) is intruded by rocks of the Carboniferous-age Falmouth Intrusive Suite (Pavlides, 1980).

Coastal Plain

al *alluvium (Holocene).*

Fine to coarse gravelly sand and sandy gravel, silt, and clay, light- to medium-gray and yellowish-gray. Deposited mainly in channel, point-bar, and flood plain environments; includes sandy deposits of narrow estuarine beaches, and mud, muddy sand, and peat in swamps and in fresh- and brackish-water marshes bordering tidewater rivers. Grades into colluvium along steeper

valley walls at margins of unit. Mostly Holocene but, locally, includes low-lying Pleistocene (?) terrace deposits. As much as 80 feet thick along major streams.

QTu *Quaternary and Tertiary deposits*, undifferentiated.
Tabb through Windsor Formations and alluvial/tidal prism deposits.

Qt *Tabb Formation, undifferentiated* (upper Pleistocene, Johnson, 1976).
Sand, silt, and peat of coast-parallel plains seaward of the Suffolk and Harpersville scarps, includes coeval terrace deposits along major river valleys west to Fall Line. Subdivided into three members (Johnson, 1976).

Qsh *Shirley Formation* (middle Pleistocene, Johnson and Berquist, 1989).
Light- to dark-gray, bluish-gray and brown sand, gravel, silt, clay, and peat. Constitutes surficial deposits of riverine terraces and relict bay mouth barriers and bay flood plains (altitude 35-45 feet) inset below depositional surfaces of the Chuckatuck Formation (Johnson and Peebles, 1984). Upper part of unit is truncated on the east by the Suffolk and Harpersville scarps; locally, lower part occurs east and west of scarps. Fluvial-estuarine facies comprises (1) a lower pebble to boulder sand overlain by (2) fine to coarse sand interbedded with peat and clayey silt rich in organic material, including *in-situ* tree stumps and leaves and seeds of cypress, oak, and hickory, which grades upward to (3) medium- to thick-bedded, clayey and sandy silt and silty clay. Marginal-matrix facies in lower James River and lowermost Rappahannock River areas is silty, fine-grained sand and sandy silt containing *Crassostrea virginica*, *Mulinia*, *Noetia*, *Mercenaria*, and other mollusks. *Astrangia* from lower Rappahannock River area has yielded a uranium-series age of 184,000 ± 20,000 yrs B.P. (Mixon and others, 1982). Thickness is 0 to 80 feet.

Qcc *Charles City Formation* (lower Pleistocene (?), Johnson and Berquist, 1989).
Light- to medium-gray and light-to dark-yellowish and reddish-brown sand, silt, and clay composing surficial deposits of riverine terraces and coast-parallel plains at altitudes of 70 to 80 feet. Unit is adjacent to, and inset below, the Windsor Formation and older deposits. Bay or shallow-shelf facies of the Charles City (Johnson and Peebles, 1984), present beneath flat to gently seaward-sloping plain in Suffolk area, includes a thin, basal, gravelly sand grading upward into fine- to medium-grained sand and an uppermost clayey and sandy silt; lower and middle parts of unit contain clay-lined, sand-filled burrows. Fluvial-estuarine facies in terrace remnants along major rivers consists of cross-bedded gravelly sand and clayey silt. Thickness is 0 to 55 feet, or more.

QTw *Windsor Formation* (lower Pleistocene or upper Pliocene, Coch, 1968).
Gray and yellowish- to reddish-brown sand, gravel, silt, and clay. Constitutes surficial deposits of extensive plain (altitude 85-95 feet.) seaward of Surry scarp and of coeval, fluvial-estuarine terraces west of scarp. Fining-upward sequence beneath plain consists of a basal pebbly sand grading upward into cross-bedded, quartzose sand and massive, clayey silt and silty clay; lower and upper parts of sequence were deposited, respectively, in shallow-marine or open-bay and restricted-bay or lagoonal environments. In terraces west of Surry scarp, fluvial-estuarine deposits comprise muddy, coarse, trough cross-bedded sand and gravel grading upward to sandy silt and clay. Thickness is 0 to 40 feet.

Tb1/Tb2 *Bacons Castle Formation* (upper Pliocene, Coch, 1965).

Gray, yellowish-orange, and reddish-brown sand, gravel, silt, and clay; constitutes surficial deposits of high plain extending from Richmond, eastward to the Surry scarp. Unit is subdivided into two members: Tb1, massive to thick-bedded pebble and cobble gravel grading upward into cross-bedded, pebbly sand and sandy and clayey silt, and Tb2, predominantly thin-bedded and laminated clayey silt and silty fine-grained sand. Tb2 is characterized by flaser, wavy, and lenticular bedding and rare to common clay-lined burrows including *Ophiomorpha nodosa*. Thickness is 0 to 70 feet.

Tc *Chesapeake Group* (upper Pliocene to lower Miocene, Darton, 1891).

Fine-to coarse-grained, quartzose sand, silt, and clay; variably shelly and diatomaceous, deposited mainly in shallow, inner- and middle-shelf waters. Ages of units based on studies of foraminiferal, nannofossil, diatom, and molluscan assemblages in Virginia and adjacent states (Andrews, 1988; Gibson, 1983; Gibson and others, 1980; Poag, 1989; Ward and Blackwelder, 1980; Ward and Krafft, 1984). Includes the following formations, from youngest to oldest:

Chowan River Formation (upper Pliocene, Blackwelder, 1981).

Gray to dusky blue-green sand, fine- to medium-grained, clayey and silty, commonly very shelly; grades laterally into laminated, silty clay and upward into cross-bedded, biofragmental sand, clayey silt, and silty clay. Discontinuous pebbly to bouldery sand at very irregular base of unit. Mollusks include *Glycymeris hummi*, *Noetia carolinensis*, and *Carolinapecten eboreus bertiensis*. Thickness is 0 to 50 feet. Recognized only in southeasternmost Virginia and North Carolina.

Yorktown Formation (lower upper Pliocene to lower Pliocene, Clark and Miller, 1906).

Bluish-gray and brownish-yellow sand, fine- to coarse-grained, in part glauconitic and phosphatic, commonly very shelly, interbedded with sandy and silty blue-gray clay. In lower York and James River basins, unit includes cross-bedded shell hash. Mollusks include *Glycymeris subovata*, *Chesapecten jeffersonius*, *Chesapecten madisonius*, *Mercenaria tridacnoides*, *Panopea reflexa*. Coarse-grained sand and gravel facies of the Yorktown in up dip areas is mapped separately as unit psg. Thickness is 0 to 150 feet.

Eastover Formation (upper Miocene, Ward and Black-welder, 1980).

Dark-gray to bluish-gray, muddy sand, very fine to fine, micaceous, interbedded with sandy silt and clay. Lower part of unit is dominantly medium- to very-thin-bedded and laminated silt and clay interbedded with very-fine sand, lenticular and wavy bedding common; upper part is mainly very-fine- to fine-grained sand containing abundant clay laminae. Typical mollusks include *Chesapecten middlesexensis*, *Marvacrassatella surryensis*, *Glossus fraterna*. Thickness is 0 to 270 feet.

St. Marys Formation (upper and middle Miocene, Shattuck, 1902).

Bluish- to pinkish-gray, muddy, very-fine sand and sandy clay-silt, locally abundantly shelly. *Chesapecten santamaria*, *Buccinofusus parilis*, and *Ecphora gardnerae* are characteristic mollusks. Occurs northeast of Mattaponi River. Thickness is 0 to 40 feet.

Choptank Formation (middle Miocene, Shattuck, 1902).

Olive-gray sand, fine to very-fine, clayey and silty, shelly, and diatomaceous clay-silt; commonly forms fining-upward sequences. Mollusks include *Chesapecten nefrens*, *Mercenaria cuneata*, *Ecphora meganae*. Thickness is 0 to 50 feet.

Calvert Formation (middle and lower Miocene, Shattuck, 1902).

Commonly consists of 2 to 7 fining-upward sequences. Each sequence includes a light- to dark-olive-gray basal sand, very fine to fine, clayey and silty, very sparsely to abundantly shelly; grades upward to sandy, diatomaceous clay-silt and diatomite. Typical mollusks include *Chesapecten coccymelus*, *Crassatella melinus*, *Ecphora tricostata*. hickness is 0 to 600 feet.

psg *Pliocene sand and gravel*.

Interbedded yellowish-orange to reddish-brown gravelly sand, sandy gravel, and fine to coarse sand, poorly to well-sorted, cross-bedded in part, includes lesser amounts of clay and silt in thin to medium beds. Commonly caps drainage divides (altitude 250-170 feet) in western part of Coastal Plain. Lower part of unit, showing flaser and lenticular bedding and containing rare to abundant *Ophiomorpha nodosa*, represents deposition in marginal-marine environments and is, in part, a near-shore equivalent of the more down dip, marine facies of the Yorktown Formation. In the northern part of the Coastal Plain, the more poorly sorted and less cleanly washed upper part of unit, which lacks fossils, comprises fluvial-deltaic sediments that prograded eastward across the shelf during a regressive phase of the Yorktown. To the south, the upper part of unit is massively bedded clayey sand in places containing heavy mineral concentrations that average 8 percent or more; the sands are near shore, beach and dune origin; interstitial clay was derived, in part, from *in-situ* weathering of feldspar sand. Thickness is 0 to 50 feet.

msg *Miocene sand and gravel.*

Fine- to coarse-grained sand, sandy gravel, silt, and clay, gray to light-yellowish-gray, commonly oxidized to yellowish-orange and yellowish-brown; pebbles and cobbles are deeply etched. Commonly caps interfluves at northwestern edge of Coastal Plain and constitutes thin Coastal Plain outliers in easternmost Piedmont where deposits directly overlie weathered crystalline rocks. In part, may represent a fluvial to marginal-marine facies of the Choptank Formation. Thickness is 0 to 30 feet.

Tl *Lower Tertiary deposits* (Oligocene, Eocene, and Paleocene).

Mostly fine- to coarse-grained glauconitic quartz sand and clay-silt, shelly in part; includes lesser amounts of sandy limestone and limey sand. In outcrop, unit comprises the Pamunkey Group (Brightseat, Aquia, Marlboro, Nanjemoy, and Piney Point Formations) and the Old Church Formation. In subsurface, unit includes Eocene and Oligocene strata not included in the Pamunkey and Old Church. Ages of formational units based on foraminiferal, nannofossil, dinocyst, pollen, and molluscan studies (Frederiksen, 1979; Gibson and others, 1980; Gibson and Bybell, 1984; Edwards, 1984, 1989; Edwards and others, 1984; Poag, 1989; Ward, 1985; Ward and Krafft, 1984). Stratigraphic sections vary widely, comprising one or more of the following formations:

Old Church Formation (Ward, 1985) and unnamed glauconitic sands (upper Oligocene).

In inner and middle Coastal Plain, unit is 0 to 5 feet of olive-gray, fine- to coarse-grained, shelly, very sparsely glauconitic quartz sand of the Old Church Formation; typical fossils include *Anomia*

ruffini, *Lucina sp*., and *Mercenaria capax*. In subsurface of outer Coastal Plain, unit includes about 45 feet of dark-olive-gray to greenish-black glauconite sand with lesser amounts of quartz; sand has olive-brown clay-silt matrix.

Lower Oligocene beds.

Olive-gray to grayish-olive sand, very-fine-grained, clayey and silty, micaceous, glauconitic; coarsens upward to a very-fine- to fine-grained sand. Unit is 0 to 50 feet thick; identified only in subsurface of Eastern Shore area (Exmore, core hole, R. B. Mixon and D. S. Powars, personal communication).

Chickahominy Formation (upper Eocene, Cushman and Cederstrom, 1945).

Predominantly olive-gray clayey silt and silty clay, very compact, glauconitic, micaceous, contains abundant finely crystalline iron sulfide. Coarsens downward to a very-fine- to fine-grained sand, pebbles at base. Rare fragmental shell, microfossils very abundant. Thickness is 0 to 100 feet; present in subsurface of southeastern Virginia.

Piney Point Formation (middle Eocene, Otton, 1955).

Olive-gray and grayish-olive-green, glauconitic quartz sand, medium-to coarse-grained, poorly sorted, contains scattered quartz pebbles, interbedded with carbonate-cemented sand and moldic limestone. Unit is characterized by large, calcitic shells of the oyster *Cubitostrea sellaeformis*, a middle Eocene marker. Aragonitic mollusks are generally leached, leaving only molds and casts. Thickness is 0 to 60 feet.

Nanjemoy Formation (lower Eocene, Clark and Martin, 1901).

Dark-olive-gray, greenish-gray, and olive-black glauconitic quartz sand, fine- to coarse-grained, very clayey and silty, intensely burrowed, sparsely to abundantly shelly, interbedded with sandy clay-silt. Sand in upper part of unit is less clayey, very micaceous, and contains scattered quartz pebbles. Typical mollusks include *Venericardia potapacoensis*, *Venericardia ascia*, and *Macrocallista subimpressa*. Unit is 0 to 140 feet thick.

Marlboro Clay (lower Eocene (?) and upper Paleocene, Clark and Martin, 1901).

Light-gray, pinkish-gray, and reddish-brown kaolinitic clay, massively bedded to laminated, interbedded with lesser amounts of laminated and ripple cross-laminated silt and very-fine-grained sand. Contains rare molds of small mollusks and arenaceous foraminifera. Thickness is 0 to 30 feet.

Aquia Formation (upper Paleocene, Clark and Martin, 1901).

Light- to dark-olive gray, glauconitic quartz sand, fine- to coarse-grained, clayey and silty, thick- to massively bedded, sparsely to abundantly shelly. Lower part of unit is more poorly sorted and more calcareous than upper part and contains a few thin to medium beds of olive-gray, white, and pale greenish-yellow limestone. Upper part of unit is moderately well sorted and characterized by thin beds of the large, high-spired gastropod *Turritella mortoni*. Other common mollusks include *Cucullaea gigantea*, *Ostrea sinuosa*, and *Crassatellites alaeformis*. Thickness is 0 to 130 feet.

Brightseat Formation (lower Paleocene, Bennett and Collins, 1952).

Olive-gray to olive-black, micaceous quartz sand, fine- to very fine-grained, clayey and silty, variably glauconitic. Thickness is 0 to 20 feet.

Kp *Potomac Formation* (Lower and Upper(?) Cretaceous, McGee, 1886).

Light-gray to pinkish- and greenish-gray quartzo-feldspathic sand, fine- to coarse-grained, pebbly, poorly sorted, commonly thick-bedded and trough cross-bedded. Sand is interbedded with gray to green, massive to thick-bedded sandy clay and silt, commonly mottled red or reddish-brown. Includes lesser amounts of clay-clast conglomerate and thin-bedded to laminated, carbonaceous clay and silt. In the inner Coastal Plain, unit was deposited mainly in fluvial-deltaic environments, intertongues eastward with thin glauconitic sands of shallow-shelf origin. Spore and pollen assemblages and leaf impressions of ferns and cycads indicate an Early Cretaceous age (Doyle and Robbins, 1977). In some down dip areas, uppermost part of unit may be of earliest Late Cretaceous age. Thickness ranges from a featheredge at western limit of outcrop to more than 3500 feet in subsurface of outermost Coastal Plain.

MINERAL RESOURCES AND INDUSTRIES

As part of this Comprehensive Plan update, County Planning efforts as they relate to Natural Resources have been enhanced to gain a better understanding of available mineral resources and opportunities they present, their value and location. Proactively considering such resources as part of land use planning and economic development efforts expand upon the planning scope and vision established in prior Comprehensive Plans. Land use planning and project approvals that conflict with the fixed geographic location of valued mineral resources effectively degrades the value of such resource potential due to lack of consideration, dismissing the potential economic, technological, social impacts value of available raw materials. The absence of planning to consider subgrade resources when land use and development above grade are planned and approved "leaves mineral resources on the table" unable to be utilized, trapped below a land use vision that my conflict or may not have considered the subgrade resources present.

Efforts to plan with a larger emphasis, accommodation and consideration of mineral resources can put the County in an advantageous leadership position early on as efforts are made to enhance sourcing of raw materials from domestic locations, and the opportunities and growth of economic value associated with increased demands from emerging and future technologies.

The Virginia Department of Mines, Minerals, and Energy Division of Geology and Mineral Resources (DMME) have provided insights into Mining, Mineral Resources and Industries within Spotsylvania County, as follows:

The availability of mineral resources within Spotsylvania County limits offer exceptional opportunities. The County overlaps two geologic provinces, each containing a diversity of mineral resources that can supply basic construction materials well into the future. A map of Spotsylvania County's Geology and Mineral Resources can be found within this Appendix for reference.

Most of Spotsylvania County is in the Piedmont province and is under-laid by igneous and metamorphic rocks. The easternmost portion of the County is in the Coastal Plain province and is predominantly

underlain by sand, gravel and clay strata that are deposited on the rocks similar to those in the Piedmont portion.

In addition, and as a consequence of the geologic diversity, there are many other potential growth opportunities with deposits of industrial clays, natural agricultural supplements, and metallic resources. Perhaps most economically advantageous and considerate of new and emerging technologies and industries the presence of "critical elements" such as graphite, tantalum, niobium, rare earth elements, among others, will be key materials for energy production and storage in the future. Federal and State resource analysts (Including representatives of the Virginia Department of Mines, Minerals and Energy) recognize the urgent need to identify new domestic resources to reduce the present reliance on foreign imports to supply these materials. Per DMME, "we are really just beginning to do these assessments and Spotsylvania looks as promising as any County in Virginia."

The positive aspects of jobs creation and economic growth opportunities that local mining operations provide are often overshadowed by the negative perceptions of unmitigated surface disturbance, noise, environmental contamination, etc. Much of the negative perception is based on antiquated mining practices and legacy sites.

Summary of Mineral Resources and Mining Industries in Spotsylvania County, Virginia

The DMME regulates five mine permits with active mineral mining operations in Spotsylvania County (See Table 2). The total land acreage under permit is about 983 acres. Three of the permitted mines produce sand and gravel for construction aggregate. The mines are located in sedimentary strata mapped as the Quaternary age Charles City Formation (Qcc) and unnamed units of Neogene age (Nsg). The other two permitted operations quarry granitic rocks for crushed stone and also produce manufactured sand that is a by-product of rock crushing.

MINERAL RESOURCES AND INDUSTRIES IN SPOTSYLVANIA COUNTY, VIRGINIA
TABLE 2: Active Mining Operations in 2016

A	B	C	D	E	F	G	H	I	J	K
COMPANY NAME	PERMIT ID	MINE NAME	MINE TYPE	COMMODITY/PRODUCT	ORIGINAL PERMIT DATE	PERMIT ACRES	DISTURBED ACRES	RECLAIMED ACRES	LONGITUDE	LATITUDE
LUCK STONE CORPORATION	08203AC	SPOTSYLVANIA PLANT	QUARRY	GRANITE / CRUSHED STONE	5/29/2002	385.6	326.9	0.0	-77.55083	38.21111
KENT BROTHERS LLC	13413AB	THE PITT	OPEN PIT	GRAVEL	8/19/1997	10.2	10.2	0.3	-77.47192	38.21951
VULCAN CONSTRUCTION MATERIALS LP	90294AC	NEW POST S&G	QUARRY	SAND AND GRAVEL	1/22/2004	50.7	50.7	3.4	-77.39779	38.24142
LUCK STONE CORPORATION	90440AA	MASSAPONAX PLANT	QUARRY	GRANITE / CRUSHED STONE	7/17/2002	229.6	139.4	0.0	-77.53059	38.18405
BARDON, INC	90468AB	FULKS PIT	OPEN PIT	SAND AND GRAVEL	2/16/2012	306.4	169.3	0.0	-77.38420	38.23237

Data Sources:
Columns A-K: Virginia Department of Mines, Minerals, and Energy - Division of Mineral Mining
Note1: Latitude (N) and Longitude (W) in decimal degrees; North American Datum 1983 (NAD 83)
Prepared by:
Virginia Department of Mines, Minerals, and Energy - Division of Geology and Mineral Resources
Date of this report:
9/7/2017

In 2016, mines in the County produced a total of about 1.6 million short tons of aggregate with an estimated value of $23.8 million (See Table 3). The value of mineral mine products has increased by almost 22 percent from 2014 when the total value was estimated to be about $19.6 million (Table 3). Employment in the mines has been relatively steady since 2014 (See Table 4). There were a total of 37 workers directly employed by the mining companies in 2016 earning approximately $2 million in wages (Table 4). Independent contractors and service providers employed by the mines are not included in the employment and wage information.

MINERAL RESOURCES AND INDUSTRIES IN SPOTSYLVANIA COUNTY, VIRGINIA
TABLE 3: Summary of Annual Production Reported by Mining Operations and Estimated Value, 2014-2016

A	B	C	D	E	F	G	H
COMPANY NAME	PERMIT ID	MINE NAME	MINE TYPE	COMMODITY/PRODUCT	YEAR	TONNAGE (short tons)	MINERAL VALUE (x $1000)
LUCK STONE CORPORATION	08203AC	SPOTSYLVANIA PLANT	QUARRY	GRANITE / CRUSHED STONE	2016	1,228,341	
KENT BROTHERS LLC	13413AB	THE PITT	OPEN PIT	GRAVEL	2016	1,071	
VULCAN CONSTRUCTION MATERIALS LP	90294AC	NEW POST S&G	QUARRY	SAND AND GRAVEL	2016	0	
LUCK STONE CORPORATION	90440AA	MASSAPONAX PLANT	QUARRY	GRANITE / CRUSHED STONE	2016	0	
BARDON, INC.	90468AB	FULKS PIT	OPEN PIT	SAND AND GRAVEL	2016	407,864	
SPOTSYLVANIA TOTAL					**2016**	**1,637,276**	**$23,770**
LUCK STONE CORPORATION	08203AC	SPOTSYLVANIA PLANT	QUARRY	GRANITE / CRUSHED STONE	2015	1,045,994	
KENT BROTHERS LLC	13413AB	THE PITT	OPEN PIT	GRAVEL	2015	27,362	
VULCAN CONSTRUCTION MATERIALS LP	90294AC	NEW POST S&G	QUARRY	SAND AND GRAVEL	2015	0	
LUCK STONE CORPORATION	90440AA	MASSAPONAX PLANT	QUARRY	GRANITE / CRUSHED STONE	2015	0	
BARDON, INC.	90468AB	FULKS PIT	OPEN PIT	SAND AND GRAVEL	2015	427,809	
SPOTSYLVANIA TOTAL					**2015**	**1,501,165**	**$20,299**
LUCK STONE CORPORATION	08203AC	SPOTSYLVANIA PLANT	QUARRY	GRANITE / CRUSHED STONE	2014	885,469	
KENT BROTHERS LLC	13413AB	THE PITT	OPEN PIT	GRAVEL	2014	134,342	
VULCAN CONSTRUCTION MATERIALS LP	90294AC	NEW POST S&G	QUARRY	SAND AND GRAVEL	2014	0	
LUCK STONE CORPORATION	90440AA	MASSAPONAX PLANT	QUARRY	GRANITE / CRUSHED STONE	2014	0	
BARDON, INC.	90468AB	FULKS PIT	OPEN PIT	SAND AND GRAVEL	2014	527,988	
SPOTSYLVANIA TOTAL					**2014**	**1,547,799**	**$19,552**

Data Sources:
Columns A-G: Virginia Department of Mines, Minerals, and Energy - Division of Mineral Mining
Column H: The Virginia Division of Geology and Mineral Resources estimated the mineral value using reported tonnage data and commodity unit average values for Virginia published annually in USGS Minerals Yearbook (http://minerals.usgs.gov/minerals/pubs/commodity), and USGS Mineral Industry Surveys (http://minerals.usgs.gov/minerals/pubs/commodity/mis.html). Unit values are subject to revision and may not be available for all commodities.
Prepared by:
Virginia Department of Mines, Minerals, and Energy - Division of Geology and Mineral Resources
Date of this report:
9/7/2017

MINERAL RESOURCES AND INDUSTRIES IN SPOTSYLVANIA COUNTY, VIRGINIA
TABLE 4: Summary of Workers, Hours, and Wages for Mining Operations, 2014-2016

A	B	C	D	E	F	G	H	I	J
			PRODUCTION		OFFICE		TOTAL		
COMPANY NAME	PERMIT ID	YEAR	WORKERS	HOURS	WORKERS	HOURS	WORKERS	HOURS	WAGES (x $1000)
LUCK STONE CORPORATION	08203AC	2016	23	54,810	0	0	23	54,810	
KENT BROTHERS LLC	13413AB	2016	1	1,120	1	10	2	1,130	
VULCAN CONSTRUCTION MATERIALS LP	90294AC	2016	0	0	0	0	0	0	
LUCK STONE CORPORATION	90440AA	2016	0	0	0	0	0	0	
BARDON, INC.	90468AB	2016	8	11,853	4	5,815	12	17,668	
SPOTSYLVANIA TOTAL		**2016**	**32**	**67,783**	**5**	**5,825**	**37**	**73,608**	**$1,977**
LUCK STONE CORPORATION	08203AC	2015	22	53,117	0	0	22	53,117	
KENT BROTHERS LLC	13413AB	2015	0	0	0	0	0	0	
VULCAN CONSTRUCTION MATERIALS LP	90294AC	2015	0	0	0	0	0	0	
LUCK STONE CORPORATION	90440AA	2015	0	0	0	0	0	0	
BARDON, INC.	90468AB	2015	9	11,413	4	5,537	13	16,950	
SPOTSYLVANIA TOTAL		**2015**	**31**	**64,530**	**4**	**5,537**	**35**	**70,067**	**$1,977**
LUCK STONE CORPORATION	08203AC	2014	22	49,565	0	0	22	49,565	
KENT BROTHERS LLC	13413AB	2014	2	1,535	1	40	3	1,575	
VULCAN CONSTRUCTION MATERIALS LP	90294AC	2014	0	0	0	0	0	0	
LUCK STONE CORPORATION	90440AA	2014	0	0	0	0	0	0	
BARDON, INC.	90468AB	2014	7	15790	2	3616	9	19,406	
SPOTSYLVANIA TOTAL		**2014**	**31**	**66,890**	**3**	**3,656**	**34**	**70,546**	**$1,924**

Data Sources:
Columns A-J: Virginia Department of Mines, Minerals, and Energy - Division of Mineral Mining
Note 1: In accordance with 45.1-161.292:35(E) of the Mineral Mine Safety Laws of Virginia, wage data has been withheld (W) to protect confidential information reported by individual permit holders. The annual wage data shown is aggregated for all permits.
Note 2: Number of employees, hours, and wages reported by independent contractors working on the listed permits is not included.
Prepared by:
Virginia Department of Mines, Minerals, and Energy - Division of Geology and Mineral Resources
Date of this report:
9/7/2017

Per DMME, Spotsylvania County occupies portions of two geologic provinces with a wide variety of mineral and energy resources utilized in the past and present, and potentially available for development in the future. In the northeastern quarter of the County, unconsolidated sediments are part of Virginia's Coastal Plain while the remainder of the County is underlain by crystalline rocks of the Piedmont province. The eastern half of the County contains sand and gravel, clay and granite resources used for construction aggregate. Sand and gravel deposits occur along Massaponax Creek within the Potomac Formation (Kp), and in the middle of the county hosted in the Ta River Metamorphic Suite (Ta). The central and western portions of the County are within the Piedmont physiographic province. Here, northeast-trending bands of rocks mapped as the Mine Run Complex and the Chopawamsic Formation (Ccv) host gold, copper, iron and zinc deposits (See Table 5). Mining and exploration of these metallic deposits dates back to the early 1800s; the first occurrence of lode gold in Virginia was reported in 1806 at the Whitehall mine located near Shady Grove Church (Watson 1907). This and other important historic gold mines including the Goodwyn and Mitchell mines are located in Virginia's gold-pyrite belt (Lonsdale, 1927).

Geologic maps of Spotsylvania County are available in reports from the U.S. Geological Survey (USGS) including mapping at 1:100,000 scale (Mixon et al., 2000) and portions of the county at 1:24,000 scale (Bobyarchick, et al., 1981; Weir, et al., 1985). These reports are available for free download on the USGS website, **HERE**.

MINERAL RESOURCES AND INDUSTRIES IN SPOTSYLVANIA COUNTY, VIRGINIA

TABLE 5: Summary of Historic Mineral Extraction and Processing Sites and Mineral Occurrences

A	B	C	D	E	F	G	H
POINT ID	QUADRANGLE NAME	PRIMARY COMMODITY	LATITUDE	LONGITUDE	LOCATION TYPE	LOCATION NAME	SITE REFERENCE(S)
169B-101	Guinea	sand and gravel	38.23077	-77.49969	pit		
169B-102	Guinea	sand and gravel	38.22878	-77.49791	pit		
169B-103	Guinea	sand and gravel	38.22729	-77.49387	pit		
169B-104	Guinea	sand and gravel	38.24096	-77.47316	pit		
169B-105	Guinea	sand and gravel	38.24097	-77.47314	pit		
169B-106	Guinea	sand and gravel	38.23706	-77.47412	pit		
169B-107	Guinea	sand and gravel	38.23998	-77.46848	pit		
169B-108	Guinea	sand and gravel	38.23835	-77.46756	pit		
169B-109	Guinea	sand and gravel	38.23930	-77.46507	pit		
169B-110	Guinea	sand and gravel	38.23711	-77.46629	pit		
169B-111	Guinea	sand and gravel	38.23805	-77.46349	pit		
169B-112	Guinea	sand and gravel	38.23762	-77.45953	pit		
169B-113	Guinea	sand and gravel	38.23082	-77.46152	pit		
169B-201	Guinea	clay	38.24184	-77.42049	sample with potential use		
169B-202	Guinea	clay	38.22206	-77.45483	sample with potential use		
169B-203	Guinea	sand and gravel	38.23310	-77.44881	pit	K. & K. Partnership	
169B-204	Guinea	sand and gravel	38.23315	-77.44672	pit		
169B-205	Guinea	sand and gravel	38.23235	-77.44442	pit		
169B-206	Guinea	sand and gravel	38.22858	-77.43734	pit		
169B-207	Guinea	sand and gravel	38.22761	-77.43670	pit		
169B-208	Guinea	sand and gravel	38.22777	-77.43313	pit		
169B-209	Guinea	sand and gravel	38.22816	-77.42136	pit		
169B-210	Guinea	sand and gravel	38.23803	-77.43995	pit		
169B-301	Guinea	sand and gravel	38.22794	-77.41618	pit		
169B-302	Guinea	sand and gravel	38.22888	-77.41241	pit		
169B-303	Guinea	sand and gravel	38.23376	-77.41001	pit	Haney & Adair Trucking	
169B-304	Guinea	sand and gravel	38.24949	-77.40483	pit		
169B-305	Guinea	sand and gravel	38.24910	-77.40016	pit		
169B-306	Guinea		38.24397	-77.41228			
169B-307	Guinea	sand and gravel	38.24959	-77.41145	pit	Tarmac - Mid Atlantic, New Post Plant	
169B-308	Guinea	sand and gravel	38.24967	-77.40678	pit	Tarmac - Mid Atlantic, New Post Plant	
169B-401	Guinea	gravel	38.18251	-77.47044	pit	Franconia Gravel Company	
169B-402	Guinea	sand and gravel	38.17567	-77.48824	pit		
169B-403	Guinea	sand and gravel	38.17509	-77.48601	pit		
169B-404	Guinea	sand and gravel	38.17401	-77.48601	pit		
169B-405	Guinea		38.19466	-77.49735	processing plant	Exposaic Industries, Inc. of Virginia	
169B-701	Guinea	sand and gravel	38.16429	-77.47621	pit		
169B-702	Guinea	sand and gravel	38.15950	-77.47832	pit		
169B-703	Guinea	sand and gravel	38.15799	-77.48118	pit		
169B-801	Guinea	sand and gravel	38.13213	-77.45660	pit		
169B-802	Guinea	sand and gravel	38.13709	-77.45085	pit	Caroline S. & G.	
169B-803	Guinea	sand and gravel	38.14107	-77.44312	pit	L. S. Sorber	
169B-804	Guinea	sand and gravel	38.12766	-77.43402	pit		
169B-805	Guinea	sand and gravel	38.12609	-77.43346	pit		
170A-301	Spotsylvania	sand and gravel	38.23268	-77.53632	pit	W. L. Hicks	
170A-302	Spotsylvania	sand and gravel	38.22589	-77.54002	pit	Leavells Shop Corporation	
170A-303	Spotsylvania	sand and gravel	38.22596	-77.50430	pit	CAD Association; Ltd. Partners	
170A-401	Spotsylvania	sand and gravel	38.19196	-77.62457	pit	J. S. Shelton Trucking Company	
170A-501	Spotsylvania	gravel	38.20592	-77.56253	crushed stone quarry	Martin Marietta Aggregates	
170A-601	Spotsylvania	sand and gravel	38.18987	-77.52782	pit	Dickerson Brothers	
170A-602	Spotsylvania	sand and gravel	38.20627	-77.51274	pit	W. L. Hicks	
170B-101	Brokenburg	gold	38.23912	-77.73834	shaft	Whitehall	Sweet et al (1989), Sweet and Trimble (1983), Credner (1868), Cline (1921), Sweet (1980), Sweet (1971), Luttrell (1966), Watson (1907), Hotchkiss (1881), Silliman (1837)
170B-101	Brokenburg	gold	38.23913	-77.73840	shaft	Whitehall	
170B-102	Brokenburg	gold	38.24738	-77.72768	prospect pit	Randolph	Sweet and Trimble (1983), Cline et al (1921), Sweet (1980), Luttrell (1966), Pardee and Park (1948)
170B-102	Brokenburg	gold	38.24739	-77.72776	prospect	Randolph	
170B-401	Brokenburg	gold	38.20810	-77.74728	prospect pit	Powell's	Sweet and Trimble (1983), Sweet (1980)
170B-401	Brokenburg	gold	38.20813	-77.74731	prospect	Powell's	
170B-601	Brokenburg	sand and gravel	38.17986	-77.63953	pit	Marion S. Copes, Jr., Inc.	
170B-901	Brokenburg	sand and gravel	38.15519	-77.65089	pit	Bishop & Settle Construction Company, Inc.	
170C-401	Lake Anna East	clay	38.07015	-77.74046	sample with potential use		
170D-201	Ladysmith	sand and gravel	38.12220	-77.55094	pit	Stanley Construction Company	
171A-301	Belmont	gold	38.24897	-77.75796	prospect pit	Beazely	Sweet and Trimble (1983), Cline et al (1921), Sweet (1980), Luttrell (1966)

MINERAL RESOURCES AND INDUSTRIES IN SPOTSYLVANIA COUNTY, VIRGINIA

TABLE 5: Summary of Historic Mineral Extraction and Processing Sites and Mineral Occurrences

A	B	C	D	E	F	G	H
POINT ID	QUADRANGLE NAME	PRIMARY COMMODITY	LATITUDE	LONGITUDE	LOCATION TYPE	LOCATION NAME	SITE REFERENCE(S)
171A-301	Belmont	gold	38.24898	-77.75791	prospect	Beazely	Sweet et al (1989), Sweet and Trimble (1983), Sweet et al (1989), Cline et al (1921), Sweet (1980), Lutrell (1966)
171A-302	Belmont	gold	38.21101	-77.76265	open pit	Roney	
171A-302	Belmont	gold	38.21102	-77.76259	quarry	Roney	
171A-303	Belmont	gold	38.20967	-77.76167	quarry	Roney	
171A-303	Belmont	gold	38.20969	-77.76174	open pit	Roney	Sweet et al (1989), Sweet and Trimble (1983), Sweet et al (1989), Cline et al (1921), Sweet (1980), Lutrell (1966)
171A-501	Belmont	zinc	38.17607	-77.79765	shaft	Valzinco	Sweet et al (1989), Pavlides et al (1982), Grosh (1949), Poole (1974), Luttrell (1966)
171A-501	Belmont	zinc	38.17607	-77.79768	shaft	Valzinco	
171A-601	Belmont	gold	38.19998	-77.77483	prospect pit	Rawlings	Sweet and Trimble (1983), Cline et al (1921)
171A-601	Belmont	gold	38.19999	-77.77480	prospect	Rawlings	
171A-602	Belmont	gold	38.19770	-77.77744	open pit	New Grindstone	Sweet et al (1989), Sweet (1980), Sweet and Trimble (1983), Cline et al (1921), McCaskey (1911), McCaskey (1912)
171A-602	Belmont	gold	38.19771	-77.77739	quarry	New Grindstone	
171A-603	Belmont	gold	38.19421	-77.76582	quarry	Grindstone (Hill)	
171A-603	Belmont	gold	38.19421	-77.76589	open pit	Grindstone (Hill)	Sweet et al (1989), Sweet and Trimble (1983), Cline et al (1921), Luttrell (1966), McCaskey (1911), McCaskey (1912), Sweet (1980)
171A-604	Belmont	gold	38.19358	-77.77985	prospect	Prospect B	
171A-604	Belmont	gold	38.19361	-77.77988	prospect pit	prospect pit B	Sweet and Trimble (1983)
171A-605	Belmont	gold	38.18490	-77.75812	prospect	Johnston's	
171A-605	Belmont	gold	38.18499	-77.75817	prospect pit	Johnston's	Sweet and Trimble (1983), Sweet (1980)
171A-606	Belmont	gold	38.17499	-77.78159	prospect	Mitchell	
171A-606	Belmont	gold	38.17508	-77.78165	open pit	Mitchell	Sweet and Trimble (1983), Cline et al (1921), Sweet (1980), Pardee and Park (1948), Watson (1907)
171A-801	Belmont	copper	38.15994	-77.80093	prospect pit	Marva	Sweet et al (1989), Cline et al (1921), Luttrell (1966)
171A-801	Belmont	copper	38.15996	-77.80096	prospect	Marva	
171A-802	Belmont	gold	38.14203	-77.80634	quarry	Stajar's (Starrs)	
171A-802	Belmont	gold	38.14208	-77.80638	open pit	Stajar's (Starrs)	Sweet and Trimble (1983), Morrill (1972), Sweet (1980)
171A-803	Belmont	gold	38.13956	-77.80659	quarry	Goodwyn	
171A-803	Belmont	gold	38.13957	-77.80661	open pit	Goodwyn	Sweet and Trimble (1983), Cline et al (1921), Sweet (1980), Luttrell (1966), Watson (1907), Hotchkiss (1881)
171A-804	Belmont	gold	38.13784	-77.80807	open pit	Goodwyn	Sweet and Trimble (1983), Cline et al (1921), Sweet (1980), Luttrell (1966), Watson (1907), Hotchkiss (1881)
171A-804	Belmont	gold	38.13784	-77.80810	quarry	Goodwyn	
171A-805	Belmont	gold	38.13942	-77.80394	quarry	Knapp	
171A-805	Belmont	gold	38.13946	-77.80399	open pit	Knapp	Sweet and Trimble (1983), Sweet (1980), Anonymous (1884)
171D-301	Lake Anna West	N/A	38.08945	-77.78703	furnace	Fredericksville Iron Furnace (Gov. Spotswood)	NONE
171D-301	Lake Anna West	iron	38.08946	-77.78700	furnace	Fredericksville Iron Furnace	
182C-701	Fredericksburg	sand and gravel	38.27409	-77.49319	pit	Alfred Ventura	
182C-702	Fredericksburg	sandstone	38.29143	-77.47935	dimension stone quarry	Aquia Sandstone	
182C-703	Fredericksburg	gravel	38.28685	-77.47842	pit	W. C. Spratt, Inc.	
182C-805	Fredericksburg	sand and gravel	38.27275	-77.43842	pit	Massaponax Sand & Gravel	
182C-806	Fredericksburg	sand and gravel	38.25462	-77.42331	pit	Massaponax Sand & Gravel	
182C-901	Fredericksburg	sand and gravel	38.25361	-77.41068	pit	Tarmac - New Post Plant	
182C-902	Fredericksburg	sand and gravel	38.25076	-77.40730	pit	Tarmac - New Post Plant	
182C-903	Fredericksburg	sand and gravel	38.25132	-77.40436	pit	Tarmac - New Post Plant	
183C-301	Chancellorsville	gold	38.33963	-77.65681	prospect pit	Hunting Run	Sweet (1980), Sweet and Trimble (1983), Lonsdale (1927)
183C-302	Chancellorsville	gold	38.35560	-77.63282	prospect pit	Brinton	Sweet (1980), Sweet and Trimble (1983), Lonsdale (1927), Pardee and Park (1948)
183C-501	Chancellorsville	gold	38.30978	-77.66712	prospect pit	prospect pit A	Sweet (1980), Sweet and Trimble (1983)
183C-601	Chancellorsville	iron	38.31291	-77.62734	open pit	unknown	NONE
183C-602	Chancellorsville	iron	38.31534	-77.63002	open pit	unknown	NONE
183C-701	Chancellorsville	gold	38.27992	-77.71914	prospect pit	Marsden	Sweet (1980), Sweet and Trimble (1983), Cline et al (1921), Luttrell (1966)

MINERAL RESOURCES AND INDUSTRIES IN SPOTSYLVANIA COUNTY, VIRGINIA
TABLE 5: Summary of Historic Mineral Extraction and Processing Sites and Mineral Occurrences

A POINT ID	B QUADRANGLE NAME	C PRIMARY COMMODITY	D LATITUDE	E LONGITUDE	F LOCATION TYPE	G LOCATION NAME	H SITE REFERENCE(S)
183C-801	Chancellorsville	gold	38.26666	-77.68121	prospect pit	Quaker	Sweet (1980), Sweet and Trimble (1983), Pardee and Park (1948), Cline et al (1921), Luttrell (1966)
183C-901	Chancellorsville	gold	38.28869	-77.65311	prospect pit	Furnace	Sweet (1980), Sweet and Trimble (1983)
183C-902	Chancellorsville	N/A	38.28864	-77.64860	furnace	Catherine Furnace	NONE
183D-114	Salem Church	gold	38.35710	-77.62146	shaft	United States	Sweet et al (1989), Sweet (1980), Sweet and Trimble (1983), Maury (1837), Pardee and Park (1948), Lonsdale (1927), Silliman (1837), Watson (1907), Park (1936), Credner (1868), Luttrell (1966)
183D-115	Salem Church	zinc	38.34650	-77.61070	prospect pit	Pruitt #4	Sweet et al (1989), Luttrell (1966)
183D-202	Salem Church	gold	38.34322	-77.57607	open pit	Ramsey	Sweet (1980), Sweet and Trimble (1983), Lonsdale (1927), Cline, Watson and Wright (1921), Luttrell (1966)
183D-203	Salem Church	gold	38.33687	-77.58204	open pit	Bell	Sweet (1980), Sweet and Trimble (1983), Lonsdale (1927), Luttrell (1966), Conley (1978)
183D-401	Salem Church	gold	38.33250	-77.60983	open pit	Gardiner	Sweet (1980), Sweet and Trimble (1983), Lonsdale (1927), Luttrell (1966), Credner (1868)
183D-402	Salem Church	gold	38.32975	-77.58910	open pit	Smith	Sweet (1980), Sweet and Trimble (1983), Lonsdale (1927), Luttrell (1966)
183D-403	Salem Church	N/A	38.33078	-77.61211	furnace	Spotswood	NONE
183D-501	Salem Church	gold	38.32374	-77.56561	open pit	Mott	Sweet (1980), Sweet and Trimble (1983), Credner (1868), Luttrell (1966)
183D-601	Salem Church	granite	38.32496	-77.50449	quarry	Fredericksburg Stone Co.	
183D-602	Salem Church	granite	38.32421	-77.50023	quarry	Fredericksburg Stone Co.	
184D-901	Mine Run	sand and gravel	38.26245	-77.76789	pit	Michie Contracting Company	

Data Source:
Columns A-H: If Point ID (column A) is "###(A-D)-###": Virginia Department of Mines, Minerals, and Energy - Division of Geology and Mineral Resources MRV;
If Point ID (column A) is "10######": U.S. Geological Survey Mineral Resources Data System (MRDS).
Note1: Latitude (N) and Longitude (W) in decimal degrees; North American Datum 1983 (NAD 83)
Prepared by:
Virginia Department of Mines, Minerals and Energy - Division of Geology and Mineral Resources
Date of this report:
4/8/2013

Past Production

In the past granite was quarried for crushed stone or dimension stone at a number of sites along the Rappahannock River, west of Fredericksburg and also along the Hazel River, south of Fredericksburg, and near Chancellorsville. Sandstone has been quarried in the Fredericksburg area for use as dimension stone. Following are some of the major inactive stone quarries and sand & gravel pits in the County:

-Alum Springs Quarry, Hazel Run, Fredericksburg (1815)
-Aquia Sandstone Quarry, Hazel Run, Fredericksburg (early 1800s)
-Willis Hill Quarry, Hazel Run, Fredericksburg (early 1800s)
-Battlefield Granite Company, 2.5 miles NW of Fredericksburg (1893-1896)
-Cartright and Davis, NW of Fredericksburg (1899-1912)
-Battlefield Granite Corporation, NW of Fredericksburg (1914-1919)
-Fredericksburg Stone Company, NW of Fredericksburg (1958-1975)
-Haney and Adair Trucking-SE of Fredericksburg (1973-1975)
-Leavells Shop Corporation, SW of Fredericksburg (1970s)
-Alfred Ventura, south Fredericksburg (1975-1976)
-Franconia Gravel Corporation, S of Fredericksburg (1975-1982)
-Massaponax Sand and Gravel Corporation, SE of Fredericksburg (1919-1990)

Mica has been mined from the Edenton mine, located in the southwestern part of the County, about a mile northeast of the North Anna River. Kyanite is found in schists in the western part of the County, and glauconitic or greensand marl is found in the eastern part of the County. Monazite, a phosphate of the rare earths, occurs in saprolite over granitic rocks near Post Oak and Five Mile Fork.

Since its discovery in 1806 within the County, gold mining and prospecting were carried on intermittently from about forty-one sites in the northern and western parts of the County. Reported gold production from Spotsylvania County is as much as 105,300 ounces with the bulk of the production from the Whitehall, Marshall (exact location unknown), and the United States mines. At the Valzinco mine, located near Porters, lead and zinc ore, with some copper mineralization was mined by the Bertha Mineral Co. (1909-1912), the Virginia Lead and Zinc Corp., (1914-1918), and by the Panaminas Co. from 1942-1945; 500,000 pounds of lead and 1,250,000 pounds of zinc were produced during these periods. There is also reported by-product production of gold at this mine in the 1940s. Iron ore was mined from gossans in western Spotsylvania County for use in local iron furnaces. Pyrite occurrences have been prospected in the vicinity of Chancellorsville.

Clay materials were formerly extracted for use in the manufacture of brick at Fredericksburg. Three samples of clay materials were tested and found suitable as raw materials for the manufacture of brick. These samples include a sample of Tertiary clay, 5 miles south of Fredericksburg; a sample of Tertiary clay, 3.5 miles southeast of Fredericksburg, and a sample of clay residuum over granitic rocks, located near Lewistown in the southeastern part of the County.

References

Following is a list of references and resources for Spotsylvania County mineral resources, which includes both references cited above as well as additional sources of information. Most references can be obtained by contacting DGMR at 434-951-6341 or by visiting the Virginia Department of Mines, Minerals and Energy website.

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SOILS

Soils are a basic resource consisting of air, water, mineral and organic matter. Arranged in layers called horizons, these natural formations are termed soil profiles or classifications. The composition of a soil profile is determined by various factors such as parent material, relief, climate and vegetation. Classification of soils is important for determining the best uses and development constraints of an area.

Due to its varied physiography, Spotsylvania County is one of the most diverse soil communities in Virginia. Approximately 42 soil classifications have been mapped in the County by the United States Department of Agriculture, Soil Conservation Service (SCS). These maps, along with suitability charts, are published in the Soil Survey of Spotsylvania County Virginia, which was completed in 1985.

The soil survey is the County's best source of information concerning soil locations and development constraints. However, the field data only apply to a depth of five or six feet and do not eliminate the need for on-site investigations. In addition, it is common for great differences in soil properties to occur within short distances. Also, some of the survey fieldwork may be outdated, particularly data on septic limitations. In spite of the above precautions, the soil survey remains highly useful for general planning purposes. Pertinent characteristics for water quality planning, including presence of hydric soils, septic limitations, depth of water table, shrink/swell potential, degree of slope, and erodability/ permeability are indicated for each classification and quantified by acreage. This data enables planners to make broad, County-wide assessments of soil conditions and limitations, providing insight into land use and development prospects and limitations.

The Spotsylvania County Geographical Information Systems (GIS) Department graphically depicts County soils as a map layer as part of the Interactive Web Based GIS located **HERE**. Soils data is produced and distributed by the Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO). NRCS provides web based access to current soil surveys that are searchable by location at their Web Soil Survey site **HERE**.

Overview of Soil Conditions

By and large, most of Spotsylvania's soils are conducive to development. Because of the County's rolling topography, it possesses an abundance of broad upland terraces, convex ridgetops and well drained lands. Both the Piedmont and Coastal Plain areas are dissected by well-established drainageways, which keeps the water table low and reduces the problems with ponding, flooding and saturated soil. Some central portions of the County, however, are only moderately well drained by the smaller streams prevalent in that area. In addition, limitations to development can result from underlying rock formations and steep slopes found along some of larger streams and river terraces.

In certain sensitive areas, County soils exhibit a number of characteristics, which can limit development or add significantly to development costs. The major limitations are discussed in each subsection below:

Steep Slopes (See Map)

The topography of Spotsylvania County is generally rolling hills of the piedmont and flat coastal plains. Steep slopes, including those in excess of 40% are most prevalent in the northern and northeastern portions of the County. Steep slope areas tend to provide the greatest risk of slope and streambank

erosion threats within the County. Steep slope areas benefit from retaining natural vegetation with root systems providing soil stabilization. Erosive threats upon steep slopes can be linked to soil type, gravity, drainage velocity over steep surfaces (wash-out effect). Typically, steepest slopes are found adjacent to the County's larger streams and rivers. The Rapidan, Rappahannock, Massaponax Creek corridors and their tributaries contain the majority of the County's steepest slopes. Utilizing USDA Natural Resources Conservation Service (NRCS) mapping data, the County has included a Steep Slopes map for reference.

Per NRCS in reference to the map data, slope gradient is the difference in elevation between two points, expressed as a percentage of the distance between those points. The slope gradient is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Shrink-Swell Soils

Shrink/swell soils are those that shrink when dry and swell when wet. While uncommon in Spotsylvania, shrink/swell soils can result in severe and costly damage to roads, building foundations, and other structures. Most soil classifications within the County are characterized as having a low to moderate shrink/swell potential (98%). The only soils noted for high shrink/swell characteristics are Orange-Iredell loams. These particular soils are estimated to comprise only 1.3% (3,427 acres) of the County's total land area. Local shrink/swell soils are believed to be scattered in small, isolated locations within the County, usually on broad convex ridgetops or side slopes. Precision determinations of shrink-swell soils presence is determined by detailed map units in the soil survey or through soil testing.

Hydric Soils (See Map)

Hydric soils are those that are sufficiently wet to support the growth and regeneration of hydrophytic vegetation. Since various state and federal laws safeguard wetlands, development activity on hydric soils is generally discouraged. Usually, the inherent wetness of hydric soils discourages development interest.

In certain instances, hydric soils may be exempt from wetland regulations, if they have been drained or converted to agricultural use (prior conversions). However, where hydric soils remain undisturbed and support wetland vegetation, development is usually prohibited or costly mitigation measures are required (e.g. construction of replacement/artificial wetlands).

The United States Environmental Protection Agency Soil Survey Geographic database (SSURGO) classifies the following levels of hydric soils status concerning hydric rating: "Hydric" means that all components listed for a given map unit are rated as being hydric. "Predominantly hydric" means components that comprise 66 to 99 percent of the map unit are rated as hydric. "Partially hydric" means components that comprise 33 to 66 percent of the map unit are rated as hydric. "Predominantly non-hydric" means components that comprise up to 33 percent of the map unit are rated as hydric. "Non-hydric" means that none of the components are rated as hydric. The assumption here is that all components of the map unit are rated as hydric or non-hydric in the underlying database.

Five (5) classifications within the County are considered hydric: Aqults, Cartecay, Fluvaquents/ Udifluvents, Partlow and Toddstav soils. In total, about 16% of Spotsylvania's soils (44,463 acres) are defined as partially or predominantly hydric. If undrained, areas of hydric soils are saturated, flooded or

ponded for a significant duration of the year. The water table for hydric soil generally lies just above (+12") or slightly below the surface (-36").

In Spotsylvania, hydric soils are coincident with the County's drainageways, floodplains and stream bottomlands and are depicted on the Hydric Soils Map. In a few cases, hydric soils may be found along stream terraces, toe slopes, and in upland depressions. More precise locations of hydric soils can be determined through the detailed map units in the soil survey. Many non-hydric soils in the county also contain "inclusions" of hydric soils, which can account for up to 20% of the dominant soil classification. Therefore, there may be small, isolated wetlands scattered in non-hydric areas of the County.

Hydric Soils are mapped based on a hydric rating, or a percentage of a map unit that meets the criteria for hydric soils. Hydric rating is further explained by the USDA **HERE**. Utilizing USDA Natural Resources Conservation Service (NRCS) Soil Survey mapping data, the County has included a Steep Slopes map for reference within this Appendix.

Per NRCS in reference to the map data, this rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor non-hydric components in the higher positions on the landform, and map units that are made up dominantly of non-hydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit. The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components. Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation. The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or non-hydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) has made available a guide entitled Field Indicators of Hydric Soils in the United States as a helpful resource for onsite identification. The guide can be found **HERE**.

Erodibility/Permeability (See Map)

Soil erosion is the process whereby rock and soil particles are detached from their original location by wind and water, and transported or deposited to a new site. Soil is considered highly erodible if it is easily detached or relocated. The water quality problems associated with erosion are considerable, particularly uncontrolled sediment originating from construction sites, stream embankments (slopes) and agricultural fields. Mitigating sources of erosion through best management practices is a key focus of the Chesapeake Bay legislation.

Uncontrolled sedimentation can have a number of adverse consequences, particularly when transported to receiving waters. Sediments can screen sunlight to aquatic habitats and spur algae growth (via organic sediments). Coarse soil particles can clog drainage ditches and accelerate channel scouring, while eroded fine silt can smother aquatic organisms and hinder their reproduction. A related area of concern is that many pollutants adhere themselves directly to soil particles. Urban and agricultural erosion can contain a variety of pollutants, such as petroleum products, phosphates, heavy metals, pesticides and bacteria. As a result, erosion is now considered to be the largest source of water pollution in the United States.

Soil that is highly permeable is that which allows liquid to be rapidly transmitted or percolated when the soil is saturated. This rapid rate of transmission can be downward or in slight lateral direction. Highly permeable soils can present a water quality hazard since pollutants may be transferred directly into the water supply before being adequately filtered. The use of on-site septic systems and underground storage tanks should be avoided in areas of highly permeable soils. The rapid movement of effluent through the soil diminishes its natural filtration ability, which can lead to the contamination of groundwater or nearby shallow wells.

Utilizing USDA Natural Resources Conservation Service (NRCS) Soil Survey mapping data, the County has included a Erodibility (K Factor-Whole Soils) map for reference in this Appendix. Per NRCS in reference to the map data, Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

The permeability and erodibility of Spotsylvania's soils have also been mapped in digital form as part of the VirGIS database. The VirGIS database defines highly erodible soils as those with an erodibility index (EI) equal to or greater than eight (8). Highly permeable soils are those having a permeability equal to or greater than six inches (6") of water movement per hour to a depth of 72". Based on the VirGIS criteria, significant portions of the County were found to be either highly erodible, highly permeable, or both.

Although no hard figures are available, health officials acknowledge that instances of substandard plumbing may be found in areas with permeable soils, thus exacerbating water quality problems. The following discussion provides a more in-depth look at septic suitability issues and protection policies in the County.

Septic Suitability Factors (See Map)

Spotsylvania County has deferred to the Virginia Department of Health's (VDH) regulations for the design and approval of onsite sewage systems. National technological advances in sewage treatment and disposal and supporting regulatory changes in Virginia have allowed alternative treatment and disposal designs to overcome many previously insurmountable site and soil limitations. VDH regulations governing

design, construction, installation, and the operation and maintenance for conventional and alternative residential sewage systems and private water wells are available **HERE**.

As stated earlier, Spotsylvania is one of the most diverse soil communities in Virginia. Great differences in soil properties occur within short distances. The ability of a site to accommodate onsite sewage septic systems is dependent on several performance-related factors. These include size of lot, slope, depth of the soil, percolation rate, filtering characteristics, and susceptibility to ponding/wetness, depth of the water table, and depth to bedrock or restrictive horizons.

Site features and soil properties limit the use of septic systems in various ways. Generally, septic systems perform best when there is deep, unsaturated soil material beneath the absorption field. This allows for efficient filtering and disposal of effluent waste. The ability of a soil to absorb and treat effluent will be restricted if there is a high water table, poor permeability, or a minimal depth to bedrock. Likewise, site difficulties with bedrock or a cemented pan can interfere with installation. Finally, groundwater can be polluted if there is hillside seepage, a high water table, fractured bedrock, or highly permeable soils (sand/gravel) below the absorption area.

Since each factor above can vary over short distances, each lot or parcel must be evaluated to determine whether it can support the proposed development, and if it can, what the size, design and location of the septic system should be. On-site evaluations, therefore, are the only definitive means of determining septic suitability for a particular parcel.

The purpose of a site evaluation is to understand the soil system and the hydrology of the site, to predict wastewater flow through the soil and into subsurface materials, and to preliminarily design a subsurface absorption system that complements the soil system and the hydrology of the site. The evaluation process is intended to allow the collection and documentation of sufficient information to determine the potential for a site to support a subsurface absorption system. A site evaluation follows a systematic approach that includes the description of surface characteristics, the interpretation of those characteristics for use in a subsurface absorption system, and the documentation of all results. The process of data collection, evaluation, and design is often repeated several times for each system. During each repetition, new information is obtained and a new design is tried until a design is developed that provides the best match with the site conditions. The comprehensive site evaluation requires considerable expertise by the evaluator. The evaluator must have substantial knowledge about soil science, geology, subsurface absorption system design, and environmental health. In Virginia, evaluators are licensed as Onsite Soil Evaluators (OSE) through the Department of Professional and Occupations Regulation (DPOR http://dpor.virginia.gov/). These certified professionals assist applicants in determining the suitability of sites for onsite sewage systems. In cases where alternative technology is required, the OSE may work in coordination with a licensed professional engineer to develop a suitable design for a system to fit lot conditions.

Generalized information on soil types and septic suitability criteria can be found utilizing USDA Natural Resources Conservation Service (NRCS) Soil Survey mapping data. Per NRCS in reference to their map data, septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. For reference, a septic suitability map has been included in this Appendix.

General Septic Limitations

The USDA Natural Resources Conservation Service (NRCS) Soil Survey provides a helpful, generalized view of septic limitations within the County.

There are county-wide septic limitations of varying degrees. The majority of the County is classified as having either very limited or somewhat limited septic tank suitability. With technological advances and emergence of alternative systems over the years, some of the issues regarding septic suitability in the County can, and have been overcome.

Although Spotsylvania possesses an abundance of elevated, well-drained soils, other site factors limit the use of septic systems. Typical suitability problems in the local area include slow perk rates, shallow depth of bedrock, wetness, and steep slopes. Again, technology can overcome some of these limitations.

Depth to Water Table (See Map)

Soils with a shallow depth to water table can pose additional constraints to development. Wet soils may readily compact under the weight of structures and settle at different rates. This can result in foundation cracks and loss of structural integrity. Costly engineering work, which is often required to successfully build on such soils, adds to the overall cost of development. In addition, the potential for wet basements, ponding and other drainage problems can reduce the desirability of such lands for development.

Approximately one-third of the County's soils have a shallow depth to water table. This figure includes soils with a water table depth of less than 18"; and those soils with a water table ranging between 18" - 36" of the surface.

Areas with a shallow depth to water table generally coincide with other sensitive features in the County, such as floodplains, stream corridors and drainage ways. Upland areas of the County may also have shallow depth to water tables, such as depressions or broad terraces that are distant from sizeable drainage ways. More precise locations of shallow water tables can be determined through the detailed map units in the soil survey. It is good to note that the water table tends to vary throughout the year with seasonal changes and precipitation patterns.

Depth to Water Table mapping is made available by the USDA NRCS and can be accessed **HERE**. Utilizing USDA Natural Resources Conservation Service (NRCS) Soil Survey mapping data, the County has included a Depth to Water Table Map for reference within this Appendix.

In reference to the data depicted in the aforementioned map, per NRCS, "Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table. This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Soil Drainage

Seven classes of natural soil drainage are recognized by the United States Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS), including: excessively drained; somewhat excessively drained; well drained; moderately well drained; somewhat poorly drained; poorly drained; very poorly drained. These classes are defined in the "Soil Survey Manual" that can be found at the USDA's NRCS website **HERE**. The majority of Spotsylvania County has been classified with well drained soils. Such soils are prevalent within areas that have historically supported agricultural and forestry operations. Much of the well-drained soils areas fall within areas designated with Rural, Agricultural- Forestal, and Open Space land uses outside of the County's Primary Development Boundary. Poorly drained soils primarily appear in the northeastern and eastern portions of the County, including within large portions of the Primary Development Boundary. Poorly drained soils tend to be catchment areas for water within low lying areas, along stream or river corridors where wetlands, resource protection areas, water bodies are present throughout the County. The County's Primary Development Area contains the greatest concentration of moderately well drained soils as per the NRCS rating.

According to the NRCS, natural soil drainage (or drainage capacity) refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil.

Soil Drainage Capacity mapping is made available by the USDA NRCS and can be accessed **HERE**. Utilizing USDA Natural Resources Conservation Service (NRCS) Soil Survey mapping data, the County has included a Soils Drainage Map for reference within this Appendix.

Groundwater Recharge Areas

Groundwater is accumulated water under the earth's surface. Sometimes groundwater is close to the surface; sometimes it is very deep, held in underground aquifers. Groundwater can surface—or discharge—through natural means, such as in a spring, or with human help, such as in a pumped well.

Groundwater is replenished—or recharged—through surface water seeping from streams or lakes into the ground or through precipitation percolating into the ground. For the groundwater table to stay at the same level, the amount of recharge must equal the amount of discharge.

Aquifers represent a geological unit, which can store and supply significant quantities of groundwater. Aquifer recharge is a function of groundwater recharge rates. Groundwater recharge represents the net amount of water that infiltrates the soil matrix to a point below the root zone of vegetation. Groundwater recharge necessarily accounts for the loss of gross precipitation due to evapotranspiration (physical and biological uptake), consumption, and surface runoff. These losses are determined by impervious cover, slope, and soil properties affecting percolation. The quantity of groundwater making it into the aquifer is based on the geology and aquifer pumping rates, but is less well modeled than groundwater recharge. Factors such as karst geology in sedimentary formations and fractured trap rock affect the transport of groundwater into aquifers.

Urbanization, and drought poses a threat to our groundwater supply in several ways. Urban development increases the amount of impervious (nonporous) surface in a watershed. Impervious surface inhibits

groundwater recharge because precipitation cannot penetrate the surface and runoff may be diverted elsewhere through storm sewer systems. In drought_situations, consumption outweighs the rate of replenishment, further stressing the availability of groundwater.

Urbanization also increases the amount of pollution in our environment. If soil is contaminated or surface runoff is polluted, the quality of the groundwater will be affected. Polluted groundwater and/or a diminished supply of groundwater are of particular concern where groundwater is the major source for drinking and irrigation water. This is especially important for areas reliant on private well and septic systems. In Spotsylvania County, roughly 82% of the County's total land area is located outside of the County's Primary Development Boundary (where public water and sewer is provided), and therefore reliant on private well and septic systems. Well and septic lots still exist within the Primary Development Boundary also. This is most prevalent in areas where utility infrastructure has not yet caught up to past Primary Development Boundary expansions and older housing stock where public utility connection had not been available historically and a retrofit would be necessary to convert service.

Citizens can help protect groundwater supplies by:

- Don't pour toxic or hazardous waste down the drain, into a toilet, on the ground, or into storm drains.
- Properly dispose of litter and pet waste.
- Don't dump anything into a sinkhole.
- Don't use or store fertilizers, pesticides, gasoline or any toxic materials near a well.
- Pump out septic tanks regularly.
- Use porous material such as flagstone, gravel, stone, or interlocking pavers rather than asphalt or concrete.
- Conserve water in your home and landscape.

In areas where development is prevalent or likely to occur in the future, negative impacts upon groundwater recharge areas can be reduced by reducing the amount of impervious surfaces in exchange for additional green space/ open space and use of pervious paving or concrete materials that allow precipitation to percolate into the soils rather than diverted away through stormwater drainage systems.

Contaminated Soils

The United States Environmental Protection Agency (EPA) Superfund program is responsible for cleaning up some of the nation's most contaminated land and responding to environmental emergencies, oil spills and natural disasters. To protect public health and the environment, the Superfund program focuses on making a visible and lasting difference in communities, ensuring that people can live and work in healthy, vibrant places. You can learn more about the Superfund Program **HERE**.

The EPA manages one Superfund Site within Spotsylvania County. Contaminants result from a wood preservation operation that operated onsite between 1937 and 1988 in the area of Benchmark Road and the Massaponax Creek Floodplain. The site was initially listed on the National Priorities list in 1986. Site remediation is ongoing. More information about the history of the site and efforts to cleanup contaminants can be found **HERE**.

Storage Tank Related Contaminants

The Virginia Department of Environmental Quality (DEQ) implements the Underground Storage Tank (UST) program under Article 9 of State Water Control Law. Article 9, first enacted in 1987, enables DEQ to receive UST notifications, receive federal grant funds, develop regulations, conduct cleanups, and provide overall supervision of UST activities in the state. The technical requirements for USTs are included in Virginia regulation 9 VAC 25-580 et seq. entitled "Underground Storage Tanks: Technical Standards and Corrective Action Requirements."

The financial responsibility requirements for USTs are found in Virginia Regulation 9 VAC 25-590 et seq. entitled "Virginia Petroleum Underground Storage Tanks Financial Responsibility Requirements Regulation." State housing law Section 36-99.6 provides for local code officials to permit and inspect UST installations, upgrades, repairs, and closures statewide in support of the program. In Virginia there were some 75,000 USTs (19,000 active) at 25,000 facilities with some 3,000 owners. VA-DEQ maintains the notification records for USTs and receives annual federal grant funding to support the program. In general, after December 22, 1998 all regulated USTs must have spill containment provisions at the fill pipe; overfill devices to alert the owner when overfills may occur; corrosion protection on both tank and product lines; release detection on both tank and product lines; and, financial responsibility.

Refer to Virginia DEQ for more information regarding Underground Storage Tanks **HERE**.

Article 11 of the State Water Control Law addresses Above Ground Storage Tanks (ASTs). The Virginia State Water Control Board in 1998 adopted the regulation, 9 VAC 25-91-10 et seq., which consolidated three repealed regulations, that is, (i) Oil Discharge Contingency Plans and Administrative Fees, 9 VAC 25-90-10 et seq. (ii) Facility and Aboveground Storage Tank Registration Requirements), 9 VAC 25-130-10 et seq., and (iii) Aboveground Storage Tanks Pollution Prevention Requirements, 9 VAC 25-140-10 et seq.

The AST regulations were revised on November 1, 2015. The AST regulations were revised primarily to incorporate new performance standards for certain aboveground storage tanks located in the City of Fairfax as mandated by the 2011 General Assembly. Other changes align Virginia's regulatory requirements with federal requirements and current industry standards.

Refer to the Virginia DEQ for more information regarding Aboveground Storage Tanks **HERE**.

Leaking Storage tanks pose contamination risk to soil health and groundwater. The Virginia DEQ maintains locality specific lists of pollution complaint cases that includes both regulated and non-regulated USTs and ASTs. The Virginia DEQ categorizes cases as “open” or “closed”. Spring, 2018 data received from the Virginia DEQ for Spotsylvania County note 9 cases in “open” status and 214 cases that have been “closed” with closure dates covering a period of time between 2018 and the late 1980s. Of 9 “open” cases, 2 are considered regulated tanks (i.e. gas stations) while the remaining 7 are non-regulated tanks (i.e. home heating oil releases).

POTABLE WATER

Spotsylvania County has four surface water sources for its public supply. The Ni River Water Treatment Plant draws water from the Ni Reservoir. Our second and third water sources are for the Motts Water Treatment Plant, which draws water from the Motts Run Reservoir and from the Rappahannock River. Our fourth source is the Hunting Run Reservoir, which can release water into the Rapidan River. This water flows into the Rappahannock River and is withdrawn at the Motts Run intake. Combined, as of 2017, Spotsylvania County treatment facilities provide roughly 3.7 billion gallons of clean drinking water every year. The Spotsylvania County Utilities/Public Works Department manages the public water system and continually monitors water quality. Annual water quality reports are made publicly available and can be found **HERE**.

As Spotsylvania's population grows and water demands increase, it is becoming increasingly important to manage not only the water supply and treatment, but also the demand on an ongoing basis. The Board of Supervisors authorized the Director of Utilities/Public Works to establish a comprehensive Green Initiative and Water Conservation Program under Chapter 22 - Section 22- 140 of the Spotsylvania County Code as a proactive approach to demand management. The ultimate goal of water conservation is not to prevent water use, but to maximize efficiency and the benefit from each gallon used. More information regarding the Water Conservation Initiative can be found **HERE**.

The County's Primary Development Boundary is a major factor in establishing the County's long term development potential, sustainable investment in public infrastructure, and future land use vision. As noted in the Future Land Use Chapter, a major aim of any Comprehensive Planning process is ensuring that the provision of community facilities and public services is phased with demand. One of the most effective tools for directing the timing and location of new development is the establishment of a Primary Development Boundary to define the area within which public water and sewer utilities will be provided. This Boundary effectively creates an "urban growth boundary" like area as land within the boundary; supported by public water and sewer, is intended to develop with higher residential densities and more intensive non-residential uses than outside of the boundary. By maintaining a Primary Development Boundary, the County encourages the most efficient use of the land and focusing growth while preserving the rural character and agricultural viability of those portions of the County outside the boundary and slowing "urban sprawl" and the resulting loss of agricultural, forestal, rural acreage.

WATER RESERVOIRS

In Spotsylvania County, publicly accessible water reservoirs provide a source of potable water for residents or a cooling function for the generation of power. They also provide natural resource preservation, natural habitat preservation, recreational opportunities for fishing and electric motor boating. Significant sources of potable water within Spotsylvania County include the Ni Reservoir, Motts Run Reservoir (serving the City of Fredericksburg), and Hunting Run Reservoir. Considering existing capacity and factoring for growth, the County Utilities Department estimates no additional water source capacity expansion will be necessary to serve Spotsylvania County citizens utilizing public water until the year 2050. Lake Anna chiefly serves as a water supply to cooling purposes associated with the North Anna Power Station and has become a destination for water recreation as well. They have been summarized below.

Reservoirs are protected locally within the Reservoir Protection Overlay District, created for the purpose of protecting and promoting the public health, safety and welfare by preserving existing and potential public drinking water supply reservoir sites and protecting them from the danger if water pollution. Regulations within such districts are established to prevent water quality degradation due to pollutant runoff from septic fields, construction sites, lawns or material storage areas and to reduce sediment loadings that shorten reservoir life.

Ni Reservoir The Ni Reservoir is a 411-acre Spotsylvania County water supply reservoir located near Chancellorsville. Angler success is very good at this impoundment for largemouth bass in the 15" size range and the potential exists for an occasional trophy fish. There are also bluegill, redear sunfish, chain pickerel, white perch, and crappie available in good numbers for anglers to pursue.
The VDGIF released a Management report concerning the status of the fishery at the Ni Reservoir in 2003. That report can be found **HERE**. The Spotsylvania County Department of Parks and Recreation manages recreational access to the reservoir. Information regarding accessibility, amenities, and regulations can be found **HERE**.

Motts Run Reservoir

Motts Run is a City of Fredericksburg water supply reservoir located in Spotsylvania County. It is a steep-sided, 160-acre lake that is normally quiet and receives light fishing pressure. The shoreline is undeveloped, making it one of the more scenic lakes in Northern Virginia. Motts Run Reservoir is also open for public access, operated by the City of Fredericksburg.

Hunting Run Reservoir

Hunting Run Reservoir is a 420-acre water supply reservoir owned and operated by Spotsylvania County. The lake was stocked by the Virginia Department of Game and Inland Fisheries (VDGIF) and opened to fishing by Spotsylvania County in fall, 2007. There is one access point near the upper end of the lake off Ely's Ford Road. The lake has an excellent largemouth bass population that is currently "bass heavy" or "predator heavy", and size structure has recently shifted downward. The combination of the lake reaching full pool in 2009 (productivity surge) combined with additional planned forage stockings and highly encouraged angler harvest of bass below the slot should allow the population to realize its trophy potential.

The VDGIF released a Management report concerning the status of the fishery at Hunting Run Reservoir in 2015. That report can be found **HERE**. The Spotsylvania County Department of Parks and Recreation manages recreational access to the reservoir. Information regarding accessibility, amenities, and regulations can be found **HERE**.

Lake Anna

Lake Anna is a 13,000-acre reservoir in the rolling fields and forested triangle formed by the Cities of Charlottesville, Fredericksburg, and Richmond, Virginia. The lake was created by Virginia Electric and Power Company in 1972 to provide cooling water for the North Anna Power Station. Lake Anna was formed by damming the North Anna River, one of the principal tributaries of the Pamunkey and York Rivers. The Power Station and Lake is now controlled by Dominion Energy.

The lake's 200+ miles of shoreline are dotted with houses, marinas, campgrounds and a large state park. Lake Anna and its watershed lie astride three counties of Central Virginia with a rich history and diversified environment. Louisa County on the south side of Lake Anna encompasses over 50% of the watershed. Orange County to the northwest of Lake Anna is the smallest county in both area and population, and comprises about 25% of the watershed. Spotsylvania County to the north of Lake Anna contains only 20% of the lake watershed, but is the most populous and rapidly growing of the three counties.

In addition to its cooling function, the Lake has become a recreational destination for boating, fishing, water skiing, wind surfing, as well as residential, business, and commercial development. These opportunities around the lake provide an economic benefit to the local economy, and are dependent on the water quality of the lake to support and maintain the recreational setting. Lake Anna is one of Virginia's premier fishing waters, hosting a fish population of striped bass, largemouth bass, perch, crappies, catfish, and bluegill, and is the site of numerous bass tournaments. The lake is served by over half a dozen marinas and several public boat launching sites which charge a small fee for launching services.

Ever growing popularity for use of the lake as a recreational resource has increased concerns within the last few years about user safety and conflicting interests on the water and shoreline burdened by increasing recreational craft traffic traversing the lake surface. Increased recreational craft traffic upon the Lake has also led to lakeshore erosion issues resulting from wake action impacting the shoreline.

Lake Anna has also been identified with a number of water impairments as noted in the following pages considering the Water Quality Assessment Integrated Report. Harmful algae bloom warnings (for the species Cylindrospermopsis) were recently issued in August, 2018 for the Pamunkey and North Anna Branches of Lake Anna in Orange, Louisa and Spotsylvania County. As per the Virginia Department of Health, Algae blooms can occur when warm water and nutrients combine to make conditions favorable for algae growth. These conditions have occurred recently with the significantly warmer temperatures and sunny weather, which occurred after high amounts of rainfall over the last month. Discolored water or scums that are green or blueish-green should be avoided as they are more likely to contain toxins.

The Virginia Department of Health and the Virginia Harmful Algal Bloom Task Force, which includes the Virginia Department of Health, Virginia Department of Environmental Quality, and the Old Dominion Phytoplankton lab, will continue to monitor water quality at Lake Anna. The advisories will be lifted following a minimum of two consecutive weeks of acceptable levels for algal cell counts and/or toxin concentration.

For everyone's safety, the lake is patrolled by the Department of Game and Inland Fisheries' game wardens, County sheriff's offices, a Coast Guard Auxiliary flotilla, and three local flotillas.

The Virginia Department of Environmental Quality (DEQ) coordinates with the Lake Anna Citizen Association (LACA) to perform water quality monitoring of Lake Anna on a yearly basis. Overall, the main body of the lake meets the water quality standards for aquatic life (dissolved oxygen, pH, temperature, nutrients) uses. Lake Anna does not support fish consumption. The entire lake is listed with a PCB impairment, due to a Virginia Department of Health, Division of Health Hazards Control, PCB fish consumption advisory. There is also a portion of the main lake that is also listed with mercury impairment, based upon fish tissue data. As per the most recent water quality study dated April, 2018, overall most

Lake readings are over acceptable bacteria readings for E.Coli with issues most prevalent in the west end (Orange County, Spotsylvania County, Louisa County) and southwest side of the lake (Louisa County).

The LACA makes the latest water quality status updates available online **HERE**.

Dominion Energy provides details regarding lake levels, water temperatures, and the overall functionality of the lake in its cooling function. That information can be found online **HERE**.

Dam Break Inundation Zones

The Spotsylvania Utilities Department have completed mapping of County Dam Break Inundation Zones for existing dams at the Hunting Run Reservoir, Ni Reservoir, and Motts Run Reservoir. These dams were put in place in the creation of local water supply reservoirs.

The Inundation Zone is the area that encompasses the affected downstream features should a dam break regardless of the current condition of the dam. The Dam Break Inundation Zone is determined using a computer model simulated dam break prepared by a professional engineer. The potentially impacted features such as homes, roads, commercial buildings, etc. dictate and result in the Hazard Classification designations. Dam Break Inundation Zone Computer Modeling and Mapping is required by the Virginia Department of Conservation and Recreation for all regulated dams for Hazard Classification (Exception for dams determined to be Special Criteria Low Hazard).

Private owners of regulated dams are required to provide the Inundation Zone Mapping to the local County or City authority for inclusion into municipal mapping. In Spotsylvania County, the dams at Lake Anna and Fawn Lake are examples. Their inundation zones have been studied and pictured in local mapping. Other private dams within the County have yet to be mapped. As part of the 2017 Regional Hazard Mitigation Plan, Spotsylvania County has established a goal to assure mapping of all dam break inundation zones including the private dams, are completed by 2025.

Staff is also requesting dam break information from adjacent localities to determine whether any of their inundation zones may impact Spotsylvania County in any way. Stafford County's Lake Mooney (formerly Rocky Pen Run Reservoir) along the Rappahannock River is one example. The Keaton Run Dam in Orange County is one example where the inundation area does include parts of northwest Spotsylvania County. Mapping has been secured for that inundation area and is included for reference within the County mapping system.

A computer model simulated dam break can be used for an Incremental Damage Analysis to determine if the minimum required spillway capacity could be lowered without increasing the hazard downstream to people or facilities. If the owner of a dam elects to have this work done, it must be done by a professional engineer.

All development as defined by the Code of Virginia, located within a mapped Dam Break Inundation Zone is subject to review by the Virginia Department of Conservation and Recreation to make a determination of the potential impacts of the proposed development on spillway design flood standards required for the dam. In order to be consistent with the Code of Virginia, on December 13, 2016 the Spotsylvania County Board of Supervisors approved an amendment to the Zoning Ordinance, specifically Chapter 23, Article 7, to add Division 2A- Dam Break Inundation Zones. As part of County development review procedures,

proposed developments are to be checked to determine whether they fall within a mapped dam break inundation zone. Projects located within dam break inundation zones are then routed to the Department of Conservation and Recreation for review, subject to the Dam Safety Act, Article 2, Chapter 6, Title [10.1], §§ 10.1-604, 10.1-605, 10.1-606 et seq., of the Code of Virginia. The Department of Conservation and Recreation is responsible for administration of the Virginia Dam Safety Act.

The Spotsylvania County Geographical Information Systems (GIS) Department graphically depicts the limits of mapped Dam Break Inundation Zones as a map layer online as part of the Interactive Web Based GIS located **HERE**.

WETLANDS

Wetlands are a valuable natural resource. They reduce floodwater damage by storing the floodwater for slow release, serve as groundwater discharge and recharge areas, improve water quality, and provide food and habitat for fish and wildlife. In addition, wetlands can be recreational and aesthetic resources. Two major legislative acts protect wetlands from alteration, destruction or potential misuse: The Clean Water Act of 1972 as amended, and the Chesapeake Bay Preservation Act of 1988.

Wetlands are defined as transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered with shallow water. Wetlands must have the following three attributes: 1) at least periodically the land supports hydrophilic vegetation; 2) the substrate is predominantly undrained hydric soils; 3) the substrate is non-soil and is saturated with water or covered with water at some time during the growing season. This means that lands flooded at least a week at a time with supporting aquatic vegetation are generally considered to be wetlands.

The Spotsylvania County Geographical Information Systems (GIS) Department graphically depicts County wetlands as a map layer as part of the Interactive Web Based GIS located **HERE**. Wetlands data is produced and distributed by the National Wetlands Inventory (NWI).

Presence of Water

The physical nature of wetlands varies from place to place as well as season to season. As a result, the extent of wetness required to identify a wetland area may be a source of confusion to the untrained. Certain kinds of wetlands may have standing water on them throughout the year while others have water on the surface for a short period of time or not at all.

Wetland Vegetation

Wetland vegetation is characterized by hydrophytes. According to the National Audubon Society, hydrophytes are a special group of plants that can tolerate various degrees of flooding, or live in frequently saturated areas. It is a rather large group. There are whole scores of different kinds of wetland plants. These hydrophytes are distinctive in that they can only live in the conditions that wetlands provide. Thus they are good indicators of wetlands, and are used to delineate wetlands. An example of a hydrophyte would be a water lily.

Hydric Soils

Wetland soils are different from their upland counterparts. The presence of water affects the soil development. They are usually a gray color and have mottles (uneven spots or blotches) present. The technical definition says that hydric soils are soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part.

Significance of Wetlands

Water Quality Control

- chemical and organic waste processing
- nutrient removal and transformation
- sediment retention

Due to their position between upland and deep water, wetlands can intercept surface water runoff from land and filter floodwaters. The way wetlands remove pollutants from the water supply has to do with the biotic life they support. Aquatic organisms such as algae and bacteria take up minerals and breakdown organic matter.

If sewerage is added upstream, the organic level will have been considerably reduced by the time the water has traveled several miles. Wetlands and wetland plants are nutrient traps and really help reduce air and water pollution problems. Runoff from development areas is a big source of wetland contamination. Runoff from agricultural areas tends to contain high levels of nitrogen and phosphorous, the two major chemicals of fertilizers. Runoff from urban sites is usually polluting the water with dangerous chemicals and/or domestic sewage. But wetlands are very efficient at removing this waste from the environment.

Flood Control

- hydrologic cycle
- water storage

Wetland soils act like a living sponge and soak up the rain, letting it enter the ground water system. The wetland also acts as a temporary storage basin or depression, wetlands are a perfect place for excess flood water to go. Wetlands lower flood crests and lessen the danger of flash floods downstream, therefore reducing the likelihood of flood damage. They "protect crops in agricultural areas as well as protecting roads, buildings, and human health and safety".

Groundwater Recharge

- critical groundwater recharge areas
- groundwater discharge

With growing urban development there are becoming significantly fewer areas available for groundwater recharge. It is increasingly important to conserve wetlands to keep some of these areas open. Wetlands are also important for groundwater discharge. Wetlands release the water they store slowly to provide long-term base-flow to streams and lakes. They also provide a steady source of moisture for the local climate.

Erosion Control

- sediment stabilization
- shoreline buffer
- wave attenuation
- current velocity
- storms
- ice

Wetlands on the shores and banks of rivers, ponds and beaches do many things to prevent erosion. Wetland plants growing on the banks stabilize the shore material. Their roots bind the soil and make it harder to erode. Wetlands along the shores and banks also prevent erosion by reducing the force of the moving water. The wetland's presence causes friction of the wave or current movement, lessening its power to erode.

Fish and Wildlife Diversity and Abundance

- habitats for rare and endangered species
- habitats for waterfowl and other birds
- fish spawning and nursery grounds
- home to many species of plants
- biodiversity

A large number of animals and plant types require wetland habitats for survival. Many of these organisms live primarily in wetlands, like the wood duck, muskrat, cattail, and swamp rose. Other types, like the peregrine falcon and white tail deer, don't directly reside in wetlands, but they rely on them for survival. The wetlands provide food, water, and cover for these animals - all essentials for living. Many of the organisms that need wetlands to survive are endangered species. "More than one-third of the nation's threatened and endangered species live only in wetlands and nearly one-half of these species use wetlands in some point in their lives". Acre for acre swamps often equal rain forests in biological diversity.

Food Chain Support

- detritus

Wetlands can be regarded as the farmlands of the aquatic environment since great volumes of food (plant material) are produced by them annually. The wetland food chain starts with detritus, which is "dead leaves and stems that break down in the water to form small particles of organic matter". Small aquatic invertebrates and forager fish eat the detritus. Then larger predatory fish hunt and eat these invertebrates and forager fish. Finally, man catches and eats the larger predator fish.

Recreation

- nature observation
- education
- hunting and fishing

There is a substantial tourist trade in wetlands every year. "More than one-half of adults in the US hunt, fish, birdwatch, or photograph wildlife. Wetlands are usually very beautiful places in their own right. They are good places to enjoy nature through hiking, boating and other recreational activities. One can get a first-hand look at ecological processes, such as energy flow, recycling, and limited carrying capacity. Wetlands are essentially "living museums" or "outdoor laboratories" important for their educational qualities. Wetlands also support a large trade of recreational fishing and hunting.

Natural Products for Human Use

- seafood harvesting
- fish
- shellfish

- timber production
- peat moss mining
- fur trapping

Humans have harvested many things from natural wetlands. Seafood is a very important product strongly tied to wetlands. According to the National Oceanic and Atmospheric Administration (NOAA) Annual Commercial Landing Statistics, U.S. commercial fishermen landed 9.9 billion pounds of seafood in 2017 (up 3.6% from 2016), valued at $5.4 billion, an increase of 2.1% from the prior year.

According to the Commercial Landing Statistics, Virginia's commercial fishermen landed approximately 338 million pounds of seafood in 2017, valued at about $188 million.

The collection of U.S. commercial fisheries landings data is a joint state and federal responsibility. The cooperative State-Federal fishery data collection systems obtain landings data from state-mandated fishery or mollusk trip-tickets, landing weighout reports provided by seafood dealers, federal logbooks of fishery catch and effort, and shipboard and portside interview and biological sampling of catches. State fishery agencies are usually the primary collectors of landings data, but in some states NOAA Fisheries and state personnel cooperatively collect the data. Survey methodology differs by state, but NOAA Fisheries makes supplemental surveys to ensure that the data from different states and years are comparable.

Statistics for each state represent a census of the volume and value of finfish and shellfish landed and sold at the dock rather than an expanded estimate of landings based on sampling data. Principal landing statistics that are collected consists of the pounds and ex-vessel dollar value of landings identified by species, year, month, state, county, port, water and fishing gear. Most states get their landings data from seafood dealers who submit monthly reports of the weight and value of landings by vessel. Increasingly, however, states are switching to mandatory trip-tickets to gather landings data. At the conclusion of every fishing trip, seafood dealers and fishermen indicate their landings by species on trip-tickets and may be required to record other data such as fishing effort and area fished.

<u>Managed Wetlands</u>
In managed wetlands, the water level is actively managed for a specific purpose.

- rice paddies
- cranberry bogs
- blueberry crops
- catfish farms
- storm-water management facilities
- wildlife refuges
- duck hunting clubs

Five Major Classifications and Characteristics of Wetlands

A classification system was established and adopted by the US Fish and Wildlife Service on December 12, 1977. This classification system was established due to the increased recognition of the value of wetlands and the need for more defined, reliable classification information that could be accepted universally amongst all other government agencies. This system allows for better inventory, evaluation, and management of wetland areas. This system defines five major classifications of wetlands: Marine

(oceanic), Estuarine (tidal), Riverine (river), Lacustrine (lake), and Palustrine (marsh or swamp). Marine and estuarine habitats include coastal wetlands such as tidal marches and mangrove swamps. Lacustrine, riverine, and palustrine wetlands represent freshwater systems and account for 90% of the nation's wetland inventory. Lacustrine wetlands are associated with lakes, riverine wetlands are found along rivers and streams, and palustrine wetlands include marshes, swamps and bogs.

Marine System

This system consists of the open ocean overlying the continental shelf. Marine habitats are exposed to the waves and currents of the open ocean and the characteristics of the water are determined by the ebb and flow of the oceanic tides. Salinities exceed 30%. An example of a marine system wetland is a mangrove swamp.

Estuarine System

This system consists of deep water tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have sporadic access to the ocean water that is usually diluted by freshwater runoff from the land. This system includes both estuaries and lagoons. Examples are the Chesapeake Bay and Chincoteague Bay, and the Lower Rappahannock below its fall line.

Riverine System

This system includes all wetlands and deeper habitats contained within a channel except for habitats with water containing ocean derived salts in excess of .5%. The riverine system is bound on the landward side by upland, by the channel bank (including natural and man-made levees), or by wetland dominated by trees, shrubs, mosses or lichens. The water is usually, but not always, flowing in this type of system. The Upper Rappahannock and the Ni and Po Rivers are categorized as this type of system.

Lacustrine System

This system includes wetlands and deep water habitats with the following characteristics: situated within a topographic depression or a dammed river channel, may lack trees, shrubs, mosses or lichens, and the total area may exceed 20 acres. The waters may be tidal or non-tidal. This system includes permanently flooded lakes and reservoirs (Lake Superior), intermittent lakes, and tidal lakes (Grand Lake, Louisiana). Within Spotsylvania County, this system includes Lake Anna, the Ni and Motts Run Reservoirs, and other ponds throughout the county.

Palustrine System

This system groups the tidal and non-tidal vegetated wetlands traditionally called by names such as marsh, swamp, bog and fen that are found throughout the United States. It also includes the small, shallow, permanent or intermittent water bodies often called ponds. Palustrine systems may also occur as islands in lakes or rivers, in isolated catchments, or on slopes. In Virginia, this system includes the Great Dismal Swamp.

WATERSHEDS

There are three main watersheds that drain Spotsylvania County, dividing the County into north, central, and south. The Spotsylvania County Geographical Information Systems (GIS) Department graphically depicts County watersheds and sub-watersheds as map layers as part of the Interactive Web Based GIS located **HERE**.

Descriptions of the watersheds are as follows:

Rappahannock Watershed

According to the Virginia Department of Environmental Quality (DEQ), The Rappahannock River Basin drains an area of 2,715 square miles, approximately 6% of the Commonwealth's total area, and is 184 miles in length, varying in width from 20 to 50 miles. The Basin is bordered by the Potomac-Shenandoah River Basin to the north, and the York River Basin and Chesapeake Bay/Small Coastal Basin to the south and east.

The northern portion of Spotsylvania County is drained by the Rappahannock River watershed, a Major Chesapeake Bay watershed whose Spotsylvania County tributaries include Massaponax Creek, Deep Run, Hazel Run, Motts Run, Mine Run, Hunting Run, and Wilderness Run.

Potentially the most valuable natural resource in the area, the Rappahannock River has considerable scenic, recreational, and historical attributes. In the past, the River served as an important transportation corridor. Today, it is considered a promising source of water for domestic and industrial consumption. The Rappahannock River is the cleanest major tributary flowing into the Chesapeake Bay, and the maintenance of that distinction is essential to efforts to restore Virginia's estuary. The protection of this resource should be of paramount importance to localities along the River.

Spotsylvania County borders on two separate and distinct sections of the Rappahannock River. Above the fall line, the river is a free flowing fresh water stream winding its way through high-forested bluffs. Development that has occurred above the fall line has posed no immediate threat to the river, in part due to the fact that much of the shoreline is owned by the City of Fredericksburg and remains is a natural state, thereby establishing an effective, though thin, buffer. Within Spotsylvania County, lands adjacent to the Fredericksburg easement are located outside of the County Primary Development Boundary and the County land use vision and existing zoning in these areas are characteristic of large lot rural residential, forestry, and agricultural uses. Intense development pressure has not been supported, directed, or occurred in close proximity to the Rappahannock River above the fall line. The County zoning ordinance includes a River Protection Overlay District meant to further assure water resource protection of the Rappahannock River above the fall line. The River Protection Overlay District is intended to promote the public health, safety, and welfare through the protection of valuable river resources that provide or may provide drinking water and recreational opportunities. Regulations within such districts are established to prevent water quality degradation due to pollutant runoff from septic fields, construction-sites, or material storage areas. Requirements associated with the River Protection Overlay District can be found in Section 23-7.4. of the County Zoning ordinance.

The river below the fall line is tidal and its shores have seen greater development of many types: industrial, residential, recreational, and agricultural. Below the fall line are also located a number of wastewater treatment facilities, two of them in Spotsylvania County, and another in Stafford County. Because the two sections of the Rappahannock River are so different, actions to protect the river will be different for each. In addition to the Rappahannock, there are many valuable resources along the County's networks of streams. Stream corridors are relatively undeveloped because of the presence of floodplains and steep slopes. Wetland, Floodplain Overlay Districts, the River Protection Overlay District, and Resource Protection Areas are in place to further protect these vital environmentally sensitive resources. In addition, these areas are often wooded, making them excellent buffers for filtering out impurities in water moving toward a stream, and good wildlife corridors.

The Code of Virginia, § 62.1-69.27. Commission purposes and mission, establishes the purpose and mission of the Rappahannock River Basin Commission:

> *The Commission's purposes and mission shall be to provide guidance for the stewardship and enhancement of the water quality and natural resources of the Rappahannock River Basin. The Commission shall be a forum in which local governments and citizens can discuss issues affecting the Basin's water quality and quantity and other natural resources. Through promoting communication, coordination and education, and by suggesting appropriate solutions to identified problems, the Commission shall promote activities by local, state and federal governments, and by individuals, that foster resource stewardship for the environmental and economic health of the Basin.*

The Friends of the Rappahannock (FOR) was founded in 1985 as a non-profit, grassroots conservation organization whose mission includes the protection and restoration of the Rappahannock River through advocacy, active restoration, and community education. Their efforts are invaluable to responsible river stewardship with positive benefits resulting in the Rappahannock watershed. Friends of the Rappahannock, including their Rappahannock River Report Card can be found **HERE**.

In 2019, the University of Maryland Center for Environmental Science Chesapeake Bay Report Card downgraded their water quality score for the Rappahannock River from a C grade to a D with the most notable loss resulting from degraded aquatic habitat. 2018 high rainfall totals paired with “extreme heat” in 2019 were identified as the source of the downgrade. These are macro level factors associated with the overall climate and not representative of any specific localized direct impacts. To help guard against such impacts the Friends of the Rappahannock notes “Cleaning up the Rappahannock means making it more resilient”. Per FOR:

> *To restore the Rappahannock River to a healthier condition, we must understand what makes a river system resilient. In a resilient river system, forests and wetlands along streams and shorelines form a protective barrier that reduces erosion, absorbs pollutants, shades the water and encourages groundwater infiltration. Robust populations of filter feeders like oysters and mussels digest pollutants and suspended particles, keeping the water clear, while abundant aquatic grasses create oxygen and provide habitat for fish and other wildlife. The river system works together to maintain stability and balance, which defends it against adverse conditions like high rainfall and heat.*

Mattaponi Watershed

A minor watershed whose tributaries include the Matta River, Po River, and Ni Rivers drain the center portion of Spotsylvania County. The Mattaponi drains into the York River watershed, a major Chesapeake Bay watershed, whose tributaries include York River, Pamunkey River, Mattaponi River.

Lake Anna Watershed

Lake Anna Watershed, whose tributaries include the North Anna River, Plentiful Creek, Northeast Creek and a portion of Terry's Run and Foremost Run drains the southern portion of the County. The Lake Anna watershed drains into the larger York River Major watershed. The Lake Anna watershed is that portion of the landscape that collects and provides the water flow to maintain water levels in the lake. Comprising three hundred and forty-two (342) square miles, or 218,860 acres in portions of the three (3) counties that border the lake: Louisa (57.4%), Orange (22.3%) and Spotsylvania (20.3%).

The watershed is approximately twenty-eight (28) miles long extending from the main dam on the eastern edge of the watershed to the edges of Gordonsville and Orange on the western edge. At the widest point the water shed is approximately eighteen (18) miles wide extending from Louisa on the southern boundary to the intersection of Routes 522 and 20 on the north.

STREAM, RIVER CORRIDORS AND SHORELINES

Virginia Scenic River Program

Virginia Scenic Rivers Program's intent is to identify, designate and help protect rivers and streams that possess outstanding scenic, recreational, historic and natural characteristics of statewide significance for future generations. The program's enabling legislation is the Virginia Scenic Rivers Act of 1970, §10.1-400. This program is managed by the state and should not be confused with the Federal Department of the Interior's Wild and Scenic Rivers Program. One of the program's strengths is the partnership forged between citizens, local governments and the state. This partnership begins in the evaluation phase and continues through and after the designation process.

The Rappahannock River, extending from its headwaters near Chester Gap to Ferry Farm is a designated Virginia Scenic River. Managed by the Virginia Department of Conservation and Recreation (DCR), the Virginia Scenic Rivers Program's intent is to identify, designate and help protect rivers and streams that possess outstanding scenic, recreational, historic and natural characteristics of statewide significance for future generations.

Scenic river designations result from initiatives from partnerships of local groups, local governments, state agencies and the Virginia General Assembly. In addition to existing designated state scenic rivers, other river segments have been deemed worthy of further study. The Virginia Outdoors Plan Mapper can be consulted **HERE** to locate and view additional segments.

Public and Private Access to Waterfront Areas

The six Chesapeake watershed States and the District of Columbia have all noted a high need for additional access in their State-wide Comprehensive Outdoor Recreation Plans (SCORPS), public access plans, and boating infrastructure plans. In Virginia's current SCORP; Department of Conservation and Recreation's Virginia Outdoors Plan (dated 2018), Visiting natural areas (Rank 1); sunbathing/ relaxing on a beach (Rank 6); viewing the water (Rank 7); swimming/ beach/lake/river (open water) (Rank 8); freshwater fishing (Rank 10) rank amongst the top ten (10) recreational activities by participation. Statewide, access to Natural areas and water trails have been identified as two of the seven most needed outdoor recreation opportunities based on the 2017 Virginia Outdoors Demand Survey. The Virginia Outdoors Plan can be found **HERE**.

The Strategy for Protecting and Restoring the Chesapeake Bay Watershed was released in May 2010, in response to Executive Order 13508 (Chesapeake Bay Protection and Restoration). This strategy includes a key goal to "Conserve Land and Increase Public Access." The basis for this goal lies in the long-standing public demand for greater access to the water in the Chesapeake Bay watershed, a 64,000 square-mile watershed with nearly 18 million residents. Specifically the goal seeks to *Expand public access to the Chesapeake Bay and its tributaries through existing and new local, state and federal parks, refuges, reserves, trails and partner sites.*, The strategy aims to increase public access to the Bay and its tributaries by adding 300 new public access sites by 2025. According to Chesapeake Progress that helps federal, public, and internal oversight groups track the Chesapeake Bay Program's progress towards the goals and outcomes of the Chesapeake Bay Watershed Agreement, between 2010 and 2017, 153 boat ramps, fishing piers and other public access sites were opened on and around the Chesapeake Bay. This marks a 51 percent achievement of the goal to add 300 new access sites to the watershed by 2025 and brings the total number of access sites in the region to 1,292.

Consistent with the past public access planning efforts of the Chesapeake Bay Program, all tidal streams and bays with boating opportunities are included in the planning area. The plan covers "fifth-order streams" and higher. Stream order is a system for classifying streams and rivers based on a scale of 1 to 12, with first-order streams being the smallest and twelfth-order the largest. Typically, first- through third-order streams are small headwater tributaries. The Amazon River for example; the largest river in the world, is a twelfth-order stream. Within the Chesapeake watershed, the lower Susquehanna and lower Potomac are seventh-order streams; the Shenandoah River, a tributary of the Potomac, is a sixth-order stream; the York River is also a sixth-order stream, while one of its tributaries, the Pamunkey River, is a fifth-order stream. Fifth-order streams are large enough to offer canoe/kayak use during at least some part of the year.

The cost of developing the different types of access varies depending on the type of facility planned, the location, and characteristics of the proposed site. The most variable factor is the price of the land to be acquired for the access site. In some cases, the land is already in public ownership; in other cases, the land will have to be purchased. The cost of land in tidal areas of Virginia is dependent on its characteristics. Well-drained land above the floodplain, which is suitable for development of septic drain fields, has a higher value than low, poorly-drained land. Also, land fronting on deep water has a higher value than land adjacent to shallow waters to be suitable for boating. Lands that suffer from severe erosion generally cost less than stable or accreting lands.

Locally, along the Rappahannock River, existing access includes parks that front on the river in the City of Fredericksburg such as the City dock where the Captain John Smith Blueway Trail has a starting or termination point. The site also includes a boat launch and waterside walkway for fishing and water views. Further upstream, a canoe and kayak launch site has been provided in the Downtown Fredericksburg area in Riverfront Park off Sophia Street. A canoe/ kayak launch, fishing and riverfront views are offered at the City's Old Mill Park, accessed via Caroline Street. The City of Fredericksburg has jurisdiction over the Rappahannock Riverfront throughout the City and within Spotsylvania County to the west of the City line where the overwhelming majority of the Rappahannock riverfront is in City ownership. The Virginia Department of Game and Inland Fisheries has established an access point on the Rappahannock Motts Landing (Route 618) in Spotsylvania County (City of Fredericksburg jurisdiction). Another access point is located on the Rapidan River at Elys Ford (Route 610) in Spotsylvania County about 14 miles upstream of Motts Landing. Access may also be gained via several non- established points. Descriptions of a variety of public access points, user groups, routes and fishing opportunities can be found at the Virginia Department of Game and Inland Fisheries website **HERE**.

The Friends of the Rappahannock, based on Fall Hill Avenue within the City of Fredericksburg promotes advocacy, education, river protection and restoration efforts throughout the Rappahannock River Corridor. Their efforts also include promotion of river access for recreational uses, offering organized kayak outings, etc. along the river. More information regarding the Friends of the Rappahannock can be found **HERE**.

The Spotsylvania County riverfront is limited to points east of the City along the Tidal portion of the Rappahannock River. East of the City of Fredericksburg there is presently no formalized public access to the river in Spotsylvania County. The Spotsylvania riverfront at present tends to be comprised of naturally forested slopes descending down to the waters edge. Extensive historic wooden bulkheads in varying conditions of decay line the river on both the Spotsylvania and Stafford shorelines. The image below is one example (See Image 1):

Image 1: River Shoreline

This portion of the Rappahannock River is considered a Category 2 site, requiring additional planning and review, prior to development. The Plan acknowledges that the identification of potential access sites is

not a closed or static process. New opportunities for access will continue to be identified over time by citizens, non-governmental organizations, and local, state, and federal government.

The Rappahannock River east of Fredericksburg in Spotsylvania County has been recognized locally as a potential public access site, offering citizens additional public access opportunities along the Rappahannock River, to provide boating, bank fishing, picnicking, and other recreational uses. This section of the river could be easily accessible by vehicles off Route 17. One potential location worthy of consideration for public water access, historic interpretation and parkland is the historic Franklin's Crossing area (a significant Civil War era site) within the County owned land inventory (See Image 2 below). The site is located adjacent to a developed industrial area (known as The Bowman Center) targeted for mixed use development, infill, and historic building revitalization for a variety of attractions, employer spaces, and residential opportunities. This site is in close proximity to the Route 17 Corridor, City of Fredericksburg, East Coast Greenway and planned Deep Run Recreational Trail systems and would be a positive complement to expanded public access goals. The Public Facilities Chapter of the Comprehensive Plan Public Facilities Element has identified this area as a recommended site for implementation of the Planned Deep Run Spur, a trail head, a riverside park with provision of river access and historic interpretation. The Deep Run Spur and trail head are also included within the Trailways Master Plan, located in Chapter 3A of the Transportation Element.

Image 2: Rappahannock Riverfront

Since 2013, additional private access sites beneficial to residents of their associated private development projects have been envisioned east of the City along the Rappahannock River. The New Post mixed use project is one example with docks and waterside access under construction as of the summer 2018. A picture of the site is below (See Image 3):

Image 3: New Post Waterfront Access

The Department of Health has a number of regulations that could impact existing or proposed public access sites.

- Local health department inspectors must approve any construction that requires development of a septic field to treat wastewater.
- The Bureau of Shellfish Sanitation is concerned about the public's health related to the consumption of oysters. Shore development, including marinas, are continually evaluated to determine effects of water quality and impacts on shellfish beds.
- The Division of Waste Water Engineering requires the development of adequate sanitary facilities in all new marinas, including pump out capability for boats.

The Virginia Department of Conservation and Recreation provides a map resource for water access points (boating) and water trails as part of its Virginia Outdoors Plan Mapper, accessible **HERE.** The resource does not include County reservoirs.

Shoreline access structures along the Rapidan and Rappahannock Rivers are also tracked by the Virginia Institute of Marine Science's (VIMS) Center for Coastal Resources Management. Shoreline access structures and additional shoreline conditions layers are available and can be searched by locality. The VIMS Comprehensive Map Viewer for Spotsylvania County can be found **HERE**.

Additional public water accesses for water recreation and fishing are available in the County at water reservoirs, including Ni Reservoir, Hunting Run Reservoir, Motts Reservoir (City of Fredericksburg owned and operated). Provision for water access also exists at Lake Anna where a number of private docks and marinas are located. Provision for public access can be found at Lake Anna State Park, operated by the Virginia Department of Conservation and Recreation. Reservoirs are addressed above in the Water Reservoirs Section and additionally have been acknowledged Parks and Recreation amenities noted in the Public Facilities Element of the Comprehensive Plan for Parks and Recreation.

Shoreline and Streambank Erosion

The Virginia Institute of Marine Science's Center for Coastal Resources Management provides locality specific map viewers that depict a number of shoreline condition analysis' and preferred shoreline BMPs along the Rappahannock and Rapidan River corridors. As noted above concerning provision of public and private access to waterfront areas, Spotsylvania County's jurisdiction along the riverfront is chiefly limited

to the Rappahannock River, east of the City of Fredericksburg. As per VIMS, this section of the Rappahannock River, approximately 8 miles, is chiefly forested in its riparian areas. As per the VIMS River System Pie Charts, over 34% of the Rappahannock River east of Fredericksburg (within Spotsylvania County) has a forest land use/ land cover. The Forest land use/land cover is followed by Agriculture (approximately 21%), Residential (approximately 19%), and grasslands (approximately 12%). Commercial, Industrial and paved land uses make up the remaining 15% of the riparian area. VIMS notes approximately 120 feet of wholly bare banks along this section of the Rappahannock River. The majority of the shoreline has full coverage. Partial bank coverage is chiefly noted along the riverbank associated with the Fredericksburg Country Club. Defended shorelines in this area include bulkheads (.03 miles) and riprap (.02 miles) shoreline stabilization. Of nearly 7.78 miles, only .06 miles have been classified as defended shoreline.

VIMS has identified a number of preferred shoreline BMPs along the Rappahannock River east of Fredericksburg. These improvements are included within the VIMS Comprehensive Map Viewer and based on mapped location, include guidance to either:

(1) Remove existing bulkheads and failed revetments, if present. Construct new revetment as far landward as possible; grading the bank if possible and including vegetation buffers where possible. If grading is not possible, construct or repair existing revetment in the same alignment; only consider a bulkhead if previously present and the site is limited by navigation. Enhance sand beach/dune, and/or vegetated wetlands present. Consider a shoreline enhancement project. In high energy settings where shoreline extends more than 200 feet see option for Offshore Breakwater with Beach Nourishment.
(2) Remove existing shoreline structure if present; grade bank if necessary and install a non-structural living shoreline which may include riparian buffer planting along the bank, and/or marsh plants, coir logs, or oyster reefs along the shoreline. Best choice for low energy environments.
(3) Highly Modified Areas: Management options for this shoreline may be limited due to the presence of highly developed upland (e.g. commercial wharfs) or infrastructure directly adjacent to the shoreline (e.g. road) and will depend on the need for and limitations posed by navigation access and erosion control. Seek expert advice on the design of your project.

Like the County's Rappahannock River frontage west of the City of Fredericksburg, much of the County's Rapidan River frontage is also in ownership by the City of Fredericksburg. There are also a number of privately owned and Homeowners Association parcels along the Rapidan River. For both the Rapidan River and Rappahannock River west of the City of Fredericksburg, VIMS notes total shoreline coverage for nearly the entire length of the Rivers along the Spotsylvania County frontage. Partial bank coverage is noted adjacent to the City of Fredericksburg line and in proximity to the City of Fredericksburg's Motts Reservoir outflow at Mine Run. The Mine Run site, owned by the City of Fredericksburg, includes a public water access site with associated parking. Its good to note that Resource Protection Area's (RPA) have been mapped along both the full extent of the Rapidan and Rappahannock Rivers as a shoreline protection measure. The Rappahannock River basin (including the Rapidan River) is also under environmental stewardship of the Friends of the Rappahannock and the Rappahannock River Basin Commission.

The VIMS Comprehensive Map Viewer for Spotsylvania County can be found **HERE**.

Elsewhere in the County, County Environmental Codes Division says no other shoreline or streambank erosion issues have been identified, referencing the George Washington Regional Commission and Friends of the Rappahannock as sources.

EXISTING PROTECTION POLICIES: WATER RELATED RESOURCES

Legislation and Programs

Federal

The Clean Water Act calls for "maintaining and restoring the chemical, physical and biological integrity of our nation's waters." It covers every aspect of water-related topics in the United States. The part that pertains to wetlands is regulated by the U.S. Army Corps of Engineers (Corps) under Section 404, which regulates what you can build on or fill in a wetland with; it covers every kind of wetland, whether it's salt or freshwater, public land or private. The use of fill or dredged materials constitutes a pollutant, and is regulated by the Corps. The purpose of this legislation is that if there is a more efficient way to achieve the desired results, the permit will be denied. The Corps can only issue permits that are not contrary to the public interest. In addition, the Corps can only permit the least environmentally damaging practicable alternative.

The permits are approved by the Corps, who evaluate the applications based on the recommendations of the Environmental Protection Agency (EPA). The EPA sets the standards for review and the Corps complies. The EPA can veto a permit issued by the corps if it feels that the permit has been issued erroneously, but it rarely does. Both agencies share the authority to decide what constitutes a wetland, and other governmental agencies (like the Fish and Wildlife Service and the National Marine Fisheries Service) also provide input. As a result, definitions quite frequently either overlap or leave gaps, and there can be much dispute throughout the permit review process. However, the vast majority of Corps permits are general permits and have all environmental documentation provided by and approved by the agencies in advance.

To review a permit, the Corps performs an environmental assessment of the area and first determines whether jurisdictional streams and/or wetlands are present on a property. Subsequently, the impact of the proposed activity in jurisdictional areas is determined. If there is a way to achieve less impact to the aquatic environment, the Corps will make the appropriate recommendations and ask the applicant to amend the application.

To improve the efficiency of the federal review process, the Corps has developed several general permits to include nationwide permits, regional permits and programmatic permits for activities on similar scope and minimal adverse impacts to the aquatic environment. For common requests, most nationwide permits are easily verified by the Corps. However, Department of the Army permits (individual permits) are issued or denied based on a public interest review on a case-by-case basis. For instance, nationwide permits can be granted for small-scale activities like riprap, bulkheads, and dredge and/or fill projects involving less than 25 cubic yards of fill. Several nationwide permits require notification procedures and may not be easily verified if federally listed endangered or threatened species are involved or if historic properties that are listed or eligible for listing in the National Register of Historic Places.

Enforcement of these regulations can be difficult, as compliance is largely voluntary. If someone decides to forego the permit process, it is possible the infraction will go completely undetected. In most cases, the Corps depends on the public for surveillance of unauthorized activities. Perpetrators may face penalties that include suspension, revocation of permits, fines, civil or criminal prosecution, and enforced mitigation processes.

One form of wetland mitigation is the process of "wetland banking"; that is, the Corps will allow the altering of a wetland if other wetlands are created to compensate for the loss of the wetlands. Mitigation operates on a ratio basis. In the Norfolk District the mitigation ratios are as follows: 2:1 mitigation for the loss of forested wetlands, 1.5:1 for the loss of scrub/shrub wetlands and 1:1 for the loss of emergent wetlands. For example, if a builder proposes to fill five acres of forested wetlands then he would need to provide 10-acres of forested wetlands somewhere else. This is generally done in one of two ways: an artificial wetland is constructed, or the builder will purchase 10-acres of wetland credits from an approved wetland mitigation bank.

State

Chesapeake Bay Act

The Commonwealth of Virginia adopted the Chesapeake Bay Preservation Act in September 1989 to partially fulfill provisions of an interstate regional agreement made in 1984 between the states of Virginia, Maryland, Pennsylvania and Washington, D. C. The Bay Act mandates all Tidewater Virginia localities to establish programs, plans and ordinances to protect and improve Bay water quality. Spotsylvania is one of the 89 jurisdictions affected by the Bay Act. All of these communities border tidal waters, such as the Rappahannock River, Chesapeake Bay, or their tributaries; and have a considerable, cumulative impact on water quality.

The Bay Act legislation requires localities to establish programs to ensure compliance with the established goals set forth in the Bay Act. The initial program included a comprehensive inventory of the environmental characteristics of the locality, the identification of environmentally sensitive areas and their designation as such in officially adopted protection districts comprised of Resource Protection Area, Resource Management Areas and Intensely Developed Areas. The second component of the program includes adoption of performance criteria for guiding site development, and the provision of non-point source pollution standards to protect state water quality.

After preliminary environmental inventories were conducted, a designation was made of the Resource Protection Areas (RPAs) and the Resource Management Areas (RMAs). In 1992, the County adopted criteria for land use development in these areas. RPA's and RMA's are described in greater detail in pages that follow.

Tidal Wetlands Act of 1972

The enactment of the Tidal Wetlands Act of 1972 gave the Virginia Marine Resources Commission (VMRC) the responsibility for issuing *tidal* wetlands permits under Chapters 12 and 13 of Title 28.2 of the Code of Virginia and authorizing localities to adopt their own wetlands zoning ordinances. This means that each

locality has the option of imposing local restrictions on top of those outlined at the federal and state level. At the state level, the Department of Environmental Quality (DEQ) and the VMRC further oversee the use of the Clean Water Act.
In the absence of a local wetland board, the VMRC is responsible for administering the permitting process. If there is a local board, the responsibility of issuing permits rests with them, and they do so based on guidelines set by the VMRC and the Virginia Institute of Marine Sciences (VIMS).

Virginia Water Protection Permit Program (DEQ)

The Department of Environmental Quality (DEQ) Virginia Water Protection permit (VWPP) program serves as Virginia's Section 401 certification program for federal Section 404 permits issued under the authority of the Clean Water Act and the Commonwealth's non-tidal wetlands program under the State Water Control Law, independent of 401 certification.

DEQ VWPP program strives to protect state waters, which are defined by State Water Control Law (62.1-44.3) and VWP program regulations (9VAC 25-210) as *all water, on the surface and under the ground, wholly or partially within or bordering the Commonwealth or within its jurisdiction, including wetlands,* through the issuance of a VWP permit or the certification of US Army Corps nationwide permits (NWP) or regional permits (RP). Permits issued by the VWP permit program protect state waters by ensuring no net loss of wetland acreage and function through mitigation requirement similar to the Corps outlined above and by avoidance and minimization of the wetland impacts to the maximum extent practicable. However, some activities are excluded, as detailed in Virginia Administrative Code 9 VAC 25-210-60, from requiring any type of VWP permit due to provisions in the law.

VWPP program conducts compliance inspections on mitigation and construction sites in order to ensure compliance with regulations and permit conditions and also investigates reports of alleged unpermitted activities in wetlands and initiates enforcement actions if alleged violations of law or regulation are found. Responses to alleged noncompliance and unpermitted impacts can result in various levels of resolution and can range from no action to referral to enforcement and potential penalties.

Final 2016 305(b)/303(d) Water Quality Assessment Integrated Report

The Virginia Department of Environmental Quality (DEQ) released the Final 2016 305(b)/303(d) Water Quality Assessment Integrated Report (Integrated Report) on April 2, 2018. The 2016 Integrated Report is a summary of the water quality conditions in Virginia from January 1, 2009, through December 31, 2014.

This biennial report satisfies the requirements of the U.S. Clean Water Act sections 305(b) and 303(d) and the Virginia Water Quality Monitoring, Information and Restoration Act. The goals of Virginia's water quality assessment program are to determine whether waters meet water quality standards, and to establish a schedule to restore waters with impaired water quality.

Water quality standards designate uses for waters. There are six designated uses for surface waters in Virginia:

- aquatic life
- fish consumption

- public water supplies (where applicable)
- recreation (swimming)
- shellfishing
- wildlife

Additionally, several subcategories of aquatic life use have been adopted for the Chesapeake Bay and its tidal tributaries. The standards define the water quality needed to support each of these uses. If a water body contains more contamination than allowed by water quality standards, it will not support one or more of its designated uses. Such waters have "impaired" water quality. In most cases, a cleanup plan (called a "total maximum daily load") must be developed and implemented to restore impaired waters.

Section 303(d) of the Clean Water Act (CWA) and the United States Environmental Protection Agency's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to develop total maximum daily loads (TMDLs) for water bodies that are exceeding water quality standards. The TMDL process establishes the allowable loadings of pollutants for a water body based on the relationship between pollution sources and in-stream water quality conditions.

On December 29, 2010, the U.S. Environmental Protection Agency established the Chesapeake Bay Total Maximum Daily Load (TMDL). The TMDL is a historic and comprehensive "pollution diet" to restore clean water in the Chesapeake Bay and the region's streams, creeks, and rivers.

A number of elements are in place to ensure that all pollution control measures needed to fully restore the Bay and its tidal rivers are in place by 2025. Practices will also be in place by 2017 to meet 60 percent of the necessary pollution reductions. Actions are being taken across six states and the District of Columbia to reduce nitrogen, phosphorus and sediment loads to meet the clean water goals of the Bay TMDL.

The Virginia DEQ has made the Final 2016 305(b)/303(d) Water Quality Assessment Integrated Report available online at the link **HERE**.

Table 6 below provided by the Virginia Department of Environmental Quality contains information for the listed impaired streams in the Final 2016 Water Quality Integrated Report (IR). The information is organized by waterbody, with the waterbody type identified. The specific segments of the waterbody that are listed in the 2016 IR are given, as well as a description of where the segment begins and ends. The impaired designated use is listed, along with the cause.

There are a couple of things about this information that should be noted:

1. Some portions of an identified segment may fall outside of the Spotsylvania County boundary.
2. The impairment information is from the Final 2016 IR. Compared to a similar Table presented within the 2013 Spotsylvania Comprehensive Plan based on the Final 2010 IR there are some segments that were identified previously that are no longer listed as impaired. Additionally, there are some new impaired segments now listed that were not identified previously.
3. Those aquatic life impairments that are suspected to be caused by natural conditions will undergo investigation to determine if the causes of the impairment are from natural conditions or from anthropogenic sources. Depending on the result of this study, a TMDL may not be needed.

Table 6: Impaired Resources

Waterbody Name	Waterbody Type	Segment ID	Location	Impaired Designated Use	Cause	TMDL	Report Link
Rapidan River	River	VAN-E18R_RAP03A02 VAN-E18R_RAP02A02 VAN-E18R_RAP01A02	Segment begins at the confluence with Wilderness Run, rivermile 7.78, and continues downstream until the confluence with the Rappahannock River.	Fish Consumption	Mercury in Fish Tissue	No	
		VAN-E18R_RAP03A02	Segment begins at the confluence with Wilderness Run, rivermile 7.78, and continues downstream until the confluence with Middle Run.	Recreation	Escherichia coli	Yes	Bacteria TMDL for the Rapidan River Basin
Wilderness Run	River	VAN-E18R_WIL01A08	Segment begins at the confluence of North Wilderness Run and South Wilderness Run and continues downstream until the confluence with the Rapidan River.	Recreation	Escherichia coli	Yes	Bacteria TMDL for the Rapidan River Basin
Hazel Run	River	VAN-E20R_HAL01A00	Segment begins at the Route 95 crossing and continues downstream until the confluence with the Rappahannock River.	Fish Consumption	PCBs	No	
				Recreation	Escherichia coli	Yes	Bacteria TMDL for the Tidal Freshwater Rappahannock River Watershed
Massaponax Creek	River	VAN-E20R_MAP02A02	Segment begins at the confluence with an unnamed tributary to Massaponax Creek, just upstream of Route 1, and continues downstream until the confluence with another unnamed tributary, approximately 0.25 rivermile upstream of Ruffins Pond.	Aquatic Life	pH	No	
		VAN-E20R_MAP04A02 VAN-E20R_MAP03A02 VAN-E20R_MAP02A02	Segment begins at the confluence with an unnamed tributary, approximately 1.1 rivermiles downstream from Route 673, and continues downstream until the confluence with another unnamed tributary, approximately 0.25 rivermile upstream of Ruffins Pond.	Recreation	Escherichia coli	Yes	Bacteria TMDL for the Tidal Freshwater Rappahannock River Watershed
Motts Run Reservoir	Reservoir	VAN-E19L_MOT02A02 VAN-E19L_MOT01A02	Entire Motts Run Reservoir waterbody	Fish Consumption	Mercury in Fish Tissue	No	
Rappahannock River	Estuarine	VAN-E20E_RPP03A02 VAN-E20E_RPP02A02 VAN-E20E_RPP01A02	Segment begins at the fall line at Route 1 and continues downstream until the outlet of waterbody VAN-E20E.	Fish Consumption	PCBs	No	
				Recreation	Escherichia coli	Yes	Bacteria TMDL for the Tidal Freshwater Rappahannock River Watershed
Plentiful Creek	River	VAN-F07R_PLT01A00	Segment begins at the confluence with an unnamed tributary to Plentiful Creek, upstream from the Route 601 bridge, and continues downstream until the confluence with Lake Anna.	Recreation	Escherichia coli	Yes	Bacteria TMDL for York River Basin
Terrys Run	River	VAN-F07R_TRY03A08	Segment begins at the headwaters of Terrys Run and continues downstream until the confluence with Horsepen Branch.	Recreation	Escherichia coli	Yes	Bacteria TMDL for York River Basin
				Fish Consumption	PCBs	No	
Music Branch	River	VAN-F09R_MUS01A06	Segment begins at the headwaters of Music Branch and continues downstream until the confluence with Northeast Creek.	Recreation	Escherichia coli	Yes	Bacteria TMDL for the Pamunkey River Basin
Northeast Creek	River	VAN-F09R_NST03A08	Segment begins at the confluence with an unnamed tributary to Northeast Creek, at rivermile 9.39, and continues downstream until the confluence with another unnamed tributary to Northeast Creek, approximately 0.67 rivermiles upstream from Route 622.	Recreation	Escherichia coli	Yes	Bacteria TMDL for the Pamunkey River Basin
		VAN-F09R_NST01A08	Segment begins at the confluence with an unnamed tributary to Northeast Creek and continues downstream until the confluence with the North Anna River.	Recreation	Escherichia coli	No	*TMDL Currently Under Development*
		VAN-F09R_NST04A08 VAN-F09R_NST03A08	Segment begins at the confluence of Knights Branch with Music Branch, forming Northeast Creek, and continues downstream until the confluence with another unnamed tributary to Northeast Creek, approximately 0.67 rivermiles upstream from Route 622.	Aquatic Life	Dissolved Oxygen	No	*Suspected Natural Conditions*
		VAN-F09R_NST04A08 AND VAN-F09R_NST02A98	Segment begins at the confluence of Knights Branch with Music Branch, forming Northeast Creek, and continues downstream until the confluence with an unnamed tributary to Northeast Creek, approximately 2.28 rivermiles downstream from Route 208. AND Segment begins at the confluence with an unnamed tributary to Northeast Creek, approximately 0.67 rivermiles upstream from Route 622, and continues downstream until the confluence with another unnamed tributary to Northeast Creek.	Aquatic Life	pH	No	
Brock Run	River	VAN-F15R_BRK01A06	Segment begins at the confluence with Wash Branch and continues downstream until the confluence with the Ni River.	Recreation	Escherichia coli	No	
Ni River	River	VAN-F15R_NIR01A00	Segment begins at the confluence of an unnamed tributary to the Ni River, approximately 0.95 rivermiles downstream from the Route 608 bridge, and continues downstream until the confluence with the Po River, forming the Poni River.	Aquatic Life	Benthic-Macroinvertebrate Bioassessments	No	
Glady Run	River	VAN-F16R_GDY01A10	Segments begins at the headwaters of Glady Run and continues downstream until the confluence with the Po River.	Recreation	Escherichia coli	No	
Po River	River	VAN-F16R_POR01A10	Segment begins at an unnamed tributary to the Po River and continues downstream until the confluence with the Ni River, forming the Poni River.	Recreation	Escherichia coli	No	
Matta River	River	VAN-F18R_MTA01A00	Segment begins at the confluence with an unnamed tributary to the Matta River, approximately 0.5 rivermile upstream from the Route 646 bridge, and continues downstream until the confluence with the Poni River, forming the Mattaponi River.	Recreation	Escherichia coli	No	
		VAN-F18R_MTA02A04	Segment begins at the confluence of the Mat River and the Ta River and continues downstream until the confluence with an unnamed tributary to the Matta River, approximately 0.5 rivermile upstream from Route 646.	Aquatic Life	Benthic-Macroinvertebrate Bioassessments	No	
Ta River	River	VAN-F18R_TAR01A00	Segment begins at the confluence with Bluff Run, approximately 0.7 rivermile upstream from Route 738, and continues downstream until the confluence with the Mat River, forming the Matta River.	Aquatic Life	Dissolved Oxygen	No	*Suspected Natural Conditions*
					pH	No	
Ni River Reservoir	Reservoir	VAN-F15L_PNB01A02 VAN-F15L_NIR02A02 VAN-F15L_NIR01A02	Entire Ni River Reservoir waterbody	Fish Consumption	Mercury in Fish Tissue	No	
Lake Anna	Reservoir	VAN-F07L_TRY01A04 AND VAN-F07L_NAR01A02	Segment includes the Terrys Run arm of Lake Anna. AND Segment includes the lower portion of Lake Anna, beginning near the northern end of the Route 690 bridge, and continues downstream until the dam.	Fish Consumption	Mercury in Fish Tissue	No	
		VAN-F07L_TRY01A04 VAN-F07L_PMC02A02 VAN-F07L_PMC01A04 VAN-F07L_PLT01A04 VAN-F07L_NAR04A06 VAN-F07L_NAR03A02 VAN-F07L_NAR02A02 VAN-F07L_NAR01A02	Entire Lake Anna waterbody	Fish Consumption	PCBs	No	

Virginia Department of Environmental Quality 2016 Impaired Waters (Category 4 & 5)								
Waterbody Name	Waterbody Type	Segment ID	Location	Impaired Designated Use	Cause/ VA Category	Cycle First Listed	TMDL Schedule	Size
Rapidan River	River	VAN-E18R_RAP01A02	Segment begins at the confluence with Hunting Run, at rivermile 1.35, and continues downstream until the confluence with the Rappahannock River.	Fish Consumption	Mercury in Fish Tissue/ 5A	2010	2022	1.24 Miles
		VAN-E18R_RAP02A02	Segment begins at the confluence with Middle Run, rivermile 5.10, and continues downstream until the confluence with Hunting Run.	Fish Consumption	Mercury in Fish Tissue/ 5A	2010	2022	3.64 Miles
		VAN-E18R_RAP03A02	Segment begins at the confluence with Wilderness Run, rivermile 7.78, and continues downstream until the confluence with Middle Run.	Fish Consumption	Mercury in Fish Tissue/ 5A	2010	2022	2.58 Miles
Wilderness Run	River	VAN-E18R_WIL01A08	Segment begins at the confluence of North Wilderness Run and South Wilderness Run and continues downstream until the confluence with the Rapidan River.	Recreation	Escherichia coli/ 4A	2008	2020	5.56 Miles
Hazel Run	River	VAN-E20R_HAL01A00	Segment begins at the Route 95 crossing and continues downstream until the confluence with the Rappahannock River	Fish Consumption	PCB in Fish Tissue/ 5A	2006	2018	4.72 Miles
		VAN-E20R_HAL01A00	Segment begins at the Route 95 crossing and continues downstream until the confluence with the Rappahannock River.	Recreation	Escherichia coli/ 4A	2004	2016	4.72 Miles
		VAN-E20R_HAL01A00	Segment begins at the Route 95 crossing and continues downstream until the confluence with the Rappahannock River.	Aquatic Life	Benthic-Macroinvertebrate Bioassessments/ 5A	2012	2024	4.72 Miles
Hazel Run Unnamed Tributary	River	VAN-E20R_XHN01A10	Segment begins at the headwaters of the unnamed tributary, and continues downstream to the confluence with Hazel Run.	Recreation	Escherichia coli/ 4A	2014	2026	1.53 Miles
Massaponax Creek	River	VAN-E20R_MAP03A02	Segment begins at the confluence with an unnamed tributary to Massaponax Creek, approximately 0.25 rivermile upstream from the Route 639 bridge, and continues downstream until the confluence with another unnamed tributary, just upstream from Route 1.	Recreation	Escherichia coli/ 4A	2010	2022	1.67 Miles
		VAN-E20R_MAP04A02	Segment begins at the confluence with an unnamed tributary, approximately 1.1 rivermiles downstream from Route 673, and continues downstream until the confluence with another unnamed tributary, approximately 0.25 rivermile upstream from Route 639.	Recreation	Escherichia coli/ 4A	2008	2020	2.17 Miles
		VAN-E20R_MAP02B12	Segment begins at the confluence with an unnamed tributary to Massaponax Creek, just upstream of Route 1, and continues downstream until the confluence with another unnamed tributary, at rivermile 2.68.	Aquatic Life	pH/ 5A	2006	2018	5.19 Miles
		VAN-E20R_MAP02B12	Segment begins at the confluence with an unnamed tributary to Massaponax Creek, just upstream of Route 1, and continues downstream until the confluence with another unnamed tributary, at rivermile 2.68.	Recreation	Escherichia coli/ 4A	2004	2016	5.19 Miles
Massaponax Creek Unnamed Tributary	River	VAN-E20R_XFE01A02	Segment begins where XEN joins XFE and continues downstream until the confluence with Massaponax Creek at rivermile 8.06	Aquatic Life	pH/ 5A	2016	2028	1.27 Miles
Motts Run Reservoir	Reservoir	VAN-E19L_MOT01A02	Segment includes the lower half of Motts Run Reservoir; beginning at rivermile 0.8 and continuing downstream until the lake's discharge.	Fish Consumption	Mercury in Fish Tissue/ 5A	2008	2020	62.88 Acres
		VAN-E19L_MOT02A02	Segment includes the upper half of Motts Run Reservoir; beginning at the upper end of the reservoir and continuing downstream until rivermile 0.8.	Fish Consumption	Mercury in Fish Tissue/ 5A	2008	2020	74.29 Acres
Mine Run	River	VAN-E19R_MIN01A14	Segment begins at the headwaters of Mine Run and continues downstream to the upper end of the Motts Run Reservoir.	Recreation	Escherichia coli/ 5A	2014	2026	4.01 Miles
Deep Run	River	VAN-E20R_DEP03A12	Segment begins at the headwaters of Deep Run, and continues downstream to the confluence with an unnamed tributary at rivermile 2.19, downstream of Route 638.	Aquatic Life	pH/ 5A	2012	2024	1.56 Miles
Rappahannock River	Estuarine	VAN-E20E_RPP01A02	Segment begins at the confluence with Massaponax Creek and continues downstream until the outlet of waterbody VAN-E20E. This segment represents the upper reach of VAN-E21E_RPP05A02. Portion of CBP segment RPPTF.	Recreation	Escherichia coli/ 4A	2006	2010	0.19 Sq. Miles
		VAN-E20E_RPP02A02	Segment begins at the confluence with Deep Run and continues downstream until the confluence with Massaponax Creek. Portion of CBP segment RPPTF.	Recreation	Escherichia coli/ 4A	2002	2010	0.23 Sq. Miles
		VAN-E20E_RPP03A02	Segment begins at the fall line at Route 1 and continues downstream until the confluence with Deep Run. Portion of CBP segment RPPTF.	Recreation	Escherichia coli/ 4A	2002	2010	0.21 Sq. Miles
		VAN-E20E_RPP01A02	Segment begins at the confluence with Massaponax Creek and continues downstream until the outlet of waterbody VAN-E20E. This segment represents the upper reach of VAN-E21E_RPP05A02. Portion of CBP segment RPPTF.	Fish Consumption	PCB in Fish Tissue/ 5A	2004	2016	0.19 Sq. Miles
		VAN-E20E_RPP02A02	Segment begins at the confluence with Deep Run and continues downstream until the confluence with Massaponax Creek. Portion of CBP segment RPPTF.	Fish Consumption	PCB in Fish Tissue/ 5A	2004	2016	0.23 Sq. Miles
		VAN-E20E_RPP03A02	Segment begins at the fall line at Route 1 and continues downstream until the confluence with Deep Run. Portion of CBP segment RPPTF.	Fish Consumption	PCB in Fish Tissue/ 5A	2004	2016	
Plentiful Creek	River	VAN-F07R_PLT01A00	Segment begins at the confluence with an unnamed tributary to Plentiful Creek, upstream from the Route 601 bridge, and continues downstream until the confluence with Lake Anna.	Recreation	Escherichia coli/ 4A	1998	2006	3.30 Miles
Terrys Run	River	VAN-F07R_TRY03A08	Segment begins at the headwaters of Terrys Run and continues downstream until the confluence with Horsepen Branch.	Recreation	Escherichia coli/ 4A	2010	2022	4.36 Miles
		VAN-F07R_TRY03A08	Segment begins at the headwaters of Terrys Run and continues downstream until the confluence with Horsepen Branch.	Fish Consumption	PCB in Fish Tissue/ 5A	2006	2018	4.36 Miles

Virginia Department of Environmental Quality 2016 Impaired Waters (Category 4 & 5)								
Music Branch	River	VAN-F09R_MUS01A06	Segment begins at the headwaters of Music Branch and continues downstream until the confluence with Northeast Creek.	Recreation	Escherichia coli/ 4A	2008	2020	3.56 Miles
Northeast Creek	River	VAN-F09R_NST03A08	Segment begins at the confluence with an unnamed tributary to Northeast Creek, at rivermile 9.39, and continues downstream until the confluence with another unnamed tributary to Northeast Creek, approximately 0.67 rivermiles upstream from Route 622.	Recreation	Escherichia coli/ 4A	2006	2018	6.36 Miles
		VAN-F09R_NST04A08	Segment begins at the confluence of Knights Branch with Music Branch, forming Northeast Creek, and continues downstream until the confluence with an unnamed tributary to Northeast Creek, approximately 2.28 rivermiles downstream from Route 208.	Recreation	Escherichia coli/ 4A	2012	2024	3.52
Northeast Creek Unnamed Tributary	River	VAN-F09R_XIA01A06	Segment begins at the headwaters of an unnamed tributary to Northeast Creek and continues downstream until the confluence with Northeast Creek, approximately 0.46 rivermiles upstream from the Route 208 crossing.	Recreation	Escherichia coli/ 4A	2016	2028	3.00 Miles
Brock Run	River	VAN-F15R_BRK01A06	Segment begins at the confluence with Wash Branch and continues downstream until the confluence with the Ni River.	Recreation	Escherichia coli/ 4A	2008	2020	2.56 Miles
		VAN-F15R_BRK01A06	Segment begins at the confluence with Aunt Sarah Spring Creek and continues downstream until the confluence with the Ni River.	Aquatic Life	Dissolved Oxygen/ 5A	2012	2024	2.56 Miles
		VAN-F15R_BRK01B12	Segment begins at the headwaters of Brock Run, and continues downstream to the confluence with Aunt Sarah Spring Creek.	Aquatic Life	pH/ 5A	2014	2026	3.21 Miles
Lewis Run	River	VAN-F15R_LWS01A12	Segment begins at the outlet of Cool Spring Lake, and continues downstream to the confluence with the Ni River.	Aquatic Life	Dissolved Oxygen/ 5A	2012	2024	1.46 Miles
Ni River	River	VAN-F15R_NIR01A00	Segment begins at the confluence of an unnamed tributary to the Ni River, approximately 0.95 rivermiles downstream from the Route 608 bridge, and continues downstream until the confluence with the Po River, forming the Poni River.	Aquatic Life	Benthic-Macroinvertebrate Bioassessments/ 5A	2010	2022	5.68 Miles
Glady Run	River	VAN-F16R_GDY01A10	Segments begins at the headwaters of Glady Run and continues downstream until the confluence with the Po River.	Recreation	Escherichia coli/ 4A	2010	2022	9.30 Miles
Po River	River	VAN-F16R_POR01A10	Segment begins at an unnamed tributary to the Po River and continues downstream until the confluence with the Ni River, forming the Poni River.	Recreation	Escherichia coli/ 4A	2010	2022	7.21 Miles
Matta River	River	VAN-F18R_MTA01A00	Segment begins at the confluence with an unnamed tributary to the Matta River, approximately 0.5 rivermile upstream from the Route 646 bridge, and continues downstream until the confluence with the Poni River, forming the Mattaponi River.	Recreation	Escherichia coli/ 4A	2004	2016	11.89 Miles
		VAN-F18R_MTA02A04	Segment begins at the confluence of the Mat River and the Ta River and continues downstream until the confluence with an unnamed tributary to the Matta River, approximately 0.5 rivermile upstream from Route 646.	Aquatic Life	Benthic-Macroinvertebrate Bioassessments/ 5A	2008	2020	1.24 Miles
North Anna River	River	VAP-F09R_NAR01A00	From Bull Run to the Doswell PWS intake approximately 0.5 mi upstream of the Rte. 30 bridge.	Recreation	Escherichia coli/ 4A	2016	2028	1.73 Miles
Ta River	River	VAN-F18R_TAR01A00	Segment begins at the confluence with Bluff Run, approximately 0.7 rivermile upstream from Route 738, and continues downstream until the confluence with the Mat River, forming the Matta River.	Aquatic Life	Dissolved Oxygen/ 5C	2010	2022	3.76 Miles
		VAN-F18R_TAR01A00	Segment begins at the confluence with Bluff Run, approximately 0.7 rivermile upstream from Route 738, and continues downstream until the confluence with the Mat River, forming the Matta River.	Aquatic Life	pH/ 5C	2010	2022	3.76 Miles
Mat River	River	VAN-F18R_MAT01A12	Segment begins at the confluence with an unnamed tributary, at rivermile 2.14, and continues downstream to the confluence with the Ta River to form the Matta River.	Recreation	Escherichia coli/ 4A	2014	2026	2.30 Miles
Cool Spring Lake Unnamed Tributary	River	VAN-F15R_XJM01A12	Segment begins at the headwaters of the unnamed tributary, and continues downstream to the inlet of Cool Spring Lake.	Aquatic Life	pH/ 5A	2016	2028	1.29 Miles
Cool Spring Lake Unnamed Tributary	River	VAN-F15R_XJM01A12	Segment begins at the headwaters of the unnamed tributary, and continues downstream to the inlet of Cool Spring Lake.	Aquatic Life	Dissolved Oxygen/ 5A	2012	2024	1.29 Miles
Lake Anna	Reservoir	VAN-F07L_TRY01A04 AND VAN-F07L_NAR01A02	Segment includes the Terrys Run arm of Lake Anna. AND Segment includes the lower portion of Lake Anna, beginning near the northern end of the Route 690 bridge, and continues downstream until the dam.	Fish Consumption	Mercury in Fish Tissue/ 5A	2010	2022	1563.4 Acres
Lake Anna	Reservoir	VAN-F07L_TRY01A04	Segment includes the Terrys Run arm of Lake Anna.	Fish Consumption	PCB in Fish Tissue/ 5A	2006	2018	4.36 Miles
		VAN-F07L_TRY01A04	Segment includes the Terrys Run arm of Lake Anna.	Fish Consumption	PCB in Water Column	2010	2022	431.09 Acres
		VAN-F07L_PMC02A02	Segment includes the Pamunkey Creek Arm of Lake Anna from the beginning of the inundated waters of Pamunkey Creek downstream to the confluence with the Terry's Run arm of the lake.	Fish Consumption	PCB in Fish Tissue/ 5A	2006	2018	471.89 Acres
		VAN-F07L_PMC01A04	Segment includes the Pamunkey Creek arm of Lake Anna beginning at the confluence with the Terrys Run arm of the lake and continuing downstream until the confluence with the North Anna River at The Splits	Fish Consumption	PCB in Fish Tissue/ 5A	2006	2018	802.74 Acres
		VAN-F07L_PMC01A04	Segment includes the Pamunkey Creek arm of Lake Anna beginning at the confluence with the Terrys Run arm of the lake and continuing downstream until the confluence with the North Anna River at The Splits.	Fish Consumption	PCB in Water Column	2010	2022	802.74 Acres
		VAN-F07L_PLT01A04	Segment includes the Plentiful Creek arm of Lake Anna.	Fish Consumption	PCB in Fish Tissue/ 5A	2006	2018	109.04 Acres
		VAN-F07L_NAR04A06	Segment includes the upper portion North Anna River of Lake Anna beginning at the start of the inundated waters of the North Anna River downstream until the boundary of the F06 watershed.	Fish Consumption	PCB in Fish Tissue/ 5A	2006	2018	1422.31 Acres
		VAN-F07L_NAR03A02	Segment includes the upper portion North Anna River portion of Lake Anna, beginning at the boundary of F07, and continues downstream until the start of the lacustrine waters of Lake Anna (0.7 miles upstream from 8-NAR044.68).	Fish Consumption	PCB in Fish Tissue/ 5A	2006	2018	1141.85 Acres
		VAN-F07L_NAR02A02	Segment begins at the start of the lacustrine waters of Lake Anna (0.7 miles upstream from 8-NAR044.68), and continues downstream until the northern end of the Route 690 bridge.	Fish Consumption	PCB in Fish Tissue/ 5A	2006	2018	3039.18 Acres
		VAN-F07L_NAR01A02	Segment includes the lower portion of Lake Anna (lacustrine), beginning near the northern end of the Route 690 bridge, and continues downstream until the dam.	Fish Consumption	PCB in Fish Tissue/ 5A	2002	2014	1563.36

Chesapeake Bay TMDL Phase I Watershed Implementation Plan

The Phase I Watershed Implementation Plan (WIP) was developed by the Commonwealth of Virginia as required by the U.S. Environmental Protection Agency (EPA) as an implementation plan for the Chesapeake Bay Total Maximum Daily Load (TMDL).

The Chesapeake Bay TMDL WIP can become a continuation of work begun with Virginia's Tributary Strategies in 2005. In Spotsylvania, those strategies included the York River Tributary Strategy and the Rappahannock River Tributary Strategy.

The Chesapeake Bay TMDL Phase I Watershed Implementation Plan charts out actions necessary to achieve the Chesapeake Bay TMDL allocations by the year 2025. It incorporates the principles of adaptive management so that the success or failures of actions can be evaluated and adjustments to programs and strategies are made. The plan incorporates the experience of tributary strategy development along with new knowledge and new tools.

The WIP acknowledges shortcomings in available data or in our ability to analyze data where this is an issue. The actions proposed will be based on the best available science and data, but we expect the base of knowledge and information to expand and to make adjustments accordingly in consultation with affected stakeholders and the Environmental Protection Agency (EPA). Virginia is also bound by the provisions of state law that require cost evaluations along with a benefit analysis for implementation plans. Adjustments to this plan will be considered based on cost effectiveness and other key factors.

Although the Chesapeake Bay TMDL is often discussed and thought of conceptually as a single TMDL, it is comprised of 92 segments. Virginia contributes drainage to 39 segments within the watershed. All 39 segments are listed as impaired for excessive nutrients and sediments.

The WIP contains pollution loads allocated or assigned to different source sectors of nitrogen, phosphorus and suspended solids. These sectors include wastewater treatment plants, agriculture, forest, urban stormwater, onsite/septic and air sources that contribute to the nutrient and sediment (also referred to as total suspended solids or "TSS") problems of the Chesapeake Bay. The plan also provides broad strategies proposed to meet those allocations. In accordance with federal expectations, those strategies and contingencies included in the plan are intended to meet reasonable assurance requirements for the Chesapeake Bay TMDL. However, we acknowledge that this is a plan and does not confer any additional budgetary, regulatory or legal authority to governmental agencies. Any programs or strategies that are not currently authorized by state law or regulation may be pursued through the legislative process or through the Virginia Administrative Process Act.

Considering the WIP, Virginia Soil and Water Conservation Districts, Regions, and localities have developed strategies aimed at improving TMDL's by sector through a number of measures including implementation, capacity building, or new Best Management Practice (BMP) approach.

The Virginia Total Maximum Daily Load (TMDL) program is a process to improve water quality and restore impaired waters in Virginia. Specifically, TMDL is the maximum amount of pollutant that a water body can assimilate without surpassing the state water quality standards for protection of the five beneficial uses: drinking water, recreational (i.e., primary contact/swimming), fishing, shell fishing, and aquatic life. If the water body surpasses the water quality criteria during an assessment period, Section 303(d) of the Clean

Water Act (CWA) and the United States Environmental Protection Agency's (USEPA) Water Quality Management and Planning Regulation (40 CFR Part 130) both require states to develop a TMDL for each pollutant.

Beaver Creek, Mountain Run, Pamunkey Creek, Plentiful Creek, and Terrys Run were initially placed on the Commonwealth of Virginia's Section 303(d) List of Impaired Waters in 1998 for exceeding of the bacteria standard. Goldmine Creek was initially placed on the list in 2004 for exceeding of the bacteria standard. After these listings, a TMDL study was conducted in 2005 to identify bacteria sources in the watersheds and set limits on the amount of bacteria these rivers can tolerate and still maintain support of the Recreational Use.

A TMDL Implementation Plan (IP) was developed to reduce bacteria levels to attain water quality standards allowing delisting of the impaired waters from the Section 303(d) List. The TMDL IP describes control measures, which can include the use of better treatment technology and the installation of best management practices (BMPs), to be implemented in a staged process. Local support and successful completion of the implementation plan will enable restoration of the impaired water while enhancing the value of this important resource for the Commonwealth. Opportunities for Louisa, Orange, and Spotsylvania Counties, local agencies, and watershed residents to obtain funding will improve with an approved IP.

Approved TMDL Reports

Virginia's goal is that all streams attain the appropriate beneficial uses. These beneficial uses are described by the following use goals:

- drinking water use
- primary contact/swimming use
- fishing use
- shellfishing use
- aquatic life use

These uses are protected by application of the state's numeric and narrative water quality criteria. When the beneficial uses are not being met, the state must take steps to ensure that water quality is restored. One very important step in restoring water quality in the impaired streams is the development of TMDLs. A TMDL Study identifies sources of pollution and reductions needed from the identified pollutants to attain water quality standards. Pollution from point sources such as residential, municipal, or industrial discharges and non-point sources such as residential, urban, or agricultural runoff are included in the TMDL study. Table 7 below includes approved TMDL studies applicable to Spotsylvania County. For reference, hyperlinks to the approved studies have been provided within the Final Report column.

Table 7: Approved TMDL Reports- Spotsylvania, County							
TMDL Project	Basin	City/County	Pollutant(s)	Final Report	EPA approval date	SWCB approval date	Comments
Tidal Freshwater Rappahannock River Watershed	Rappahannock River	Caroline, King George, Spotsylvania, Stafford	E. Coli	Final Report	5/5/2008	4/28/2009	N/A
Mattaponi River Watershed	York River	Caroline, King and Queen, Orange, Spotsylvania	E. Coli	Final Report	7/19/2016	6/27/2016	N/A
Pamunkey River and Tributaries	York River	Caroline, Hanover, King William, Louisa, New Kent, Spotsylvania	E. Coli	Final Report	4/27/2015	12/11/2014	This project replaces the Pamunkey River & Northeast, Monquin, & Black creeks equations and modifies the 4 South Anna River segments & Taylors Creek from the Pamunkey River Basin project. It also replaces the Mechumps Creek & the Matadequin Creek projects.
Terrys Run, Pamunkey Creek, Beaver Creek, Mountain Run, Gold Mine Creek, Plentiful Creek	York River	Louisa, Orange, Spotsylvania	E. Coli	Final Report	11/4/2005	9/27/2006	N/A

TMDL Prioritization

The Virginia DEQ is implementing the national 303(d) Program Vision which calls for the prioritization of impaired waters for TMDL or TMDL alternative development over a six year window (currently 2016-2022). EPA announced the 303(d) Program Vision in December, 2013, making this 2016-2022 priority window the first phase of the Vision. While the national 303(d) Program Vision involves prioritizing

impaired waters for TMDL or TMDL alternative development, DEQ took this opportunity to also prioritize impaired waters that require a stressor analysis report or a natural conditions report.

In the summer of 2015, DEQ released a 2016-2022 draft list of prioritized impaired waters. This draft list was public noticed for a 30-day public comment period that started on July 27th, 2015. One comment was received during this public comment period that did not result in any changes to the priorities list. The final list of prioritized impaired waters was established following public comment period. Soon thereafter in early winter of 2015-2016, EPA announced that these priorities lists could be revised. This opportunity to revise the priorities list was due to challenges incurred by states throughout this first prioritization process, in addition to the fact that EPA was now allowing TMDL revisions to be included as priorities for the first time. DEQ revised the list of prioritized impaired waters and public noticed it for public comment from April 4th, 2016 to May 4th, 2016 with no comments received. In 2018, EPA provided states the opportunity to adjust their priorities lists to adapt to changes in program resources. This revised list was public noticed for public comment on April 2nd, 2018. The revised 2016-2022 TMDL program list of prioritized impaired waters specific to Spotsylvania County can be found below in Table 8.

Table 8

TMDL Program List of Prioritized Impaired Waters for 2016-2022

City/County	Water Name	Impaired Use	Impaired Cause	Assessment Unit ID	Size	Units	Water Body Type	Formal Priority	Report Type
Spotsylvania	Brock Run	Recreational	E. coli	VAN-F15R_BRK01A06	2.57	Miles	River/Stream	Yes	TMDL
	Glady Run	Recreational	E. coli	VAN-F16R_GDY01A10	9.31	Miles	River/Stream	Yes	TMDL
	Po River	Recreational	E. coli	VAN-F16R_POR01A10	7.21	Miles	River/Stream	Yes	TMDL
	Mat River	Recreational	E. coli	VAN-F18R_MAT01A12	2.30	Miles	River/Stream	Yes	TMDL
	Matta River	Recreational	E. coli	VAN-F18R_MTA01A00	11.89	Miles	River/Stream	Yes	TMDL

Chesapeake Bay TMDL Phase II Watershed Implementation Plan

Per the Environmental Protection Agency, there are three phases of WIPs developed by the Bay jurisdictions. Phase I and Phase II WIPs were developed and submitted to EPA in 2010 and 2012, respectively. Both Phase I and Phase II WIPs describe actions and controls to be implemented by 2017 and 2025 to achieve applicable water quality standards. The Phase II WIPs build on the initial Phase I WIPs by providing more specific local actions.

Chesapeake Bay TMDL Phase III Watershed Implementation Plan

Virginia's Final Phase III WIP can be found **HERE**.

Virginia Marine Resources Commission

A joint permit application process for authorization of work in the waters of the Commonwealth of Virginia is available from Local Wetlands Boards, the Virginia Marine Resources Commission, the Virginia State Water Control Board, the Tennessee Valley Authority, and the U.S. Army Corps of Engineers. The Virginia Marine Resources Commission functions as the clearinghouse for the joint permit application.

The Virginia Marine Resources Commission permit program is authorized by Title 62.1, Waters of the State, Ports and Harbors, Section 62.1, Authority Required for Use of Subaqueous Beds, and Chapter 2.1, Wetlands. These laws require permits for the use of state-owned bottomlands and tidal wetlands.

Comprehensive Coastal Resource Management for Tidewater Virginia Localities
For consistency with the Code of Virginia § 15.2-2223.2. Comprehensive plan to include coastal resource management guidance, Spotsylvania County has incorporated the following coastal resource guidance, provided by the Virginia Institute of Marine Science (VIMS) into the Comprehensive Plan:

Coastal resource guidance applies to the tidal extent of the Rappahannock River. The County is working to create its own shoreline and eco environment document to address the non-tidal tributaries, streams, creeks and rivers. County environmental staff is currently working with Caroline County on researching non-tidal tributaries, creeks, streams and river shoreline restoration and preservation that will address our common watersheds and will be easily adaptable for the entire county.

Issue Statement

Coastal ecosystems reside at the interface between the land and the water, and are naturally very complex. They perform a vast array of functions that encompass biological, chemical and physical processes. Humans derive benefits from coastal ecosystems such as habitat, water quality, and shoreline stabilization.

For example, coastal wetlands absorb nutrients that drain off the upland. This is an important filtering process that improves water quality in the adjacent receiving waters. Humans benefit from having good water quality; therefore, the wetland is providing a service in that capacity.

Beaches and dunes are another component of the coastal ecosystem valued by humans. Although typically regarded for their recreational value, beaches and dunes also provide a number of other important direct and indirect services. Beaches and dunes provide habitat, foraging and nesting areas for shore birds, turtles, and crustaceans, among other organisms. They also act as the first line of defense to incoming high energy storm waves and therefore provide an important function protecting uplands from erosion and structural loss.

The science behind coastal ecosystem resource management has revealed that traditional resource management practices limit the ability of the coastal ecosystem to perform many of these essential functions. The loss of these services has already been noted throughout coastal communities in Virginia as a result of development in coastal zone areas, coupled with common erosion control practices. Beaches and dunes are diminishing due to a reduction in a natural sediment supply. Wetlands are drowning in place as sea level rises and barriers to inland migration have been created by construction of bulkheads and revetments. There is great concern by scientists at the Virginia Institute of Marine Science

and on the part of the Commonwealth of Virginia that the continued armoring of shorelines and construction within the coastal areas will threaten the long-term sustainability of coastal ecosystems under current and projected sea level rise.

In the 1980s, interest arose in the use of planted wetlands to provide natural shoreline erosion control. Today, a full spectrum of living shoreline design options is available to address the various energy settings and erosion problems found. Depending on the site characteristics, they range from marsh plantings to the use of rock sills in combination with beach nourishment. Studies have found that these approaches minimize impacts to the natural coastal ecosystems while successfully combating shoreline erosion.

Research continues to reinforce the principle that an integrated approach for managing tidal shorelines enhances coastal resources. Therefore, adoption of new guidance and shoreline best management practices for coastal communities is now necessary to insure that functions performed by coastal ecosystems will be preserved and the benefits derived by humans from coastal ecosystems will be maintained into the future.

Policy Statement

In 2011, the Virginia Assembly passed legislation to amend §28.2-1100 and §28.2-104.1 of the Code of Virginia and added section §15.2-2223.2, to codify a new directive for shoreline management in Tidewater Virginia. In accordance with section §15.2-2223.2, all local governments shall include in the next revision of their comprehensive plan beginning in 2013, guidance prepared by the Virginia Institute of Marine Science (VIMS) regarding coastal resource management and, more specifically, guidance for the appropriate selection of living shoreline management practices. The legislation establishes the policy that living shorelines are the preferred alternative for stabilizing eroding shorelines. Adoption of the VIMS shoreline guidance will help communicate to stakeholders, including private and public property owners, contractors, and developers the Commonwealth's preference for a living shorelines approach wherever possible.

This guidance, known as Comprehensive Coastal Resource Management Plans, is being prepared by VIMS for localities within the Tidewater region of Virginia. It explicitly outlines where and what new shoreline best management practices should be considered where coastal modifications are necessary to reduce shoreline erosion and protect our fragile coastal ecosystems. This guidance will include a full spectrum of appropriate management options which can be used by local governments for site-specific application and consideration of cumulative shoreline impacts. The guidance applies a decision-tree method using a based resource mapping database that will be updated from time to time, and a digital geographic information system model created by VIMS.

Health District

The Rappahannock Health District (VDH) provides environmental health services in Spotsylvania County. The Spotsylvania Office has two (2) Environmental Health Specialists assigned in the onsite program and four (4) in food protection. The Specialists also have responsibilities in rabies control, nuisance complaint and abatement, emergency preparedness and other duties as assigned.

Local environmental offices are tasked with managing the records for onsite systems in that locality. They review and issue approval for construction permits for well and septic systems, inspection reports, and

provide quality assurance for private sector permits and approvals. In Spotsylvania County, most construction permits are prepared by OSE or PE's working in coordination with an OSE.

At present, the County enforces the Chesapeake Bay Act which specifies minimum pump out requirements and reserve area requirement for new onsite systems, and has adopted the minimum state sanitary regulations as promulgated by the Health Department. Those regulations establish minimum standards for septic system capacity, minimum separation distance between drainfields and the water table, minimum setbacks to wells and from impounded and natural waterways.

By law, local governments have the authority to adopt ordinances or regulations that are more stringent than State Health Department Regulations. The County has the option to further strengthen or tailor the State Code to meet its local site and soil performance conditions. Neighboring jurisdictions have customized their sanitary codes in various ways to protect sensitive resources.

Chesapeake Bay Septic Pump-Out Program

The septic pump-out program is a required element of the County's Chesapeake Bay Preservation Act (CBPA) program and at the state-level, the program is administered by the Virginia Department of Environmental Quality (DEQ) Office of Watershed and Local Government Assistance Programs. The DEQ Office of Watershed and Local Government Assistance Programs (Section 9 VAC 10-20-120.7), in conjunction with the Spotsylvania County Chesapeake Bay Ordinance (Section 6A-10(B) (1)), requires private Septic tanks to be pumped out or inspected every five (5) years.

The Spotsylvania County Code Compliance Environmental Engineering group administers the program within the County. Regular pumping or inspection of septic tanks extends the life of septic systems and ensures environmental protection of our natural resources.

The Chesapeake Bay Septic Tank Pump-Out Program is a State Mandated Program; there are no provisions for exceptions to this mandate. Everyone with a septic tank must comply. Whether the home is a summer lake home, weekend home, or has a reduced number of occupants, the property must still have the septic tank pumped out.

As an alternative to the mandatory pump-out, the owner has the option of having a plastic filter installed and maintained in the outflow pipe from the septic tank to filter the solid material from the effluent while sustaining adequate flow to the drainfield to permit normal use of the septic system. Owners with systems with such a filter will need to submit the filter documents to the County. Plastic filters require regular maintenance to keep them from clogging and backing sewage into a home. Routine maintenance typically includes the removal and proper disposal of non-biodegradable solids from the filter and then hosing down the filter over your septic tank to return the filtered solids to the tank for additional treatment. While not mandatory, the Virginia Department of Health still recommends that systems with plastic filters pump have their septic tanks pumped regularly to maintain peak system performance and extend the life of the drainfield. Such a filter shall satisfy standards established in the Sewage Handling and Disposal Regulations (12 VAC 5-610) administered by the Virginia Department of Health.

Local Zoning and Ordinances

Local governments have a major role to play in maintaining the health of the Chesapeake Bay environment. Through the judicial administration of zoning laws and subdivision and land use ordinances, local governments influence how land will be used and how and where development will take place. The zoning of land uses ensures that land is protected from incompatible uses and development activities

follow the intent of the local comprehensive plan. Careful administration of these land use controls provides local governments with the tools they need to manage growth and to keep it within the carrying capacity of the local infrastructure. Local zoning, subdivision, and site plan review ordinances should be consulted in developing public access sites. These tools may also be used to protect good public access resources.

To better understand the problem one must remember that in the past the Rappahannock and York Rivers both were noted for their aquaculture and recreational uses including commercial/recreational fishing and swimming. These activities have been drastically curtailed due to the increasing degradation of the water quality within these 2 rivers that ultimately flow to the Chesapeake Bay. Several factors related to land use and their associated land disturbances have impacted our watersheds through the years.

The identified contributing activities in the past were focused on urbanization, farming, timbering & gold mining however they have recently been redefined to focus on sediment transport and introduced pollutant loads such as fertilizer, etc.

There is not one factor, entity or use that needs to be considered but all of them in their entirety must be focused on to slow the water down through quantity control measures and to stop the continuing deterioration of water quality from introduced pollutant loads. Storm events do not discern as to the development, farm, forest or mine nor a specific use or practice being performed. The stormwater runoff flows regardless the use of the land that is devoid of vegetation to move the water and its associated sediment quickly. The stormwater runoff will also pick up the unused portions of all pollutant loads such as fertilizer (nitrogen & phosphorous) that is being introduced to the ground and relocate it in the creeks, streams, rivers and ultimately the bay.

To help better understand the activities that must be monitored, they break down into the following two (2) sections to be considered

1. Land disturbance; these are activities that are related to the actual removal of the vegetative ground cover's root system which have traditionally been through development, farming, silviculture & mining within the commonwealth.
2. Pollutant loads such as fertilization for example (nitrogen & phosphorous); these are activities that have been closely related to pet waste, fertilizing lawns and agricultural crops/activities. Other potential pollutant load sources are petroleum based products, metals and other elements that are usually introduced through friction or maintenance of daily routines.

When considering the many factors that have impacted the water quality of the Commonwealth's waters the highest items of concern are phosphorous and nitrogen as the primary contributing players. For water quality, the amount of water flow from impervious surfaces need to be reduced through practices that will allow the water to re-infiltrate into the soil to recharge the groundwater aquifers as it was doing before any land disturbance activity occurred. The introduction of low impact development (LID) techniques by means of infiltration facilities, landscaping and vegetative buffer will help to achieve this goal and promote both better water quantity and quality of stormwater runoff.

Other potential sources of pollution may include industrial discharges and the discharges from municipal sewage treatment plants (STPs). If improperly maintained or treated, discharges from the wastewater

plant can introduce chlorine, bacteria, and nutrients into the receiving waters, with the potential to cause harmful environmental effects.

In late July 2020 the Spotsylvania County Laboratory Services Environmental Compliance Manager was able to confirm that the Massaponax Wastewater Plant has one effluent outfall along the Rappahannock River, east of the City of Fredericksburg. The effluent travels through a cascade aerator prior to surface discharge into the Rappahannock River. Additionally, the County has two other Wastewater Plants. The FMC Wastewater Plant effluent discharges into the Rappahannock in proximity to the Bowman Center/FMC/Sylvania Plant through one submerged outfall. The Thornburg Wastewater Plant discharges through one effluent outfall into an unnamed tributary that leads to the Po River. DEQ approves all designs and conducts site inspections at each location routinely. Authorization to discharge for all of the Wastewater Plants is in accordance with the effluent limitations and monitoring requirements outlined in the permits issued by DEQ.

As part of the permitting process, DEQ takes into account potential waterway risks and builds in the necessary protections into the permit. DEQ writes the permits for each plant based on permit renewal data, continuous monitoring data, Virginia Environmental Laboratory Accreditation Program (VELAP) certified laboratory data, technical inspections, and the conditions in and around the waterway that the plants discharge into. There are no documented concerns with any of the discharges that exist or that need to be mitigated. No known potential waterway risks exist with any of the plants. All plants operate within compliance with their permits and are in good standing with DEQ.

The condition of water in impoundment (reservoirs) that feed into River systems are also a consideration. As of the July, 2020 update from the Environmental Compliance Manager there are no documented DEQ related water quality and pollutant concerns for County reservoirs or downstream rivers. There are no known natural or man-made concerns with County reservoirs. The County monitors the flow-rate out of the reservoirs among additional flows at reservoirs and water treatment plants that are monitored (includes flows going in and out of the reservoirs as well as the instream flow by measurements to ensure they do not withdrawal too much water and stay within compliance with their permits) in order to stay in compliance with County permits.

Reservoir water is released according to our permits and designed in a way that ensures scouring downstream is as minimal as possible. The reservoirs are continuously monitored to optimize water quality. However, water pollution monitoring would be mandated by the State. The County does not have any mandated reservoir testing for water pollution required by the State. As part of the EPA's Fourth Unregulated Contaminant Monitoring Rule, the source water from all reservoirs were tested for Haloacetic Acid Indicators that included Total Organic Carbon and Bromide. This rule affected all Public Water Systems in the United States and will be used to create future regulations.

Resource Protection Area (RPA)

As described by the Virginia Department of Environmental Quality (DEQ), the Chesapeake Bay Preservation Act and regulations require that a vegetated buffer no less than 100 feet wide be located adjacent to and landward of all tidal shores, tidal wetlands, non-tidal wetlands connected by surface flow and contiguous to tidal wetlands or along water bodies with perennial flow. These features, including the 100-foot buffer, comprise the Resource Protection Area (RPA), and serve a direct water quality function by removing excess sediment, nutrients, and potentially harmful or toxic substances from groundwater

and surface water entering the Chesapeake Bay and its tributaries. Buffers also help to absorb periodic flood surges, and supply thermal protection, food, and cover to fish and other wildlife, stabilize stream-banks, and provide recreation and aesthetic values.

Generally, vegetation in the 100-foot buffer must be preserved on lots that include an RPA, and established where it does not exist. The regulations permit a property owner to modify the buffer by removing vegetation for several reasons:

- To provide for reasonable sight lines
- The construction of access paths
- General woodlot management
- Shoreline erosion control projects

The total amount of land designated as RPAs in Spotsylvania County is estimated to be 12,800 acres, or roughly 5% of the county's total land area. Development in the RPA is limited to water-dependent facilities and redevelopment. In the RPA, a 100-foot buffer of vegetation that is effective in limiting runoff, preventing erosion, and filtering non-point source pollution from runoff must be retained if already present, or established if it does not exist. Clearing in the RPA is limited to what is necessary to provide for reasonable views of the water, and for general woodland management purposes. Cleared vegetation must be replaced with other vegetation is equally effective in protecting water quality.

The Spotsylvania County Geographical Information Systems (GIS) Department graphically depicts the limits of RPA as a map layer online as part of the Interactive Web Based GIS located **HERE**.

Resource Management Area (RMA)

In Spotsylvania County all land outside of the designated RPA is designated as a Resource Management Area. The RMA is protected by the County's Chesapeake Bay Preservation Ordinance (CBPO) and the County Design Standards Manual through the establishment of standards which apply to all development and redevelopment activities.

Resource Management Areas are intended as buffer areas outside of the RPAs wherein environmental factors are still significant to warrant water quality protection. These include areas where development impacts should be mitigated through the implementation or application of design guidelines and performance criteria. These areas include floodplains, highly erodible soils (including steep slopes), highly permeable soils, hydric soils, and isolated non-tidal wetlands not included in the RPA.

The CBPO and Design Standards require that no more land should be disturbed than is necessary to provide for the desired use or development. On-site impervious cover must be minimized, indigenous vegetation should be preserved, on-site sewage disposal systems not requiring a VPDES permit must be pumped at least once every five years, an on-site 100% reserve sewage disposal site must be provided, stormwater runoff must be controlled with the use of best management practices, and on lands where agricultural activity is taking place a Chesapeake Bay Conservation Plan is required.

Reservoir Protection Overlay District

The Reservoir Protection Overlay District is established in the Spotsylvania County Zoning Ordinance. As per Spotsylvania County Code Sec. 23-7.5.1(a), Reservoir Protection Overlay Districts are created for the purpose of protecting and promoting the health, safety and welfare by preserving the existing and potential public drinking water supply reservoir sites and protecting them from water pollution. Regulations within such districts are established to prevent water quality degradation due to pollutant runoff from septic fields, construction sites, lawns, agricultural lands or material storage areas and to reduce sediment loadings that shorten reservoir life. This district is in addition to and overlays all other zoning districts where it is applied, so that any parcel lying in such an overlay district shall also lie in one or more zoning district. The minimum lot size for any residential use where such lot is contiguous to a reservoir site is five acres for lots to be served by private septic systems and two acres for lots to be served by public sewer.

The Spotsylvania County Geographical Information Systems (GIS) Department graphically depicts the limits of the Reservoir Protection Overlay District information available as a map layer online as part of the Interactive Web Based GIS located **HERE**.

River Protection Overlay District

The River Protection Overlay District is established in the Spotsylvania County Zoning Ordinance and is focused on areas in proximity to the Rappahannock River extending from the Fredericksburg (City) line to Orange County. As per Spotsylvania County Code Sec. 23-7.4.1(a), River Protection Overlay Districts are created for the purpose of promoting the public health, safety and welfare through the protection of valuable river resources that provide or may provide drinking water and recreational opportunities. Regulations within such districts are established to prevent water quality degradation due to pollutant runoff from septic fields, construction sites, or material storage areas. This District is in addition to and overlays all other zoning districts where it is applied. The effect is to create a new district that has the characteristics and limitations of the Overlay District.

The minimum lot size for a single-family dwelling in River Protection Overlay Districts is five acres for lots to be served by private septic systems. Lots to be served by public water and sewer, or public well and public sewer are subject to the lot size requirements of the underlying zoning district, which in most cases is two acres within subdivision and one acre outside of subdivision.

In addition to any use limitations in the underlying zoning districts, the following use limitations apply in the River Protection Overlay District:

- The placement of septic fields within the one-hundred-year floodplain is prohibited.
- Before the issuance of a land-disturbing permit for any activity that will disturb more than ten thousand (10,000) square feet of land, a site plan for the control of erosion and sediment runoff must be submitted to and approved by the department of utility construction and erosion control (single-family dwellings outside of subdivisions are exempt from this requirement).

- The aboveground storage of hazardous liquid materials, including fuel oil, pesticides, herbicides, etc., in bulk greater than one thousand (1,000) gallons without approved containment structures is prohibited.

The Spotsylvania County Geographical Information Systems (GIS) Department graphically depicts the limits of the River Protection Overlay District information available as a map layer online as part of the Interactive Web Based GIS located **HERE**.

Floodplains

One hundred-year floodplains are defined as areas with a one percent chance of being flooded in any given year. In order to qualify for flood insurance, the Federal Emergency Management Agency (FEMA) requirements prohibit development within the floodway (water channel) and strongly discourage development in the adjacent 100-year floodway fringe.

With enhanced analytical tools to more properly map floodplain areas, FEMA, its mapping partner, working with Spotsylvania County are in the process of updating the County Flood Insurance Rate Map (FIRM). The result of the updated FIRM maps will lend greater insights into areas subject to flooding and the extent of flooding likely to occur. This update is expected to result in changes to the regulatory floodplain boundaries, resulting in areas removed from prior floodplain designations while others are added.

The County GIS office updated the County floodplain information and has made it publicly available in July, 2018 via Web Based GIS **HERE**.

Floodplain Overlay District

The Floodplain Overlay District is established in the Spotsylvania County Zoning Ordinance. As per Spotsylvania County Code Sec. 23-7.2.1, the Floodplain Overlay District was created to prevent the loss of property and life, the creation of health and safety hazards, the disruption of commerce and governmental services, the extraordinary and unnecessary expenditure of public funds for floor protection and relief, and the impairment of the tax base.

The Spotsylvania County Geographical Information Systems (GIS) Department graphically depicts the limits of the Floodplain Overlay District information available as a map layer online as part of the Interactive Web Based GIS located **HERE**.

Massaponax Creek Watershed Plan

The Friends of the Rappahannock (FOR), in partnership with Spotsylvania County received a Small Watersheds Program Grant from the Alliance for the Chesapeake Bay to develop and implement a water quality management plan for the Massaponax Creek watershed. The "Rapid Watershed Planning Handbook" will be used for this planning effort. The goal of this plan is to assist the County in preserving water quality and riparian corridors within the context of continued economic development. The Plan

serves to guide the development of the County's regional stormwater plan, and well as future Comprehensive Plan revisions. Additionally, this project will use the planning process as a means to:

- Educate County staff, elected officials and citizens on the importance of watershed/ resource based planning:
- Reduce nutrient and toxics loads by specifying state-if-the-art stormwater management and site design practices;
- Demonstrate and model effective watershed planning to other localities; and cultivate an informed and active grassroots constituency of FOR in the watershed, increasing their capacity to advocate locally for water quality protection.

FLORA AND FAUNA

Spotsylvania Natural Heritage Resources

The Virginia Department of Conservation and Recreation's mission is to "Conserve, protect, enhance and advocate wise use of the Commonwealth's unique natural, historical, recreational, scenic and cultural resources."

Spotsylvania County has historically reached out to the Virginia Department of Conservation and Recreation considering Natural Resources. Concerning the identification and protection of flora and fauna, the Department of Conservation and Recreation is a chief source of information to determine via predictive models whether proposed development may threaten a Natural Heritage Resource and warrant additional study, resource avoidance, or additional support for conservation efforts. The Department of Conservation and Recreation's Natural Heritage Division has provided the following County Profile information regarding Natural Heritage Resources applicable to Spotsylvania County:

Natural heritage resources as defined by the Virginia Department of Conservation and Recreation – Division of Natural Heritage (DCR) are the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations such as caves and karst features. Spotsylvania County is currently home to twenty-nine distinct types of natural heritage resources with 48 total occurrences throughout the county (Natural Heritage Resources). In addition, DCR has identified twenty-five terrestrial and aquatic conservation sites (Conservation Sites) as areas necessary for their survival. The Natural Heritage Resources and Conservation Sites can be found on the following pages in Exhibit Map (See Exhibit 3) and Table format (See Table 9-10).

DCR identifies and protects natural heritage resources statewide and maintains a comprehensive database of all documented occurrences of natural heritage resources in Virginia. DCR has developed conservation sites that contain known populations of natural heritage resources and include adjacent or surrounding habitat vital for their protection. Conservation sites do not represent protected lands. See Table 10 for existing conservation sites in Spotsylvania County. They are recommended for protection and stewardship because of the natural heritage resources and habitat they support but are not currently under any official protection designation. Conservation sites are polygons built around one or more rare plant, animal, or natural community designed to include the element and, where possible, its associated habitat, and buffer or other adjacent land thought necessary for the element's conservation. Conservation sites can be used to screen development projects for potential impacts to natural heritage

resources, aid local and regional planning, identify targets for acquisitions and easements and guide priorities for restoration activities.

An example of a conservation site in Spotsylvania County is Lake Anna Uplands Conservation Site. In addition to multiple rare species and habitat types found here, the site/ecosystem is critically important because of the geographic location adjacent to Lake Anna. Conservation sites are given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain; on a scale of 1-5, 1 being most significant. Lake Anna Uplands Conservation Site has been given a biodiversity significance ranking of B5, which represents a site of general significance. The natural heritage resources associated with this conservation site are:

Red milkweed (Image 4) *Asclepias rubra*, G4G5/S2/NL/NL
Ten-angle pipewort (Image 5) *Eriocaulon decangulare*, G5/S2/NL/NL
Piedmont / Central Appalachian Mixed Oak / Heath Forest G5/S5/NL/NL

Image 4: Red Milkweed (Asclepias rubra, G4G5/S2/NL/NL)

Red milkweed, a state rare perennial herb, inhabits wet pine savannas, sandhill seeps, seepage swamps (Weakley, in prep.). It has also been documented in such disturbed areas as powerline rights-of-way (TNC, 1996). This species produces dull red to lavender flowers from June through July (Radford et al., 1968). Like many wetland species, this species has suffered a loss of habitat due to conversion and/or draining of wetlands. In addition, this plant has declined as a result of active fire suppression, which has eliminated significant herbaceous-dominated wetlands (DCR, 1989). Red milkweed is currently known from 29 locations in Virginia's coastal plain and piedmont regions, of which 4 occurrences are historic.

Ten-angle pipewort a state rare plant, inhabits bogs, savannas and low pinelands and blooms from June through October (Radford et. al., 1968). This plant is currently known from 14 locations throughout Virginia and known historically at 3 locations.

Image 5: Ten-angle pipewort (Eriocaulon decangulare, G5/S2/NL/NL)

The Piedmont / Central Appalachian Mixed Oak / Heath Forest community is a matrix forest of dry, infertile uplands of the Mid-Atlantic region. In Virginia, it is most common in the Piedmont, but also occurs in the inner (western) part of the Coastal Plain and at low-elevations (mostly toe slopes and valley floors) of the mountains. This unit is distinct among Virginia's oak/heath forests in its occurrence on low-elevation, rolling to sub-level, usually non-rocky terrain. The vegetation is a closed to very open oak forest with mixed and variable canopy dominance by white, black, scarlet, and chestnut oaks. Various pine spp., including Virginia, shortleaf, eastern white, and pitch pines are frequent overstory associates, particularly following fire or logging disturbances. Southern red oak, post oak, pignut hickory, and mockernut hickory are infrequent canopy trees. Black gum, downy serviceberry and, in the southern part of the range, sourwood attain exceptional abundance and stature in these forests, dominating the sub-canopy layers and occasionally reaching the overstory. Red maple and sassafras are other common understory trees. In typical stands, the shrub layer is dominated by deciduous ericaceous species such as blueberries and black huckleberry. Herbaceous species are sparse, and species-richness is low.

The Piedmont / Central Appalachian Mixed Oak / Heath Forest community evolved in pre-settlement habitats that were subject to frequent fires, and all the dominant species are at least somewhat dependent on fire for successful reproduction. Although still fairly common, many stands of this community type have been altered by repeated logging or completely destroyed by conversion of sites to silvicultural loblolly pine. Because of widespread fire exclusion, poor recruitment of oaks and invasion by red maple, beech, and other fire-intolerant trees are characteristic of remaining stands.

Potential Threats to Natural Heritage Resources:

The great threat to this area and its bird species is the ongoing conversion of habitat to residential and commercial development. Interest in the area from developers and potential homeowners has led to a rise in land valuations and subdivision of privately-owned land for development. Alteration of the local hydrology by land disturbance can change or eliminate habitat and diminish water quality. Fragmentation of forests and the introduction of invasives, both flora and fauna, can have a direct effect on the survival

of many native plants. Threats to the Natural Communities are incompatible development, and recreational activities, invasive species; incompatible agricultural and forestry.

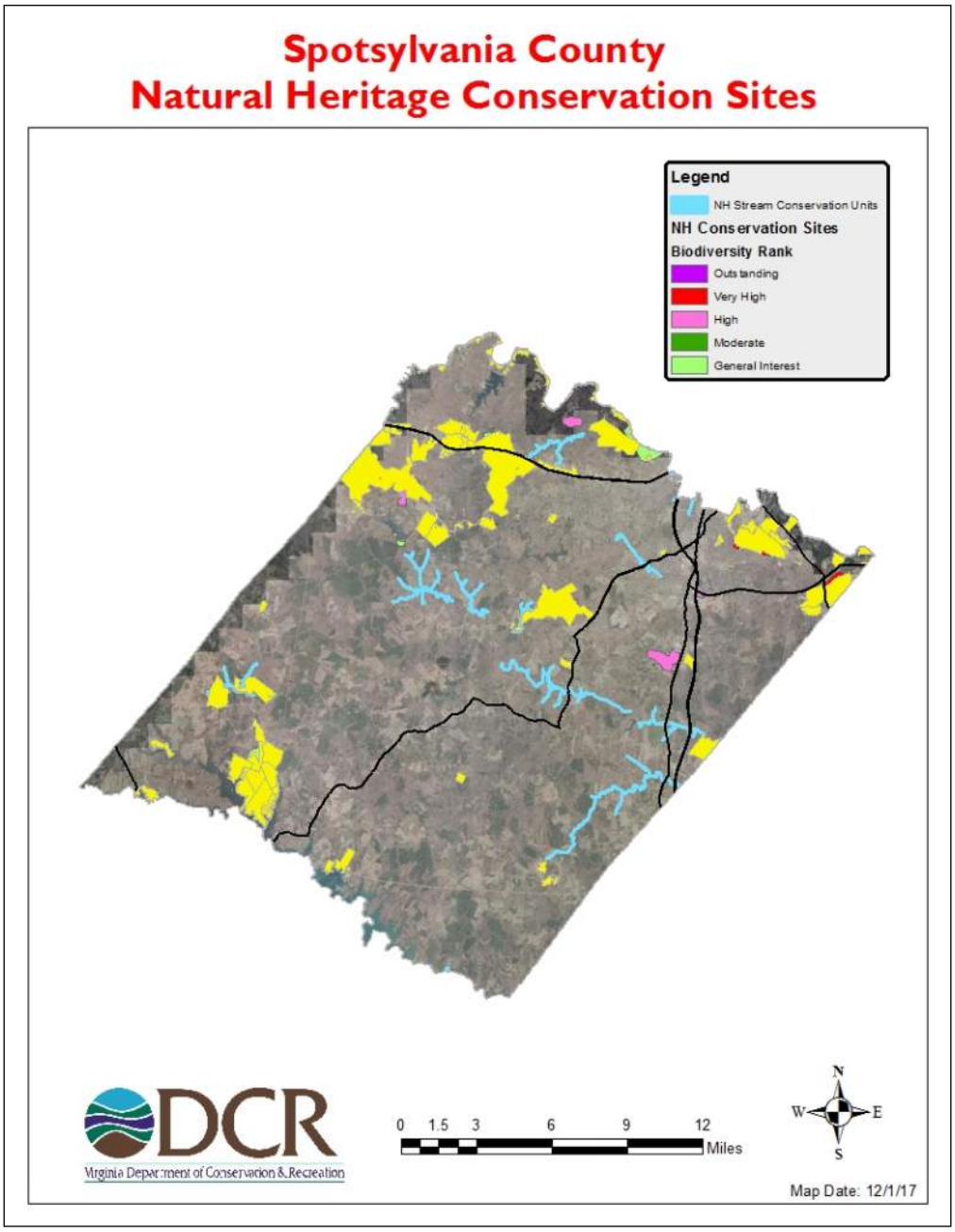

Exhibit 3: Conservation Sites

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Table 9: Spotsylvania County - Natural Heritage Resources

Group Name	Scientific Name	Common Name	Last Observed	Global Rank	USFWS - Species of Concern	State Rank	Federal Status	State Status	SCU Element	Conservation Site Name
Vascular Plant	Isotria medeoloides	Small Whorled Pogonia	2006-06-00	G2?		S2	LT	LE		COSNER CORNER EAST
Terrestrial Natural Community	Justicia americana Herbaceous Vegetation	Water-Willow Rocky Bar and Shore	2008-08-26	G4G5		S4				EMBREY HILL
Vascular Plant	Liparis loeselii	Bog twayblade	1997-09-12	G5		S2				FAWN LAKE SOUTH
Terrestrial Natural Community	Acer rubrum - Nyssa sylvatica - Magnolia virginiana / Viburnum nudum / Osmundastrum cinnamomeum - Woodwardia areolata	Coastal Plain / Outer Piedmont Acidic Seepage Swamp	2004-07-19	G3?		S3				HAMILTONS THICKET
Vascular Plant	Asclepias rubra	Red Milkweed	1993-06-12	G4G5		S2				HAMILTONS THICKET
Terrestrial Natural Community	Quercus phellos - Acer rubrum - Liquidambar	Coastal Plain Depression Swamp	2004-05-07	G3		S2				HAMILTONS THICKET
Vascular Plant	Asclepias rubra	Red Milkweed	2016-07-01	G4G5		S2				LAKE ANNA UPLANDS
Vascular Plant	Eriocaulon decangulare var.	Ten-angled pipewort	2016-07-01	G5T5?		S2				LAKE ANNA UPLANDS
Terrestrial Natural Community	Quercus alba - Quercus (coccinea,	Piedmont / Central Appalachian Mixed	2013-09-18	G5		S5				LAKE ANNA UPLANDS
Vascular Plant	Asclepias rubra	Red Milkweed	1992-10-02	G4G5		S2				LITTLE HUNTING RUN

Table 9: Spotsylvania County - Natural Heritage Resources

Group Name	Scientific Name	Common Name	Last Observed	Global Rank	USFWS - Species of Concern	State Rank	Federal Status	State Status	SCU Element	Conservation Site Name
Aquatic Natural Community	NP-Lower Rappahannock Second Order Stream	NP-Lower Rappahannock Second Order Stream	2011-01	G2?		S2?			SCU	MASSAPONAX CREEK SCU
Invertebrate Animal	Elliptio lanceolata	Yellow Lance	1994-10-22	G2G3	SOC	S2S3			SCU	MATTA RIVER SCU
Aquatic Natural Community	NP-Mattaponi First Order Stream	NP-Mattaponi First Order Stream	2011-01	G3?		S3?			SCU	MATTA RIVER SCU
Aquatic Natural Community	NP-Mattaponi Fourth Order Stream	NP-Mattaponi Fourth Order Stream	2015-01	G1		S1			SCU	MATTA RIVER SCU
Aquatic Natural Community	NP-Lower Rappahannock Third Order Stream	NP-Lower Rappahannock Third Order Stream	2015-01	G1		S1			SCU	MINE RUN SCU
Terrestrial Natural Community	Quercus (phellos, pagoda, michauxii) / Ilex opaca - Clethra alnifolia / Woodwardia areolata Forest	Non-Riverine Wet Hardwood Forest (Northern Coastal Plain Type)	2009-06-12	G2?		S2				NEW POST FLATWOODS
Terrestrial Natural Community	Acer rubrum - Fraxinus pennsylvanica / Saururus cernuus Forest	Coastal Plain / Piedmont Floodplain Swamp (Green Ash - Red Maple Type)	2012-07-16	G3G4		S3S4				NI RIVER MASSAPONAX FLATWOODS
Terrestrial Natural Community	Quercus (phellos, palustris, michauxii) - Liquidambar styraciflua / Cinna arundinacea Forest	Northern Coastal Plain / Inner Piedmont Mixed Oak Floodplain Swamp	2012-07-16	G3G4		S3?				NI RIVER MASSAPONAX FLATWOODS

Table 9: Spotsylvania County - Natural Heritage Resources

Group Name	Scientific Name	Common Name	Last Observed	Global Rank	USFWS - Species of Concern	State Rank	Federal Status	State Status	SCU Element	Conservation Site Name
Terrestrial Natural Community	Quercus phellos - Acer rubrum - Liquidambar styraciflua / Vaccinium (formosum, fuscatum) Forest	Coastal Plain Depression Swamp (Willow Oak - Red Maple - Sweetgum Type)	2012-07-16	G3		S2				NI RIVER MASSAPONAX FLATWOODS
Vascular Plant	Isotria medeoloides	Small Whorled Pogonia	2006-06-15	G2?		S2	LT	LE		NI RIVER TRIBUTARY SLOPES
Aquatic Natural Community	NP-Pamunkey Fifth Order Stream	NP-Pamunkey Fifth Order Stream	2011-01	G1G2		S1S2			SCU	NORTH ANNA RIVER BELOW RT 601 SCU
Terrestrial Natural Community	Acer rubrum - Nyssa sylvatica - Magnolia virginiana / Viburnum nudum / Osmundastrum cinnamomeum - Woodwardia areolata Forest	Coastal Plain / Outer Piedmont Acidic Seepage Swamp	2004-06-15	G3?		S3				PICKETTS CIRCLE
Aquatic Natural Community	NP-Pamunkey Second Order Stream	NP-Pamunkey Second Order Stream	2011-01	G3		S3			SCU	PLENTIFUL CREEK SCU
Invertebrate Animal	Alasmidonta heterodon	Dwarf Wedgemussel	2008-06-12	G1G2		S1	LE	LE	SCU	PO RIVER - ANDREWS BRIDGE SCU
Invertebrate Animal	Elliptio lanceolata	Yellow Lance	1995-07-26	G2G3	SOC	S2S3			SCU	PO RIVER - ANDREWS BRIDGE SCU
Aquatic Natural Community	NP-Mattaponi Fourth Order Stream	NP-Mattaponi Fourth Order Stream	2015-01	G1		S1			SCU	PO RIVER - ANDREWS BRIDGE SCU
Invertebrate Animal	Lampsilis radiata	Eastern Lampmussel	1989-09-04	G5		S2S3			SCU	PO RIVER - STANARDS MILL SCU
Invertebrate Animal	Alasmidonta heterodon	Dwarf Wedgemussel	2000-06-09	G1G2		S1	LE	LE	SCU	PO RIVER - WRIGHTS POND - PILTZER CREEK SCU
Invertebrate Animal	Elliptio roanokensis	Roanoke Slabshell	2000-06-09	G3		S2			SCU	PO RIVER - WRIGHTS POND - PILTZER CREEK SCU

Table 9: Spotsylvania County - Natural Heritage Resources

Group Name	Scientific Name	Common Name	Last Observed	Global Rank	USFWS - Species of Concern	State Rank	Federal Status	State Status	SCU Element	Conservation Site Name
Invertebrate Animal	Alasmidonta heterodon	Dwarf Wedgemussel	2012-08-28	G1G2		S1	LE	LE	SCU	PO RIVER AT CORBIN BRIDGE SCU
Aquatic Natural Community	NP-Mattaponi First Order Stream	NP-Mattaponi First Order Stream	2011-01	G3?		S3?			SCU	PO RIVER AT RT 613 SCU
Invertebrate Animal	Alasmidonta heterodon	Dwarf Wedgemussel	1994-09-12	G1G2		S1	LE	LE	SCU	RAPPAHANNOCK RIVER - ROCKY PEN RUN SCU
Terrestrial Natural Community	Acer rubrum - Nyssa sylvatica - Magnolia virginiana / Viburnum nudum / Osmundastrum cinnamomeum - Woodwardia areolata Forest	Coastal Plain / Outer Piedmont Acidic Seepage Swamp	2005-05-17	G3?		S3				SOUTH FREDERICKSBURG
Terrestrial Natural Community	Quercus (phellos, pagoda, michauxii) / Ilex opaca - Clethra alnifolia / Woodwardia areolata Forest	Non-Riverine Wet Hardwood Forest (Northern Coastal Plain Type)	2005-05-31	G2?		S2				SOUTH FREDERICKSBURG
Vascular Plant	Isotria medeoloides	Small Whorled Pogonia	1999-06-23	G2?		S2	LT	LE		UPPER MINE RUN TRIBUTARY
Invertebrate Animal	Alasmidonta heterodon	Dwarf Wedgemussel	1925-08-18	G1G2		S1	LE	LE	SCU	
Vascular Plant	Asclepias rubra	Red Milkweed	1990-07-21	G4G5		S2				
Invertebrate Animal	Callophrys irus	Frosted Elfin	1993-04-21	G3		S2?				
Vascular Plant	Eriocaulon decangulare var. decangulare	Ten-angled pipewort	1995-07-27	G5T5?		S2				
Invertebrate Animal	Lasmigona subviridis	Green Floater	1927-10-07	G3		S2		LT	SCU	

Table 9: Spotsylvania County - Natural Heritage Resources

Group Name	Scientific Name	Common Name	Last Observed	Global Rank	USFWS - Species of Concern	State Rank	Federal Status	State Status	SCU Element	Conservation Site Name
Aquatic Natural Community	NP-Rapidan-Upper Rappahannock Second Order Stream	NP-Rapidan-Upper Rappahannock Second Order Stream	2011-01	G2G3		S2S3			SCU	
Vascular Plant	Quercus prinoides	Dwarf Chinquapin Oak	1977-07-24	G5		S1				
Vascular Plant	Quercus prinoides	Dwarf Chinquapin Oak	2001-05-31	G5		S1				
Vascular Plant	Ranunculus ambigens	Water-plantain crowfoot	1977-07-31	G4		S1				
Vascular Plant	Saccharum coarctatum	Compressed plumegrass	1972-10-08	G5?		S1				
Vascular Plant	Sarracenia purpurea	Northern pitcher plant	1986-08-20	G5		S2				
Invertebrate Animal	Sigara depressa	Virginia Piedmont Water Boatman	1969-07-03	G1G2	SOC	S1S2		LE	PSCU	
Invertebrate Animal	Stylurus laurae	Laura's Clubtail	1967	G4		S2			SCU	

Table 10: Spotsylvania County - Conservation Sites

Conservation Site Name	Biodiversity Rank	Legal Status	Conservation Site Type
Cosner Corner East	B3	FL	Conservation Site
Embrey Hill	B5	NL	Conservation Site
Fawn Lake South	B5	NL	Conservation Site
Hamiltons Thicket	B3	NL	Conservation Site
Hazel Run Rt 1 to Rt 2 SCU	B3	NL	SCU
L ake Anna Uplands	B5	NL	Conservation Site
Little Hunting Run	B5	NL	Conservation Site
Massaponax Creek SCU	B3	NL	SCU
Matta River SCU	B2	NL	SCU
Mine Run SCU	B2	NL	SCU
New Post Flatwoods	B2	NL	Conservation Site
Ni River Massaponax Flatwoods	B3	NL	Conservation Site
Ni River Tributary Slopes	B3	FL	Conservation Site
North Anna River Below Rt 601 SCU	B2	NL	SCU
Picketts Circle	B4	NL	Conservation Site
Plentiful Creek SCU	B4	NL	SCU
Po River - Andrews Bridge SCU	B2	FL	SCU
Po River - Standards Mill SCU	B5	NL	SCU
Po River - Wrights Pond - Piltzer Creek SCU	B2	FL	SCU
Po River at Corbin Bridge SCU	B2	FL	SCU
Po River at Rt 613 SCU	B4	NL	SCU
Rappahannock River - Rocky Pen Run SCU	B2	FL	SCU
Snow Creek Ravine	B4	NL	Conservation Site
South Fredericksburg	B2	NL	Conservation Site
Upper Mine Run Tributary	B3	FL	Conservation Site

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Definitions of Abbreviations Used on Natural Heritage Resource Lists of the Virginia Department of Conservation and Recreation

Natural Heritage State Ranks

The following ranks are used by the Virginia Department of Conservation and Recreation to set protection priorities for natural heritage resources. Natural Heritage Resources, or "NHR's," are rare plant and animal species, rare and exemplary natural communities, and significant geologic features. The criterion for ranking NHR's is the number of populations or occurrences, i.e. the number of known distinct localities; the number of individuals in existence at each locality or, if a highly mobile organism (e.g., sea turtles, many birds, and butterflies), the total number of individuals; the quality of the occurrences, the number of protected occurrences; and threats.

S1 - Critically imperiled in the state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state. Typically 5 or fewer populations or occurrences, or very few remaining individuals (<1000).

S2 - Imperiled in the state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state. Typically 6 to 20 populations or occurrences or few remaining individuals (1,000 to 3,000).

S3 - Vulnerable in the state either because rare and uncommon, or found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation. Typically having 21 to 100 populations or occurrences (1,000 to 3,000 individuals).

S4 - Apparently secure; Uncommon but not rare, and usually widespread in the state. Possible cause of long-term concern. Usually having >100 populations or occurrences and more than 10,000 individuals.

S5 - Secure; Common, widespread and abundant in the state. Essentially ineradicable under present conditions, typically having considerably more than 100 populations or occurrences and more than 10,000 individuals.

S#B - Breeding status of an animal within the state

S#N - Non-breeding status of animal within the state. Usually applied to winter resident species.

S#? - Inexact or uncertain numeric rank.

SH - Possibly extirpated (Historical). Historically known from the state, but not verified for an extended period, usually > 15 years; this rank is used primarily when inventory has been attempted recently.

S#S# - Range rank; A numeric range rank, (e.g. S2S3) is used to indicate the range of uncertainty about the exact status of the element. Ranges cannot skip more than one rank.

SU - Unrankable; Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

SNR - Unranked; state rank not yet assessed.

SX - Presumed extirpated from the state. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.

SNA - A conservation status rank is not applicable because the element is not a suitable target for conservation activities.

Natural Heritage Global Ranks are similar, but refer to a species' rarity throughout its total range. Global ranks are denoted with a "G" followed by a character. Note GX means the element is presumed extinct throughout its range. A "Q" in a rank indicates that a taxonomic question concerning that species exists. Ranks for subspecies are denoted with a "T". The global and state ranks combined (e.g. G2/S1) give an instant grasp of a species' known rarity. These ranks should not be interpreted as legal designations.

FEDERAL LEGAL STATUS
The Division of Natural Heritage uses the standard abbreviations for Federal endangerment developed by the U.S. Fish and Wildlife Service, Division of Endangered Species and Habitat Conservation.

LE - Listed Endangered
LT - Listed Threatened
PE - Proposed Endangered
PT - Proposed Threatened
C - Candidate (formerly C1 - Candidate category 1)
E(S/A) - treat as endangered because of similarity of appearance
T(S/A) - treat as threatened because of similarity of appearance
SOC - Species of Concern species that merit special concern (not a regulatory category)
NL – no federal legal status

STATE LEGAL STATUS
The Division of Natural Heritage uses similar abbreviations for State endangerment.

LE - Listed Endangered
PE - Proposed Endangered
SC - Special Concern - animals that merit special concern according to VDGIF (not a regulatory category)
LT - Listed Threatened
PT - Proposed Threatened
C - Candidate
NL - no state legal status

For information on the laws pertaining to threatened or endangered species, please contact:

U.S. Fish and Wildlife Service for all FEDERALLY listed species;
Department of Agriculture and Consumer Services, Plant Protection Bureau for STATE listed plants and insects

Department of Game and Inland Fisheries for all other STATE listed animals

Conservation Sites Ranking

Brank is a rating of the significance of the conservation site based on presence and number of natural heritage resources; on a scale of 1-5, 1 being most significant. Sites are also coded to reflect the presence/absence of federally/state listed species:

Conservation Site Ranks	Legal Status of Site
B1 – Outstanding significance	FL – Federally listed species present
B2 – Very High significance	SL – State listed species present
B3 – High significance	NL – No listed species present
B4 – Moderate significance	
B5 – Of general Biodiversity significance	

Natural Heritage Data Explorer (NHDE)

The Virginia Department of Conservation and Recreation describes (NHDE) as an ArcGIS Server based interactive mapping application that anyone can use to map the conservation status and conservation values of lands. The NHDE is a combination of three tools used to access Natural Heritage, Conservation Lands, and conservation planning data and information, and used to obtain Environmental Review services.

As a development review tool, County staff and local decision makers are able to utilize the NHDE to make better informed decisions regarding the prospect of development impacts in areas where natural heritage resources are, or are likely to occur. Such models can and have resulted in requests for additional information in an effort to mitigate potential impacts upon threatened or endangered species and their habitats where models identify potential conflicts. Additionally, models can help better inform land use and public service decisions as part of the County Comprehensive Plan creation, review, and update processes whereby helping guide informed planning efforts.

The NHDE can be found **HERE**

2015 Virginia Wildlife Action Plan

As per the Virginia Department of Game and Inland Fisheries, the 2015 Wildlife Action Plan (Plan) was written to offer strategies for rising to the challenges of the 21st century. The Plan describes opportunities to maintain and improve our natural habitats, allowing us to conserve wildlife in ways that benefit people. It details efforts to restore our rivers, maintain our forests, and prevent species from declining to the point where federal protections are imposed. Practical actions based on the best available science describe how we help our wildlife and our human communities adapt to changing conditions. Most importantly, the Plan demonstrates that some of our most critical conservation issues can be addressed in a cost-effective way using proven techniques and technologies.

The updated 2015 Action Plan identifies 883 species that are in decline statewide. Habitat loss is the single greatest challenge impacting these species. The Plan identifies strategies to conserve and restore these species through conservation efforts. In addition to a statewide overview, the Action Plan describes strategies for 21 multi-county planning regions which are roughly consistent with Virginia's Planning

District Commissions. Spotsylvania County is located within the George Washington Region Chapter of the Plan. Within the George Washington Region, 76 of the statewide 883 species are believed to either occur or have occurred. For each planning region, the Action Plan identifies the local wildlife priorities, the habitats those species rely upon, threats impacting these species and habitats, and conservation actions that can be taken to address those threats. The Plan identifies: priority places for either conservation or restoration within each planning region, programs working to address threats or define best management practices, and data that could be used to document and evaluate the success of conservation actions. Within Spotsylvania County, those areas identified where Top Tier Species of Greatest Conservation Needs have the greatest density include: northwestern; central; south-central; southeastern Spotsylvania County. These are areas of the County that historically have had fewer development pressures where agriculture, forestry, and large lot rural residential land uses prevail and are supported by the County Future Land Use vision, outside of the Primary Development Boundary. Finally, the updated Action Plan describes climate trends that have been projected for Virginia and identifies actions that can be taken to conserve wildlife under changing climatic conditions.

The 2015 Wildlife Action Plan is made available online by the Virginia Department of Game and Inland Fisheries Here.

Virginia Fish and Wildlife Information Service (VaFWIS)

The Virginia Fish and Wildlife Information Service (VaFWIS) complements the Wildlife Action Plan and provides an interactive mapping service to help identify a number of geographic based natural resources overlays including: designated trout waters; anadromous fish waters; designated waters for threatened and endangered species; bald eagle nest sites, concentration areas and roosts; Wildlife Action Plan Tier I and II observations (approximate locations within 2 miles); predicted habitat for Wildlife Action Plan Tier I and II Species.

As a development review tool, County staff and local decision makers are able to utilize the VaFWIS to make better informed decisions regarding the prospect of development impacts in areas where Tier I and II species and their habitats are or are likely to occur. Such models can and have resulted in requests for additional information in an effort to mitigate potential impacts where areas of potential conflict exists. Additionally, VaFWIS can help better inform land use and public service decisions as part of County Comprehensive Plan creation, review, and update processes whereby helping guide informed planning efforts.

The VaFWIS can be found **HERE**.

U.S. Fish and Wildlife Service Information for Planning and Consultation (IPaC)

The U.S. Fish and Wildlife Service IPaC service assists in the environmental review process by identifying species and resources that may be impacted by activities at a specific location. Like the VaFWIS and NHDE services referenced previously, IPaC offers an easy to use mapping system to help geo-locate resources to consider as part of the development review process.

As a development review tool, County staff and local decision makers can utilize the IPaC service to make better informed decisions regarding the prospect of development impacts in areas where endangered species, critical habitat, migratory birds or other natural resources are, or are likely to occur. Such models

can and have resulted in requests for additional information in an effort to mitigate potential impacts where areas of potential conflict exists. Additionally, IPaC can help better inform land use and public service decisions as part of County Comprehensive Plan creation, review, and update processes whereby helping guide informed planning efforts.

The IPaC service can be found **HERE**.

FORESTRY

The Virginia Department of Forestry's mission is to "protect and develop healthy, sustainable forest resources for Virginians". As per the Virginia Department of Forestry, their Vision envisions a healthy, abundant, forest resource providing economic and environmental benefits to the Commonwealth on a sustained basis. We see a resource whose scenic beauty enhances natural surroundings and whose protected environment supports clean water and wildlife. We further see a diverse forest resource as a part of natural ecosystems. We envision the economic benefits of forest industry to be in balance with the environmental values of the resource.

Spotsylvania County has historically reached out to the Virginia Department of Forestry to seek updated Spotsylvania County forestry profile information as part of the Comprehensive Plan update process, as follows:

County Profile

Forestry in Spotsylvania County, as it is most anywhere, is dictated largely by its soils, its historical uses and management techniques, local demands and the natural forest cover present. Historically, Spotsylvania County was rich in minerals as well as in agricultural and forestal resources. The County seal, with an image of three trees, reflects the importance of forestry to the local economy.

During colonial times, a great deal of effort was spent in mining iron ore, gold, silver and other minerals from the soils of this county. The county was named after colonial Lt. Gov. Alexander Spotswood (1676-1740), who, among other things, was responsible for establishing iron furnaces and foundries in the area. As these resources were being mined, productive timberland was harvested to provide firewood to operate the furnaces used to melt these minerals into a usable form.

During the Civil War, four major battles and countless minor battles and skirmishes were fought in the area, earning Spotsylvania the title "Crossroads of the Civil War." Civil War-era photos show the vast amount of open land during this time period; the timber had been cleared to provide firewood for the numerous furnaces in the county, as well as to make way for crop fields. The northwest area of the county is called "Wilderness," where large areas of dense shrub land made the area nearly impossible to travel through. The "Wilderness" shrubs grew in the poor soils that resulted from forest clearing and the removal of raw materials.

Both the mining operations and the land clearing combined with poor agricultural practices have left Spotsylvania with depleted topsoils. Additionally, certain areas of the county have poorly drained soils that may be the result of a 'plow pan' or 'hard pan' layer, developed during agricultural tillage. Once bountiful regions had now been reduced to marginal productivity, at best. Although marginal for agriculture, the soils were good for pine plantations, predominately Loblolly pine (Pinus taeda).

Once the Civil War ended, with much of the pre-war workforce no longer available, much of the cleared land throughout the county reverted back to forest land. A considerable amount of the hardwoods (oak, hickory, poplar, etc.) existing in the county today is a result of the forest succession that began after the Civil War ended.

After the turn of the 20th century, and most of the 1900s, forestry and forest products were an important part of the economy of Spotsylvania County. Numerous portable sawmills, permanent sawmills and timber harvesters operated in the area, providing a livelihood for many families. The operations were responsible for harvesting the hardwoods, milling the product on site in the forest, and shipping only the final product (in the form of rough lumber) out of the forest. This process usually focused on trees of merchantable size, species and quality, and left un-merchantable trees uncut. Primary products for this era included grade lumber and railroad ties, among others. This method of harvesting timber was common for several reasons: harvesting timber was very labor intensive, so crews only focused on what was profitable, and there was generally little to no market value for smaller or poorly formed trees. However, in some cases, this left the forest devoid of any market value, often for decades after the harvest.

Prior to the 1950's, it was commonplace for a landowner to sell the standing timber and land together as a unit, or once the timber had been harvested, sell the land for a very low cost. The value of the land was in the forest, and with the forest having been harvested, the landowner would then be required to pay taxes on the property until the forest matured again, possibly taking many decades. In some cases, the landowner was unwilling to carry that long. Clearing the land for agriculture was generally not an option because it was often not suited for farming. However, due to the differences of agriculture and farming, land that was substandard for agriculture often grows pines very well.

Beginning in the 1960's and 1970's, paper companies, such as WestVaCo, Continental Can, Bear Island, Chesapeake and other smaller, locally owned sawmills would purchase these lands for the expressed purpose of growing pines for fiber production.

Eventually, clear cutting as a method of timber harvesting was used more frequently, primarily due to the marketability of previously un-merchantable wood, such as hardwood pulpwood, as well as the onset of mechanized harvesting (which reduced the amount of manual labor required in the harvesting process). Clear cutting made it possible for the forest landowner to reforest using planted pine; the pine plantation was thereby developed.

As a result of Interstate 95 being built during the early 1960s, and the fact that Spotsylvania lies mid-way between Washington, D.C., and Richmond, the population of Spotsylvania began to grow. Prior to that, much of the timberland in the county was owned in large tract sizes by paper and pulp companies, sawmills and other timber producers as a relatively inexpensive commodity. As the population of Spotsylvania increased, however, so did the value of the land. Developers and builders were able to buy land to subdivide, further increasing the price of real estate. This once rural county has now become suburbanized, with large tracts of land being broken into smaller and smaller pieces, contributing to forest fragmentation.

Table 11: Forestry Land in Spotsylvania County	
Land Use	Acres
Total Area of Spotsylvania County	252,499
Commercial Timberland	143,374
Total Area of Forestland	150,656
Nonforest Area	89,439
Water	12,403
% of Spotsylvania County in Forest	60%

Table 12: Forest Lands Ownership		
Ownership	Acres	Percentage
Area of Forestland all classes	150,656	100%
National Park	1,456	1%
State	8,709	6%
County	5,826	4%
Private Ownership	134,665	89%

Currently, there are still a large number of loblolly pine plantations of considerable size being managed here in the County. However, many of the paper and pulp companies have sold their holdings here in the County; some of which has gone to landowners with forest management goals, while other tracts have been converted into housing developments. Converting a pine plantation into a housing development presents two important issues:

1. It creates a fire hazard for the homes of that community (due to the highly flammable nature of loblolly pine) and;

2. The larger forest, now subdivided, is now much more difficult to manage. Due to the difficulty in managing this stand, often the forest becomes overcrowded, stressed, and susceptible to insects and diseases. Trees killed by insects and diseases (often this occurs in areas of several acres or more) become a fire hazard and have no market value whatsoever.

Bearing this history in mind, and its influences on the forests of today, the soils of Spotsylvania County are by and large well suited for Loblolly and Shortleaf pine. Pines can be grown in a higher quality and in a shorter amount of time than hardwoods. In Spotsylvania, on upland sites, a typical hardwood forest is dominated by white oak, red oak, hickory and yellow poplar. On bottomland sites, a typical hardwood forest is dominated by river birch, sycamore, sweet gum and red maple. The quality of the hardwood present today on upland sites is generally fair to poor, as quality hardwoods require very productive soils.

Table 13: Forest Types		
Forest Type Group	Acres	Percentage
Loblolly Pine	51,887	34%
Oak-Pine	23,280	15%
Oak - Hickory	63,838	42%
Bottomland Hardwood	10,195	7%
Non-stocked	1,456	1%
Total	150,656	100%

Forest products in Spotsylvania County today include pulpwood, grade lumber (both pine and hardwood), railroad ties, and some veneer. Of course, firewood, fence posts and associated products are produced on a small scale. Some timber harvesters, however, have begun chipping low quality and un-merchantable products created during the timber harvest (such as tree tops) into a mulch-like material, where it is used as fuel at large mills and plants.

The trend of forestry in Spotsylvania is like that elsewhere in eastern Virginia. Timber harvesting in general is tied closely to both the economy and to the housing market. Acres harvested statewide were down in 2009, however, they have recovered to more typical numbers today. Total acres reforested, after a timber harvest have maintained a steady trend over the past few years. Spotsylvania County ranks 36th statewide in timber harvesting for total average annual harvest value, from 2005 to 2015.

One notable trend over the past thirty years is the absence of fire. While no one would argue that wildfires are good, a prescribed fire does have benefits when handled properly. Due to the high population in Spotsylvania County, the use of prescribed fire as a management tool has been increasingly difficult to use, due to the issues associated with smoke management. Additionally, in rural Virginia periodic wildfires, although dangerous, did have an effect on the forest over time. Certain tree species such as sweetgum, red maple and others, typically were killed off by fire, whereas most species of oak were able to survive and even thrive. Periodic wildfires often gave way to a higher composition of oaks in Virginia forests, which in turn were more marketable. Fire now largely precluded from the forestland, many hardwood forests now are comprised more heavily of sweetgum, red maple, and less of the oaks.

While portions of the western and southern sections of the county are still somewhat rural, Spotsylvania County today is largely made up of suburban areas. Many county residents commute to Northern Virginia or Washington, D.C., for high-paying jobs. Other people are moving to Spotsylvania from those areas because of the relatively lower cost of living. As a result of this shift from rural to suburban, the urban and community forests have become increasingly important to homeowners, and new housing developments are being built with “green spaces” for their residents to enjoy. These people also see the value in protecting forested areas so that all will be able to enjoy the many benefits forests provide.

Forest Industry

Currently, there are two operating, commercial sawmills within Spotsylvania County, however, there are at least two smaller portable mills in existence, and likely others. Additionally, there is a wood preservative plant and a planing mill, neither of which uses raw logs in their processes. The wood preservative plant

treats finished lumber with an approved chemical for use in exterior construction, such as decks, playground equipment, etc. The planing mill receives large cants, and re-saws them into pallet parts.

Much of the timber harvested in Spotsylvania County is hauled to primary processing facilities outside of the county, and in some cases, outside of Virginia.

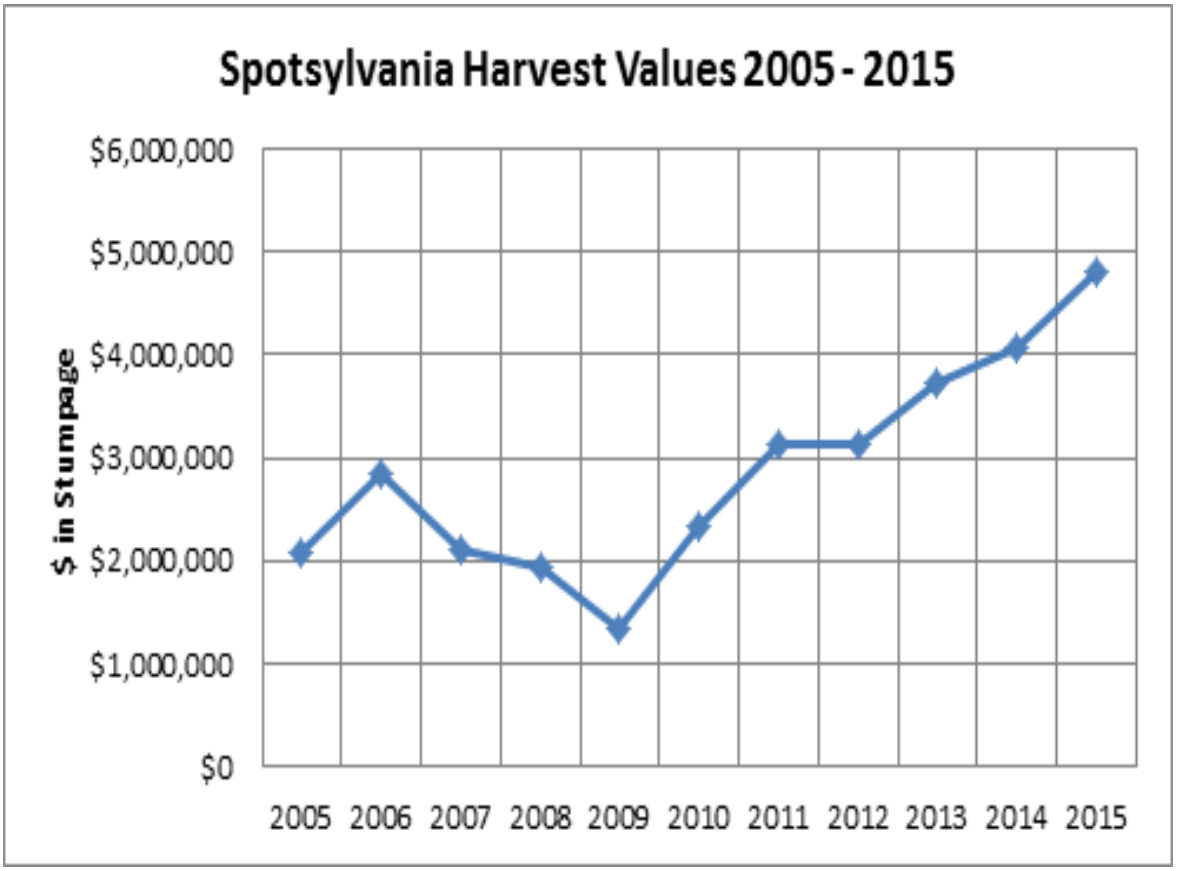


Exhibit 3: Harvest Values '05-'15

The "annual harvest value" is in fact the value of the timber harvested in the County, for a given year. The term generally used to describe timber removed from a given site is 'stumpage'. In order to determine this number, harvest volume (the amount of timber harvested) is needed, as well as value (price paid for what was harvested). Therefore, this data is derived from a combination of two sources. The County harvest volumes come from the forest products tax information and the values are based on average stumpage values that are collected each year from local consultants and sources like Timber Mart - South. See Exhibit 3, 4 and Table 14, 15.

Table 14: Virginia Department of Forestry: Spotsylvania County Timber Value and Supply					
	2015	2010	2009	2008	2007
Pine (MBF)	22,034	6,217	2,265	6,173	7,646
Pine (cords)	18,370	19,177	12,353	21,568	19,227
Value: Pine	$3,764,702	$1,342,075	$602,479	$1,307,209	$1,493,002.34
Hardwood (MBF)	5,614	5,050	4,774.14	4,474	4,944
Hardwood (cords)	8,429	12,189	8,263.29	11,756	9,824
Value: Hardwood	$1,016,219	$981,331	$740,899	$624,608	$614,755
Total Value	$4,795,099	$2,323,406	$1,343,378	$1,931,817	$2,107,757

Exhibit 4: Harvest Volumes

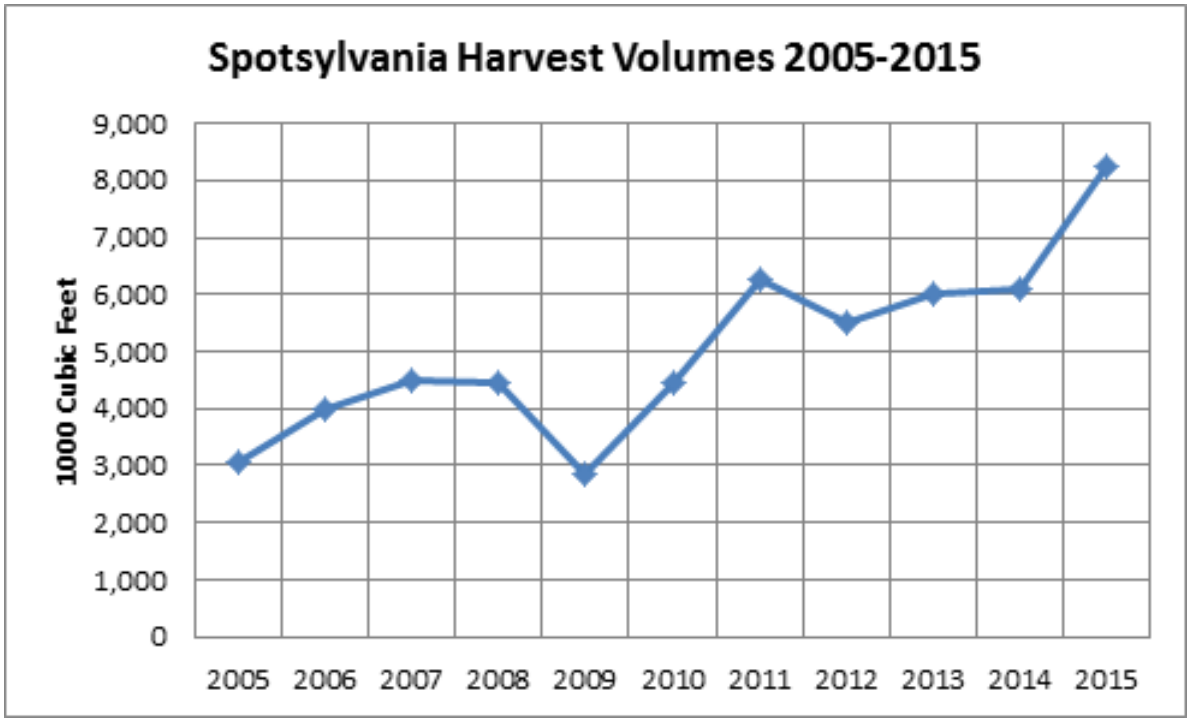


Table 15: USDA Census of Agriculture: Spotsylvania County Woodland Crops					
		2017	**2012**	**2007**	**2002**
Cut Christmas Trees	**Farms**	11	12	11	9
	Acres in Production	99	90	80	96
	Trees Cut	1,371	1,624	2,282	4,170

Forest Conservation Value Map (included within this appendix)

The Virginia Department of Forestry has established a relative Forest Conservation Value (FCV) for all of the forestland in the state. This FCV ranking is based on the level of benefits provided by a particular area of forest in combination with the level of threat the area faces from conversion to another land use, primarily to development. The FCV map divides the state's forestlands into five categories; the Virginia Department of Forestry (VDOF) has identified categories 4 and 5 as having high forest conservation value. While all forests provide a range of benefits and the threat of forest conversion is widespread, the VDOF recommends that these high conservation value forests be given priority in land conservation efforts such as donated conservation easements, PDR programs, or Ag-Forestal Districts.

In the GIS analysis used to develop the FCV rankings, the forest benefits that were measured included water quality protection, natural habitat, the extent of contiguous forest cover, and the potential forest economic productivity. Threat to conversion was based on the likelihood that the area would change from rural land to a more developed use. This was determined based on road density, county population projections, and 30-year projections of housing density.

In developing the FCV map, the following datasets were used to calculate forest benefits utilizing a weighted overlay model. The model also included forest conversion threat as described above.

1. Streams, shorelines, and floodplain forests and forested wetlands
2. Forests in headwaters and on steep slopes
3. Forests protecting drinking water supplies
4. Large contiguous blocks of forest; and
5. Sustainable, managed working forests - based on woodland soil productivity, forest types, and economic value of timber
6. Areas of high terrestrial integrity – takes into account stream buffers, road fragmentation, and impervious surfaces
7. Areas of high aquatic integrity – incorporates number of species and species richness

An important forestland conservation tool that Spotsylvania County has utilized over the past few years is Forest Land Use Taxation. By offering a tax reduction to landowners who have a minimum of 20 forested acres when they take the simple step of working with forestry professionals to identify their forestry resources and developing a plan for managing them, many people can afford to hold onto their land. This reduces the amount of forest fragmentation and land use conversion and maintains the county's green spaces which might otherwise be lost to commercial and residential development. Forested parcels

greater than 20 acres in size have been identified as being profitable for both the landowner and the timber harvesting contractor who has set costs involved with relocating their operations from project to project.

Sustainable Practices

Wise usage of wood and wood by-products to reduce additional tonnage to the county landfill should be a goal of the county. There are already practices in use such as incorporating woody debris into fertilizer and grinding mulch to be used by the public in landscaping projects. Composting of leaf collections and small pruning residues is an age-old practice that can create rich potting soil. Larger branches and small diameter damaged trees can be chipped to create material to be used on park trails. These measures, along with other recycling strategies, can go a long way towards extending the duration of current landfill space.

PRODUCTION OF FOOD AND FIBER

The Census is conducted by the United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). The Census of Agriculture, conducted only once every five years, is the only source of consistent and comprehensive agricultural data for every state and county in the nation. United States law (Title 7 USC 2204(g) Public Law 105-113), requires all those who receive a Census of Agriculture report form to respond even if they did not operate a farm or ranch in 2017. The Census of Agriculture is a complete count of U.S. farms and ranches and the people who operate them. Even small plots of land - whether rural or urban - growing fruit, vegetables or some food animals count if $1,000 or more of such products were raised and sold, or normally would have been sold, during the Census year. It looks at farms, value of land, market value of agricultural production, farm practices, expenditures, and other factors that affect the way farmers and ranchers do business. The information is used by town planners, policy makers, agribusinesses and others to help make important growth-generating decisions.

Presently, the results of the 2017 Census are the most recent available. The prior update occurred in 2012. The attached County profile from the 2017 Census of Agriculture (Insert Sheets A, B) summarizes and reflects Spotsylvania County's production of food and fiber and notes trends since 2012. See Tables 16 through 19 for additional insights.

2017 CENSUS OF AGRICULTURE *County Profile*

Spotsylvania County
Virginia

Total and Per Farm Overview, 2017 and change since 2012

	2017	% change since 2012
Number of farms	338	-8
Land in farms (acres)	41,674	-1
Average size of farm (acres)	123	+8
Total	($)	
Market value of products sold	9,011,000	-18
Government payments	199,000	-40
Farm-related income	3,028,000	+19
Total farm production expenses	11,275,000	-23
Net cash farm income	963,000	+211
Per farm average	($)	
Market value of products sold	26,661	-11
Government payments (average per farm receiving)	6,859	+22
Farm-related income	25,025	+31
Total farm production expenses	33,359	-16
Net cash farm income	2,850	+221

(Z) Percent of state agriculture sales

Share of Sales by Type (%)

Crops	48
Livestock, poultry, and products	52

Land in Farms by Use (%) [a]

Cropland	40
Pastureland	25
Woodland	30
Other	5

Acres irrigated: 96

(Z)% of land in farms

Land Use Practices (% of farms)

No till	17
Reduced till	5
Intensive till	1
Cover crop	15

Farms by Value of Sales

	Number	Percent of Total [a]
Less than $2,500	176	52
$2,500 to $4,999	34	10
$5,000 to $9,999	33	10
$10,000 to $24,999	31	9
$25,000 to $49,999	16	5
$50,000 to $99,999	21	6
$100,000 or more	27	8

Farms by Size

	Number	Percent of Total [a]
1 to 9 acres	35	10
10 to 49 acres	159	47
50 to 179 acres	94	28
180 to 499 acres	28	8
500 to 999 acres	13	4
1,000 + acres	9	3

USDA United States Department of Agriculture
National Agricultural Statistics Service
www.nass.usda.gov/AgCensus

2017 CENSUS OF AGRICULTURE *County Profile*

Market Value of Agricultural Products Sold

	Sales ($1,000)	Rank in State [b]	Counties Producing Item	Rank in U.S. [b]	Counties Producing Item
Total	**9,011**	**75**	**98**	**2,709**	**3,077**
Crops	**4,369**	**65**	**97**	**2,424**	**3,073**
Grains, oilseeds, dry beans, dry peas	2,438	50	96	1,877	2,916
Tobacco	-	-	25	-	323
Cotton and cottonseed	-	-	11	-	647
Vegetables, melons, potatoes, sweet potatoes	528	32	97	947	2,821
Fruits, tree nuts, berries	565	22	95	625	2,748
Nursery, greenhouse, floriculture, sod	408	50	93	1,101	2,601
Cultivated Christmas trees, short rotation woody crops	34	25	58	423	1,384
Other crops and hay	397	72	97	2,421	3,040
Livestock, poultry, and products	**4,642**	**61**	**98**	**2,471**	**3,073**
Poultry and eggs	46	49	97	1,274	3,007
Cattle and calves	3,297	45	97	1,932	3,055
Milk from cows	(D)	45	59	(D)	1,892
Hogs and pigs	58	30	89	1,051	2,856
Sheep, goats, wool, mohair, milk	87	34	94	1,383	2,984
Horses, ponies, mules, burros, donkeys	640	11	94	330	2,970
Aquaculture	-	-	49	-	1,251
Other animals and animal products	(D)	(D)	93	(D)	2,878

Total Producers [c] 590

Sex
Male 378
Female 212

Age
<35 44
35 – 64 314
65 and older 232

Race
American Indian/Alaska Native 7
Asian 12
Black or African American 35
Native Hawaiian/Pacific Islander -
White 516
More than one race 20

Other characteristics
Hispanic, Latino, Spanish origin 5
With military service 99
New and beginning farmers 163

Percent of farms that:

Have internet access **77**

Farm organically **1**

Sell directly to consumers **7**

Hire farm labor **25**

Are family farms **99**

Top Crops in Acres [d]

Forage (hay/haylage), all	8,315
Soybeans for beans	3,237
Corn for grain	1,042
Wheat for grain, all	602
Corn for silage or greenchop	404

Livestock Inventory (Dec 31, 2017)

Broilers and other meat-type chickens	124
Cattle and calves	8,435
Goats	579
Hogs and pigs	755
Horses and ponies	963
Layers	2,102
Pullets	507
Sheep and lambs	66
Turkeys	119

See 2017 Census of Agriculture, U.S. Summary and State Data, for complete footnotes, explanations, definitions, commodity descriptions, and methodology.
[a] May not add to 100% due to rounding. [b] Among counties whose rank can be displayed. [c] Data collected for a maximum of four producers per farm.
[d] Crop commodity names may be shortened; see full names at www.nass.usda.gov/go/cropnames.pdf. [e] Position below the line does not indicate rank.
(D) Withheld to avoid disclosing data for individual operations. (NA) Not available. (Z) Less than half of the unit shown. (-) Represents zero.

As of the 2017 census, Spotsylvania County had 338 farms. Total farms are down 8% since 2012. This has corresponded with a 1% decrease in total farm acreage within the County while the average size of remaining farms has shown an increase in size. Between 2002 and 2012, County-wide land in farms decreased from 56,346 acres to 42,191 acres, a decrease of approximately twenty-five (25%) percent. As of 2017, total acreage is now 41,674 acres. Recognizing an established downward trend in farms and total farm acres the County has emphasized maintenance and protection of prime agricultural soils and productive farmlands through expansion of the County's Agricultural and Forestal Land Use Designation. Regardless of agricultural trends ongoing there is interest in protecting the historic farm and forest character of the County and associated agricultural based economy outside of the Primary Development Boundary. Protection of prime agricultural soils (a finite resource) recognizes the importance of maintaining the land inventory for future generations to assure the acreage is there to support food and fiber production. This effort supports promotes the concept of domestically produced locally sourced agricultural crops and regional or super-regional supply chains within a smaller geographical footprint.

As part of the 2020 Comprehensive Plan update process, the Agricultural/ Forestal District Review Committee was solicited to provide insights into the history, economics, strengths and challenges facing local farm operators. The purpose of the committee is to advise the Planning Commission and the Board of Supervisors and assist in creating, reviewing, modifying, continuing or terminating Agricultural and Forestal districts within the County. In particular, the committee shall render expert advice as to the nature of farming and agricultural and forestal resources within the district and their relation to the entire County. Spotsylvania County agriculture faces a number of challenges that result from both local and national issues. The Spotsylvania County Agricultural- Forestal Commission has identified the following as having a negative effect on agricultural operations within the County:

- Local climate and soils conditions are not ideal for high production crop yields in many areas. Seasonal rain and drought cycles provide agricultural challenges paired with shallow soils and soil nutrient deficiencies compared to other agricultural regions in the Country;
- Aging farmer populations with an insufficient stream of younger generations pursuing farming. (For reference, see Table 16 for USDA Census of Agriculture Data for Statewide and County figures)
- Ability to offset expenses associated with owning and operating a farm locally are challenged by climate and soil conditions for crop yields paired with profitability concerns resulting from restricted pricing and resulting low profit margins for raw direct from farm produce.
- Sale of agricultural acres to development interests in areas where demand is high can be more economically advantageous for local farm operators, especially those who may seek to downsize or prepare to retire.
- Farm supplies are not readily available within the region. Often time's necessary supplies must be sourced from distant places. A limited number of farm equipment manufacturers exist and tend to operate far reaching international supply chains.

Table 16: 2017 Primary Farm Operator Age Characteristics (USDA Census of Agriculture)		
	Virginia (Statewide)	Spotsylvania County
	2017	2017
Under 25 Years	1,086	20
25 to 34 Years	4,344	24
35 to 44 Years	7,152	48
45 to 54 Years	12,238	97
55 to 64 Years	19,760	169
65 to 74 Years	16,812	133
75 Years and Over	9,202	99
Historical Average Age of Primary Farm Operator (USDA Census of Agriculture)		
	Virginia (Statewide)	Spotsylvania County
2017	58.5	60
2012	59.5	60.2
2007	58.2	59.4

Table 17: USDA Census of Agriculture- Spotsylvania County Farms							
		Virginia (Statewide)		Spotsylvania County			
		2017	2012	2017	2012	2007	2002
Number of Farms		43,225	46,030	338	369	359	369
Land in Farms		7,797,979	8,302,444	41,674 acres	42,191 acres	52,230 acres	56,346 acres
Average Size of Farm		180	180	123 acres	114 acres	145 acres	153 acres
Estimated Market Value of Land and Buildings	Per Farm	834,254	776,719	695,020	700,861	738,592	532,446
	Per Acre	4,624	4,306	5,637	6,130	5,077	4,288
Estimated Market Value of all Machinery and Equipment	Total	3,723,234,000	3,339,696,000	23,674,000	31,591,000	N/A	N/A
	Average Per Farm	86,136	72,561	70,042	85,613	61,026	36,238
Market Value of Products Sold	Total (Crops, Livestock)	3,960,501,000	3,753,287,000	9,011,000	10,996,000	8,218,000	5,937,000
	Average Per Farm	91,625	81,540	26,661	29,800	22,893	16,090
Total Cropland	Farms	32,091	34,525	240	249	278	315
	Acres	3,084,067	2,990,561	16,725	18,715	23,773	27,442
Harvested Cropland	Farms	28,783	31,041	192	227	235	248
	Acres	2,613,010	2,618,291	13,735	16,296	18,355	17,936

Table 18: USDA Census of Agriculture: Spotsylvania County Livestock and Poultry					
		2017	2012	2007	2002
Cattle and Calves Inventory	Farms	122	136	149	158
	Number	8,435	8,615	12,062	9,140
Beef Cows	Farms	115	122	134	147
	Number	4,041	4,075	5,501	4,149
Milk Cows	Farms	6	11	8	10
	Number	11	522	599	884
Cattle and Calves Sold	Farms	85	111	125	121
	Number	6,606	3,956	4,662	3,566
Hogs and Pigs Inventory	Farms	35	19	15	10
	Number	755	554	313	506
Hogs and Pigs Sold	Farms	18	13	12	9
	Number	852	1,385	781	1,353
Sheep and Lambs Inventory	Farms	13	19	10	12
	Number	66	363	129	366
Broilers and other meat-type chickens sold	Farms	6	9	-	5
	Number	778	195	-	228
Layers Inventory	Farms	62	74	51	41
	Number	2,102	2,184	2,014	1,624
Horses and Ponies	Farms	135	141	125	129
	Number	963	1,369	1,043	948
Goats, all	Farms	39	29	25	8
	Number	579	691	321	(D)
(D) - Data withheld to prevent the disclosure of data for individual farms.					

Table 19: USDA Census of Agriculture: Spotsylvania County Selected Crops Harvested					
		2017	2012	2007	2002
Corn for Grain	Farms	12	20	28	20
	Acres	1,042	1,881	3,314	3,132
	Bushels	123,863	142,048	193,088	128,690
Corn for Silage or Greenchop	Farms	6	7	17	11
	Acres	404	655	1,262	1,162
	Tons	8,080	8,957	14,446	10,955
Wheat for Grain, All	Farms	11	12	18	15
	Acres	602	707	796	487
	Bushels	31,742	37,593	46,236	27,273
Winter Wheat for Grain	Farms	11	12	18	15
	Acres	602	707	796	487
	Bushels	31,742	37,593	46,236	27,273
Oats for Grain	Farms	-	-	3	3
	Acres	-	-	48	50
	Bushels	-	-	2,400	3,240
Barley for Grain	Farms	3	10	13	14
	Acres	204	426	698	882
	Bushels	12,305	30,878	54,762	59,031
Sorghum for Grain	Farms	2	-	-	1
	Acres	(D)	-	-	(D)
	Bushels	(D)	-	-	(D)
Sorghum for Silage or Greenchop	Farms	2	1	4	-
	Acres	(D)	(D)	221	-
	Tons	(D)	(D)	1,402	-
Soybeans for Beans	Farms	30	22	20	18
	Acres	3,237	3,228	2,914	1,954
	Bushels	177,020	138,591	65,885	34,649
Forage	Farms	144	188	203	216
	Acres	8,315	9,621	9,910	11,082
	Tons, dry	16,624	18,815	16,720	18,284
Vegetables harvested for sale	Farms	16	11	9	8
	Acres	146	62	41	60
Land in Orchards	Farms	17	10	9	10
	Acres	107	78	34	62
(D) - Data withheld to prevent the disclosure of data for individual farms.					

Commercial Fisheries and Aquaculture

There were no aquaculture producers noted in the 2017 or 2012 Census of Agriculture for Spotsylvania County. Per the Spotsylvania County Environmental Codes staff, as of 2019, there remain no aquaculture or commercial fishing operations within the County.

The Spotsylvania County Zoning office in conjunction with Virginia Tech are exploring the possibility of establishing a freshwater mussel farm in the Loriella Park area. On September 26, 2017 the Spotsylvania County Board of Supervisors approved a request to submit a grant application to the Chesapeake Bay Restoration Fund for an education and restoration project that would result in Virginia's first freshwater mussel farm. The initial early phase grant funds pursued would support exploration and design efforts needed to create plans to submit to the US Army Corp and Department of Environmental Quality for necessary permits for construction. The concept is envisioned to establish a resource for the propagation of freshwater mussels that will ultimately be used to repopulate streams and creeks that have had a significant reduction in active native mussels in the ecosystem. Repopulation of deficient streams and creeks are expected to positively contribute to water quality. In addition to significant natural resource benefits it is expected this resource will also provide a significant education and outreach resource, attracting K-12 students, collegiate academia, development community, state, federal and local government representatives.

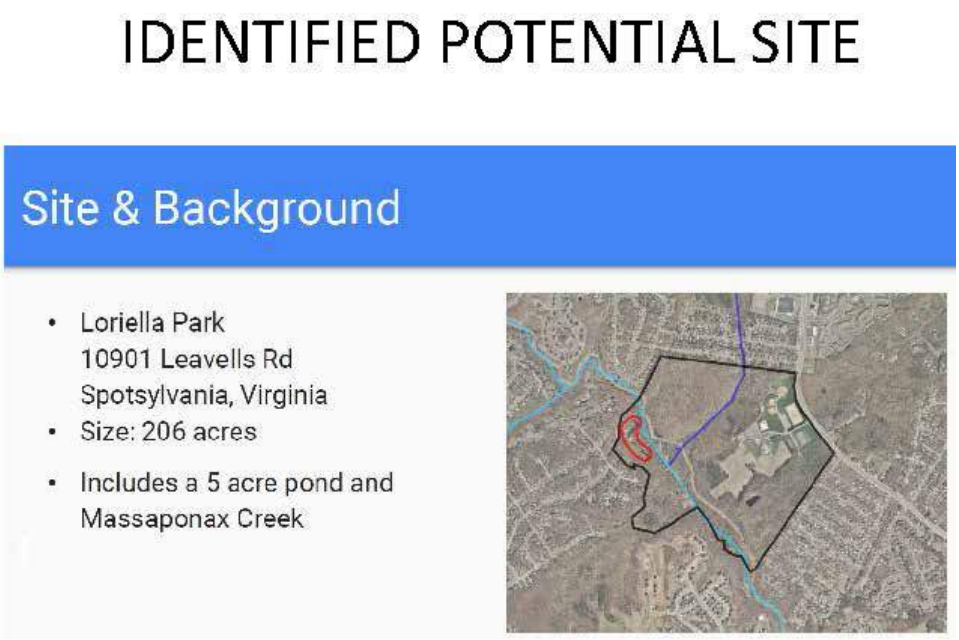


Image 6: Potential location for freshwater mussel farm

Land Use Suitability

The suite of ConservationVision Conservation Planning map layers presented through the Virginia Department of Conservation and Recreation's Natural Heritage Data Explorer provide great insight and guidance for land use planning, especially in areas not targeted for growth and development. For Spotsylvania County, roughly 80% of the County land area falls outside of the Primary Development Boundary limits. As described in the Future Land Use Element of the Comprehensive Plan, these areas

outside of the Primary Development Boundary are intended for rural character preservation, farms, forestlands, open space, agricultural viability, rural residential.

As part of this Comprehensive Plan update, land use designations outside of the Primary Development Area were reviewed considering the insights provided by the ConservationVision map layers, with a focus on promotion of, preservation and protection of agriculture, forestry, and ecological core areas. These land use insights were used to better align agricultural-forestal land use designations with the numerous variables considered as part of ConservationVision's modeling that include but are not limited to soils, proximity to markets (economic development), watershed integrity, connectivity. Areas of high value are finite and as such have been recognized for their value for agriculture, forestry, and ecological purposes. Aside from by-right potential, proposed large scale land use changes that would compromise or reduce the agricultural, forestal, or ecological use and potential of such areas should be discouraged. The resulting land use designations outside of the Primary Development Boundary put greater emphasis on finite resource protection of high value agriculture, forestry, and ecological areas in exchange for fewer total acres identified as rural residential that may come via rural residential rezoning, or other proposed land use change of notable size. Production of food, fiber, forest within the County has been emphasized as part of the land use update. These areas are ideal candidates for inclusion within the County land use taxation program (provided they meet program parameters), inclusion within the agricultural/forestal district, open space/conservation easement upon active agricultural or forestry lands aimed at maintaining such uses, or sensitive environmental areas.

Agricultural Suitability Model (See Map)

As part of the land use analysis, County staff mapped areas identified within the Agricultural Suitability Model considered high suitability, very high suitability, and outstanding suitability for agriculture. Per the Virginia Department of Conservation and Recreation's Natural Heritage Data Explorer, the Virginia Agricultural Model is a raster dataset that quantifies the relative suitability of lands for agricultural activity. Agricultural value is assessed primarily based on inherent soil suitability, but also accounts for current land cover as well as travel time between agricultural producers and consumers. Model values range from 0 (unsuitable for agriculture) to 100 (optimal).

From the output, staff was able to identify core areas outside of the Primary Development Boundary that would be best suited for the Future Land Use Agricultural-Forestal designation. Staff recognized in many areas, those outputs of highest value tended to "hug" road corridors. In order to identify more comprehensive core areas, the agricultural soils map was created, seeking to identify areas of prime farmland, and farmland of statewide significance. These areas are spread throughout much of the County and when paired with areas of high agricultural suitability (considering numerous factors in model), are intended to identify priority outside of the Primary Development Boundary for agriculture and agricultural soils protection.

Using AgrValue data as presented by DCR's NHDE, findings of the Agricultural Suitability Model have been presented in map form for reference.

Agricultural Soils (See Map)

Per DCR's Natural Heritage Data Explorer, the dataset is a compilation of soil map unit polygons and associated attributes used to develop the Virginia ConservationVision Agricultural Model. It was developed by staff at the Virginia Natural Heritage Program, using data extracted from the gSSURGO geodatabase for Virginia. The gSSURGO dataset (gSSURGO_VA.gdb) was retrieved from the Geospatial Data Gateway in May 2015.The gSSURGO dataset is a digital soil survey and generally is the most detailed level of soil geographic data developed by the National Cooperative Soil Survey. The information was prepared by digitizing maps, by compiling information onto a planimetric correct base and digitizing, or by revising digitized maps using remotely sensed and other information. This dataset consists of georeferenced digital map data and computerized attribute data. The map data are in a state-wide extent format and include a detailed, field verified inventory of soils and miscellaneous areas that normally occur in a repeatable pattern on the landscape and that can be cartographically shown at the scale mapped. The soil map units are linked to attributes in the National Soil Information System relational database, which gives the proportionate extent of the component soils and their properties.

DCR NHDE Soil Survey Staff used USDA NRCS Soil Survey data to provide the agricultural/farmland soils classifications. Utilizing their data, Agricultural Soils have been presented in map form for reference.

Forest Conservation Value (See Map)

The Forest Conservation Value (FCV) model is a tool designed by the Virginia Department of Forestry (VDOF) to strategically identify the highest priority forestland for conservation in Virginia. The intent is to maximize the efficiency of limited resources by focusing conservation efforts on the highest quality, most productive, and most vulnerable forestland statewide.

The original FCV model was developed in 2013 by the Virginia Department of Forestry (VDOF). Since that time, a number of factors necessitated an update to the 2013 model. The agency has sharpened its focus and priorities through a strategic planning effort completed in 2017. In 2017, VDOF's Forestland Conservation Program team implemented a new conservation ranking and prioritization system designed to identify the highest priority projects to accept on a quarterly basis throughout each year; the FCV is a key component of this ranking system. The FCV is further intended to contribute to the Virginia ConservationVision, the suite of GIS models maintained by the Virginia Department of Conservation and Recreation (DCR) to inform a cohesive, statewide strategy for land conservation. As this multitude of needs were identified and as new data has become available, VDOF has taken the opportunity to create an up to date, improved FCV model to help inform both internal and statewide conservation efforts throughout the Commonwealth.

In order to provide a spatial representation of the relative value of Virginia's forests, six key components were established in the model:

1. Forested Blocks
2. Forest Management Potential
3. Connectivity
4. Watershed Integrity
5. Threat of Conversion
6. Significant Forest Communities and Diminished Tree Species

Six data input layers were created based on these components and were ultimately combined to create the final FCV model. A brief summary of each of these components and the methodology is provided here for the purpose of the initial review process. More complete detail on the background for selection, methodology, and limitations of each component will be available in the final summary report.

Utilizing the Forest Conservation Values model, staff has mapped forestlands classified as Very High, Outstanding Value for reference.

Ecological Cores (See Map)

Per Virginia DCR, The Virginia Natural Landscape Assessment (VaNLA) is a landscape-scale GIS analysis that has identified, prioritized, and linked important lands to form natural land networks throughout Virginia. Using land cover data derived from satellite imagery, the VaNLA identified large, unfragmented cores, which are patches of natural land with at least 100 acres of interior cover. Cores provide habitat for a wide range of species, from interior-dependent forest species to habitat generalists, as well as for species that utilize marsh and maritime habitats. The cores layer represents cores as polygons that are symbolized by Ecological Integrity scores, calculated from an Ecological Composite Model (ECM). Maintaining vital natural landscapes is essential for basic ecosystem services such as cleaning our air and filtering our water. Natural lands also harbor thousands of species of animals and plants and contain libraries of genetic information from which we derive new foods, materials, and medicinal compounds. These parts of the landscape also provide us with recreational opportunities and open space resources. But these qualities are represented differently across the cores and habitat fragments that constitute the natural landscape. To assess their unique values, each core and habitat fragment has been assigned an Ecological Integrity score that rates the relative contribution of that area to ecosystem services such as wildlife and plant habitat, biodiversity conservation, open space, recreation, water resources protection, erosion control, sediment retention, protection from storm and flood damage, crop pollination, and carbon sequestration. In general, larger, more biologically diverse areas are given higher scores. Scores are enhanced if the core or habitat fragment is part of a larger complex of natural lands. Scores also are increased for those cores and habitat fragments that contribute to water quality enhancement.

Ecological cores of Very High and Outstanding Value have been mapped for reference and lend insight into land use recommendations and conservation planning efforts.

George Washington Regional Commission (GWRC) Green Infrastructure Plan

In October 2008 the GWRC received a Virginia Coastal Zone Management Program Grant to focus on developing a regional green infrastructure dataset and develop a plan. Over the next two years the GWRC conducted a number of studies and the proposed plan was vetted with public meetings, presentations to the local planning commissions and other stakeholders.

In 2011 the GWRC adopted the PD 16 Regional Green Infrastructure Plan (GI Plan), which identified important high value environmental core areas, contributing core areas, and connected these core areas, creating a web of priority open space. The recommendations of the plan called for an increase in tree canopy; a target of 14,300 acres of new conservation easements; support for the Chesapeake Bay Watershed Implementation Plans (WIPs); enhanced data layer capabilities; new tree preservation ordinances; and outreach to stakeholders. The GI Plan was forwarded to the local governments as a matter of information with no Call for Action.

Revisiting the 2011 GWRC Green Infrastructure Plan (2017)

The central focus of this study was to assess the local impact and level of implementation of the 2011 George Washington Regional Commission ("GWRC") Regional Green Infrastructure Plan. While formally "adopted" by GWRC, the Regional Green Infrastructure Plan was referred to the local governments for consideration. No specific policies, actions, regulations or ordinances directly emerged from this plan. During the period since 2011, development has significantly infringed on priority green infrastructure resulting in further fragmentation of the green infrastructure network and forest cover. The 2017 report tracks development of notable ecological areas as "lost acreage" between the years 2009 and 2016. That data is presented below (Table 20) as an excerpt from the 2017 report:

Table 20: Tracking Inventory of Notable Ecological Areas

2009-2016 Building Acreage Loses by Locality

Locality	Total Land Area (Acres)	2008 - 2016 Development Impact (Lost Acreage)				
		Hi-Value Eco-Cores	Contributing Eco-Cores	Eco-Corridors	Total GI Footprint	Percent Loss Since 2008
Caroline	343,596.80	-5.98	-37.79	-4.97	-48.73	-0.02%
King George	114,969.60	-82.30	-217.23	-168.32	-467.85	-0.88%
Spotsylvania	256,960.00	-295.02	-1,025.89	-54.21	-1,375.12	-1.18%
Stafford	172,134.40	-523.41	-1,224.30	-78.71	-1,826.42	-2.12%
Fredericksburg	6,720.00	0.00	-39.27	0.00	-39.27	-4.10%
GWRC Total	**894,380.80**	**-906.70**	**-2,544.48**	**-306.21**	**-3,757.38**	**-0.81%**

There were three objectives associated with this project: 1) To ascertain where each locality stood in implementing their respective parts of the 2011 Regional Green Infrastructure Plan developed for the local governments in the George Washington Regional Commission (GWRC) region and the impacts that development has had on the network during this timeframe; 2) Examine the current impediments for better and more rapid implementation of the Regional Green Infrastructure (GI) Plan; and 3) put forth recommendations for future implementation strategies for the GI Plan. This report and the associated reports (Appendices) represent the culmination of over a year of research that was conducted during this project upon which the Findings and Conclusions are based.

The report notes that *the only quantified goal of the 2011 Plan was to encourage greater use of conservation easements, a private voluntary method of conserving open space. Of the 14,300 acre goal only 6,400 acres have come under conservation easement in the Region since 2011.*

Since the 2017 report update, significant additional acres have been placed in conservation by the Virginia Department of Game and Inland Fisheries within Spotsylvania County via the Oakley Wildlife Management Area (4,459 acres).

As part of this Comprehensive Plan update, the efforts of the Green Infrastructure Plan are recognized. In conjunction with the ConservationVision Conservation Planning map layers identified prior, greater emphasis and parity between land use recommendations and natural resources, including green

infrastructure, is envisioned in the Comprehensive Plan, especially as it relates to the Agricultural and Forestal Land Use and Open Space Land Use. These resources are overwhelmingly located outside of the Primary Development Boundary and are subject to competing land interests for silviculture (tree cover that is removed at large scale on occasion outside of local processes), agriculture, rural residential development (less common well outside of the Primary Development Boundary), recently renewable energy facilities, and purely conserved undisturbed acreage. Conserved lands remain encouraged in these land use designations whose geographic area has expanded greatly since the last Comprehensive Plan update. This Comprehensive Plan update has strengthened language in support of voluntary conservation efforts based on land use designation.

LAND CONSERVATION

In 1970, Virginia's population was about 4.6 million. It had grown by more than 50 percent to 7.1 million by the year 2000, and to 8 slightly over million by the 2010 US Census. The US Census population estimate for 2019 was 8,535,519. Consistent with population growth in Virginia, Spotsylvania County has seen a great deal of growth over the last twenty years. The County population in 1990 was 57,403. By 2000, the population had grown to 90,395 and within the next 10 years grew another 35% to a population of 122,397 by the 2010 US Census. The US Census County population estimate for 2019 is 136,215. While such growth is certainly impressive – even enviable – population expansion and corresponding development growth require more land and, as the saying goes, "They're not making any more of it."

This growth necessitates careful and intelligent planning. There are lands in Virginia that have witnessed some of America's greatest human triumphs and tragedies. Our open spaces, farms, award-winning parks, battlefields and other historic places attract visitors from around the world. Similarly, Virginia's beautiful natural habitats – some types of which are found nowhere else – provide sanctuary for many exceptional plants and animals. Such astonishing natural and cultural resources come as well with an extraordinary responsibility. Land conservation is a big part of that responsibility.

The public benefits from such protection because it assures the availability of land for agriculture, forests, recreation and open space. It protects our natural resources and maintains and enhances air and water quality. Land conservation also preserves historical, architectural and archaeological heritage.

And conserving land doesn't mean it can't be touched. For example, land in conservation or open space easements can typically still be used normally, such as for timber harvesting, farming, residency, etc. The easement simply protects the property's unique characteristics – prime soils, wetlands, endangered species habitat, and so forth. There are a variety of tools and levels of land conservation that can be employed. Some, like conservation easements can result in the conservation of parcels of land in perpetuity, while others, like the Comprehensive Plan and Water and Sewer Master Plan can have the effect of conserving land from the effects of urban and suburban sprawl.

Virginia ConservationVision

Virginia ConservationVision has been developed and maintained by the Virginia Department of Conservation and Recreation (DCR). As per DCR, the Virginia ConservationVision is helping guide effective conservation by providing tools that help both government and private organizations identify resource protection areas and that, at the local level, help planners manage growth in a balanced way. The Virginia

ConservationVision is helping the Virginia Land Conservation Foundation to prioritize conservation targets.

DCR describes the Initiative as a suite of broadly applicable tools for guiding strategic conservation decisions. ConservationVision, originally developed as the *Virginia Conservation Lands Needs Assessment,* is maintained using GIS (Geographic Information System) analyses to model and map land conservation priorities in Virginia based on a variety of datasets from private, local, state and federal agencies. The models facilitate conservation by helping target conservation efforts, and by guiding comprehensive planning (Green Infrastructure). They are available on Natural Heritage Data Explorer, LandScope Virginia and LandScope Chesapeake, and DCR's website. ConservationVision allows the manipulation of issue-specific data sets that can be weighted and overlaid to reflect the needs and concerns of a variety of conservation partners - issues like:

- unfragmented natural habitats
- natural heritage resources
- outdoor recreation
- prime agricultural lands
- cultural and historic resources
- sustainable forestry
- water quality improvement
- drinking water protection

Virginia ConservationVision consists of: green infrastructure model; VA Natural landscape assessment; cultural model; development vulnerability model; forest economics model; recreation model; watershed model; agricultural model.

As a development review tool, County staff and local decision makers can utilize the various ConservationVision models to make better informed decisions regarding the prospect of development impacts in areas where valuable natural resources are likely to occur. Such models can and have resulted in requests for additional information to mitigate potential impacts where models identify potential conflicts. Additionally, models can help better inform land use and public service decisions as part of County Comprehensive Plan creation, review, and update processes whereby helping guide informed planning efforts.

Virginia Treasures Initiative

Launched as a Major Conservation Initiative in 2015 by Governor Terry McAuliffe, the Virginia Treasures Initiative was introduced as a new strategy for conserving land and expanding access to public outdoor recreation.

As per the Virginia Department of Conservation and Recreation, The Virginia Treasures initiative focuses on quality rather than just quantity. The program stresses safeguarding significant sites and assets rather than just the numbers. The idea is to preserve, protect and highlight Virginia's most important ecological, cultural, scenic and recreational assets as well as its special lands.

The conservation of working farms, forests, waterways and open space will continue. Most of this effort will be accomplished through conservation easements, which preserve land and improve the health of

waterways, including that of the Chesapeake Bay. Particular attention will be paid to land with rare and endangered species and habitat.

The initiative also aims to identify and expand public access to the great outdoors through playgrounds, boat ramps, scenic byways, public gardens and so on. By increasing public access to and appreciation for Virginia's outdoor treasures, public support for conserving, protecting and maintaining Virginia's natural resources will likewise grow.

Virginia Treasures will be the scorecard by which the McAuliffe administration measures success at protecting land, water and recreational space. The goal is to identify, conserve and protect at least 1,000 treasures by the end of the governor's term. The program was wildly successful and 1,337 treasures were registered over four years as per the Virginia Department of Conservation and Recreation. Having met and exceeded the goal, DCR discontinued accepting additional Virginia Treasure applications.

A land protection treasure is one permanent, fee-simple conservation or open-space easement, or an amendment of an existing easement that permanently protects significant resources. Significant resource protection is measured by means of 14 metrics; a treasure must protect at least one metric.

- Cultural or historical assets
- Agricultural land
- Local agricultural and forest districts
- Forest land
- Virginia Natural Landscape Assessment
- Natural Heritage Conservation Sites
- Wetlands
- Forest land with high water quality value
- Riparian buffers
- Recreation land
- Land near protected land
- Land near scenic rivers, scenic byways, the Appalachian Trail or the Potomac National Scenic Trail
- Virginia Outdoors Foundation special project areas
- The Nature Conservancy Focus Areas

A recreational treasure is a one that provides new public access to a natural, cultural or scenic outdoor recreation resource. These are projects that help the public by enhancing outdoor recreation and foster stewardship of natural and cultural resources. Emphasis is on ventures that meet the public's most needed outdoor recreational offerings. Treasures are added when they are opened to the public. To be eligible, recreational or cultural treasures must be owned by the federal, state or local government or, if privately owned, accessible to the public.

An asset must consist of at least one of the following:

New facilities

- Trails
- Water access
- New park facilities

- Gardens and arboretums
- Playgrounds and natural play areas
- Historic rehabilitation
- Newly restored habitat for wildlife viewing

Special designations

- Historic or cultural sites that receive state or national register designation and provide public access
- Trails special recognition, such as national trail designations
- Scenic river and scenic byway
- Scenic viewshed
- Recreational use agreement

A treasure is *not*

- An event or program
- A management or maintenance function (e.g., stocking a lake with fish, bush-hogging an existing viewshed, painting a building, dredging a boat ramp or conducting a routine prescribed burn)
- Ball fields, golf courses, sports facilities, zip lines… i.e., facilities in which the primary focus is not on natural or cultural resources

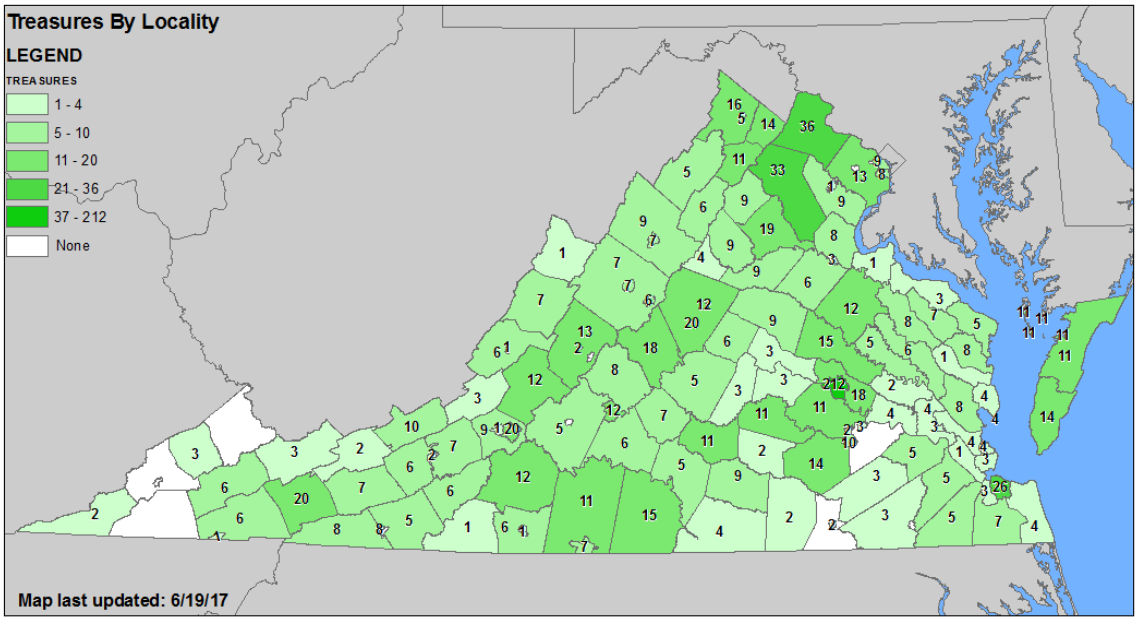


Exhibit 5: Virginia Treasures Inventory (Source: Virginia Dept. Conservation and Recreation)

Spotsylvania County has six (6) recognized Virginia Treasures sites. The sites are summarized in Table 21 below based on information provided by the Virginia Department of Conservation and Recreation.

Table 21

VIRGINIA TREASURES IN SPOTSYLVANIA COUNTY IN 2017		
Site	**Locality**	**Type**
Civil War Trust Holding	Spotsylvania	Land Conservation
Civil War Trust Holding	Spotsylvania	Land Conservation
Conservation Easement: Spotsylvania County	Spotsylvania	Land Conservation
Conservation Easement: VA-DHR	Spotsylvania	Land Conservation
Fredericksburg and Spotsylvania Addition	Spotsylvania	Land Conservation
Kronenwetter Tract, Chancellorsville Battlefield	Spotsylvania	VA-DHR Designation

Source: Virginia Department of Conservation and Recreation

Zoning Ordinance

The regulations set forth in the Spotsylvania Zoning Ordinance are adopted for purposes that include but are not limited to: provide for the preservation of agricultural and forested lands and other lands of significance for the protection of the natural environment; protect surface water and groundwater, especially within areas designated as Chesapeake Bay Preservation Area Overlay Districts, in accordance with requirements of the Virginia Chesapeake Bay Preservation Act; and protect against destruction of, or encroachment upon historic areas.

A number of zoning districts within Spotsylvania County have been established to protect and maintain the rural character of the County and to protect and enhance the agricultural economy, while also providing for low density residential development in a rural setting. The Rural and Agricultural Districts have been established to achieve that purpose to varying intensities. The zoning ordinance employs open space requirements, minimum lot size requirements, maximum densities and lot yield. Within Agricultural, Rural, and some Residential districts, the zoning ordinance includes the ability for cluster subdivision, a means to achieve smaller lots in exchange for greater open space.

Comprehensive Plan

The Comprehensive Plan is a guide designed to encourage the most appropriate use of land, water and resources within the County consistent with the interests of the citizens. The Comprehensive Plan sets forth goals, objectives, policies and implementation techniques that will guide the development activity within the County and promote, preserve and protect the health, safety, and general welfare of its citizens. The Comprehensive Plan acknowledges the importance of historic and natural resource protection and has established development districts and future land use categories intended to promote the continuance of the rural farm and forestal character in many areas of the County, whereby reducing the effects of urban and suburban sprawl.

The County Primary Development Boundary as depicted within the Comprehensive Plan Future Land Use Map has been established as the area where public utility supported higher intensity growth and development is supported. Spotsylvania County's Primary Development Boundary encompasses approximately 72 square miles, or roughly 18% of the County's total land area, leaving 82% of the County's

total land outside of the areas intended for growth and more intense development. These remaining areas are generally envisioned as large lot rural residential, agricultural, and open space areas.

The County recognizes that lands of outstanding value to produce food or fiber, environmental stewardship, cultural and historic resource protection, are often times location specific and always finite. Certain locations are more favorable for growth and urbanization than others. Consideration of finite resources of conservation value when looking at the prospect of Primary Development District boundary expansion and land use recommendations are vital to the protection of natural resources. As part of this Comprehensive Plan update, an emphasis has been placed on the preservation and protection of natural resources within the Future Land Use Map where the open space land use category has been expanded to include mapped wetland and resource protection areas throughout the County, including the Primary Development Boundary. Protection of these environmental corridors complement efforts to establish recreational greenway trails and protect vital habitat corridors through developed areas. The Virginia Department of Conservation and Recreation's Natural Heritage Data Explorer includes map layers identifying lands of high conservation value for agriculture, forestry, and ecological cores. As part of this Comprehensive Plan update, land use designations and descriptions outside of the Primary Development Boundary are more considerate to the promotion and protection of forest, farmlands and ecological core areas. The County Agricultural and Forestal Land Use designation now aligns with areas designated as highly suitable for such uses based on inherent soil suitability, current land use cover, travel time between agricultural producers and consumers, forest management potential, watershed integrity, among others.

Water and Sewer Master Plan

The Water and Sewer Master Plan is intended to complement and facilitate implementation of the Comprehensive Plan. After considering the County's intended Primary Development Boundary along with the future land use vision, the Master Plan defines specific capital water and sewer projects that must be implemented to help facilitate the intended growth areas consistent with the Comprehensive Plan. Development intensity and development demands tend to be higher in areas where public water and sewer facilities are available. In other areas, outside of intended growth areas or outside of the County's Primary Development Boundary for instance, where the rural and agricultural character and economy are intended to be sustained, public water and sewer are not planned. As a result, the tendency for urban and/ or suburban sprawl is inhibited and the larger lot agricultural and forestal tracts of land tend to be maintained, and the "urban heat island" effects and impervious surface areas are confined to a smaller area of impact.

The last update to the Water and Sewer Master Plan occurred in 2002 coinciding with the 2002 Comprehensive Plan. The Spotsylvania County Utilities Department is in the process of updating the Water and Sewer Master Plan as of this Comprehensive Plan update. An updated Water and Sewer Master Plan is under development and expected to be adopted within the planning period.

The Water and Sewer Master Plan is available for review online as part of the County Utilities/ Public Works' Guidelines, Codes and Policies **HERE**.

Parks, Conservation Lands and Easements

There are Federal, State, and County Parks, conservation lands owned or in easement within Spotsylvania County. These areas preserve and protect open space and environmental features with benefits including but not limited to: passive or active recreation, habitat protection, historic resource preservation and interpretation, impervious surface minimization, protection of rural character, tree preservation, soil stabilization, water quality and stormwater.

Spotsylvania County has a number of conservation easement holders for historic and natural resources including the Central Virginia Battlefields Trust, whose easements include but are not limited to Pelham's Corner and the Stonewall Jackson amputation site, an 81-acre parcel along Rt. 3 affiliated with the Chancellorsville Battlefield. The Virginia Department of Conservation and Recreation, Virginia Department of Forestry, Virginia Department of Historic Resources, The Nature Conservancy and the Virginia Outdoors Foundation have conservation easements within the County.

Conservation easements preserve farmland, forestland, historic, natural and recreational areas by restricting intensive uses, such as development and mining, which would alter the conservation values of the land. Each easement is tailored to reflect the conservation values of the property and is recorded at the County Clerk of the Court office as a permanent part of the property records. Such easements do not grant public access to a landowner's property.

Conservation lands and easements are tracked by the Virginia Institute of Marine Science's (VIMS) Center for Coastal Resources Management. The VIMS Comprehensive Map Viewer for Spotsylvania County can be found **HERE**. The County's future land use map also seeks to track conserved lands and reflects them as open space areas.

Federally managed by the National Park Service, The Fredericksburg and Spotsylvania National Military Park, including the Wilderness, Chancellorsville, and Spotsylvania Courthouse Battlefields, and portions of the Fredericksburg Battlefield cover roughly 7,300 acres in land owned, and protected by easement. Since the Battlefield Parks are considered passive parks, they act as both historic and natural conservation sites.

Table 22: National Park Service Inventory

National Military Parks	Total Acreage Owned	Passive Acreage Owned	Total Acreage (With Easements)	Interpretive Trails (Miles)
Chancellorsville Battlefield	1,840.3	1,840.3	2,712.4	6.8
Fredericksburg Battlefield	1,230.4	1,230.4	1,341.3	5.6
Spotsylvania Battlefield	1,327.8	1,327.8	1,394.9	5.9
Wilderness Battlefield	1,810.1	1,810.1	1,846.6	3.9
Salem Church	3.2	3.2	3.2	-
TOTAL:	6,211.8	6,211.8	7,298.4	22.2

Additional Civil War battlefield lands have been preserved by the Civil War Trust as well as the Central Virginia Battlefields Trust. The Civil War Trust manages an additional 415.91 acres of preserved, publicly accessible lands traversed by 5.52 miles of interpretive trails (3.64 miles at Chancellorsville and 1.88 miles at Slaughter Pen Farm (part of the Fredericksburg Battlefield) off Tidewater Trail in the northeast of the County.

The Central Virginia Battlefields Trust has 369.45 acres in ownership with an additional 8.63 acres in easement. Easement acreage is not readily open for public access except by organized tour or with granted permission of landowners. Harris Farm (1.74 acres) and Pelham's Corner (4.5 acres) are always open to the public and include interpretive wayside exhibits, monument at Harris Farm, and cannon at the Pelham's site. The Central Virginia Battlefields Trust stress that the remaining acreage is not generally open to the public except for special tours operated by the CVBT, NPS, or others with permission. CVBT manages no interpretive trails.

Lake Anna State Park is roughly 2,800 acres in size, offering both active and passive recreational opportunities with many acres left in their natural state. As per the Virginia Department of Conservation and Recreation, the land in Lake Anna State Park used to be known as "Gold Hill" and contained the Goodwin Gold Mine. Gold was first discovered in 1829 with mining reaching its peak in the 1880s. In 1971, Lake Anna was created to serve as a water coolant for Virginia Power's nuclear plant. In 1972, work began on the acquisition and development of a water-oriented state park. Lake Anna State Park opened in 1983.

The park has a beach on one of Virginia's most popular lakes, a fishing pond accessible to children and the disabled, a bathhouse-concessions complex and a boat launch. Overnight stays are made possible by camping, six camping cabins, two six-bedroom lodges and 10 two-bedroom cabins. Seven cabins and the lodges have views of the lake. With more than 15 miles of trails, the park offers many hiking, biking and horseback riding options. Visitor center exhibits trace the history of the area's gold mining and highlight the park's natural features. Nature and gold panning programs are popular, and the park offers guided tours of the Goodwin Gold Mine.

More information about Lake Anna State Park can be found **HERE**.

In 2019, 535.5 acres of accessible County parkland is operated by the Parks and Recreation Department. The County also owns a future District Park size 65 acre site known as the Hilldrup Tract that is not presently developed or accessible as a usable park. Within the planning period, staff expects additional public access parks acreage to be made accessible at Keswick Park (36 Acres Community Park Scale and amenities) and the Fortunes Landing fifteen (15) acre Special Use Park fronting the Ni Reservoir. These new park acres, when activated, will add an additional 131 acres to the inventory for a total parkland inventory of 651.5 acres. Park sites with amenities include: Arritt Park; Chewning Park; Cosner Park; Harrison Road Park; Hunting Run Recreation Area (at Hunting Run Reservoir); Lee Hill Park; Loriella Park; Marshall Park; Marshall Center/ Legion Fields Park; Mary Lee Carter Park; Ni River Recreation Area (at Ni Reservoir); Patriot Park; Virginia Central Trail. Future County Park sites not yet developed or early in development and planning include: Belmont Park (CIP projected FY '21); Hilldrup Tract- Ni River Park (CIP projected FY '23); The "Echo" at Fortune's Landing (via proffer); Keswick (via proffer).

Additional park acreage may be warranted for consideration in the area of Massaponax/ Lee Hill area as per County Parks and Recreation. No specific location has been identified as of this Comprehensive Plan update.

More information about County Parks and their amenities can be found **HERE**.

In 2017, the Virginia Department of Game and Inland Fisheries (VDGIF) acquired the approximately 2,911 acre Oakley Forest Wildlife Management Area (WMA) located on the west side of Catharpin Road within the Livingston Voting District. VDGIF is actively looking to enhance site access and develop a WMA Comprehensive Management Plan. The plan will be developed in compliance with the purpose for which the property was acquired consistent with an awarded grant request submitted to the U.S. Fish and Wildlife Service for funding through the Wildlife and Sport Fish Restoration program.

As per VDGIF's successful application, the objective/purpose of this land acquisition job is to acquire, in fee title, the 2,911+-acre Oakley Forest Tract located in Spotsylvania County, Virginia. Once acquired, the property will become part of DGIF's statewide WMA network, and will be will be managed to promote a diversity of healthy and vigorous habitats and wildlife populations while providing public access and opportunities for hunting, fishing, recreational shooting, and other wildlife-oriented recreation that will compliment and be compatible with habitat and population management goals. Existing habitats will be maintained and enhanced utilizing commonly accepted land management practices with strict adherence to Virginia and Forest Management BMPs.

Expected Results and Benefit:

Acquisition of the Oakley Forest tract will increase DGIF's ability to:

- Meet the goal of maintaining, creating, or enhancing a variety of high quality habitats that ensures landscapes support healthy and diverse populations of game and nongame wildlife at optimum levels, and helps DGIF move toward management plans directed at improving wildlife habitat at an ecoregion/landscape scale;
- Protect and enhance breeding, nesting, foraging, migrating, and wintering habitat for numerous game and non-game bird and mammal species statewide.;
- Address conservation challenges that cross jurisdictional boundaries, such as habitat fragmentation, wildlife disease, and climate change, enabling improved opportunities for conservation planning at an ecologically appropriate scale (e.g., watersheds, landscapes, ecoregions) rather than smaller scales (e.g., single land management units).
- Protect property, removing any remaining threat of residential and commercial development and associated infrastructure, and inappropriate agriculture and forestry activities;
- Increase forest habitat diversity and various stages of early successional habitats essential to the health and benefit of diverse bird and mammal populations;
- Provide water quality benefits to the Chesapeake Bay through the maintenance of wetland nutrient and sediment filtering capacity by removing the threat of potential development and incompatible farming and forestry practices;
- Preserve and enhance riparian and wetland habitats to help reduce non-point source pollution, improve water quality, and protect spawning, nursery, or foraging habitats for important aquatic species.

- Increase public lands for wildlife-based recreation opportunities (hunting, shooting, fishing, trapping, recreational shooting, wildlife viewing) consistent with maintaining and enhancing wildlife habitat and populations.
- Provide potential opportunity to utilize purchased land and new WMAs to develop safe, accessible, and environmental friendly public firearms and archery range facilities in areas of high demand that will complement and be compatible with population and habitat management goals.
- Provide additional opportunity to utilize WMAs as educational resources to further public knowledge and understanding of science-based habitat management practices.
- Provide a model and impetus for additional preservation, conservation, and restoration of other public and private lands.
- Continue to build enduring conservation partnerships seeking shared conservation outcomes to position Virginia to better leverage resources and support for ensuring landscapes capable of sustaining diverse and sustainable populations of fish, wildlife, and plants.

The VDGIF has created a webpage devoted to the Oakley Forest WMA that can be found **HERE**. As of 2020, VDGIF reports the Oakley Forest WMA has risen to 4,459 acres in size.

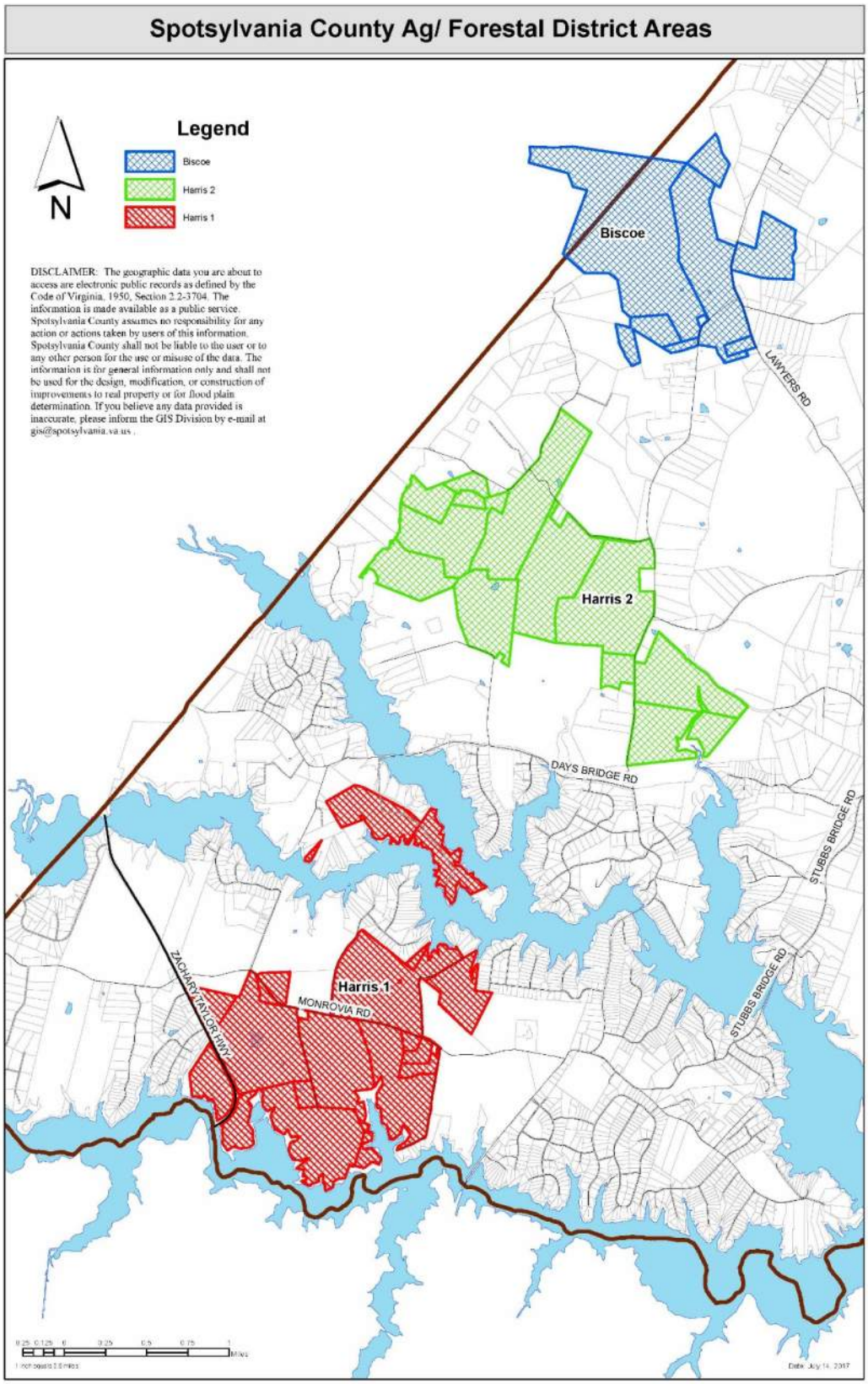
Agricultural/ Forestal District

The purpose of Agricultural/Forestal Districts is to encourage the preservation, development and improvement of the appropriate lands in the County for the production of agricultural and forestal products by providing a mechanism for the creation and administration of agricultural and forestal districts of statewide significance. The Board of Supervisors finds that agricultural and forestal lands are valued natural and ecological resources which provide essential open spaces for clean air sheds, watershed protection, wildlife habitat, as well as aesthetic value in our community. It is the purpose of these Districts to provide a means to protect and enhance agricultural and forestal land as a viable segment of the County's economy and as an economic and environmental resource of major importance.

The Agricultural/Forestal District Review Committee has been established to administer the County's Agricultural/ Forestal Disticts. In particular, the committee is charged with rendering expert advice as to the nature of farming and agricultural and forestal resources within the district and their relation to the entire County. The committee advises the Planning Commission and the Board of Supervisors and assist in creating, reviewing, modifying, continuing or terminating Agricultural and Forestal districts within the County. Agricultural/forestal districts in the County are reviewed every 10 years, at which time they must be renewed, and hearing applications for new districts as they come up.

As of 2020 within Spotsylvania County there are 2,883 acres that are in the Agricultural/Forestal District divided amongst three (3) separate tracts. Geographically they are in the southwestern portion of the County and have been recognized within the County future land use map as part of the Agricultural and Forestal Land Use. Exhibit 6 below shows the extent of the current Agricultural/Forestal District designations. It is good to note that the agricultural/forestal districts complement the agricultural and forestal land use designation in the land use element but they are separate designations; not on in the same.

Exhibit 6: Agricultural/Forestal District



Purchase of Development Rights

The purposes of the Purchase of Development Rights (PDR) program include, but are not limited to: establishing a program to facilitate County acquisition of conservation easements voluntarily offered by owners to serve as one means of preserving the County's character and resources; preserving farm and forest land and to protect and enhance family farms and the economic viability of the agricultural and forestal sectors of the local economy; conserving and protecting water resources and environmentally sensitive lands, waters and other natural resources; conserving and protecting biodiversity and wildlife and aquatic habitat; assisting in shaping the character and direction of the development of the community; Improving the quality of life for the inhabitants of the County; and promoting recreation and tourism through the preservation of scenic and historical resources.

The Spotsylvania Code Chapter 17A sets the regulatory framework for the program. Priority properties are established via ranking system that include a number of features that are complementary to the purpose of the program including: soil productivity; farmland capability; development factors; number of potential family conveyances; Comprehensive Plan consistency; Farm size (acreage); Protected land contiguous to site; Existing approved soil conservation plan; ownership; contribution to continued viability of Agricultural Community; other special conditions as defined.

As of 2018, two properties have been accepted into the Purchase of Development rights program representing approximately 116 acres in total.

The PDR program is administered by the Agricultural/ Forestal District Review Committee who review prospective PDR applications. Enrollment opportunities for the program are closed presently. The program has not been active since 2014.

Land Use Program

The Land Use Program is administered by the County Commissioner of Revenue's office. The purpose of the Land Use Program is to further the public interest by encouraging the preservation of land, to conserve and protect the County's natural resources, to protect safe water supplies, and to promote orderly land use planning and development. The Land Use Program is a **tax deferral**, not a discount. The assessment of the land is based on the use value and not the fair market value. The tax deferral amount will be repaid with interest if the use of the land changes.

Four categories that qualify for the Land Use Program:

Agricultural Use:
When devoted to the bona fide production for commercial sale of plants and animals or plant and animal products useful to man under uniform standards prescribed by the Virginia Commissioner of Agriculture and Consumer Services, or when devoted to and meeting the requirements and qualifications for payments or other compensation pursuant to a soil conservation program under an agreement with an agency of the federal government. Requiring 5 acres minimum in agricultural use.

Virginia State Code requires a minimum of five (5) contiguous (unimproved or more) acres. One acre is excluded for a house-site (if dwelling exists) or a proposed house-site. The remaining five acres or more may qualify for Land Use taxation.

AND

The property must have a five (5) year previous history of continuous farming or horticultural activity before qualifying on the sixth year. If land is left vacant for one year or more, the farm history must begin again for five (5) continuous years.

AND

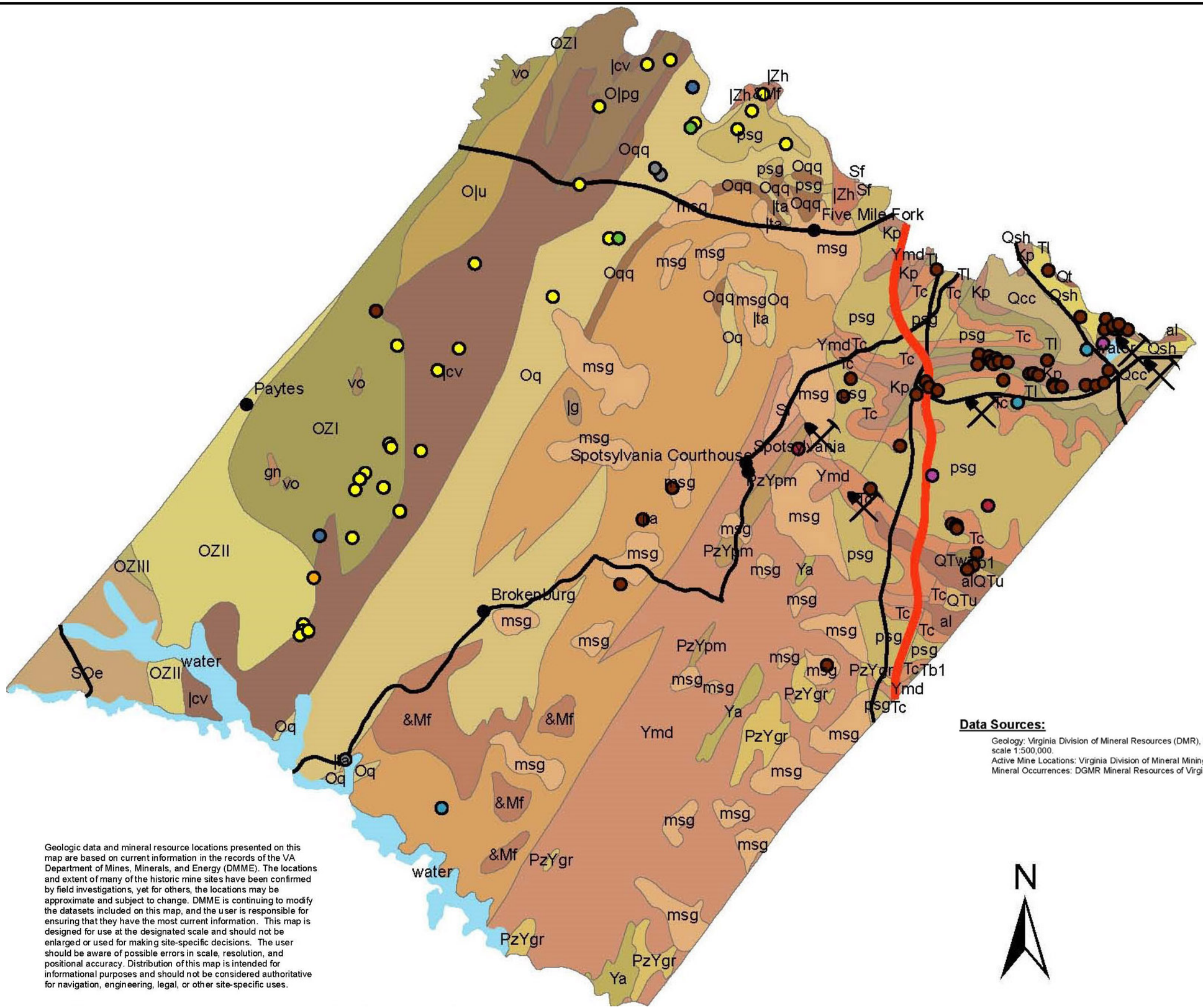
The farm must produce either 1/2 of the county average in crops or meet the minimum animal requirements. The entire farm must be qualified with adequate livestock: One mature cow, five goats, five sheep, or five swine, one hundred chickens, and/or sixty-six turkeys per every five acres for twelve (12) months. Horses can qualify the land only if they are being used for breeding or a boarding business.

Horticultural Use:
When devoted to the bona fide production for sale of fruits of all kinds, including grapes, nuts and berries, vegetables, nursery and floral products under uniform standards prescribed by the Virginia Commissioner of Agriculture and Consumer Services, or when devoted to and meeting the requirements and qualifications for payments or other compensation pursuant to a soil conservation program under an agreement with an agency of the federal government. Requiring 5 acres minimum.

Forest Use:
When devoted to tree growth in such quantity and so spaced and maintained as to constitute a forest area under standards prescribed by the Virginia State Forester. Requiring 20 acres minimum in forest use.

Open Space:
When so used as to be provided or preserved for park or recreational purposes, conservation of land or other natural resources, floodways, historic or scenic purposes, or assisting in the shaping of the character, direction, and timing of community development or for the public interest sand consistent with the local land use plan under uniform standards prescribed by the Director of the Virginia Department of Conservation and Recreation. Requires 5 acres minimum in Open Space use unless the local ordinance specifies otherwise.

GEOLOGY AND MINERAL RESOURCES OF SPOTSYLVANIA COUNTY, VIRGINIA



Legend

Primary_Co

- N/A
- clay
- copper
- gold
- granite
- gravel
- iron
- sand and gravel
- sandstone
- zinc
- Active_Mines
- Towns
- Interstate_Highway
- Primary_Roads

Spotsylvania_Geology

SYMBOL

- water
- al
- QTu
- Qt
- Qsh
- Qcc
- QTw
- Tb1
- Tc
- psg
- msg
- Tl
- Kp
- &Mf
- Sf
- SOe
- OZI
- OZII
- OZIII
- gn
- vo
- O|pg
- O|u
- Oq
- Oqq
- |cv
- |ta
- |g
- |Zh
- PzYgr
- PzYpm
- Ya
- Ymd

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
15 April 2013

N

Geologic data and mineral resource locations presented on this map are based on current information in the records of the VA Department of Mines, Minerals, and Energy (DMME). The locations and extent of many of the historic mine sites have been confirmed by field investigations, yet for others, the locations may be approximate and subject to change. DMME is continuing to modify the datasets included on this map, and the user is responsible for ensuring that they have the most current information. This map is designed for use at the designated scale and should not be enlarged or used for making site-specific decisions. The user should be aware of possible errors in scale, resolution, and positional accuracy. Distribution of this map is intended for informational purposes and should not be considered authoritative for navigation, engineering, legal, or other site-specific uses.

December 14, 2021

Steep Slopes

December 14, 2021

CULPEPER COUNTY

ORANGE COUNTY

STAFFORD COUNTY

CITY OF FREDERICKSBURG

LOUISA COUNTY

CAROLINE COUNTY

HANOVER COUNTY

Legend

Major Waterbody

Slope

- 0 - 5%
- 5 - 15%
- 15 - 30%
- 30 - 45%
- 45 - 60%
- 60 - 100%
- Not rated or not available

N

W E

S

5 Miles

Data Source: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at https://websoilsurvey.sc.egov.usda.gov/.

Note the presentation of steep slopes data here reflects extent based on the County Boundary and GIS lines as they existed prior to the April 2021 County Boundary update. The extent will reflect the latest County boundary when data from the external source is updated to the new boundary.

Hydric Soils

December 14, 2021

CULPEPER COUNTY

STAFFORD COUNTY

CITY OF FREDERICKSBURG

ORANGE COUNTY

CAROLINE COUNTY

LOUISA COUNTY

HANOVER COUNTY

N

W E

S

5 Miles

Legend

Major Waterbody

Hydric Soils Rating

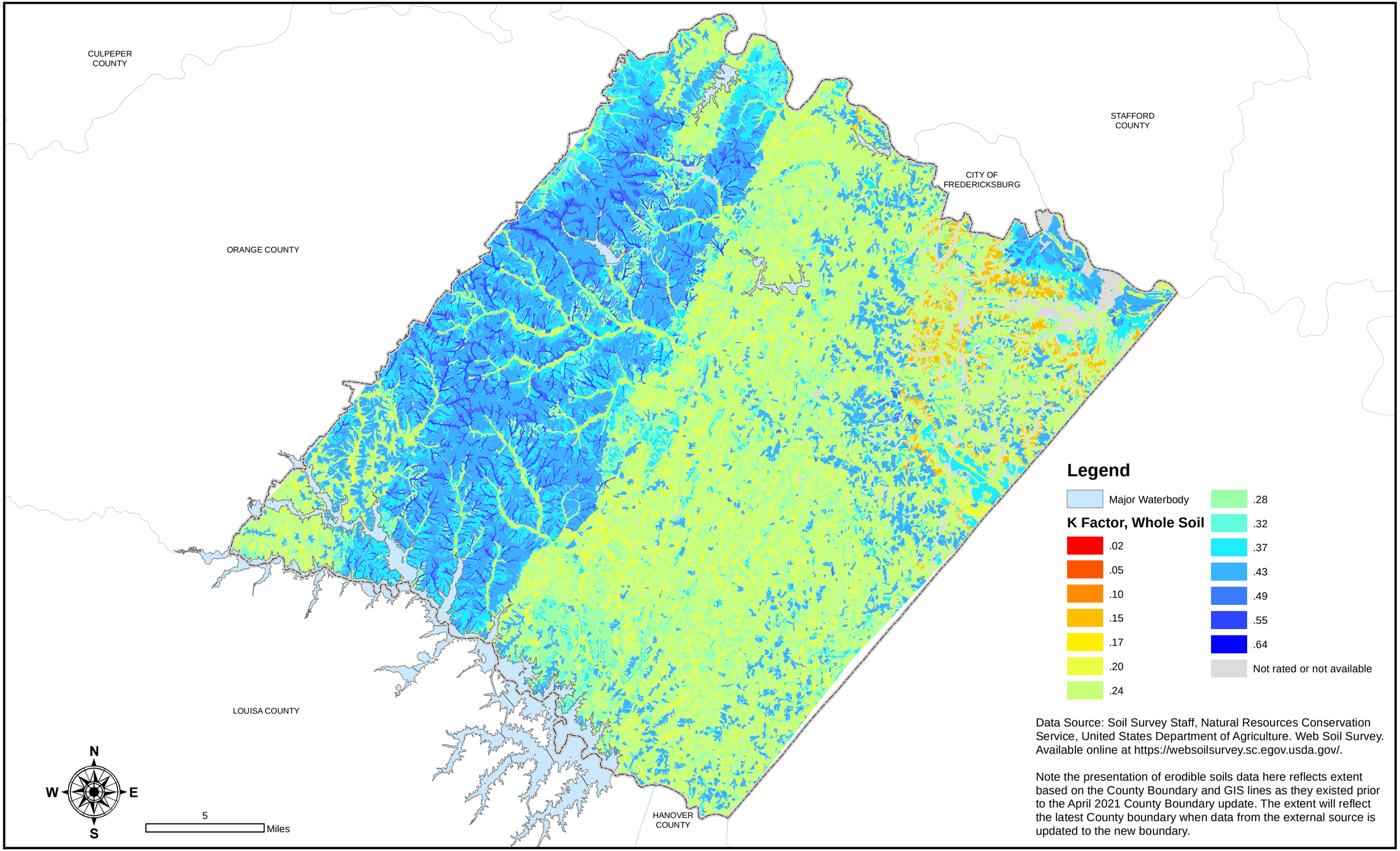
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Data Source: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at https://websoilsurvey.sc.egov.usda.gov/.

Note the presentation of hydric soils data here reflects extent based on the County Boundary and GIS lines as they existed prior to the April 2021 County Boundary update. The extent will reflect the latest County boundary when data from the external source is updated to the new boundary.

Erodibility (K Factor- Whole Soil)

December 14, 2021



Legend

- Major Waterbody

K Factor, Whole Soil

- .02
- .05
- .10
- .15
- .17
- .20
- .24
- .28
- .32
- .37
- .43
- .49
- .55
- .64
- Not rated or not available

Data Source: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at https://websoilsurvey.sc.egov.usda.gov/.

Note the presentation of erodible soils data here reflects extent based on the County Boundary and GIS lines as they existed prior to the April 2021 County Boundary update. The extent will reflect the latest County boundary when data from the external source is updated to the new boundary.

Septic Suitability

December 14, 2021

CULPEPER COUNTY

STAFFORD COUNTY

CITY OF FREDERICKSBURG

ORANGE COUNTY

LOUISA COUNTY

CAROLINE COUNTY

HANOVER COUNTY

Legend

Major Waterbody

Septic Suitability

- Very limited
- Somewhat limited
- Not rated or not available

N

W E

S

5

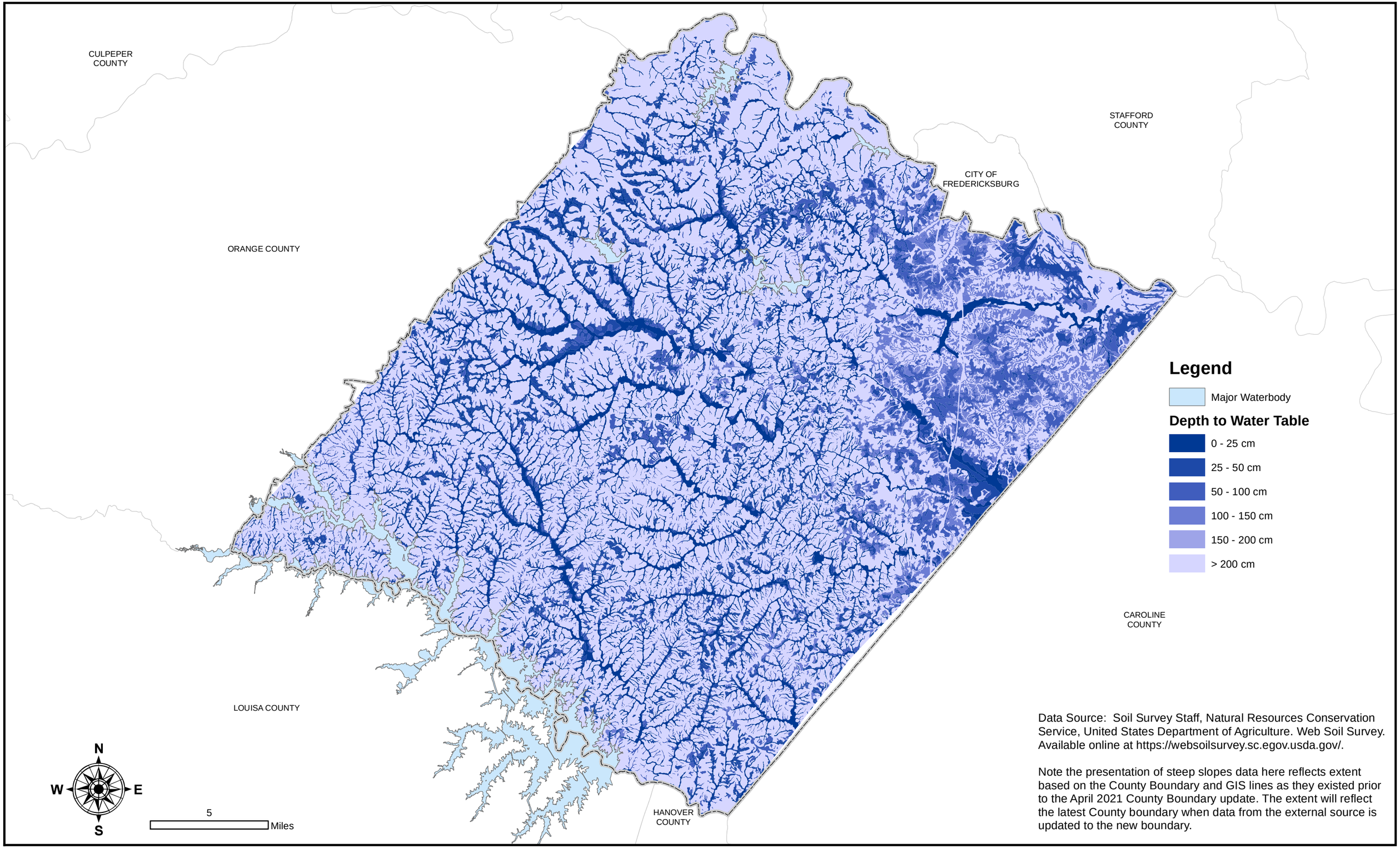
Miles

Data Source: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at https://websoilsurvey.sc.egov.usda.gov/.

Note the presentation of septic suitability data here reflects extent based on the County Boundary and GIS lines as they existed prior to the April 2021 County Boundary update. The extent will reflect the latest County boundary when data from the external source is updated to the new boundary.

Depth to Water Table (cm)

December 14, 2021

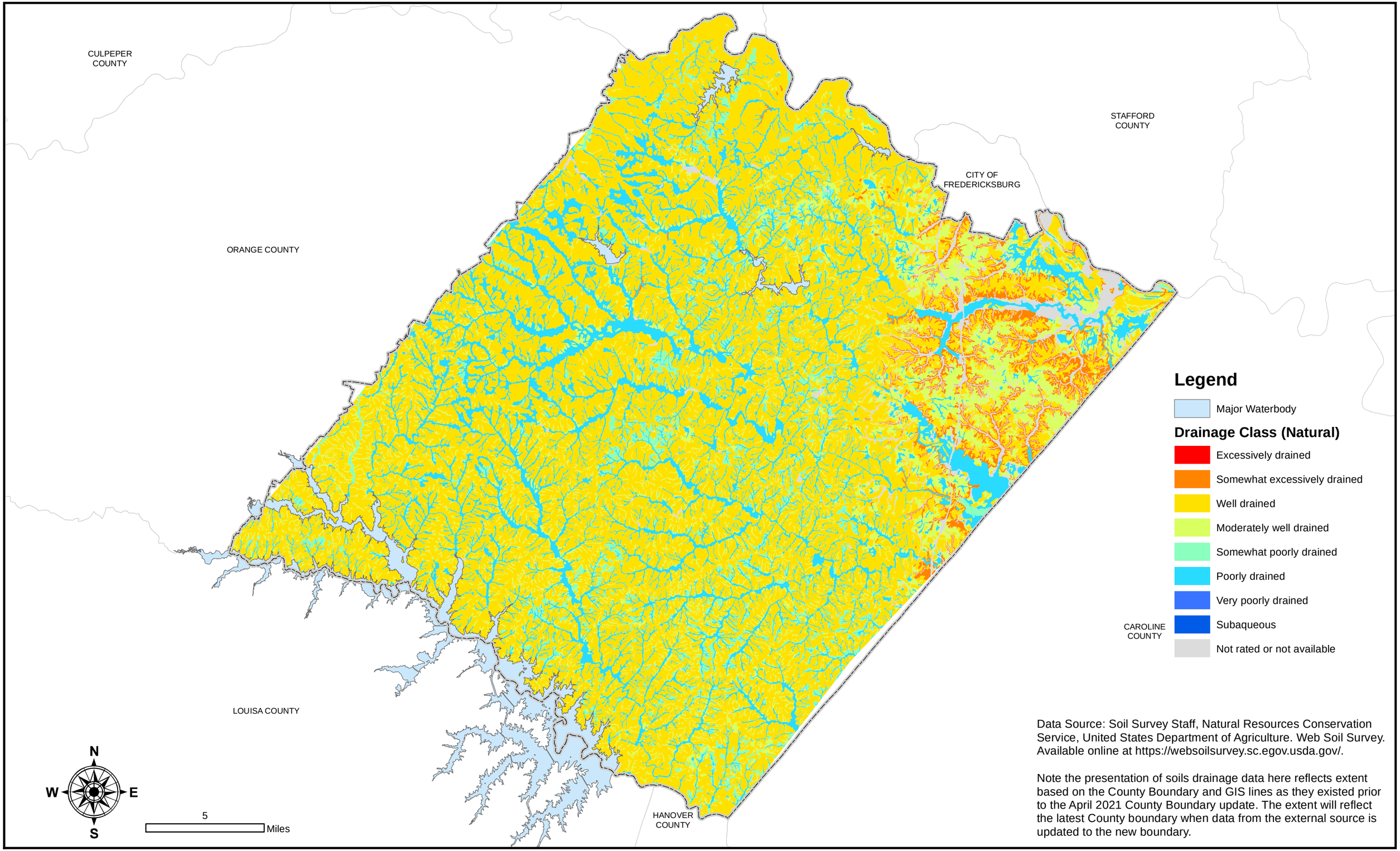


Data Source: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at https://websoilsurvey.sc.egov.usda.gov/.

Note the presentation of steep slopes data here reflects extent based on the County Boundary and GIS lines as they existed prior to the April 2021 County Boundary update. The extent will reflect the latest County boundary when data from the external source is updated to the new boundary.

Soils Drainage

December 14, 2021



Legend

- Major Waterbody

Drainage Class (Natural)

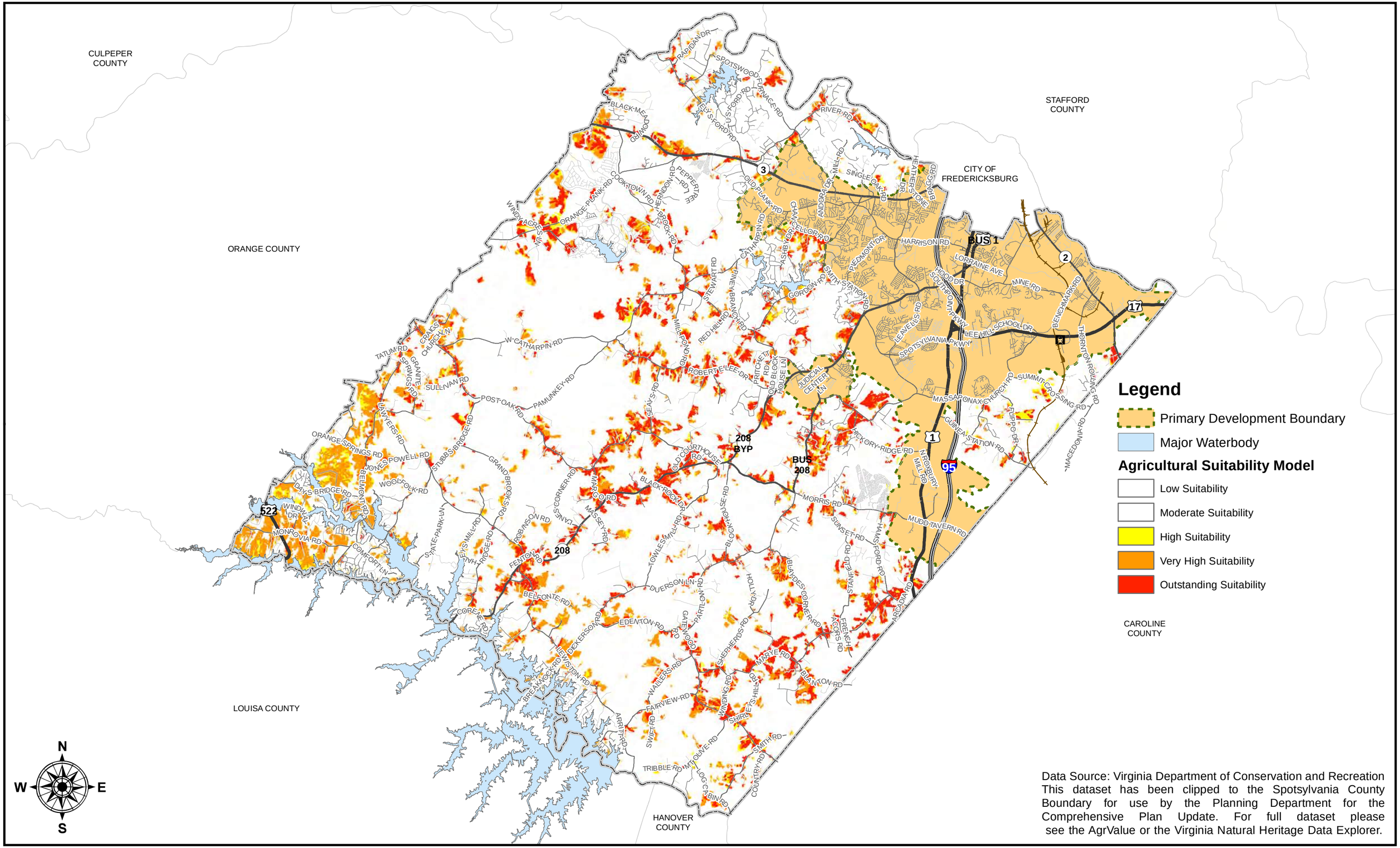
- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Data Source: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at https://websoilsurvey.sc.egov.usda.gov/.

Note the presentation of soils drainage data here reflects extent based on the County Boundary and GIS lines as they existed prior to the April 2021 County Boundary update. The extent will reflect the latest County boundary when data from the external source is updated to the new boundary.

Virginia Natural Heritage Date Explorer Agricultural Model

December 14, 2021



Legend

- Primary Development Boundary
- Major Waterbody

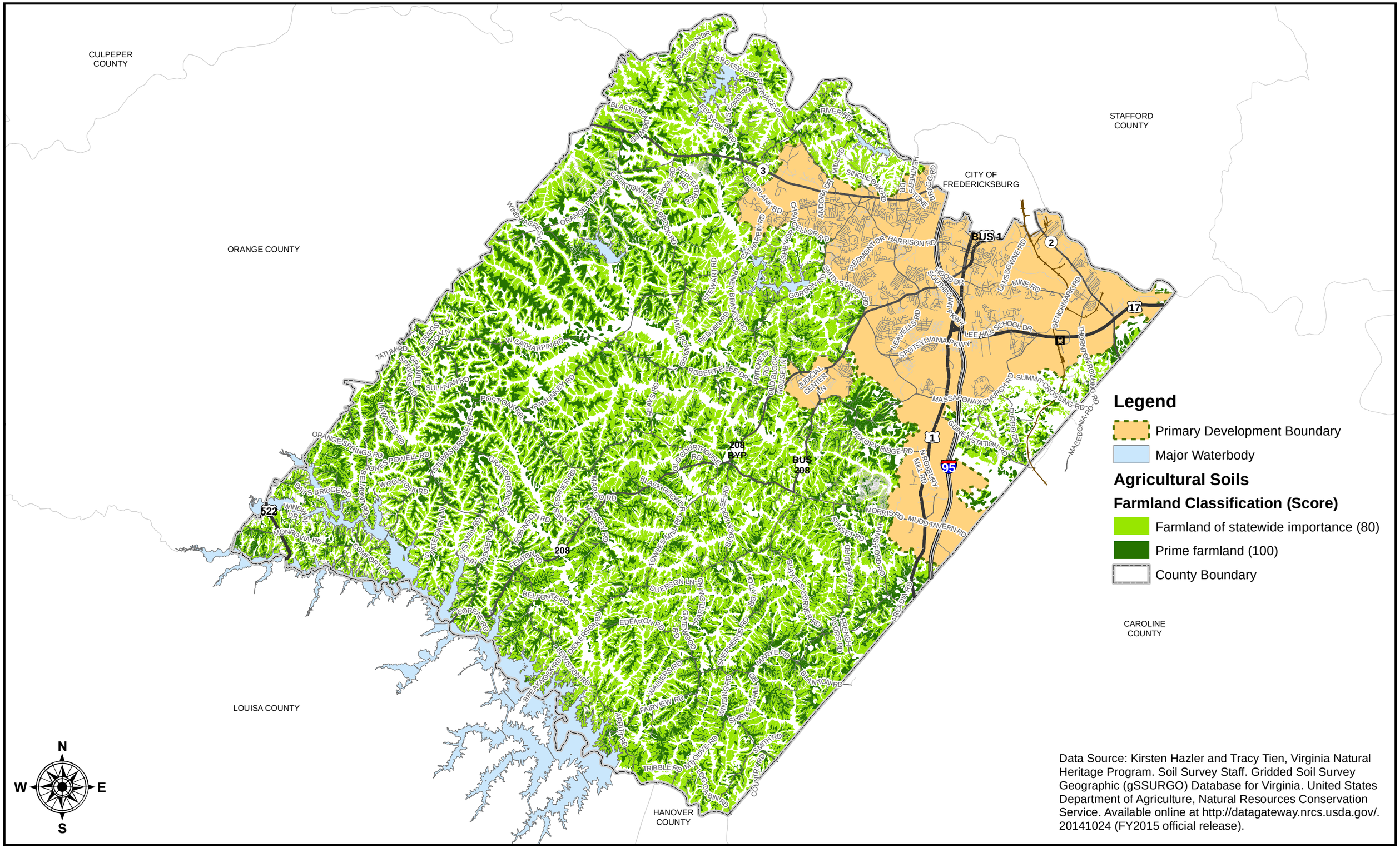
Agricultural Suitability Model

- Low Suitability
- Moderate Suitability
- High Suitability
- Very High Suitability
- Outstanding Suitability

Data Source: Virginia Department of Conservation and Recreation
This dataset has been clipped to the Spotsylvania County Boundary for use by the Planning Department for the Comprehensive Plan Update. For full dataset please see the AgrValue or the Virginia Natural Heritage Data Explorer.

Virginia Natural Heritage Data Explorer Agricultural Soils

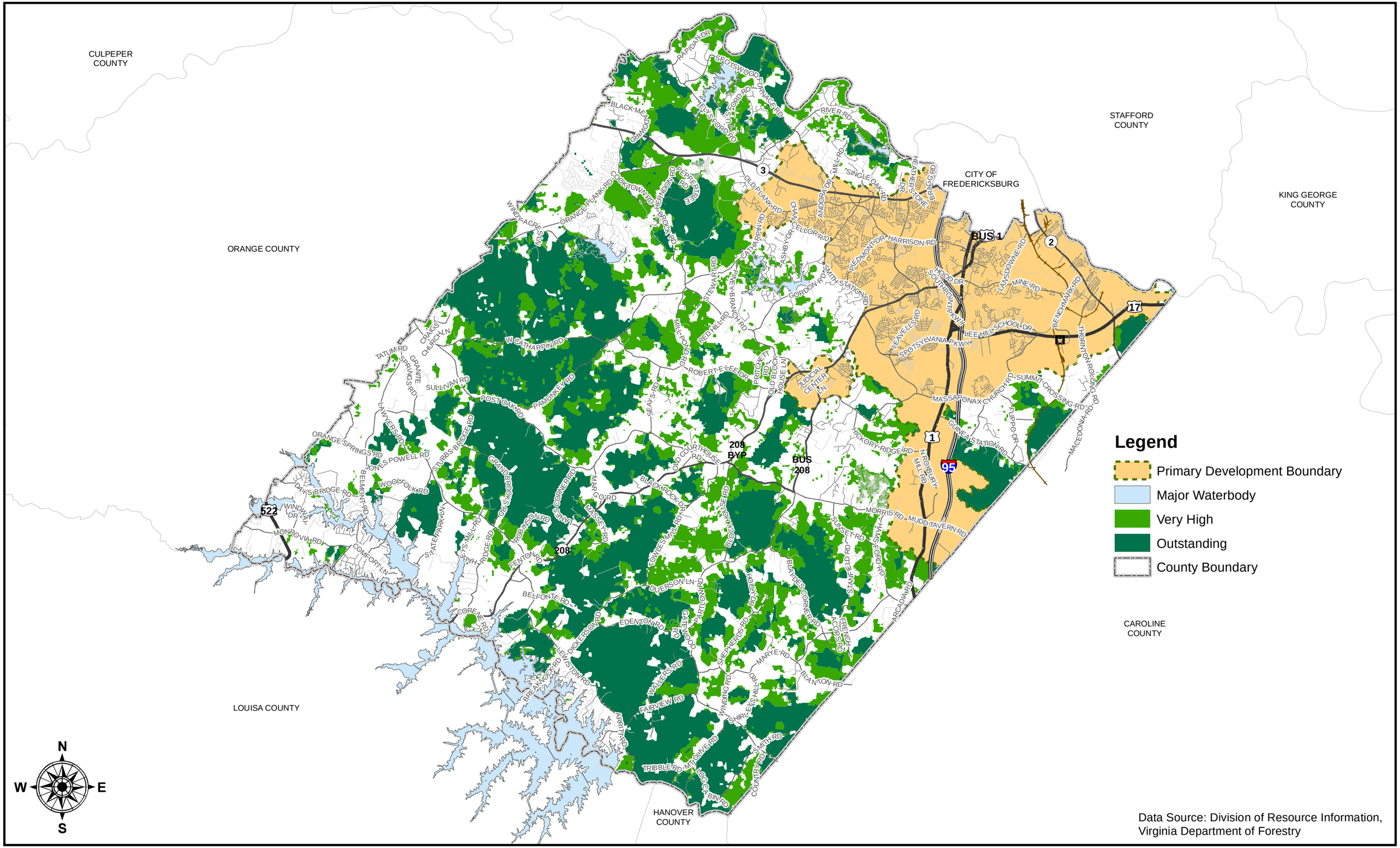
December 14, 2021



Data Source: Kirsten Hazler and Tracy Tien, Virginia Natural Heritage Program. Soil Survey Staff. Gridded Soil Survey Geographic (gSSURGO) Database for Virginia. United States Department of Agriculture, Natural Resources Conservation Service. Available online at http://datagateway.nrcs.usda.gov/. 20141024 (FY2015 official release).

Virginia Department of Forestry Forest Conservation Value

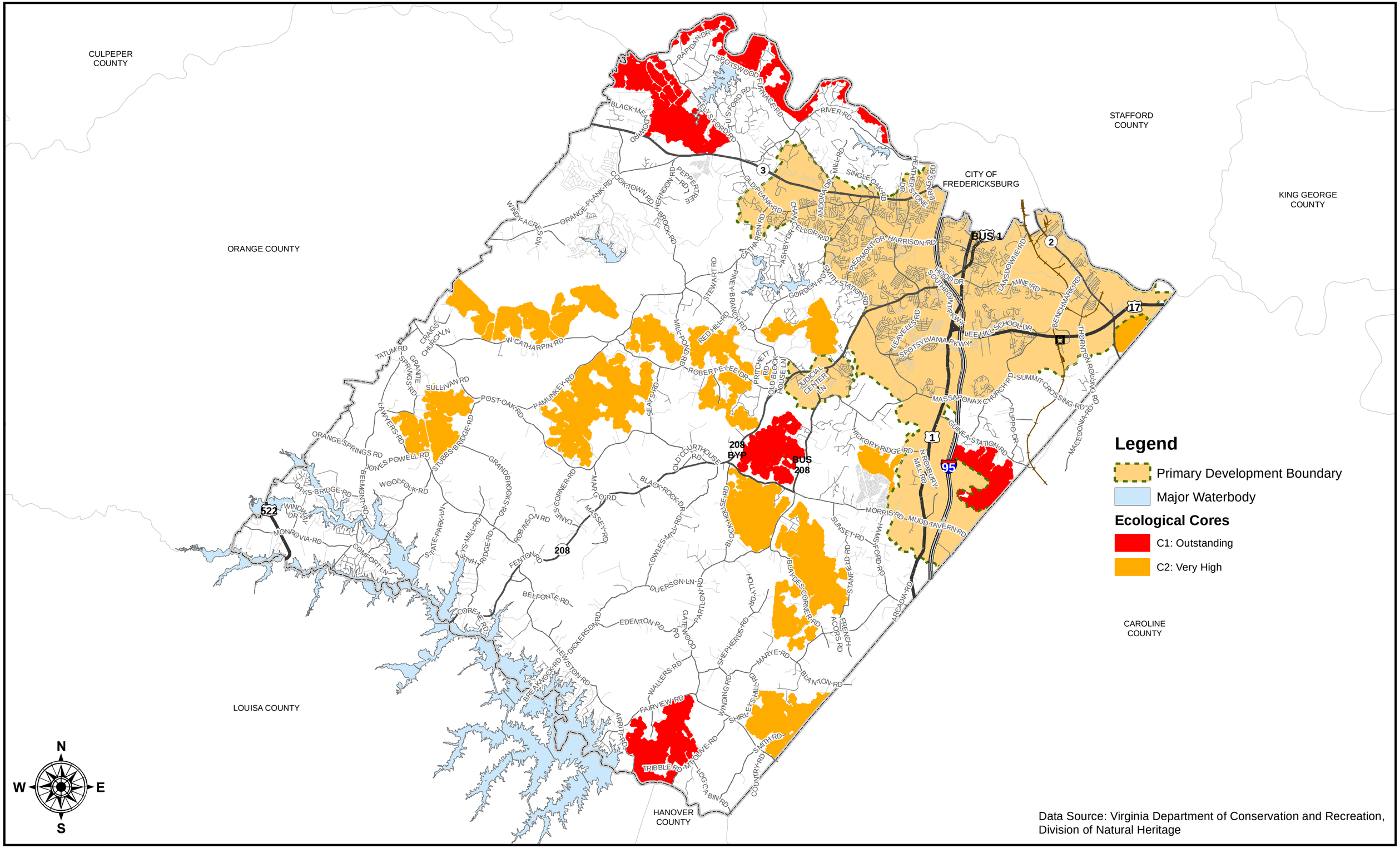
December 14, 2021



Data Source: Division of Resource Information, Virginia Department of Forestry

Virginia Department of Conservation and Recreation Ecological Cores

December 14, 2021



Data Source: Virginia Department of Conservation and Recreation, Division of Natural Heritage