4. ENVIRONMENT

INTRODUCTION

This chapter covers the minerals, soils and hydrologic resources in Culpeper County. Topography and other development constraints, as well as endangered species are also discussed.
In Culpeper County, the resources we use for our growing needs are plentiful, but limited. The degree to which we can meet these demands depends on the ability of our environment to support them. As the County evolves we intend to preserve and conserve our natural resources through responsible planning.

SOILS

Soil is the living medium of the earth's surface that helps store water and nutrients and provide habitat. Soil characteristics are determined by (1) the physical and mineralogical composition of the parent material (underlying bedrock), (2) the climate under which the soil has formed or accumulated, (3) the relief or slope of the land, (4) the biologic forces (plant and animal interaction) and (5) the length of time the climatic and biologic forces act upon the soil.

Culpeper County lies entirely within the Piedmont Plateau physiographic province. Physiographic provinces are geologic regions with similar relief, biologic and climatic characteristics. The north, northwest and western portions of the County is known as the Piedmont Uplands and is composed of acid crystalline rock material such as granites, gneisses, basalts and arkosic sandstones. The southeastern part of the County, east of Lignum near the Rapidan-Rappahannock confluence, is also a remnant part of the Piedmont Uplands and is composed of basic metamorphic rock such as sericite shists. The southern and central portion of the County, east of Route 15 to Lignum, is known as the Triassic plain or basin (an old ocean bed) and is composed of sedimentary rock such as shale and sandstone with intrusions of igneous rock. The different rock types determine the physical and chemical composition of the overlying soil types.

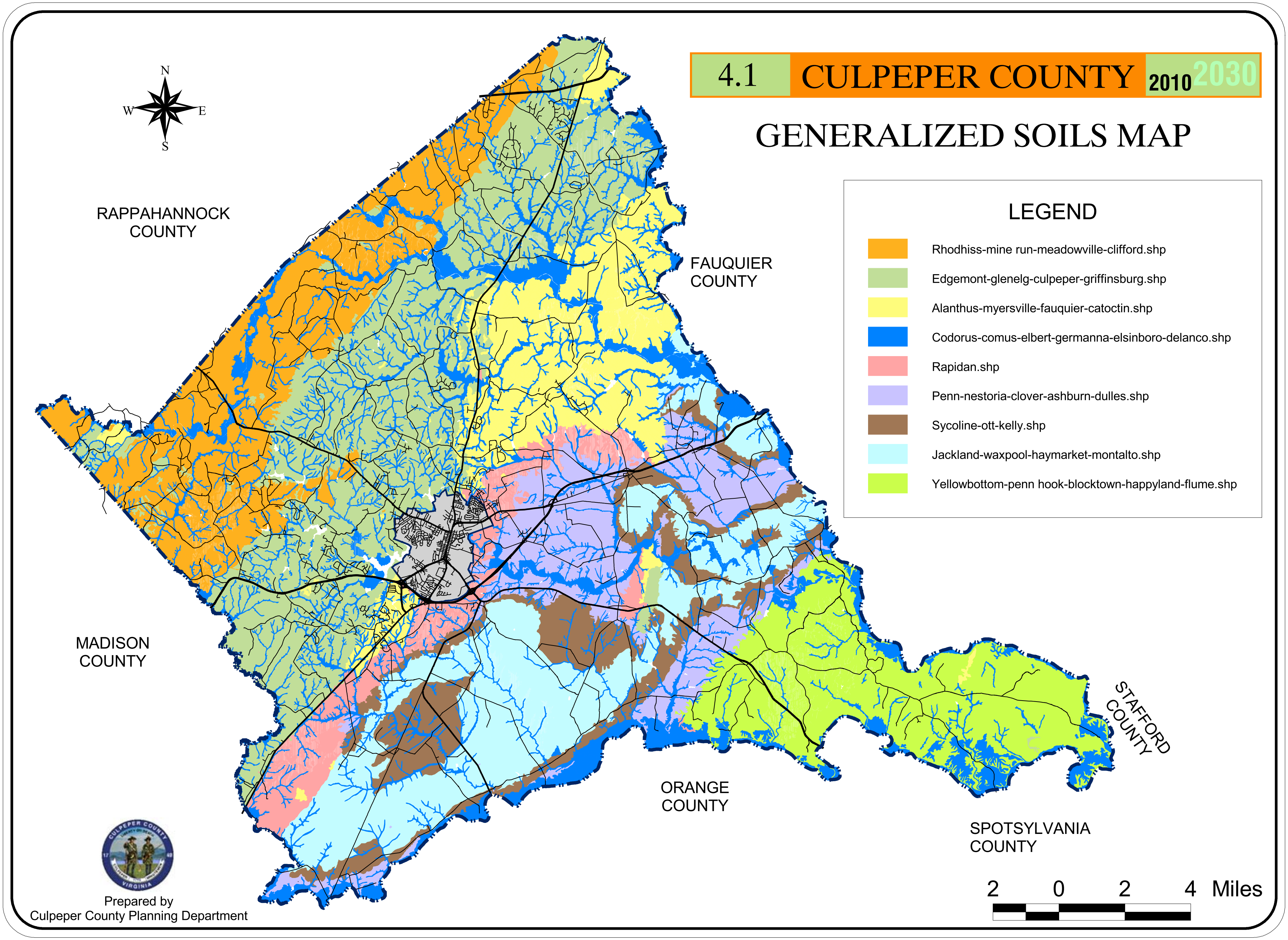
Source: Culpeper County Soil Survey Series. Soil Conservation Service. 1941. No 3.
Many soils found within the County are suitable for agricultural and residential purposes. Soil limitations do exist in some locations; these limitations include steep slopes, susceptibility to wind and water erosion, shallow soil depths, unfavorable soil structure and workability, and permanent wetness problems that hinders farming and septic disposal. All soils require careful management and conservation practices to prevent deterioration in water quality and to maintain and improve soil quality. See table 4.4 for a list of soils associated with wetlands and the websoilsurvey.nrcs.usda.gov online for additional soils information.

TABLE 4.1	CULPEPER COUNTY SOILS		
SOIL NAME	SLOPE CHARACTERISTICS	ACRES	PERCENT
Alanthus - Myersville complex	7 to 15 percent slopes	5,326	2.2
Alanthus - Myersville complex	15 to 25 percent slopes	3,726	1.5
Ashburn-Dulles complex	0 to 2 percent slopes	532	0.2
Blocktown-Yellowbottom complex	15 to 25 percent slopes	2,923	1.2
Blocktown-Yellowbottom complex	25 to 45 percent slopes	998	0.4
Cardova-Edgemont complex	7 to 15 percent slopes	365	0.1
Cardova-Edgemont complex	15 to 25 percent slopes	258	0.1
Catoctin -Fletcherville complex	2 to 7 percent slopes	769	0.3
Catoctin-Alanthus complex	7 to 15 percent slopes	2,035	0.8
Catoctin-Alanthus complex	15 to 25 percent slopes	2,063	0.8
Catoctin-Alanthus - Rock Outcrop complex	25 to 45 percent slopes	566	0.2
Clifford loam	2 to 7 percent slopes	2,814	1.1
Clifford loam	7 to 15 percent slopes	3,178	1.3
Clover-Penn complex	0 to 2 percent slopes	2,661	1.1
Clover-Penn complex	2 to 7 percent slopes	1673	0.7
Codorus and Hatboro soils	0 to 2 percent slopes, frequently flooded	1,360	0.6
Codorus and Meadowville soils	2 to 7 percent slopes, occasionally flooded	9,778	4.0
Codorus silt loam	0 to 2 percent slopes, occasionally flooded	6,423	2.6
Comus silt loam	0 to 2 percent slopes, frequently flooded	6,257	2.6
Culpeper sandy loam	2 to 7 percent slopes	5,310	2.2
Delanco-Kinkora complex	0 to 2 percent slopes, rarely flooded	213	*
Dulles-Nestoria complex	0 to 2 percent slopes	3,574	1.5
Dulles-Nestoria complex	2 to 7 percent slopes	1,616	0.7
Edgemont sandy loam	2 to 7 percent slopes	920	0.4
Edgemont-Culpeper complex	7 to 15 percent slopes	14,850	6.1
Edgemont-Culpeper complex	15 to 25 percent slopes	710	0.3
Edgemont-Rixeyville complex	15 to 25 percent slopes, very rocky	7,488	3.1
Edgemont-Rixeyville complex	25 to 45 percent slopes, very rocky	3,426	1.4
Elbert silt loam	0 to 2 percent slopes, occasionally ponded	3,835	1.6
Elsinboro-Delanco complex	2 to 7 percent slopes, rarely flooded	1,861	0.8
Fauquier silt loam	2 to 7 percent slopes	3,478	1.4
Fauquier silt loam	7 to 15 percent slopes	6,289	2.6
Fletcherville-Myersville complex	2 to 7 percent slopes	69	*

Fletcherville-Myersville complex	7 to 15 percent slopes	68	*
Flume loam	2 to 7 percent slopes	825	0.3
Flume-Goldvein complex	7 to 15 percent slopes	375	0.2
Germanna silt loam	2 to 7 percent slopes	2,828	1.2
Germanna silt loam	7 to 15 percent slopes	2,300	0.9
Germanna silt loam	15 to 25 percent slopes	464	0.2
Glenelg silt loam	2 to 7 percent slopes	2,166	0.9
Glenelg silt loam	7 to 15 percent slopes	9,122	3.7
Glenelg-Rixeyville complex	15 to 25 percent slopes	3,923	1.6
Glenelg-Griffinsburg complex	25 to 45 percent slopes	494	0.2
Griffinsburg-Edgemont complex	7 to 15 percent slopes	520	0.2
Griffinsburg-Edgemont complex	15 to 25 percent slopes, very rocky	288	0.1
Griffinsburg-Edgemont complex	25 to 45 percent slopes, very rocky	788	0.3
Halifax gravelly fine sandy loam	2 to 7 percent slopes	106	*
Happyland-Flume complex	15 to 25 percent slopes	643	0.3
Happyland-Mine Run complex	25 to 45 percent slopes	527	0.2
Haymarket-Jackland complex	7 to 15 percent slopes, bouldery	527	0.2
Haymarket silt loam	15 to 25 percent slopes, very bouldery	364	0.1
Haymarket silt loam	25 to 45 percent slopes, extremely bouldery	238	*
Jackland and Haymarket soils	0 to 2 percent slopes	2,150	0.9
Jackland and Haymarket soils	2 to 7 percent slopes	8,539	3.5
Jackland and Haymarket soils	0 to 2 percent slopes, very bouldery	284	0.1
Jackland and Haymarket soils	2 to 7 percent slopes, very bouldery	4,317	1.8
Meadowville loam	7 to 15 percent slopes	1,086	0.4
Minnieville loam	2 to 7 percent slopes	512	0.2
Montalto silty clay loam	2 to 7 percent slopes	387	0.2
Montalto sitly clay loam	7 to 15 percent slopes	692	0.3
Montalto silty clay loam	15 to 25 percent slopes	189	*
Ott-Kelly complex	2 to 7 percent slopes	5,406	2.2
Ott-Kelly complex	7 to 15 percent slopes	533	0.2
Penhook silt loam	2 to 7 percent slopes	2,536	1.0
Penhook silt loam	7 to 15 percent slopes	2,120	0.9
Penn-Nestoria complex	0 to 2 percent slopes	1,798	0.7
Penn-Nestoria complex	2 to 7 percent slopes	5,350	2.2
Penn-Nestoria complex	7 to 15 percent slopes	565	0.2
Penn-Nestoria complex	15 to 25 percent slopes	132	*
Pits	quarry	91	*
Rapidan silty clay loam	2 to 7 percent slopes	2,050	0.8

Rapidan-Penn complex	7 to 15 percent slopes, rocky	8,974	3.7
Rapidan-Penn complex	15 to 25 percent slopes, rocky	1,015	0.4
Rapidan-Rock Outcrop complex	25 to 45 percent slopes	293	0.1
Rhodhiss-Mine Run complex	7 to 15 percent slopes	10,788	4.4
Rhodhiss-Mine Run complex	15 to 25 percent slopes	9,535	3.9
Rhodhiss-Mine Run complex	25 to 45 percent slopes	2,750	1.1
Sycoline-Kelly complex	0 to 2 percent slopes	9,695	4.0
Udorthents smoothed-Urbanland	0 to 7 percent slopes	951	0.4
Waxpool silt loam	0 to 2 percent slopes, occasionally ponded	10,827	4.4
Waxpool silt loam	0 to 2 percent slopes, very bouldery, occasionally ponded	1,090	0.4
Yellowbottom loam	2 to 7 percent slopes	2,647	1.1
Yellowbottom loam	7 to 15 percent slopes	10,265	4.2
Yellowbottom-Goldvein complex	2 to 7 percent slopes	848	0.3
Yellowbottom-Milldraper complex	15 to 25 percent slopes	414	0.2
Water		1,961	0.8
TOTAL		**244,700**	**100**

*** Less than 0.1 percent** **USDA SOILS SURVEY - CULPEPER COUNTY, VIRGINIA soildatamart.nrcs.usda.gov**


4.1
CULPEPER COUNTY
2010 2030
GENERALIZED SOILS MAP
LEGEND
Rhodhiss-mine run-meadowville-clifford.shp
Edgemont-glenelg-culpeper-griffinsburg.shp
Alanthus-myersville-fauquier-catoctin.shp
Codorus-comus-elbert-germanna-elsinboro-delanco.shp
Rapidan.shp
Penn-nestoria-clover-ashburn-dulles.shp
Sycoline-ott-kelly.shp
Jackland-waxpool-haymarket-montalto.shp
Yellowbottom-penn hook-blocktown-happyland-flume.shp
N
W
E
S
RAPPAHANNOCK COUNTY
FAUQUIER COUNTY
MADISON COUNTY
ORANGE COUNTY
SPOTSYLVANIA COUNTY
STAFFORD COUNTY
2 0 2 4 Miles
Prepared by
Culpeper County Planning Department

HYDROLOGY

Surface Hydrology

The County of Culpeper lies wholly within the Rappahannock River basin. The County is drained by three major tributaries and their stream networks into the Rappahannock River. The three major tributaries are the Hazel River, which drains the northern portion of the County; Mountain Run, which drains the central portion of the County and consists of several impoundments that were designed as multi-purpose lakes; and the Rapidan River, which drains the southern portion of the County and forms the County's southern boundary. The Rappahannock River itself forms the northern and eastern boundaries of Culpeper County and the confluence of the Rappahannock and Rapidan Rivers border the southeastern tip of the County. The County is also located in the non-tidal portion of the Chesapeake Bay Watershed. Approximately 2,075 acres of Culpeper County is covered by lakes, rivers and streams.

The 26 square mile portion of the Mountain Run watershed west of the Town of Culpeper contains Lake Pelham and Mountain Run Lake which serve as the primary water supply sources for the Town of Culpeper. These lakes are also used for recreation, including fishing and boating, although gas engines are prohibited. Mountain Run Lake was completed in 1959 and consists of an earth fill structure approximately 700 feet long and 40 feet high that impounds 611 acre-feet of which 531 acre-feet are reserved for water supply storage and 80-acre feet are reserved for sediment storage. The lake has a surface area of 75 acres. Lake Pelham was completed in 1972 and consists of an earth-fill structure about 1,000 feet long and 38 feet high. The dam impounds 1,942 acre-feet of which 1,000 acre-feet are reserved for water supply and 942 acre-feet are reserved for sediment storage. Lake Pelham has a surface area of 254 acres (Lake Pelham Watershed Management Plan, 1989 Espey, Houston & Associates). There are two additional lakes, Caynor and Merrimac, in the watershed that could possibly be considered for future water supply. These impoundment structures are owned and maintained by the Culpeper Soil and Water Conservation District.

There are 16,542 acres in the drainage area for Lake Pelham, approximately 30% is suburban and 70% is agricultural and forestal. The lakes west of the Town of Culpeper have proved to be an amenity, increasing growth pressures in this area thereby increasing the potential of point and non-point source pollution. To mitigate the adverse environmental impacts of this growth and associated development, the Town and County have developed a watershed management plan that will protect and enhance the water quality conditions within the watershed. This plan led to the adoption of a Watershed Management District (WMD) which is detailed beginning on page 4-17. See Maps 4.2 and 4.3 for the watershed and sub-basin boundaries.

Several stream flow-gauging stations are maintained throughout the County. The U.S. Geological Survey publishes the data from these annually (http://va.water.usgs.gov/). Flow information coupled with water quality information can help determine the feasibility of water withdrawals or surface water impoundments along these streams and rivers.

The Virginia Department of Environmental Quality (DEQ) released the Final 2008 305(b)/303(d) Water Quality Assessment Integrated Report (Integrated Report) on December 22, 2008. The 2008 Integrated Report is a summary of the water quality conditions in Virginia from January 1, 2001, to December 31, 2006. The Virginia Department of Environmental Quality develops and submits this report to the U.S. Environmental Protection Agency every even-numbered year. Impaired waters are listed to identify a potential risk to public health and safety. These listed waters require implementing an action plan called a TMDL to improve water quality. There were a number of Culpeper County streams included on this impaired waters list. Table 4.2 lists the stream segments and the impairment of streams within Culpeper County.

Impaired Streams

4.2 DEPARTMENT OF ENVIRONMENTAL QUALITY			2008 IMPAIRED WATERS	
NAME	**LOCATION**	**CAUSE**	**ORIGINAL LIST YEAR**	**IMPAIRED MILES**
Rappahannock River	Segment begins at the confluence with Great Run, at rivermile 154.9, and continues downstream until the confluence with the Hazel River, at rivermile 147.52.	Escherichia coli	2006	6.81
Hughes River	Segment begins at the confluence with Kilbys Creek and continues downstream until the confluence with the Hazel River.	Escherichia coli	2004	3.67
Hazel River	Segment begins at the confluence with Blackwater Creek and continues downstream until the confluence with an unnamed tributary to the Hazel River, at rivermile 16.03.	Escherichia coli	2002	5.64
Hazel River	Segment begins at the confluence with Devils Run and continues downstream until the confluence with Blackwater Creek.	Escherichia coli	2006	4.32
Hazel River	Segment begins at the confluence with the Hughes River and continues downstream until the confluence with Devils Run.	Escherichia coli	2006	5.47
Thornton River	Segment begins at the confluence with Mill Run, at rivermile 8.65, and continues downstream until the confluence with an unnamed tributary to the Thornton River, at rivermile 3.25.	Escherichia coli	2006	5.40
Muddy Run	Segment begins at the confluence with an unnamed tributary to Muddy Run, approximately 0.2 rivermile upstream of Route 229, and continues downstream until the confluence with the Hazel River.	Escherichia coli	1996	5.56
Muddy Run	Segment begins at the headwaters of Muddy Run and continues downstream until the confluence with an unnamed tributary to Muddy Run, approximately 0.2 rivermile upstream of Route 229.	Escherichia coli	2002	7.04

Hazel River	Segment begins at the confluence with Indian Run and continues downstream until the confluence with Muddy Run.	Escherichia coli	2006	3.32
Indian Run	Segment begins at the confluence with an unnamed tributary to Indian Run, upstream from Route 626, and continues downstream until the confluence with the Hazel River.	Fecal Coliform	2006	3.82
Rappahannock River	Segment begins at the confluence with Ruffans Run and continues downstream until the confluence with Tinpot Run.	Escherichia coli	2004	2.02
Rappahannock River	Segment begins at the confluence with an unnamed tributary to the Rappahannock River, at approximately rivermile 142.5, and continues downstream until the confluence with Marsh Run.	Escherichia coli	2006	2.83
Lake Pelham	Segment includes all of Lake Pelham.	Oxygen, Dissolved, pH	2002, 2004	249.58 (acres)
Mountain Run Reservoir	Segment includes all of Mountain Run Reservoir.	Oxygen, Dissolved	2002	72.75 (acres)
Mountain Run	Segment begins at the confluence with Flat Run and continues downstream until the confluence with the Rappahannock River.	Escherichia coli, Benthic-Macroinvertebrate Bioassessments, PCB in Fish Tissue	1996, 2008, 2006	7.39
Mountain Run	Segment begins at the confluence with Jonas Run and continues downstream until the confluence with Flat Run.	Benthic-Macroinvertebrate Bioassessments, PCB in Fish Tissue	2008, 2006	5.51
Mountain Run	Segment begins at the Route 15/29 bridge crossing and continues downstream until the confluence with Jonas Run.	Benthic-Macroinvertebrate Bioassessments, PCB in Fish Tissue	2008, 2006	6.43
Mountain Run	Segment begins at the confluence with an unnamed tributary that flows from Caymore Lake and continues downstream until Lake Pelham.	Escherichia coli	2006	1.56
Jonas Run	Segment begins at the confluence with an unnamed tributary to Jonas Run (XDZ), at approximately rivermile 3.74, and continues downstream until the confluence with Mountain Run.	Escherichia coli	2008	3.71
Robinson River	Segment begins at the confluence with White Oak Run, at rivermile 5.18, and continues downstream until the confluence with the Rapidan River.	Escherichia coli	2004	5.21

Cedar Run	Segment begins at the confluence with Buck Run and continues downstream until the confluence with Cabin Branch.	Escherichia coli	2006	3.20
Rapidan River	Segment begins at the confluence with an unnamed tributary to the Rapidan River, at rivermile 34.5, approximately 0.6 rivermile downstream from Route 689, and continues downstream until the confluence with Cedar Run.	Escherichia coli	2006	4.58
Rapidan River	Segment begins at the confluence with the Robinson River and continues downstream until the confluence with an unnamed tributary to the Rapidan River, at rivermile 36.6.	Escherichia coli	2008	3.33
Rapidan River	Segment begins at the confluence with Wilderness Run, rivermile 7.78, and continues downstream until the confluence with Middle Run.	Escherichia coli	2002	2.47
Rapidan River	Segment begins at the boundary of the public water supply area, approximately 1.21 rivermiles upstream from the Route 3 crossing, and continues downstream until the confluence with Lick Branch.	Escherichia coli	2008	3.46

Land development which may further impact impaired streams should be required to take additional measures in order to prevent any further degradation.

Ground Water

Culpeper County depends on groundwater for domestic, commercial and industrial use. Several areas adjacent to the Town of Culpeper utilize the Town's water system; otherwise, development is serviced by individual or community wells.

Culpeper County's groundwater lies in two aquifer systems, the Piedmont/Mesozoic basin aquifer (Culpeper Triassic basin) and the Piedmont/Blue Ridge Crystalline aquifer. Culpeper Triassic basin is composed of sedimentary rocks such as shale and sandstone which have good porosity; however, due to compaction and cementation the pores have decreased in size and become poorly interconnected creating confining layers called aquitards. The Culpeper Triassic basin covers 33 square miles or 21,280 acres from Locust Dale to Brandy Station and ranges in depth from 10 feet to 2,000 feet. Groundwater moves primarily along joints, fractures and bedding planes as continuous tabular aquifers, but with poor hydraulic connection between individual aquifers. The water can become perched when encountering a restrictive layer such as a Diabase (or other igneous rock) intrusion in the form of a dike or sill. The water of the Triassic Basin is very hard with large concentrations of dissolved solids such as calcium and magnesium rendering the water basic with a pH of 7.6. The Piedmont/Blue Ridge Crystalline aquifers are composed of intrusive igneous and metamorphic rocks. Groundwater within the crystalline rocks is stored in the pores spaces of the regolith (weathered soil and rocks) and in the fractures of the underlying bedrock. The aquifers tend to be more connected since the groundwater moves in the direction of the fractures, but sustained quantities are highly variable. The water of the Piedmont/Blue Ridge Crystalline aquifers is slightly acidic with a pH of 6.7 producing a much lower hardness level than the Culpeper Triassic basin aquifer.

Groundwater is the primary source of base flow for many streams in the County. Base flow is the part of the stream discharge not attributed to direct runoff from rainfall and snowmelt. The Piedmont/ Blue Ridge Crystalline aquifers account for an average base-flow of 33 to 67 percent of stream flow, whereas the Piedmont/Mesozoic basin aquifer (Culpeper basin) provides an average base-flow of 68 percent of stream flow. The difference in base flow contributions is due to groundwater recharge factors and depth to water table. Groundwater recharge factors include the topography, vegetation and land use practices of the contributing watershed. The depth to water table is dependent on soil type and underlining geology. The groundwater of the Triassic Basin maintains a closer relationship with surface water due to large, flat watersheds and shallow depth to the water table (U.S. Geological Survey, Hydrologic Atlas 730-L. Henry Trapp, Jr. and Marilee A. Horn, 1997).

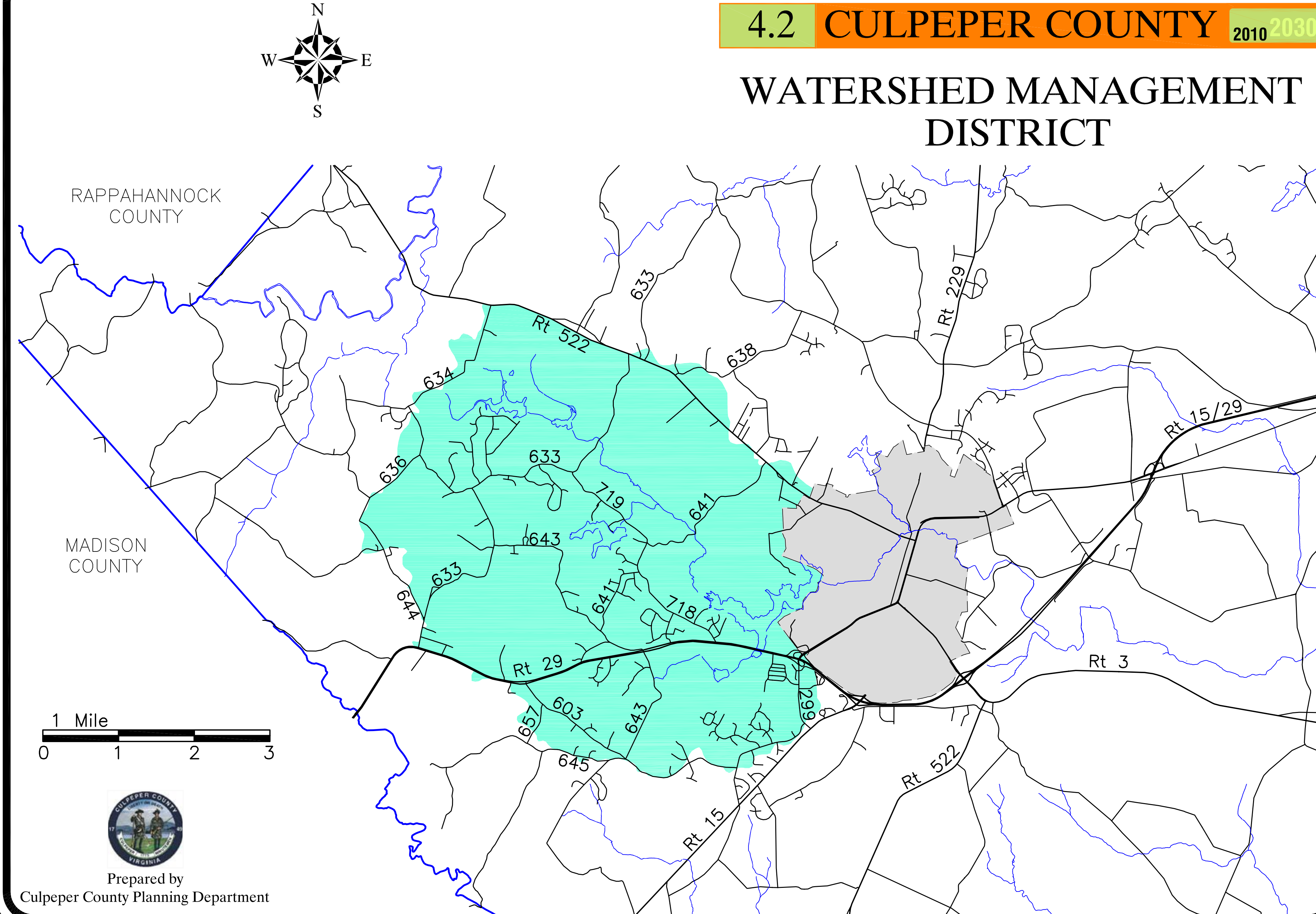
Groundwater is a vulnerable resource in which its quality is largely determined by how people use the land. Due to Culpeper County's dependence on groundwater, it is imperative that measures are taken to protect this resource. According to the Virginia Water Control Board, the most severe threats to groundwater quality come from leaking surface impoundments used to store, treat and recycle waste products; leaking underground storage-tanks; malfunctioning septic tanks and drain fields; improper uses and inadequate design of landfills; and agricultural use of fertilizers and pesticides.

There are several areas in the County that have been associated with potential groundwater contamination. Petroleum products have been identified in several wells along Business Route 15/29 at Inlet. The State Water Control Board studied this area and recommended extending the Town water service to those residences and businesses with contaminated water supplies, which was done in 1994. A site off Route 706 was identified, and illegally buried barrels of chemicals were discovered and removed. No well contamination resulting from this situation has been identified. The Brandy Station area has water quality problems that result from the combination of malfunctioning drain fields in poor soils and shallow wells.

A groundwater protection program is being developed for the County to insure that this vital and limited resource is protected. This cannot be done effectively without the nature, location, and hydrogeology of the groundwater in the County being fully evaluated. It is essential that a thorough, County-wide groundwater study be completed and that groundwater protection ordinances be developed and implemented. A generalized program for groundwater protection through mandatory and voluntary Best Management Practice (BMP) implementation, recycling programs for used oil and waste reduction in the landfill, household and farm hazardous waste cleanup days, and public education currently seems attainable. In addition, the protection of surface and groundwater quality and quantity must be considered each time a land use change is proposed.

4.2 CULPEPER COUNTY 2010 2030

WATERSHED MANAGEMENT DISTRICT



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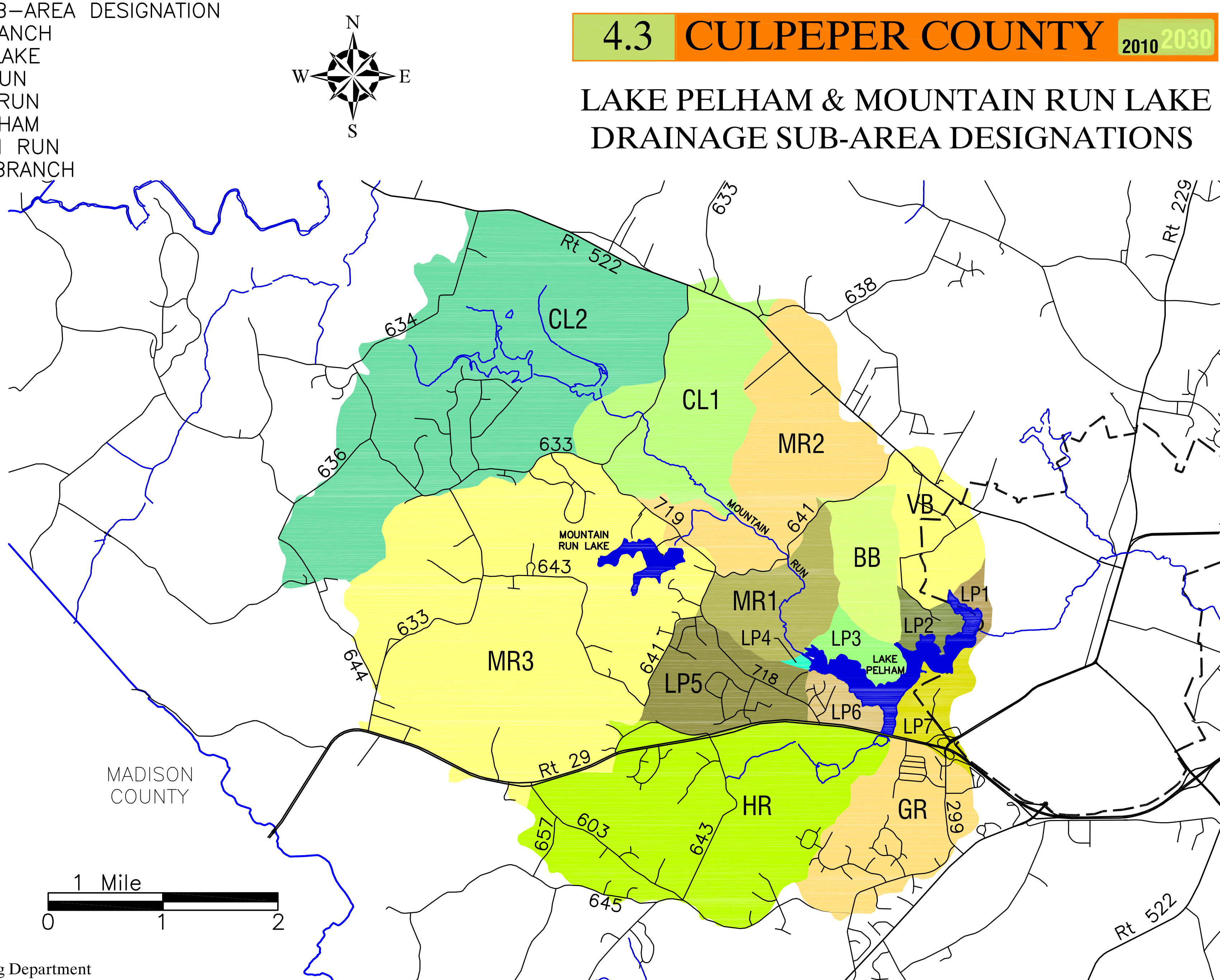
4.3 CULPEPER COUNTY 2010 2030

LAKE PELHAM & MOUNTAIN RUN LAKE DRAINAGE SUB-AREA DESIGNATIONS

DRAINAGE SUB-AREA DESIGNATION
BB–BOND BRANCH
CL–CAYNOR LAKE
GR–GAINES RUN
HR–HUNGRY RUN
LP–LAKE PELHAM
MR–MOUNTAIN RUN
VB–VAUGHN BRANCH



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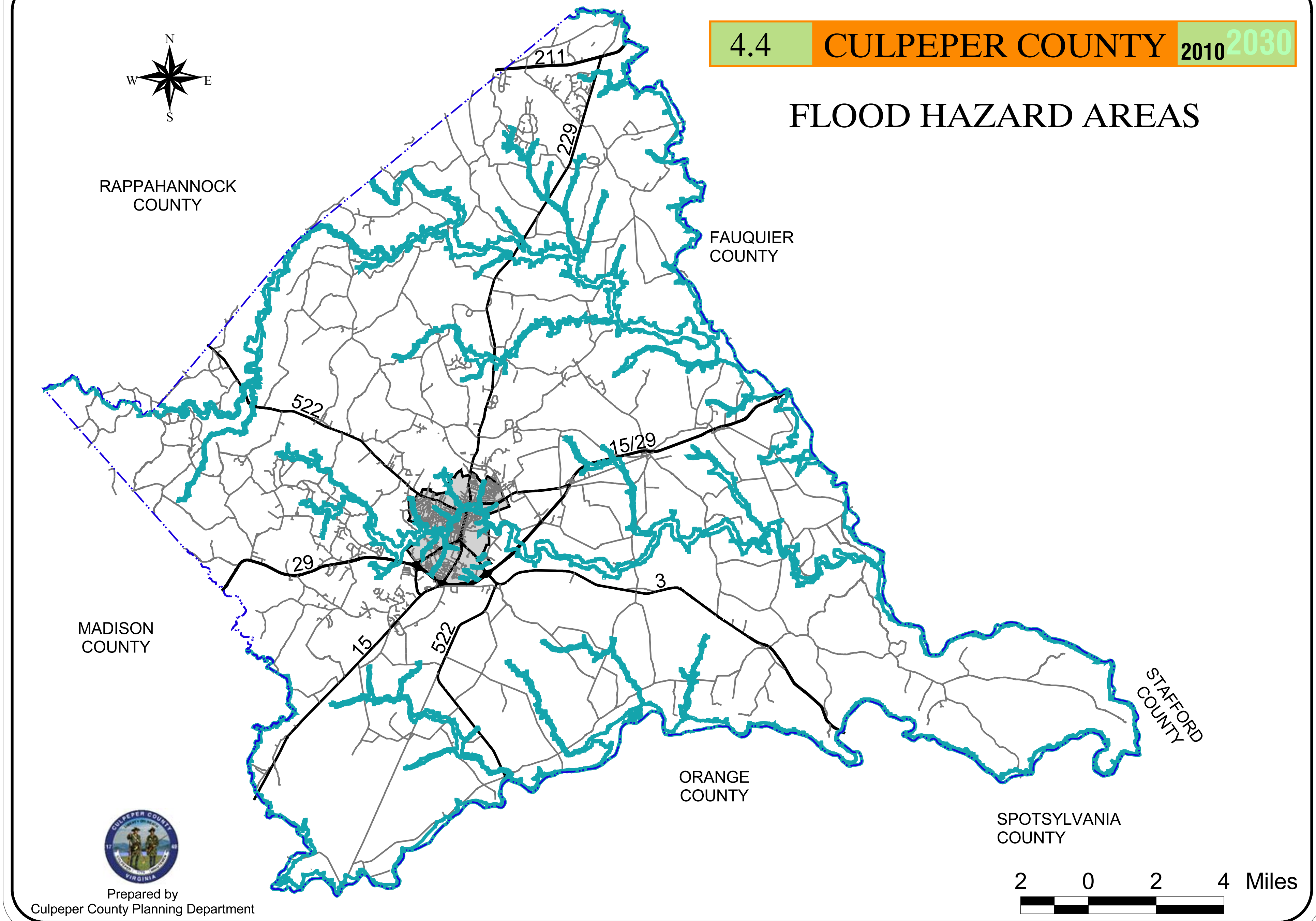
4.4 CULPEPER COUNTY 2010 2030

FLOOD HAZARD AREAS



FLOODPLAIN

Flood prone areas in Culpeper County occur along all major streams as designated by the Flood Hazard Map (Map 4.4) developed from the 2007 HUD Flood Hazard Boundary Maps. Approximately 17,000 acres in Culpeper County are located in the 100-year floodplain. The Development Constraints Map (Map 4.6) also shows the approximate limits of the 100-year floodplain along with topographical and soils constraints

Land uses in the flood prone areas are subject to the provisions contained in the County's Floodplain Overlay District section of the County Zoning Ordinance. The Floodplain Overlay District outlines permitted uses, special uses, and other regulations concerning development and structures within the 100-year floodplain areas. Culpeper County is also a participant in the National Flood Insurance Program that allows for the issuance of flood insurance and disaster assistance in the case of flooding.

Forests and other natural vegetation along streams and ponds are important to protecting water quality. These vegetated streambanks and shorelines provide a riparian buffer that filters nutrients and sediments, provide shade that moderates water temperature, and provide habitat and food for wildlife. In addition to the County's Floodplain and Watershed Management Overlay Districts, Culpeper County encourages development to protect streams and surface water from disturbance through the use of riparian buffer setbacks under the County's Stormwater Management ordinance. For proposed development there shall be a 100-foot setback from the Hazel, Rapidan, and Rappahannock River, 50-foot setback for all other perennial streams and 25-foot setback for all intermittent streams and stormwater ponds. Culpeper County plays a vital role in protecting the water quality in the headwaters of the Rappahannock River.

WETLANDS

Wetlands are transitional zones between open water and dry land. Non-tidal wetlands, as are found within Culpeper County, often occur where water is found at or near the surface of the ground or in places where the ground is covered by shallow water ranging from a few inches to several feet. Some wetland areas are dry during certain seasons and flooding is common during the winter and spring when rivers overflow their banks. Nontidal wetlands include freshwater marshes and ponds, shrub swamps, bottomland hardwood forests, and wooded swamps and bogs.

Wetland Definition

The Federal Manual for Identifying and Delineating Jurisdictional Wetlands identifies three technical criteria that must be met for an area to be considered a wetland. These criteria are the presence of: 1.) **hydrophytic vegetation**, 2.) **hydric soils** and 3.) **wetland hydrology**.

Hydrophytic vegetation (Table 4.3) is defined as macrophytic plant life, which means water-loving plants that the naked eye can see growing in water or in soil or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. Plants that grow in wetlands are classified in two ways. One way is by their stratum, that is, whether they are trees, saplings, shrubs, vines, herbs or bryophytes (mosses and liverworts). The other way is according to their relative ability to live in either wetlands or uplands. If a plant is found only in wet areas, it is classified as "obligate" (OBL). If it is found in either wetlands or uplands, it is classified as "facultative" (FAC) and if it is facultative but is found more often in wetlands, it is considered to be "facultative wet" (FACW). Other plants are found only in uplands (UPL) or more often in uplands than in wet areas (FACU).

Hydric soils are saturated, flooded or ponded long enough during the growing season (usually between March and October in Culpeper County) to develop anaerobic conditions, that is oxygen deficient, in the upper layers. Wetland hydrology is characterized by flooding or saturation which is either permanent or which recurs for significant periods of time.

The U.S. Army Corps of Engineers, in cooperation with the EPA, administers wetlands through Section 404 of the Clean Water Act and has had the primary regulatory authority for preserving non-tidal wetlands in Virginia. The Corps must review any development plan that involves wetland areas, and a permit to work in a wetland or a letter indicating that a permit is not necessary must be obtained.

TABLE 4.3 TYPICAL DOMINANT PLANTS IN VIRGINIA'S WETLANDS

COMMON NAME	INDICATOR	COMMON NAME	INDICATOR
TREES		***HERBACEOUS PLANTS***	
Red Maple	FAC	Sweet Flag	PBL
River Birch	FACW	Giant Cane	OBL
Green Ash	FACW	False Nettle	FACW
Sweet Gum	FAC	Sedges	OBL or FACW
Water Tupelo	OBL	Joe Pye Weed	FACW (most)
Black Gum	FAC	Marsh Hibiscus	OBL
Swamp Chestnut Oak	FACW	Irises (various)	OBL
Bald Cypress	OBL	Soft Rush	FACW
SHRUBS		***SEEDBOX***	
Highbush Blueberry	FACW	Waterlilies	OBL
Hazel Alder	OBL	Sensitive Fern	FACW
Buttonbush	OBL	Cinnamon Fern	FACW
Sweet Pepperbush	FAC	Arrow Arum	OBL
Northern Spicebush	FACW	Common Reed	FACW
Sweetbay Magnolia	FACW	Smartweeds Spp.	OBL
Southern Waxmyrtle	FAC	Pickerel Weed	OBL
Willows (Various Sp.)	FACW (most)	Arrowhead	OBL
		Lizards Tail	OBL
		Cattail Spp.	OBL
VINES			
Common Greenbriar	FAC		

CHESAPEAKE BAY LOCAL ASSISTANCE DEPARTMENT

HYDRIC SOILS FOR CULPEPER COUNTY	
ASHBURN-DULLES	0-2 percent slopes
CLOVER-PENN	0-2 percent slopes
CLOVER-PENN	2-7 percent slopes
CODORUS AND HATBORO	0-2 percent slopes, frequently flooded
CODORUS AND MEADOWVILLE	2-7 percent slopes, occasionally flooded
CODORUS SILT LOAM	0-2 percent slopes, occasionally flooded
COMUS SILT LOAM	0-2 percent slopes, frequently flooded
DELANCO-KINKORA	0-2 percent slopes, rarely flooded
DULLES-NESTORIA	0-2 percent slopes
DULLES-NESTORIA	2-7 percent slopes
ELBERT SILT LOAM	0-2 percent slopes, occasionally ponded
ELSINBORO-DELANCO	2-7 percent slopes, rarely flooded
HAYMARKET-JACKLAND	7-15 percent slopes, very bouldery
HAYMARKET SILT LOAM	15-25 percent slopes, very bouldery
HAYMARKTER SILT LOAM	25-45 percent slopes, extremely bouldery
JACKLAND AND HAYMARKET	0-2 percent slopes
JACKLAND AND HAYMARKET	2-7 percent slopes
JACKLAND AND HAYMARKET	0-2 percent slopes, very bouldery
JACKLAND AND HAYMARKET	2-7 percent slopes, very bouldery
MEADOWVILLE LOAM	7-15 percent slopes
OTT-KELLY	2-7 percent slopes
OTT-KELLY	7-15 percent slopes
PENN-NESTORIA	0-2 percent slopes
PENN-NESTORIA	2-7 percent slopes
PENN-NESTORIA	7-15 percent slopes
PENN-NESTORIA	15-25 percent slopes
RAPIDAN SILTY CLAY LOAM	2-7 percent slopes
RAPIDAN-PENN	7-15 percent slopes, rocky
RAPIDAN-PENN	15-25 percent slopes, rocky
SYCOLINE-KELLY	0-2 percent slopes
WAXPOOL SILT LOAM	0-2 percent slopes, occasionally ponded
WAXPOOL SILT LOAM	0-2 percent slopes, very bouldery, occasionally ponded
	USDA SOILS SURVEY - CULPEPER COUNTY, VIRGINIA soildatamart.nrcs.usda.gov

Wetland Preservation

In 1780, it is estimated that there were 220 million acres of wetlands in what is now the continental United States. In 1980, it was estimated that only 104 million acres of wetlands remained, and that we are continuing to lose wetlands at a rate of 100,000 to 300,000 acres per year.

Wetlands perform the following functions:

- By trapping waterborne sediment and its pollutants, wetlands protect the quality of surface waters. Therefore, the preservation of wetlands will help mitigate the water quality impacts that future development will have on the streams and lakes in Culpeper County.
- Wetlands serve as a natural means of flood control; they absorb and store water during high-runoff periods, thereby reducing flood crests, and protecting life and property.
- Wetlands are critical at times of drought because they maintain critical base-flow to surface waters through the gradual release of stored flood-waters. Wetlands, therefore, can reduce the need to create the reservoirs and other water-storage facilities often constructed as a means to augment municipal water supplies.
- Some wetlands contain important, even unique, communities of wild plant and animal species. They also serve as temporary refuge for migratory birds such as ducks.
- Wetlands provide recreational venues for hunters, fishermen, and campers, as well as open spaces to buffer incompatible uses.

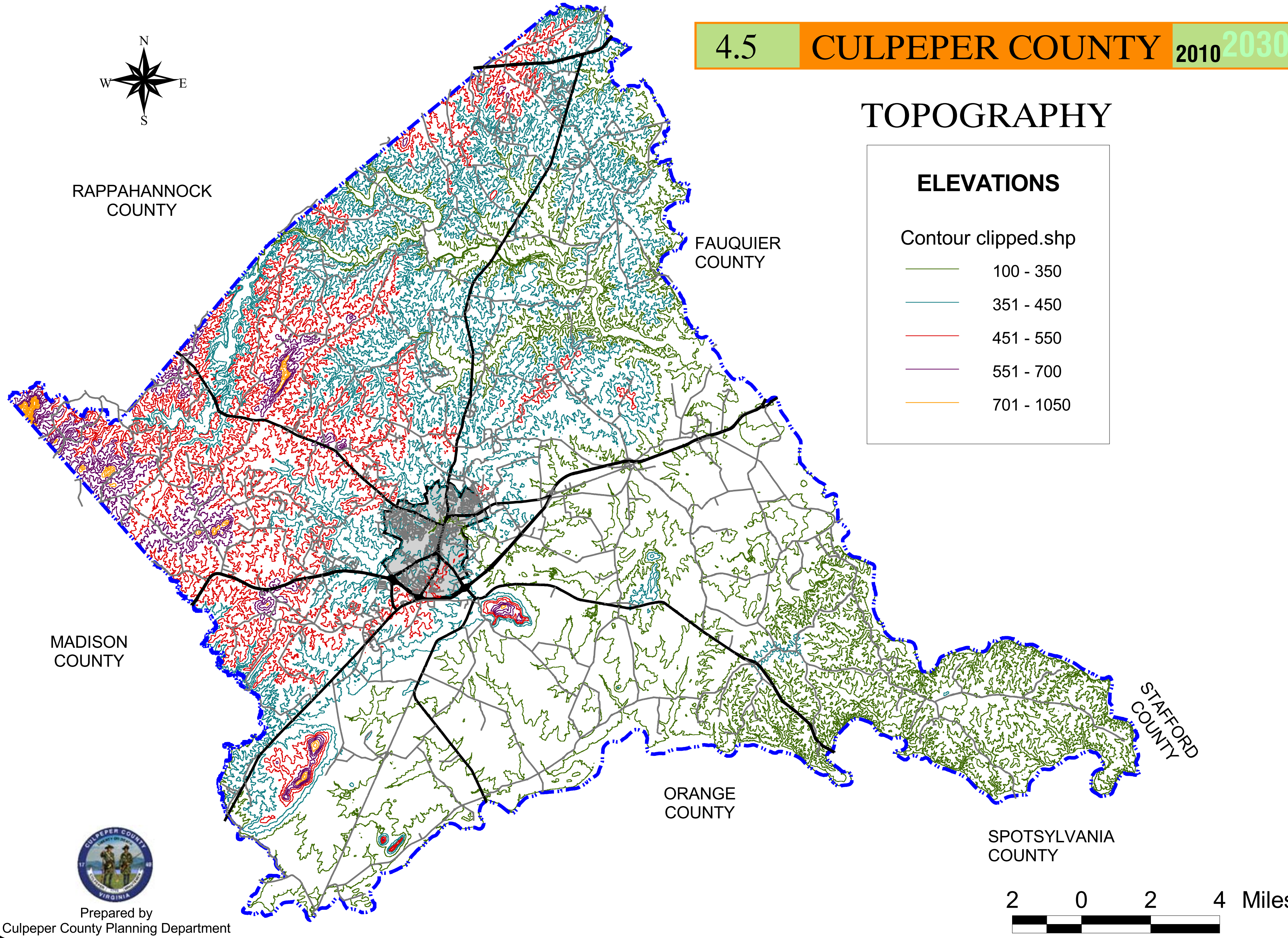
Wetlands are a valuable resource that must be preserved. Therefore, it will be the policy of Culpeper County to discourage the drainage or destruction of wetlands that meet the criteria as outlined in the Federal Manual for Identifying and Delineating Wetlands (or the most current federal identification and delineation policy). If such disturbance is unavoidable, the proper permits must be obtained from the Army Corps of Engineers. Innovative storm water management and Best Management Practices (BMPs) that preserve, establish and enhance wetland features are encouraged.

TOPOGRAPHY

Culpeper County topography ranges from an elevation of 1160 feet above sea level on Mitchell's Mountain to 130 feet above sea level at the junction of the Rapidan and the Rappahannock Rivers. In general, the land surface slopes southeastward from an average altitude of 600 feet above sea level in the western portion of the county to 350 feet in the southeast. The northwestern portion of the County is generally hilly to steep, the central portion of Culpeper County ranges from mostly level to rolling; and the southeastern section of the County is rolling. There are numerous mountains designated in the County, the elevations of which are shown in Table 4.4.

4.5 CULPEPER COUNTY 2010 2030

TOPOGRAPHY



Prepared by
Culpeper County Planning Department

Development and land disturbing activities, excluding agriculture, on 15-25% slopes should always require grading permits with erosion and sediment controls prescribed. Additionally, drain fields located on 15-25% slopes should require a hydrologic report assuring that ground and surface water will be protected both on and off-site. Those areas located on 25% or greater slopes should be restricted from development and drain fields should be prohibited.

TABLE 4.4 MOUNTAIN ELEVATIONS IN CULPEPER COUNTY

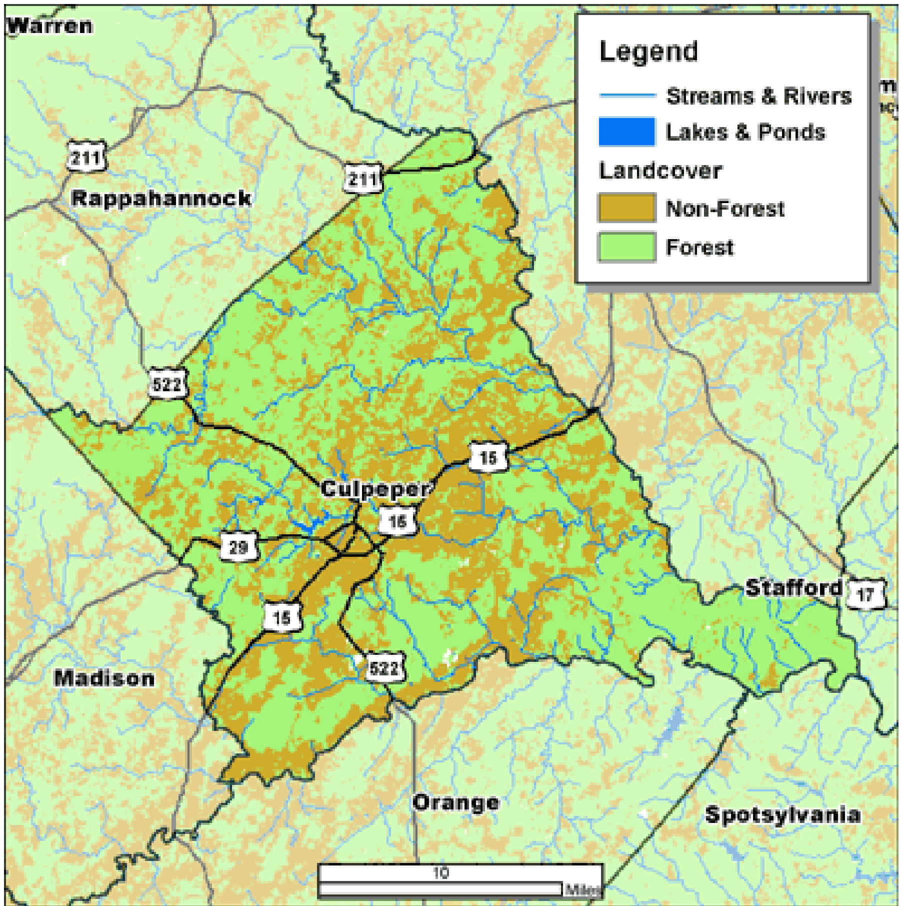
MOUNTAIN	ELEVATION
Mitchells Mountain	1,160
Scott Mountain	890
Hitt Mountain	882
Bruce Mountain	850
Cedar Mountain	833
Parrish Mountain	817
Mount Pony	790
Fox Mountain	762
Buzzard Mountain	621
Fleetwood Hill	540
Sheads Mountain	540
Coles Hill	510
Hansbrough's Ridge	470
Stony Point	410

WOODLAND FEATURES

Culpeper County has forested land in tracts that range from small privately owned wood lots to major parcels managed for commercial harvest. In addition to commercial timber opportunities, wooded areas also provide the following benefits: Watershed protection through storm water management and erosion control, aesthetic and scenic viewsheds, air pollution and noise reduction, groundwater recharge areas and recreation.

As shown in diagram 4.1, a large portion of the County is wooded. Retention of this acreage will help ensure that the environmental quality of the community is protected. Areas that are managed for commercial timber operations should use Best Management Practices (BMP) and should enact a reforestation plan. Areas under development should provide plans that indicate preservation of the existing woodland features and re-vegetation of areas that are denuded in order to reduce the erosion, sedimentation, and storm water runoff impacts on downstream areas. Retention of existing woodlands on slopes greater than 15% is encouraged.

DIAGRAM 4.1 CULPEPER FOREST COVER



Map Produced by the Virginia Department of Forestry, 2003

ENDANGERED SPECIES

The Virginia Natural Heritage Program was established in 1986 and in 1988 became an organizational component of the Virginia Department of Conservation and Recreation in the Division of Natural Heritage. Natural Heritage Resources (NHRs) are defined by the Virginia Natural Area Preserves Act as "the habitat of rare, threatened, or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest". The Virginia Department of Game and Inland Fisheries and the Virginia Department of Agriculture maintain the lists for these species.

Based upon the current listing of the Virginia Department of Game and Inland Fisheries there is only one species in Culpeper County on the Federal and State “threatened” list: the American Bald Eagle. The State “threatened” list also includes the Loggerhead Shrike and the Upland Sandpiper, but these have not been identified in Culpeper County. The ‘threatened’ category has a legal status and federal protective policies apply. A species carrying the ‘special concern’ designation does not have legal status but habitats are to be protected to the extent practicable. Currently, the species of special concern status known or likely to occur in Culpeper County are:

- **Caspian Tern**
- **Common Moorhen**
- **Red-breasted Nuthatch**
- **Brown Creeper**
- **Winter Wren**
- **Northern Harrier**
- **Great Egret**
- **Barn Owl**
- **Hermit Thrush**
- **Golden Crowned Kinglet**
- **Magnolia Warbler**
- **Purple Finch**
- **Dickcissel**
- **Northern River Otter**

Barn Owl *Photo by Jerry Liguori*

Special attention should be taken to facilitate the protection of endangered species whenever reasonably possible.

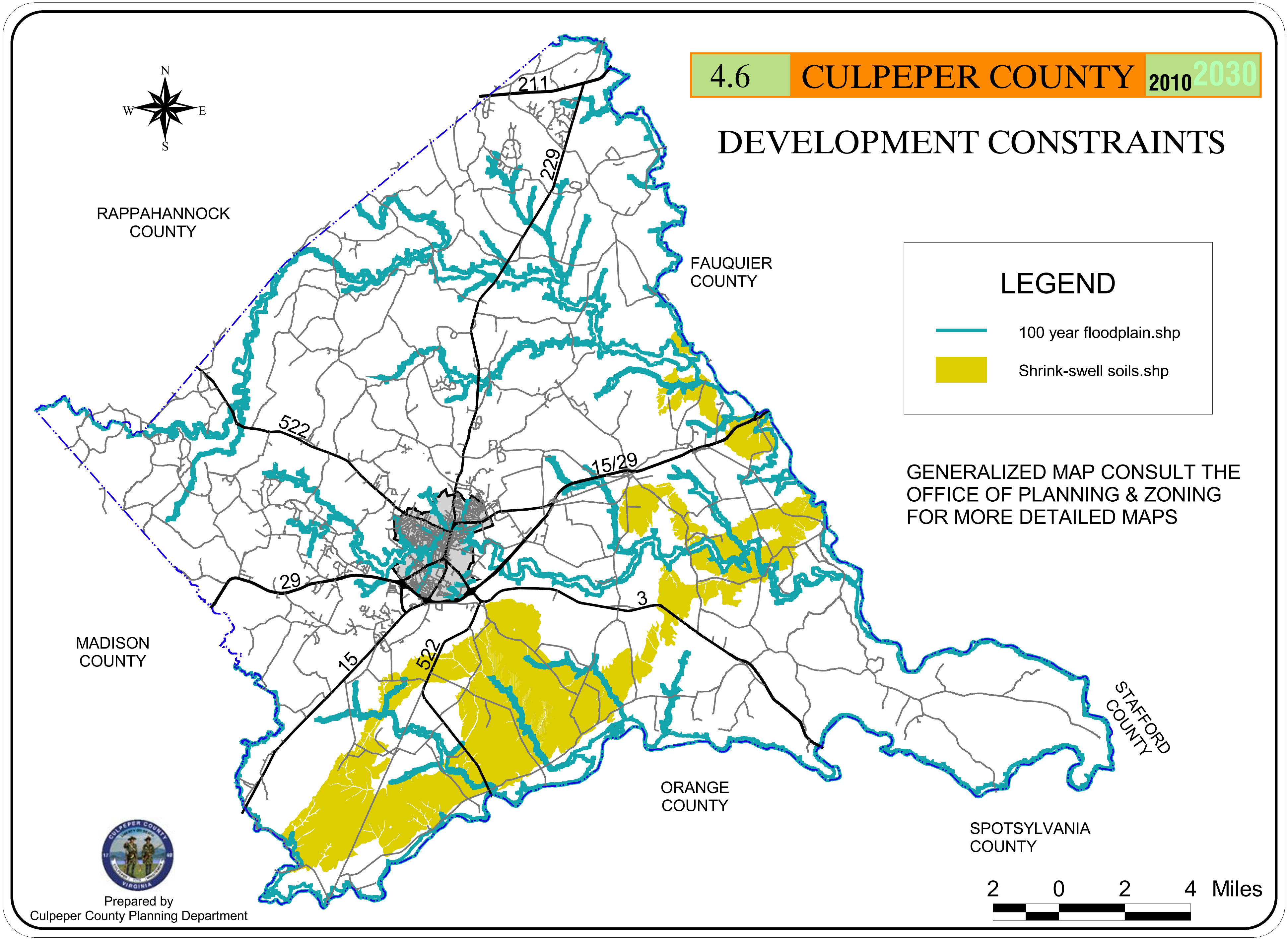
LAND CAPACITY / DEVELOPMENT CONSTRAINTS

The Development Constraints Map (Map 4.6) identifies both areas that are restricted from building and those with building limitations. This is a generalized map that approximates those areas with development constraints. The map is not intended to be site specific or all-inclusive. Site-specific information should be provided for any development project that encounters areas with building restrictions.

The allowable activities in a floodplain area include agricultural uses, public and private recreational uses, accessory residential uses such as yards and gardens, and stormwater management facilities as long as the floodplain elevation is not altered as described in the floodplain ordinance.

Soil properties are measured in terms of depth to water table, ease with which water filters through, moisture retention capacity, stability with changes in temperature and moisture content, acidity (ph), corrosiveness and a variety of other criteria. The relative importance of each criterion varies with the contemplated use. Specifically, home sites are relied upon to provide both drinking water and to clean wastes. The areas designated as unsuitable for drain fields are those in areas where the soils have high shrink-swell potential or shallow depth to bedrock. In general, the soils with the greatest building limitations are found in the Triassic Basin.

Slope can be a limiting and restrictive development factor for buildings and grading. Disturbing moderately steep (15-20 %) and steep slopes (>20%) can increase erosion rates and change the hydrology of the landscape. Critical slope is typically defined as a slope gradient exceeding 15 percent where erosion rates increase and groundwater flows can seep to the surface. Practical engineering judgment should be used when developing on critical slope areas and conservative use of erosion control measures is encouraged.


4.6
CULPEPER COUNTY
2010 2030
DEVELOPMENT CONSTRAINTS
N
W
E
S
RAPPAHANNOCK COUNTY
FAUQUIER COUNTY
MADISON COUNTY
ORANGE COUNTY
SPOTSYLVANIA COUNTY
STAFFORD COUNTY
211
229
522
15/29
29
3
15
522
LEGEND
100 year floodplain.shp
Shrink-swell soils.shp
GENERALIZED MAP CONSULT THE OFFICE OF PLANNING & ZONING FOR MORE DETAILED MAPS
2 0 2 4 Miles
Prepared by
Culpeper County Planning Department

ALTERNATE ENERGY

Renewable energy sources like wind, solar, geothermal, hydrogen and biomass are expected to play an important role in our future. Wind is the Nation's fastest-growing sources of energy. Solar power is used to generate electricity with both thermal and photovoltaic technologies. Solar water heaters are used for water or space heating for residential, commercial, and industrial facilities. Geothermal energy is the heat from the Earth which can be used to create electricity with minimal environmental impact. Resources of geothermal energy range from shallow ground to hot water and hot rock found a few miles beneath the Earth's surface. Hydrogen is a clean energy carrier made from renewable energy resources (e.g. solar, wind, geothermal), nuclear energy, and fossil energy. The term 'biomass' means any plant derived organic matter available on a renewable basis, including dedicated energy crops and trees, agricultural food and feed crops, agricultural crop wastes and residues, wood wastes and residues, aquatic plants, animal wastes, municipal wastes, and other waste materials. Biomass is used to create fuel, electricity, and chemical resources. Examples of biofuels are ethanol and renewable diesel. Culpeper County supports the expansion and use of renewable energy sources where appropriate Countywide. As these energy sources become more common, it may be necessary to implement any appropriate regulations which address changing technologies. For example, wind power can generate noise, aesthetic and other concerns that may need to be addressed.

WATERSHED PROTECTION: GENERAL

Chesapeake Bay Act

With the advent of the Chesapeake Bay Preservation Act (the Bay Act), enacted in 1988 by the State legislature, a program of watershed management was initiated designed to restore the once pristine water quality afforded by the Chesapeake Bay. Stringent guidelines and enforcement measures were set in place to manage tributaries leading to the Bay. These measures impact private citizenry, private industry and public policy with the goal of improving the ecology of the Bay.

The implementation of measures taken from the Bay Act may be advisable to improve water quality over time.

Stormwater Management Ordinance and Low Impact Development

In July 2006 the Culpeper County Planning Department was awarded grant funding from the Department of Conservation and Recreation Water Quality Improvement Fund. This allowed the planning staff to hire consultants to write a countywide Stormwater Management Ordinance. Along with the consultant, a steering committee was created whose members included a local planner, an engineer, Soil and Water Conservation District staff, county staff, and Department of Conservation and Recreation staff. The steering committee met on several occasions and reviewed the draft ordinance. The ordinance was adopted by the Board of Supervisors June 3, 2008

The purpose of the ordinance is to mitigate the effects of the ever increasing impermeable surfaces which have resulted from the recent increase in development. Impermeable surfaces increase water runoff rates and can accelerate erosion of the soil. The ordinance requires that post-development runoff rates do not exceed pre-development runoff rates for any site disturbing more than one acre.

The Culpeper County Stormwater Management Ordinance requires that Stormwater Management Concept Plans use low-impact development site planning to the maximum extent practicable. Low Impact Development (LID) is an approach to site design and stormwater that seeks to maintain the site's predevelopment rates and volumes of runoff. LID accomplishes this through the minimization of impervious cover, strategic placement of buildings, pavement and landscaping, and the use of small-scale distributed management features collectively called "Integrated Management Practices".

A full LID design must be considered in every case. The feasibility of LID design will vary based on factors such as soils, topography, downstream drainage, proposed land use, cost, and others.

LAKE PELHAM AND MOUNTAIN RUN LAKE WATERSHEDS

On March 3, 1992, the Culpeper County Board of Supervisors adopted Article 8C *Watershed Management District* *(WMD)*, into the Culpeper County Zoning Ordinance. The WMD is an overlay zone specific to the Mountain Run Lake - Lake Pelham Watershed. The Ordinance seeks to implement the policies that follow. The maximum densities allowable, as well as other aspects of the ordinance, differ slightly from the policies listed below. As with all of the guidelines set forth in this Comprehensive Plan, these policies are general in nature, and implementation must be undertaken with many considerations in mind, and at the discretion of the Board of Supervisors.

General Policy

1. The County seeks to outline a set of general policies (goals) and specific implementing policies (or objectives) which will achieve the protection of the public health and safety and the prevention of water quality deterioration in the Lake Pelham watershed.

2. Any strategy to improve water quality will seek to keep costs of land use conservation and water quality enhancement below the cost of the benefits achieved for public health and safety. In considering benefits, the County will fully consider the costs to the public health from damage to the water supply and where necessary attempt to quantify the same.

3. In determining whether the water quality of the water supply is being maintained, the County will examine the following water quality parameters: (1) the amount of nitrogen, phosphorous, solids, and the effect on dissolved oxygen; (2) the amount and concentration of the following metals and toxics: arsenic, cadmium, chromium, lead, mercury and zinc; (3) fecal coli form concentrations; (4) temperature; (5) tree cover distribution.

Specific or Implementation Policies

1. Because non-residential uses, particularly commercial and industrial uses, involve considerable threats of toxin and metal pollution, both from their own wastes and from heavy auto travel associated with the uses, non-residential development, other than what already exists or is planned should be limited. Non-residential uses, other than parks, schools, churches and other community facilities, and those public facilities that must locate in the Lake Pelham Watershed in order to serve development that has or is likely to locate there, shall be required to provide storm water management facilities and utilize Best Management Practices (BMPs), which insure water quality will not be degraded.

2. The average overall density for residential development in any sub-area as set out in the LPW Management District shall not exceed the density for the full area unless adjustments are made to another sub-area which would result in the same or lesser overall impact being achieved.

3. Cluster styles of development, such as cluster subdivisions, planned residential developments, architecturally integrated developments, and planned unit developments, offer the opportunity, although not the certainty, that the development will pose the least adverse impact on the water supply. Clustering provides an opportunity to improve the use of open space for filtering and to avoid highly erodible soils or steep slopes or other areas where impacts could be difficult to control. The County acknowledges that cluster styles of development that are designed to protect the water supply are the preferred method of development in the LPW.

4. The County will require that developments using clustering demonstrate that densities are actually increasing as they move further from the lakes and primary creeks and streams, or that the developments have been specifically designed to maximize the effectiveness of local wet ponds.

5. Natural vegetated buffer areas are encouraged along intermittent streams and around stormwater ponds in order to allow soils an opportunity to filter out particles before they reach the water supply. Natural filtration is a proven way to reduce pollution in the water supply.

6. In order to protect the water supply the County will require that a natural vegetated buffer areas of at least 200 feet be provided along Lake Pelham and Mountain Run Lake, at least 100 feet shall be provided along primary creeks and streams leading into those Lakes, and at least 50 feet shall be provided along tributaries to the lakes and to those creeks and streams. Adequate mechanisms are needed in development proposals to insure that these areas remain and be maintained in a natural state.

7. At the heart of the watershed protection plan is a reliance on Low Impact Development and other Best Management Practices intended to engineer at the site and regional levels a system that will protect the water supply. The amount of runoff in the Lake Pelham Watershed is directly related to the amount of impervious surface. The quality of that runoff is directly related to the land use and intensity. The County will modify development standards to require that developments utilize Low Impact Development and other Best Management Practices. Grading is limited during development to only that which is necessary to put roads, utilities, driveways, parking areas, principal structures, necessary accessory structures and a reasonable amount of activity space in place.

8. The Lake Pelham Watershed is susceptible to pollution from failed drain fields or highly concentrated pollutant loadings, especially in areas directly abutting Lake Pelham, or within direct storm water access. Because the principal problem anticipated in the Lake Pelham watershed is nitrification, development of public sewer is encouraged. In order to avoid future lake degradation, policies shall be implemented which properly restrict septic systems in the Lake Pelham area. The County shall discourage those developments in the Lake Pelham area which cannot be served by Town water and sewer, or wait for the availability of those services. Alternative methods of sewage are strongly discouraged within the Lake Pelham Watershed.

9. The County requires Erosion and Sediment Control Plans for land disturbing activities of greater than 5,000 sq. ft. in the WMD.

ENVIRONMENTALLY SUSTAINABLE BUILDING

LEED Design

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is the nationally accepted benchmark for the design, construction, and operation of high performance low impact commercial and institutional buildings. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health; sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

Culpeper County seeks to encourage LEED certification. Consideration should be given to providing incentives for development which attains such certification. Additionally, County projects should endeavor to obtain LEED certifications where economically feasible.

The Allied Concrete showroom was one of the first sites in Culpeper County to qualify for LEED certification

Green Building Code

The National Green Building Standard, known as ICC-700, was approved Jan. 29, 2009 as an American National Standard. The new Standard provides guidance for safe and sustainable building practices for residential construction, including both new and renovated single-family to high-rise residential buildings. This is the only "green" standard that is coordinated with the Code Council's family of I-Codes and standards.

The International Code Council and the National Association of Home Builders developed the Standard with input from diverse stakeholders ranging from code officials and other building professionals to the entire spectrum of the "green" building community. This new standard and other programs like it provide a practical route and clear guidance towards greener residential construction. The standard also promotes homeowner education for the maintenance and operation of residential buildings in order to ensure long-term health, financial, and environmental benefits.

The Culpeper County Building Department will continue internal training with this new code section and support the use of “green” technology within the community.

BUY LOCAL AND FARMERS MARKET

Locally marketed food doesn't have to travel far. This reduces carbon dioxide emissions and packing materials. Buying local food also helps to make farming more profitable and selling farmland for development less attractive. This ensures that family farms in the community will continue to thrive and that healthy, flavorful, plentiful food will be more available for future generations. Culpeper County strongly encourages the local food movement.

MINERAL RESOURCES

Purpose

It is important to know where mining occurred in the past, where mining is suitable in the present, and where potential mining sites may be in the future. Future mineral resource expansion can add to the tax base, provide jobs and may offer post-mining recreation sites. By recognizing the mineral resources available for Culpeper County, it becomes easier to plan for those resources that are important to the community. The most suitable areas for mineral resource mining are usually unsuitable for drainfields and agricultural uses. Specific quarry site selection requires detailed investigations, including evaluation of terrain, accessibility, rock quality, zoning and land-use ordinances, and environmental impacts.

History

Culpeper County is located within the Northern Piedmont and Blue Ridge Major Land Resource Areas (Land Resource Regions and Major Land Resource Areas of the United States, USDA, NRCS, 1981) and is underlain by igneous, sedimentary, and metamorphic rocks (see Map 4.8, Geology). These areas are bordered by the North Appalachian Ridge Valley to the west and the North Coastal Plain to the east.

The Triassic-Jurassic Basin, also known as the Culpeper Basin, is the dominant feature of Culpeper County’s geology and stretches from the mid-eastern portion of the County diagonally to the southern tip (see Map 4.9). The rocks in this basin are Triassic-Jurassic red and brown shales, siltstones, and sandstones intruded by diabase. The types of rocks within this region include sandstone, siltstone, shale, hornfels, diabase, basalt, limited coal seams in some areas, and conglomerate. Groundwater quality in this basin is generally lower because of hardness, acidity, salinity, and iron.

Culpeper County has a varied history of mining efforts. In the mid to late 1800s, copper was found near Slaughter’s mountain. The Virginia Department of Mines, Minerals and Energy has identified three mines that contain small deposits of copper: the Batna Mine, Culpeper Prospect, and Ellis Mine. Copper mineralization associated with Triassic rocks near Culpeper and Batna have been prospected but no commercial production has been established.

Gold was first found in Culpeper County around 1828. The gold deposits that were found, and may still exist today, are located in a 150 mile long by a 10 to 15 mile wide strip which runs from Montgomery County, Maryland to Appomattox County, Virginia (see Diagram 4.2). This linear region contains scattered occurrences of pyrite and gold. Gold ore was mined and milled at several sites in the vicinity of Richardsville in the eastern part of the County. Known gold deposits tend to be relatively low grade with low concentrations of fine flakes. In addition, soapstone has been found near Richardsville.

In the past, diabase, basalt, granitic rocks, sandstone, hornfels, and conglomerate have been quarried as sources of crushed stone. Limestone was quarried near Jennings Store for use as agricultural stone, and limestone from other parts of the County has also been burned to produce lime. Slate has been quarried and other types of rock have been used for local construction purposes. Clay materials were formerly produced for use in brick plants at Culpeper and Elkwood, and for use in the manufacture of brick and tile at Stevensburg. Sand obtained in the Hazel River area has been used for paving, masonry, concrete, and ice control. Sand and gravel deposits suitable for construction are present along the Robinson, Rappahannock, and Rapidan Rivers.

DIAGRAM 4.2 VIRGINIA GEOLOGY

Valley and Ridge

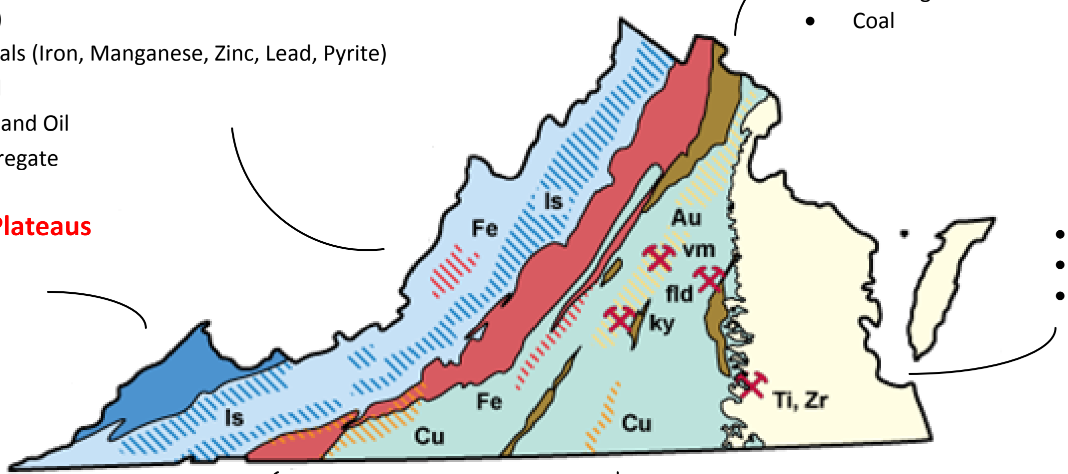
- High-Calcium Limestone
- Industrial Minerals (Barite, Silica, Gypsum, Salt)
- Metals (Iron, Manganese, Zinc, Lead, Pyrite)
- Coal
- Gas and Oil
- Aggregate

Mesozoic Basins

- Aggregate
- Building Stone
- Coal

Appalachian Plateaus

- Coal
- Gas and Oil
- Aggregate



Coastal Plain

- Sand and Gravel
- Marl
- Titanium

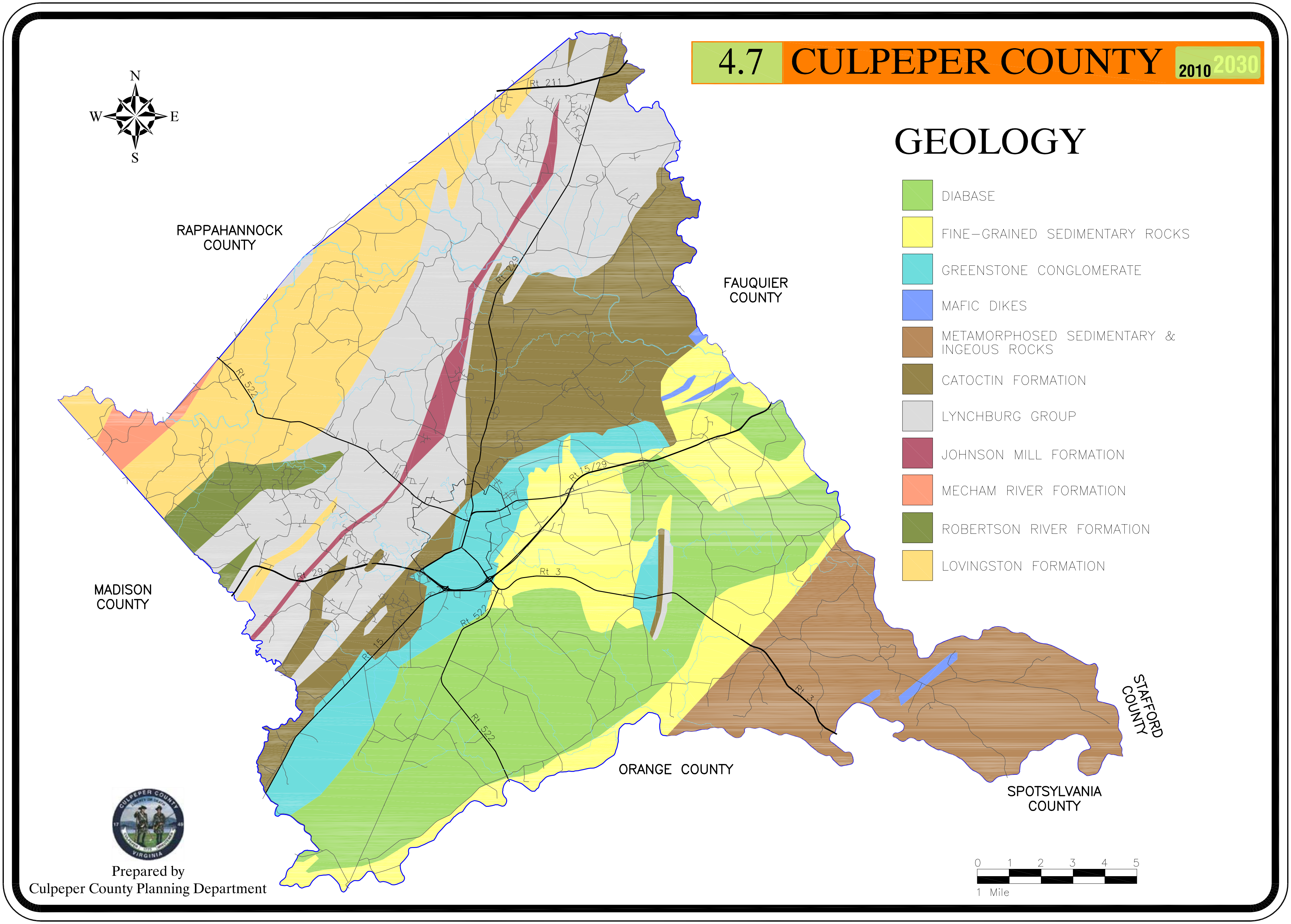
Blue Ridge

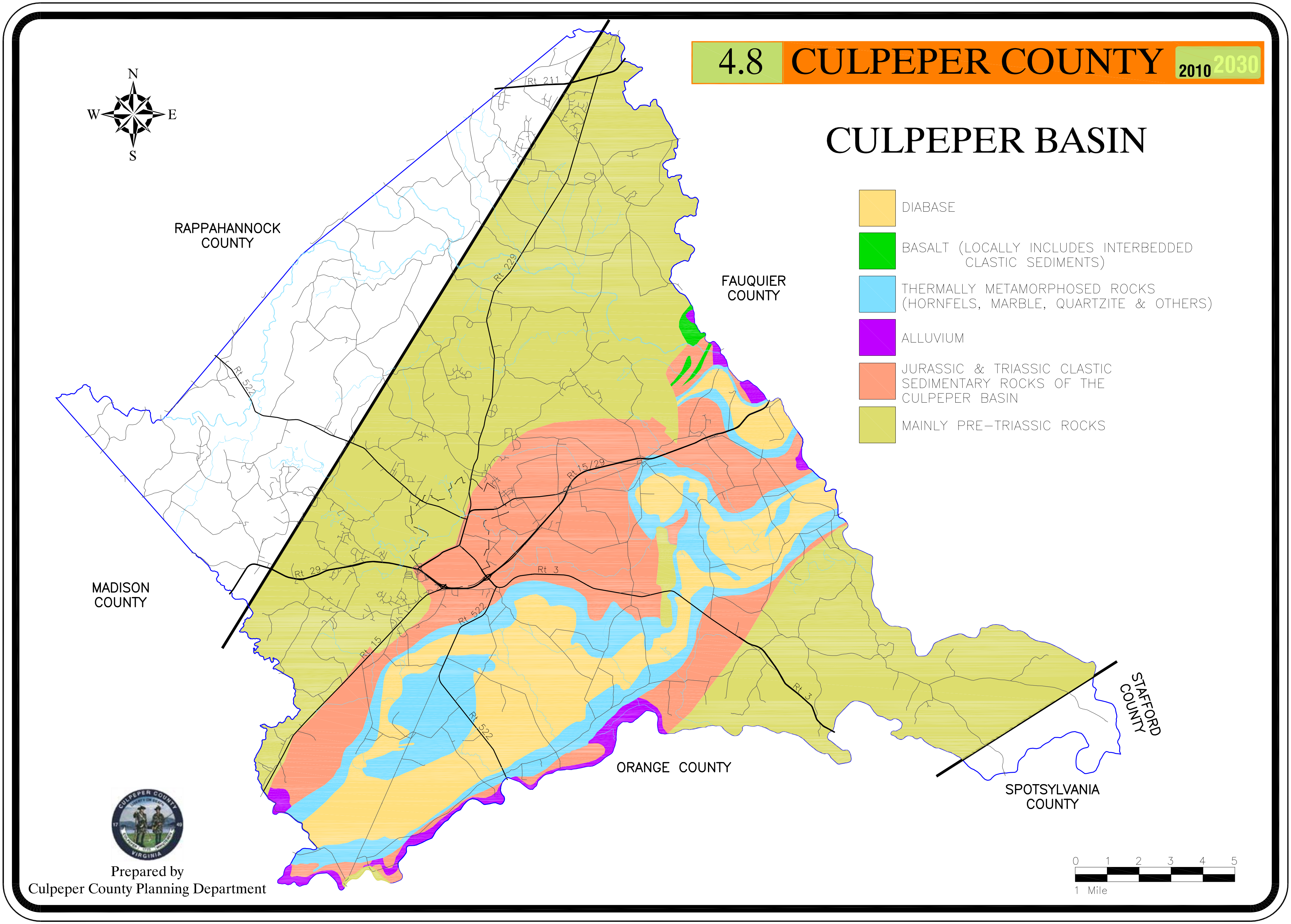
- Industrial Minerals (Feldspar, Phosphate, Kaolin)
- Metals (Iron, Manganese, Copper, Titanium)
- Building Stone (Soapstone) Aggregate

Piedmont Belts

- Industrial Minerals (Feldspar, Mica, Kyanite, Vermiculite, Banite)
- Metals (Iron, Manganese, Copper, Gold, Pyrite, Tungsten)
- Building Stone (Granite, Slate, Marble)
- Aggregate

Virginia Department of Mines Minerals and Energy


4.7
CULPEPER COUNTY
2010 2030
GEOLOGY
DIABASE
FINE-GRAINED SEDIMENTARY ROCKS
GREENSTONE CONGLOMERATE
MAFIC DIKES
METAMORPHOSED SEDIMENTARY & INGEOUS ROCKS
CATOCTIN FORMATION
LYNCHBURG GROUP
JOHNSON MILL FORMATION
MECHAM RIVER FORMATION
ROBERTSON RIVER FORMATION
LOVINGSTON FORMATION
N
S
E
W
RAPPAHANNOCK COUNTY
FAUQUIER COUNTY
MADISON COUNTY
ORANGE COUNTY
STAFFORD COUNTY
SPOTSYLVANIA COUNTY
Rt 211
Rt 229
Rt 522
Rt 29
Rt 15/29
Rt 3
Rt 15
0 1 2 3 4 5
1 Mile
Prepared by
Culpeper County Planning Department


4.8
CULPEPER COUNTY
2010 2030
CULPEPER BASIN
DIABASE
BASALT (LOCALLY INCLUDES INTERBEDDED CLASTIC SEDIMENTS)
THERMALLY METAMORPHOSED ROCKS (HORNFELS, MARBLE, QUARTZITE & OTHERS)
ALLUVIUM
JURASSIC & TRIASSIC CLASTIC SEDIMENTARY ROCKS OF THE CULPEPER BASIN
MAINLY PRE–TRIASSIC ROCKS
N
W
E
S
RAPPAHANNOCK COUNTY
FAUQUIER COUNTY
MADISON COUNTY
ORANGE COUNTY
STAFFORD COUNTY
SPOTSYLVANIA COUNTY
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Rt 29
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Rt 3
Rt 15
Rt 522
Rt 522
Rt 3
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1 Mile
Prepared by
Culpeper County Planning Department

TABLE 4.5 CULPEPER GEOLOGY

GEOLOGIC AGE	ROCK UNITS	DRILLED WELL DATA
JURASSIC	**DIABASE:** Dikes, sills, and thermally-metamorphosed sedimentary rocks which exhibit characteristics similar to diabase and basalt lava flows	43 Wells; Mean Depth = 480' Mode Depth = 450' Mean Static Level = 40' Mean Yield = 3.7 GPM
TRIASSIC	**FINE-GRAINED SEDIMENTARY ROCKS:** Sandstone, Siltstone, Shale and Argillite	77 Wells; Mean Depth = 205' Mode Depth = 180' Mean Static Level = 18' Mean Yield = 16 GPM
TRIASSIC	**GREENSTONE CONGLOMERATE**	66 Wells; Mean Depth = 160' Mode Depth = 150' Mean Static Level = 15' Mean Yield = 40 GPM
LATE PRECAMBRIAN -PALEOZOIC	**MAFIC DIKES:** Metabasalt, Metagabbro, and Meta-Pyroxenite	4 Wells; Mean Depth = 318' Mode Depth = None Mean Static Level = 20' Mean Yield = 28 GPM (1@60)
LATE PRECAMBRIAN -PALEOZOIC	**METAMORPHOSED SEDIMENTARY AND IGNEOUS ROCKS:** Phyllite, Schist, and Gneiss, and Columbia Granite and Quartz DiorIte	78 Wells; Mean Depth = 415' Mean Depth = 390' Mean Static Level = 30' Mean Yield = 4.2 GPM
LATE PROTEROZOIC	**CANDLER FORMATION:** Phyllites, Minor Micaceaus Sandstones and stones, marble, limestone at top of unit	
LATE PROTEROZOIC	**CATOCTIN FORMATION:** Massive Metabasalts and Flow Breccia, Interbedded Arkosic and Graywacke Quartzites	314 Wells; Mean Depth = 465' Mode Depth = 480' Mean Static Level = 20' Mean Yield = 3.6 GPM
LATE PROTEROZOIC	**LYNCHBURG GROUP:** Charlottesville Formation, Fine-Grained Meta-Siltstones and Meta-Arkose; Rockfish Formation, Meta-Graywacke and Meta-Graywacke Conglomerates; Monumental Mills Formation, Meta-Siltstone and Meta-Graywacke; Fauquier Formation, Meta-Arkose and Meta-Arkose Conglomerates	691 Wells; Mean Depth = 265' Mode Depth = 300' (37 Wells) Mean Static Level = 26' Mean Yield = 7.3 GPM
	JOHNSON MILL FORMATION: Carbon-Rich Phyllites and Graphitic Schists. (Well Quality = Poor, Often very high in Iron and Sulpher; Low PH)	104 Wells; Mean Depth = 280' Mode Depth = 230' Mean Static Level = 20' Mean Yield = 5.6 GPM
	MECHUMS RIVER FORMATION: Metamorphosed Sandstones, Arkoses, Schists and Phyllites	6 Wells; Mean Depth = 320' Mode Depth = NONE Mean Static Level = 25' Mean Yield = 6 GPM
MIDDLE PROTEROZOIC	**ROBERTSON RIVER FORMATION:** Granites, Syenites and Sub-Volcanic Felsites	61 Wells; Mean Depth = 327' Mode Depth = 410' (7 WELLS) Mean Static Level = 20' Mean Yield = 6.3 GPM
MIDDLE PROTEROZOIC	**LOVINGSTON COMPLEX:** Flint Hill Gneiss, Amissville Granite and Augen Gneiss	218 Wells; Mean Depth = 362' Mode Depth = 390' Mean Static Level = 37' Mean Yield = 11.3 GPM

Current Activity

The mining industry in Culpeper County presently includes operations that are conducted at six locations under mineral mining permits issued by the Virginia Department of Mines, Minerals and Energy, Division of Mineral Mining. These mines produce crushed stone for roadstone and concrete aggregate, and dimension stone for monuments and other architectural applications. The total area permitted is about 1,453 acres. During 2008, the latest year for which production data is available, two mining operations produced about 1.2 million short tons of crushed stone from sandstone and diabase. Three other operations reported about 15,670 short tons of diabase marketed as dimension stone. The total estimated value of all stone produced in 2008 was over $14,400,000 million dollars. The total tonnage reported in 2008 was about 27 percent lower than the tonnage reported in 2007, likely a reflection of the decreased demand for construction raw materials in the current economy. The mines employed a total of 94 workers in 2008, an increase from 83 reported in 2007, not including independent contractors.

At the Rapidan Quarry, located in southern Culpeper County just north of Buena, Cedar Mountain Stone Corporation mines Jurassic-age diabase and produces crushed stone products. This mine is the largest operation in the county with respect to production tonnage and employment.

Table 4.6

MINERAL RESOURCES & ANNUAL PRODUCTION 2004-2008

	Luck Stone	New England Stone	Buena Black Granite	Cedar Mountain Stone	Rockwell Granite	Virginia Black Granite	Granite Managers	Mineral Value (thousands)
Mine Name	Culpeper Plant	Jet Mist	Aston Quarry	Rapidan Quarry	Virginia Black Granite	Virginia Balck Granite	Virginia Mist Quarry	
Commodity	Sandstone Quarry	Diabase/ Dim St Quarry	Diabase/ Dim St Quarry	Diabase/ Cr St Open Pit	Diabase/ Dim St Quarry	Diabase/ Dim St Quarry	Diabase/ Dim St Quarry	
2004 Tonnage (short tons)	900,950	4,477	5,124	1,076,350	1,283	0	2,036	$14,544
2005 Tonnage (short tons)	903,371	4,767	3,805	1,412,145	0	-	3,531	$20,146
2006 Tonnage (short tons)	718,711	4,580	4,373	1,421,201	0	-	1,584	$22,191
2007 Tonnage (short tons)	396,772	6,633	1,962	1,253,115	0	-	0	$17,484
2008 Tonnage (short tons)	205,174	8,855	6,014	987,973	0	-	801	$14,427

THE CULPEPER BASIN

The Culpeper Basin is a structural trough filled with sedimentary, metamorphic, and igneous rocks of Mesozoic age that border the eastern front of the Blue Ridge in northern Virginia. The basin extends 1,062 square miles from the Rapidan River near Madison Mills, Virginia, northeastward across the Potomac River and terminates just west of Frederick, Maryland.

The rock and mineral resources of the Culpeper basin are presently used for construction material, highway fill and building stone. The principal quarries, pits, mines, and prospects are shown on Map 4.11. Diabase is quarried for crushed aggregate and dimension stone, basalt is quarried for aggregate and crushed stone, and shale is extracted as a source of clay for brick manufacture. Future construction may require adequate quantities of crushed stone, brick clay, and aggregate at or near the surface and close to the area of use. Large reserves of some industrial materials are present, but new pits or quarries may be needed to fulfill the requirements economically before future construction commences. Inactive mineral producers include granite quarries, limestone quarries, and gneiss quarries.

RESOURCES

Gneiss material is a foliated metamorphic rock that corresponds in composition to granite or feldspathic plutonic (igneus) rock**.** This type of rock is found primarily in the northwestern to southwestern region of the County. There exists a small amount in the eastern region of the County. Crushed stone, road material, rip-rap, and dimension stone are the types of rock processed in this region of the County.

Diabase is a fine to medium textured, dark igneous rock suitable for crushed stone that underlies large areas of the Culpeper Basin at shallow depths. This material produces aggregate of excellent quality because of its toughness, uniform texture, and resistance to chemical weathering. This rock is readily quarried because of the ability for splitting and removal facilitated by an intersecting network of closely to moderately spaced joints. Crushed diabase is used primarily as binder/filler for asphalt paving, base course for highways, road material, rip-rap, and concrete aggregate. Diabase for dimension stone and ornamental stone is also quarried. This material includes dimension and monument stone (black granite), copper and iron containing ores found in fractures (chalcopyrite, magnetite, specularite, bornite, malachite), and some amethyst. Diabase is generally found diagonally in the eastern portion of the County, east of the Town of Culpeper and west of Lignum.

Thermally metamorphosed zones, or hornfels, form a belt of altered sedimentary rocks that surround diabase bodies in the Culpeper Basin. These include Triassic siltstone and shale, which have been produced locally as a source of fill and roadbed material, and also very small, scattered coal seams. The hornfels material is quarried for crushed stone, aggregate, rip-rap, dimension and monument stone, and brick and tile material. Engineering tests are required at potential quarry sites to ascertain whether these rocks have the required characteristics for their intended use.

Hornfels material also contains some metallic and nonmetallic ores, such as copper and iron ores, and barite. These ores are found in small quantities in fissure fillings along the perimeter of the diabase intrusions in the Culpeper Basin. Minor disseminated copper occurrences have been found near Batna. Copper ore has been mined near Brandy and Cedar Mountain.

Magnetite and specular hematite are commonly associated with copper minerals, as well as barite and pyrite. The most common type of occurrence is in or near thermally metamorphosed zones surrounding diabase where heat apparently converted disseminated hematite and limonite to specularite and magnetite. Iron, copper, lead, arsenic, and zinc containing ores occur along the Rapidan River. Gold may be included in some of the lead ores.

Triassic conglomerate material is used for road fill. This material is found in smaller quantities along the perimeter of the Culpeper Basin.

The Goldvein material extends into Culpeper County. This material is located in the eastern region of the County east of Richardsville along the Rappahannock River. The Goldvein pluton body includes gold, iron bearing ore, quartz monzonite for crushed stone, aggregate, and road fill.

Areas containing soils high in vermiculite and gibbsite are found along the eastern portion of the County, east of Lignum and in the vicinity of Richardsville. Some areas along the Rappahannock River contain blue quartz that is high in titanium. There is a small area that may contain marble in an outcropping that is north along the Metabasalt region.

Sand and gravel from floodplain soils are scattered throughout the County. Some of these materials were formerly extracted from pits in the northern part of the basin, but no pits have been active from 1980 to the present.

Opals from quarrying activities have been found along the Rapidan River near Rapidan. Placer gold from the Rapidan River has been found but exact locations are unknown.

Broad areas in the northwestern part of the Culpeper Basin are underlain by impure limestone conglomerate associated with red sandstone and siltstone. Limestone for agricultural lime is found near Jennings Store. The local material has not been used for many years because of its impurities, limited outcroppings, and the availability of quality sources elsewhere.

Commercial clay deposits are known and deposits of clay which have commercial potential are common in fresh and weathered shale in the Culpeper Basin. Red-brown shale and silty shale are dug from clay pits in which the strata are abundant in the Culpeper Basin. Clay analyses indicate that raw materials potentially suitable for the manufacture of common brick and terra cotta pipe and tile products are abundant. Light to dark gray slightly calcareous shale and silty shale are less common than red-brown shale. Preliminary firing tests by the U.S. Bureau of Mines of samples of gray clay indicate that these rock types are suitable for common brick and light weight aggregate. Material suitable for light weight aggregate is relatively rare.

Uranium

Culpeper County has a history of uranium prospects (see Map 4.9). In the late 1970's to early 1980's, a significant number of land leases were obtained; however, only a very limited amount of core drilling was actually done and no use permits for mining of uranium were ever granted. The conglomerate nature of the geology of the Triassic Basin would indicate the presence of uranium and other metals, but extraction did not prove to be economically viable.

In the 1980s, uranium leases were filed on thousands of acres of land in Virginia including Fauquier, Orange, Culpeper, and Madison Counties, stretching along the Piedmont to Pittsylvania in Southside Virginia.

At that time, the Commonwealth undertook an extensive study of uranium mining. When completed, the General Assembly and Governor decided to maintain a moratorium on uranium mining in Virginia.

During the 2008 Virginia General Assembly session, legislation (SB 525) was introduced on behalf of Virginia Uranium, Inc. to create a study of the safety of uranium mining in Virginia. The bill included a requirement for a determination of "whether it is feasible to mine and process uranium in Virginia, in a manner that fully protects public health, the environment, natural resources, including but not limited to surface waters, groundwater, air quality, fish and wildlife, agriculture and historic resources". The bill did not progress farther than the House Rules Committee (source: Piedmont Environmental Council). Culpeper County has taken no formal position on uranium mining in the County; however, the County believes that localities should retain the right to prohibit uranium mining at the local level.

What is economically viable

Future mineral needs must be forecast and analyzed in addition to identifying, inventorying, classifying, and ranking potential sites of adequate size. Sites with economic potential should be protected from preemptive less productive uses. Reclamation plans for sites of depleted resources should consider alternative land uses that take advantage of the topographic, hydrologic, and geologic characteristics of each site.

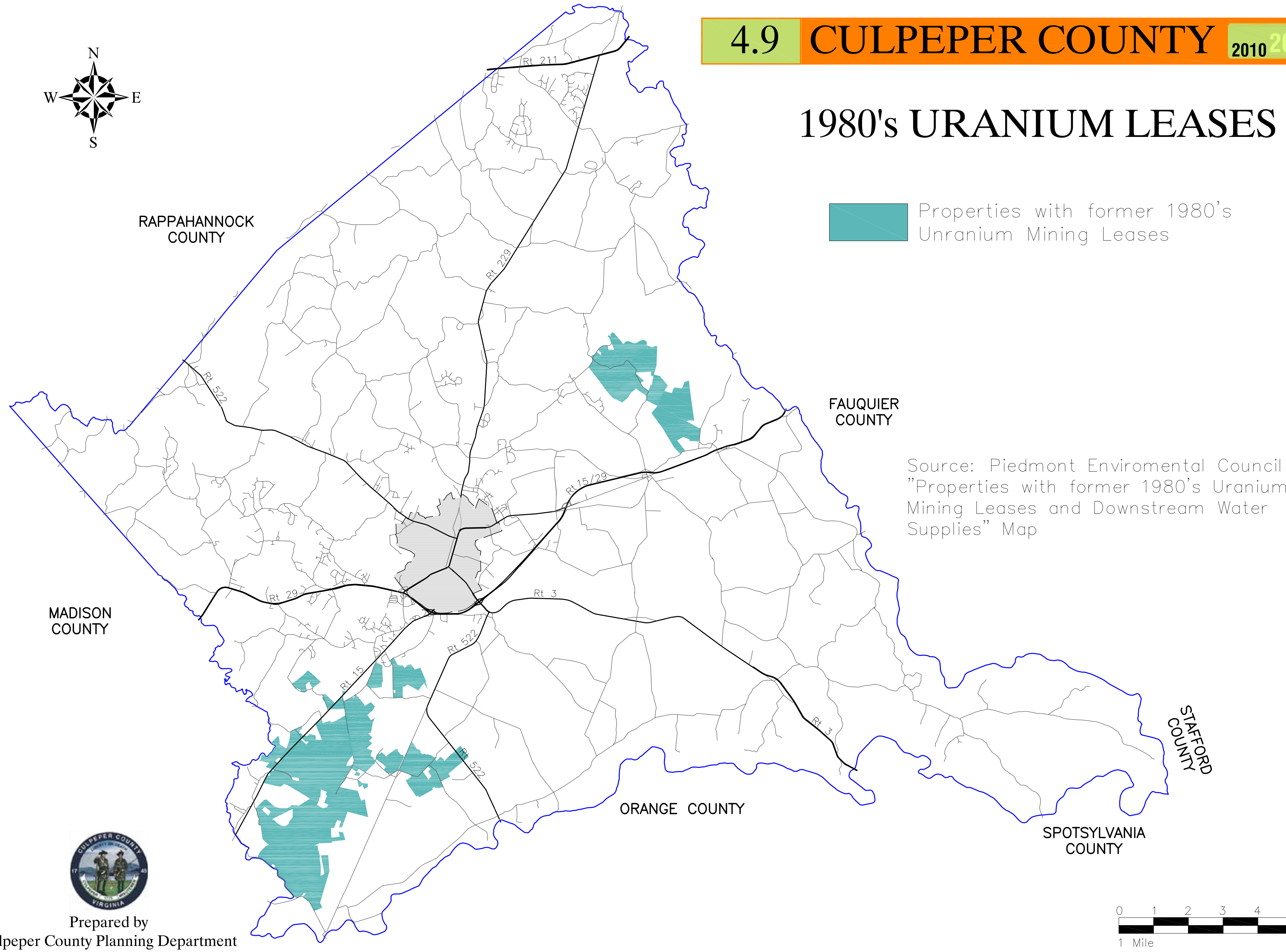
The Virginia Department of Mines, Minerals and Energy has located four clay deposits in the southeastern part of the County. These deposits may have an economic value for the production of building materials, common brick and tile. According to the Virginia Department of Mines, Minerals and Energy, in 2008, there were seven operating quarries in Culpeper County. The annual tonnage of granite and sandstone quarried from these operations in 2008 was 1,208,817 short tons.

The maps within this plan show the location of economically available rock and mineral resources. Informed decisions on expected future needs can be made now by local governments, industry, and regulatory agencies to insure that the identified resources will be available when needed. If urbanization expands into areas that are presently rural or undeveloped, potential mineral deposits may be preempted, unless such deposits are recognized and preserved in the land-use planning process. Extraction of rock or clay may be only a temporary stage in the efficient use of land. After extraction, the land may be used for agriculture, recreational areas, building sites, or solid waste disposal.

4.9 CULPEPER COUNTY 2010 2030

1980's URANIUM LEASES

Properties with former 1980's Unranium Mining Leases



Source: Piedmont Enviromental Council "Properties with former 1980's Uranium Mining Leases and Downstream Water Supplies" Map

Prepared by
Culpeper County Planning Department

CRITERIA FOR FUTURE QUARRY AND MINE LOCATIONS

Access

Transportation is an important aspect of identifying mineral resources potential. Access is extremely important to active mineral facilities. The weight and size of the vehicles transporting material demand adequate transportation routes. By siting these facilities along paved roadways with adequate widths, negative traffic impacts can be reduced. Where feasible, the use of railroad sidings should be encouraged. If truck traffic can be reduced through the practice of shipping freight via rail, this should be treated as a substantial benefit.

Compatible surrounding land use

The availability and location of mineral resources is important information for land-use planners, mining and quarrying industries, and the concerned public. Future availability and utilization of rock and mineral commodities depend on the decisions made by planners and other land-use decision makers. In planning for future extraction, the need to reserve adequate space for facilities, access roads, buffer zones, and corridors for high-load electrical lines should be considered. Effective protection of resources remote from urban areas often depend on land use planning efforts which occur before requests are received.

Mineral resource extraction should be compatible with surrounding land uses. Siting facilities in agricultural or rural areas in A-1 and RA zoning districts with very low residential densities is appropriate. Large tracts of land are necessary to provide buffers from the dust, noise, and vibration associated with this industry.

Focus on environmental issues

The decision to utilize an available resource relies upon many external factors, principally economic and environmental concerns. Proper planning and regulation in advance of extraction of resources can minimize and prevent environmental disruption. Plans to extract any type of resource must be weighed against the effects of extraction on scenic values, recreational uses, surface water quality of the rivers and creeks, agricultural operations and residential quality of life.

Mineral resources can be mined only where they are found, thus planning for their potential environmentally sound extraction is the responsibility of the local government. It has been noted by the former U.S. Bureau of Mines that the average American will use, in his/her lifetime:

1,600 kg (3,600 lb) of aluminum
360 kg (800 lb) of zinc
11,300 kg (25,000 lb) of clay
25,000 kg (56,000 lb) of steel
360 kg (800 lb) of lead
680 kg (1,500 lb) of copper
12,200 kg (27,000 lb) of salt
More than 226,000 kg (500,000 lb) of coal
More than 452,000 kg (1 million lb) of stone, sand, gravel, and cement.

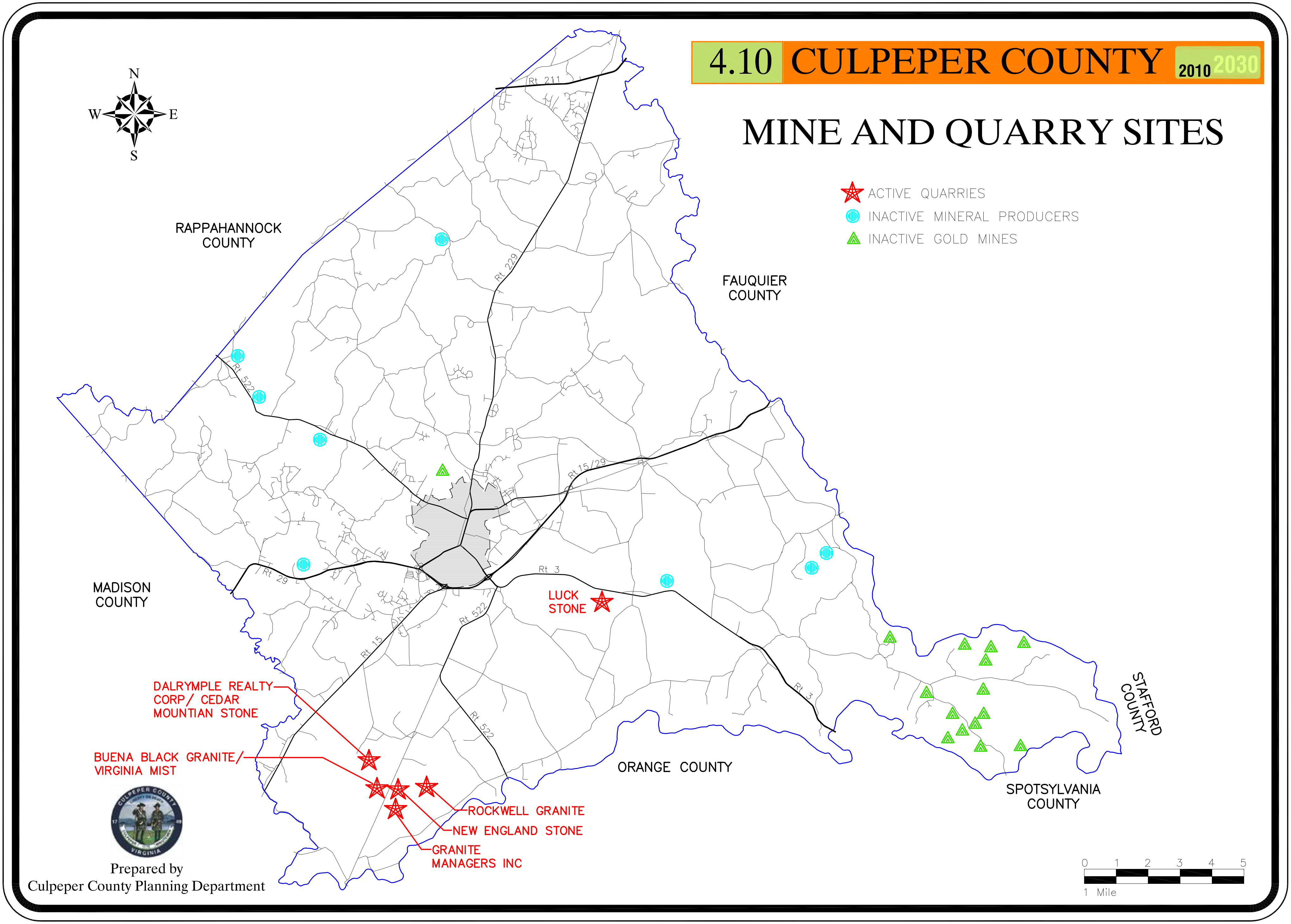
It is easy to see the amount of resources that will be required, but it is important to consider the environmental effects of mining. Mining for sand and gravel or quarrying for different types of stone often occurs near waterways. The Culpeper Basin's southern to southeastern boundary in Culpeper County occurs along the Rapidan River. Environmental degradation may occur if proper planning and design techniques are not utilized. As such, all use permit applications for mineral extraction should include documentation which insures environmental protection.

Case by case consideration via conditional use permit

Mining, excavation, quarrying, product drilling, and all associated activities of extractive and mining operations are conditionally permitted in the Agricultural (A-1) and the Rural Area, (RA) zoning districts. Consequently, any operation of this type must apply for a conditional use permit. All applications for conditional use permits will be considered on a case by case basis by the Planning Commission and the Board of Supervisors. This process will allow for site-specific studies with proper planning and siting of the facility. Appropriate conditions should be imposed and approval should be given only when it is shown that the surrounding areas will be compatible with this type of land use, and only when the criteria outlined here have been met.

Future Mineral Resource Extraction

Map 4.11-Future Mineral Resource Extraction is intended to recognize areas where mineral resources exist, where access is adequate, where residential population is low, and where the environment can be protected. In short, it is an indicator of those areas where the County's mining and quarrying site criteria can most likely be met. It should be utilized as a guideline with more thorough study through the use permitting process, which is required for any application for permission to begin a mineral extraction operation.

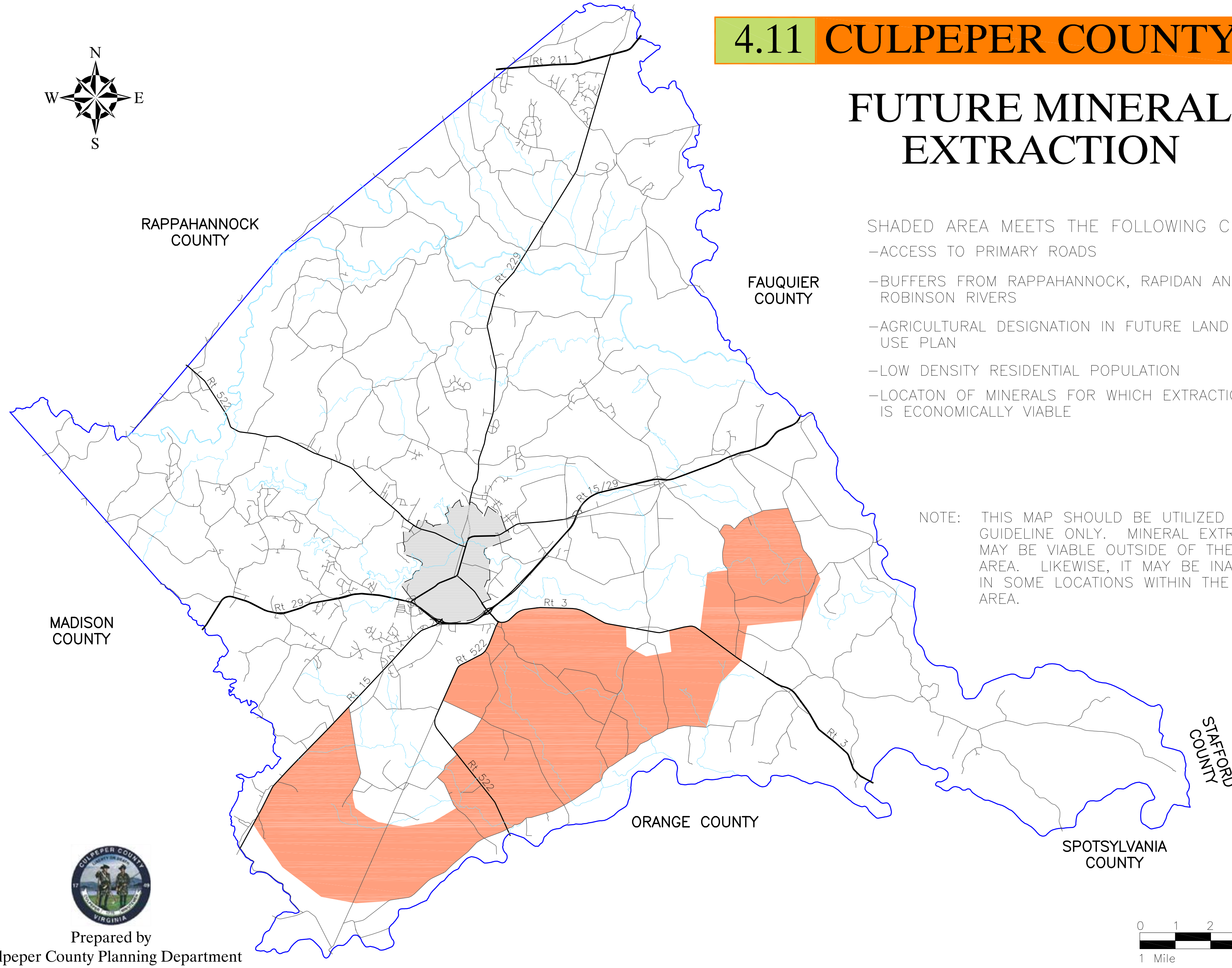

4.10 CULPEPER COUNTY 2010 2030
MINE AND QUARRY SITES
ACTIVE QUARRIES
INACTIVE MINERAL PRODUCERS
INACTIVE GOLD MINES
N
S
E
W
RAPPAHANNOCK COUNTY
FAUQUIER COUNTY
MADISON COUNTY
ORANGE COUNTY
SPOTSYLVANIA COUNTY
STAFFORD COUNTY
Rt 211
Rt 229
Rt 522
Rt 15/29
Rt 29
Rt 3
Rt 15
LUCK STONE
DALRYMPLE REALTY CORP/ CEDAR MOUNTIAN STONE
BUENA BLACK GRANITE/ VIRGINIA MIST
ROCKWELL GRANITE
NEW ENGLAND STONE
GRANITE MANAGERS INC
0 1 2 3 4 5
1 Mile
Prepared by
Culpeper County Planning Department

FUTURE MINERAL EXTRACTION

SHADED AREA MEETS THE FOLLOWING CRITERIA:

- ACCESS TO PRIMARY ROADS
- BUFFERS FROM RAPPAHANNOCK, RAPIDAN AND ROBINSON RIVERS
- AGRICULTURAL DESIGNATION IN FUTURE LAND USE PLAN
- LOW DENSITY RESIDENTIAL POPULATION
- LOCATON OF MINERALS FOR WHICH EXTRACTION IS ECONOMICALLY VIABLE

NOTE: THIS MAP SHOULD BE UTILIZED AS A GUIDELINE ONLY. MINERAL EXTRACTION MAY BE VIABLE OUTSIDE OF THE SHADED AREA. LIKEWISE, IT MAY BE INAPPROPRIATE IN SOME LOCATIONS WITHIN THE SHADED AREA.



0 1 2 3 4 5
1 Mile

Prepared by
Culpeper County Planning Department

GOALS AND OBJECTIVES

General

GOAL: PRESERVE AND IMPROVE THE QUALITY OF THE COUNTY'S SOIL, WATER, AIR, FORESTS AND FARMLAND.

GOAL: PROTECT ENVIRONMENTALLY SENSITIVE AREAS FROM DEVELOPMENT.

OBJECTIVES:

1. Require development to meet the highest standards in erosion and sediment control and storm water management.

2. Utilize groundwater studies to minimize excessive and inappropriate ground water withdrawals.

3. Require an impact assessment from any use that proposes to introduce hazardous wastes into the atmosphere, soil or water as a condition of review and approval.

4. Encourage preservation of forested lands and waterways that provide long-term environmental benefits to water quality, recreation, tourism, general aesthetics, and which reduces air and noise pollution.

5. Prohibit new construction in flood hazard areas.

6. Support and promote the preservation of significant wetlands as identified by Federal Government guidelines.

7. Identify prime farmland and promote public policies designed for its preservation and general conservation.

GOAL: MAINTAIN THE RURAL CHARACTER OF CULPEPER COUNTY.

OBJECTIVES:

1. Manage land-consumptive development through policies and development incentives which support rural characteristics.

2. Encourage residential and commercial development within the designated village centers where it can be economically and conveniently served by public facilities.

3. Encourage the effective maintenance of open space by restricting strip development and offering cluster alternatives in its place.

4. Encourage the design of subdivisions that provide adequate open space commensurate with the number and need of prospective residents and the County viewscapes.

5. Limit the extension of infrastructure improvements into agricultural and natural resource areas.

6. Ensure capital improvements are implemented in a manner which will enhance the quality and character of the rural nature of the County of Culpeper.

GOAL: PROTECT WATER RESOURCES AND WATER QUALITY FROM DETERIORATION FROM ALL SOURCES OF POLLUTION.

OBJECTIVES:

1. Provide technical assistance to farmers through the SWCD to reduce soil erosion on crop and pasture fields; implement the Virginia Agricultural Best Management Practices (BMP) Cost Share Program and take steps to better manage nutrient and pesticide applications.

2. Recommend to forest land owners, through the Virginia Extension Agent, that they develop a forest conservation plan which addresses timber stand improvements, utilization of damaged timber, sound harvesting techniques, pest control and reforestation practices.

3. Ensure that municipal waste is properly treated before being discharged. Limit or prohibit the use of individual septic systems in development areas and require wastewater pre-treatment and/or testing for businesses and industries.

4. Ensure informed decisions on rezoning applications, by requiring information concerning water quality, prime farm and forest land, urban and agricultural BMPs and storm water management.

5. Require both above ground and below ground storage tanks to have containment measures to prevent contamination of surface and groundwater due to leaks and spills.

GOAL: PROVIDE FOR A GREATER SUPPLY OF SUBSURFACE WATER FOR THE INDIVIDUAL RURAL USERS THAT ARE DEPENDENT UPON WELLS.

OBJECTIVES:

1. Inventory present water needs and supplies; locate water supply sources; and assess future needs and supplies.

2. Ensure that tests indicate clearly adequate groundwater resources as growth occurs in rural areas.

3. Encourage ground water testing and hydrogeologic studies.

4. Prevent local pollution of groundwater through the use of BMPs; the establishment of recycling programs for used oil; sponsoring household and farm hazardous waste cleanup days, and implementing public education programs.

5. Encourage the Virginia Department of Health (VDH) to assist owners of existing community and non-community wells to treat secondary contaminants such as iron and manganese.

GOAL: ENCOURAGE WATER SUPPLY PROTECTION AND FLOOD PREVENTION.

OBJECTIVES:

1. Consistent with federal and Virginia law, develop a public policy regarding water quality. This should include drinking water, effluent discharge, as well as underground water sources for agriculture, residential, commercial and industrial development.

2. Encourage the development of educational programs in the school systems to teach conservation, wise use of resources, and environmental awareness.