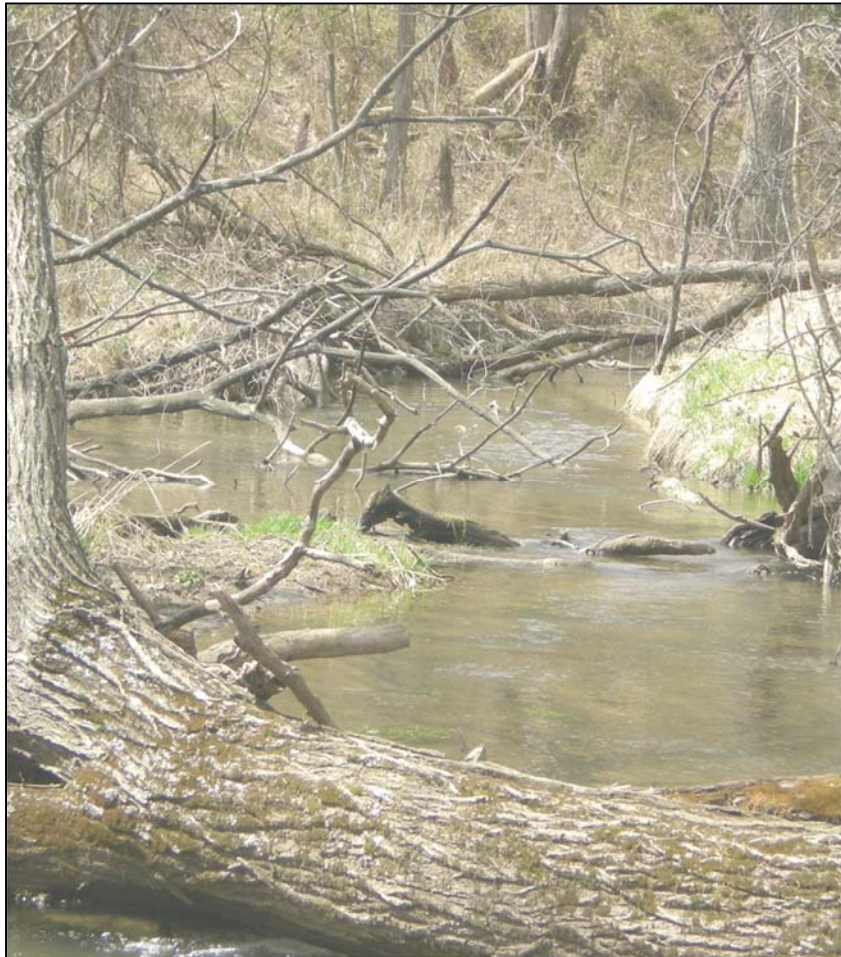


**VII. NATURAL RESOURCES**



## **NATURAL RESOURCES**

### **CURRENT CONDITIONS**

Frederick County's natural resources and geographic location has long influenced the County's history and settlement patterns. The last several decades has seen the Community mature with a significant amount of residential and business growth. The greatest potential impact on our natural environment is the increasing population in the County which results in alteration of the land use. Conversion of land in the rural areas results in reduced open space and fragmentation of farm and forest lands. It can also disrupt natural and wildlife systems that help purify our air, recharge our groundwater and protect our local streams. Likewise, the denser growth in the UDA results in increased impervious surfaces which can impact natural resources.

The priority natural resource issues for Frederick County that are the focus of this chapter are:

- Water Supply and Water Quality
- Sensitive Natural Areas
- Agricultural and Forestal Areas
- Stormwater Management
- Erosion and Sediment Control
- Green Infrastructure
- Habitat Fragmentation and Environmental Corridors
- Light and Noise Pollution

### **FOCUS FOR THE FUTURE**

The intent of this Chapter is to provide guidance that the future of the County's natural resources is viable and balanced, and able to meet the needs of the present community and that of future residents. As the County continues to grow and develop we should ensure that the natural beauty is preserved, air and water qualities are protected, property values and quality of life are enhanced, and ecological diversity is maintained.

### **COMMUNITY BENEFITS**

The preservation, maintenance and enhancement of the natural resources within Frederick County are important to the Community for many reasons. Principal are those which help support the economic wealth, health of citizens, and the vitality of the County. Others include the protection of the scenic quality residents and visitors enjoy, and that supports native habitat and wildlife and maintains biodiversity

Sound regulations on the part of the public and good practices on the part of the developer make for less costly public investment. New developments that protect the environment with

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## NATURAL RESOURCES

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quality systems present less cost to the County in the long term when maintenance may become a necessity. Recreational and aesthetic considerations are also part of our community resource management responsibilities.

One focus of this Plan is to ensure that applications for development address environmental issues at the earliest planning phase. Projects that include components of green infrastructure can help foster community cohesiveness by engaging residents in the planning process. This Chapter defines those areas of the County that are sensitive and need to be preserved.

### **WATER SUPPLY AND WATER QUALITY**

#### *WATER SUPPLY*

Water supply is critical to both the natural and built environment, and viable sources are essential for future economic development in the County. There are no major rivers flowing through the County. The majority of the County contains small springs, seeps and headwater streams that contribute to three watersheds: the Opequon, Back Creek, and Cedar Creek. The County is within the larger Potomac River watershed, and ultimately the Chesapeake Bay watershed. The average flows from these streams within the County are marginal, and only Cedar Creek has been considered as a supplemental source with the potential for withdrawals during peak flows. With the exception of water purchased from the City of Winchester, which comes from the North Fork of the Shenandoah River, the County is entirely dependent on groundwater sources.

The most productive aquifers in the County are the limestone/carbonate aquifers. Ninety percent of the recharge areas for groundwater in Frederick County are located in the limestone-carbonate topography or karst areas (see map). As development continues to occur in this region it is important to consider the impacts to both groundwater recharge and the pollution of groundwater from stormwater runoff. These are complex issues that also have a connection to surface water and will be referenced further in the water quality section. Groundwater studies in conjunction the United States Geological Survey (USGS) Virginia Water Science Center should continue, and participation in a regional water authority should be investigated to ensure adequate water supplies are available for the future.

### **GOALS/STRATEGIES**

**GOAL:**           **PROTECT GROUNDWATER SOURCES AND THE AREAS THAT CONTRIBUTE RECHARGE (OR RESUPPLY OF WATER) TO ENSURE THAT ADEQUATE WATER SUPPLIES ARE MAINTAINED, AND WORK TOWARD DEVELOPING INCREASED WATER SUPPLIES TO MEET FUTURE NEEDS.**

**STRATEGIES:**

- Regional water supplies should be investigated.

## NATURAL RESOURCES

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- Groundwater recharge areas should be identified and protected. Protecting recharge areas can be accomplished through both technology options and reduced land disturbance practices during building and construction activities.
- Water conservation and efficiency practices should be encouraged and practiced throughout the County.
- Development within the limestone/carbonate geology should be limited and optimally these areas should be placed in conservation easements or preserved through the Transfer or Purchase of Development Rights (TDR and PDR) programs.

### *WATER QUALITY*

Land use and development activities have the potential to impact the ecological quality of streams and water bodies through the direct transport of pathogens and pollutants. Hydrologic changes can alter the character of flow in streams, resulting in alterations to stream morphology, such as increasing stream bank erosion, increased high-flow events and more critically low flows during low-flow periods.

Unlike point source pollution, which comes from a defined permitted source like industrial and sewage treatment plants, nonpoint source pollution (NPS) comes from many different and diffuse sources. NPS occurs when runoff from rainfall and snowmelt cause erosion and wash various pollutants from the land into our local waterways and potentially into our local waterways. In addition, these pollutants can also enter the groundwater via karst recharge, without the benefit of any natural filtration or dilution. This is a significant issue, as most of the surface streams and rivers in the region are dependent on groundwater recharge for their base flow, rather than surface runoff. Many of the streams/creeks in Frederick County are on the State's impaired waterways list, and warrant future efforts to improve water quality. Volunteer efforts are underway to correct such situations.

On-site sewage disposal systems are a potential source of water pollution when not properly maintained. These systems are regulated by the Virginia Health Department and by the Virginia Department of Environmental Quality. Package treatment plant sewer systems designed to serve particular developments should only be allowed in areas planned for more intensive residential development, such as in the Rural Community Centers. Where such systems are allowed, they should be dedicated to a public authority or sanitary district to insure that the facilities are properly operated.

### **GOALS/STRATEGIES**

**GOAL: PROTECT GROUND AND SURFACE WATER QUALITY.**

**STRATEGIES:**



## NATURAL RESOURCES

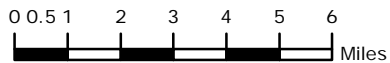
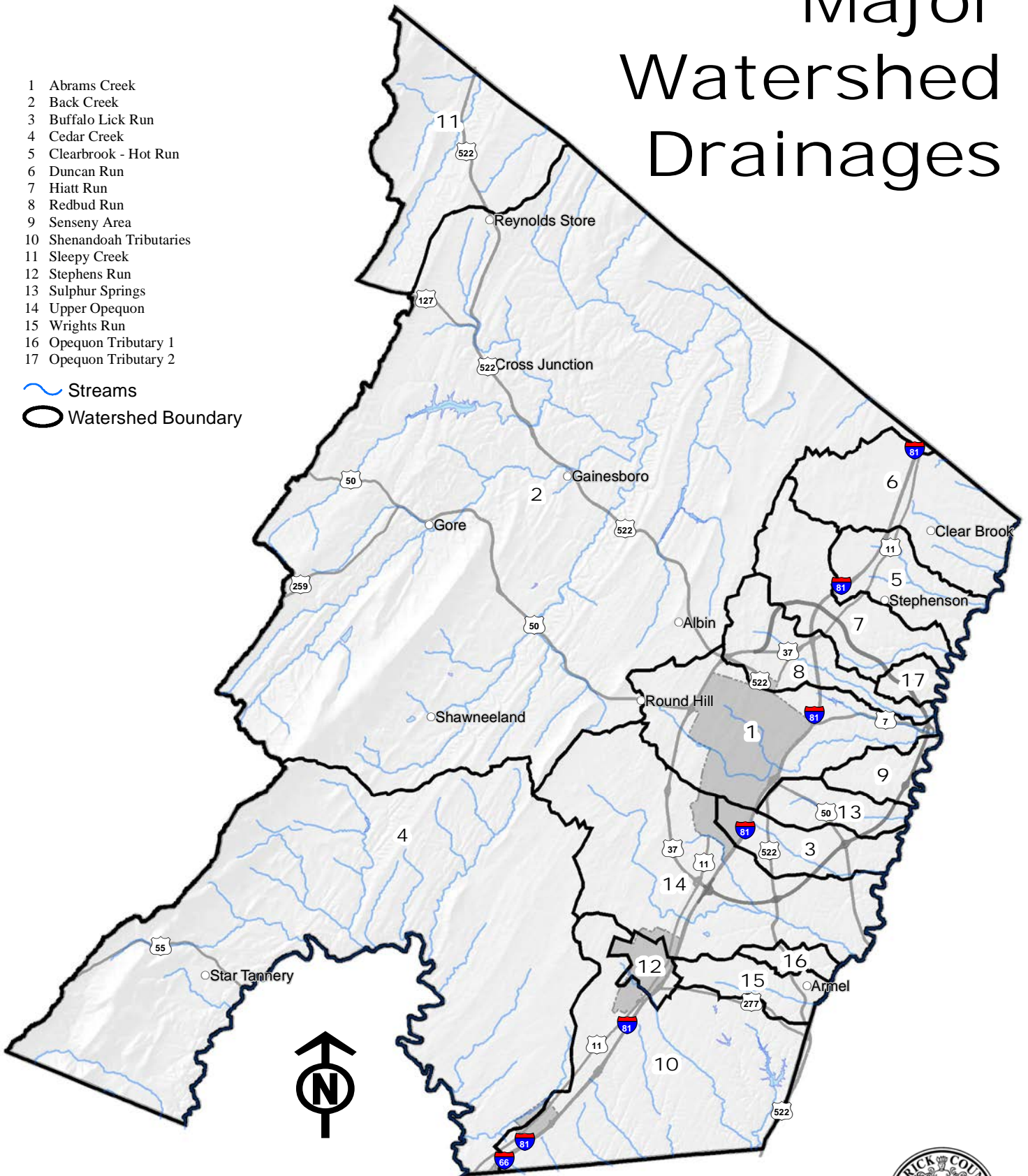
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- Watershed management throughout the County should encourage forested or vegetated streamside buffers to filter pollutants, stabilize stream banks and provide wildlife habitat.
- The types of onsite sewage disposal systems permitted in the County need to be managed to insure proper location, installation, operation, maintenance and inspection.
- Special emphasis should be placed on utilizing state and federal cost share programs specifically funded to address water quality in the Opequon Creek watershed and other environmentally sensitive areas. Work with local community and non-profit organizations to promote agricultural best management practices.

# Major Watershed Drainages

- 1 Abrams Creek
- 2 Back Creek
- 3 Buffalo Lick Run
- 4 Cedar Creek
- 5 Clearbrook - Hot Run
- 6 Duncan Run
- 7 Hiatt Run
- 8 Redbud Run
- 9 Senseny Area
- 10 Shenandoah Tributaries
- 11 Sleepy Creek
- 12 Stephens Run
- 13 Sulphur Springs
- 14 Upper Opequon
- 15 Wrights Run
- 16 Opequon Tributary 1
- 17 Opequon Tributary 2

 Streams  
 Watershed Boundary



### **SENSITIVE NATURAL AREAS**

Sensitive natural areas encompass various resources in the County, such as floodplains, steep slopes, karst terrain, and agricultural areas. This section describes the importance of these sensitive natural areas to Frederick County. These resources are further identified and integrated into the small area land use plans contained within the Comprehensive Policy Plan.

#### *FLOODPLAINS*

Floodplains provide a necessary interface between land and water. Floodplains by definition store water and accommodate fluctuations in stream volume during heavy rains and can become flooded. Floodplains provide essential environmental benefits such as reducing peak flows and improving water quality. Encroachment of development into floodplains removes those benefits as well as increasing the impact on life, health and property.

Regulations to protect floodplains and waterways from disturbance are included in the County's Zoning Ordinance.

Floodplain areas have been generally identified in studies conducted by the Federal Emergency Management Administration (FEMA). Detailed maps produced by FEMA show floodways, as well as 100 and 500-year floodplains.

#### *STEEP SLOPES*

Areas of steep slopes are located throughout the County, predominately in the mountainous areas, stream valleys and drainage areas. Steep sloped areas are often susceptible to erosion. The amount that may occur varies according to the amount and intensity of precipitation, slope steepness and length, vegetated cover and the soil type and erodibility. Clearing steeply sloped areas can exacerbate erosion of soil and increase stormwater runoff resulting in increased siltation and sedimentation.

Careful consideration should be given to avoid concentrated runoff when impervious surfaces are located close to steep slopes. Minimal disturbance of natural vegetative cover, in particular forest cover should be encouraged versus replant requirements.

#### *KARST TERRAIN*

The central geophysical area of Frederick County is underlain by a band of carbonate bedrock consisting of limestone and/or dolomite and is identified as karst terrain. Karst terrain is characterized by the presence of sinkholes, surface depressions, caves, large springs, and a highly irregular, pinnacled bedrock-soil interface. Karst terrain is inherently unstable and susceptible to subsidence and surface collapse. As a result, the alteration of drainage patterns in these areas by the placement of impervious coverage, grade changes, or increased run-off from site changes can lead to sinking of land levels and sinkholes.

It is important to realize that the most of the water recharge area for the drinking water for the County is located in the karst terrain. Groundwater supplies in these areas are particularly

## NATURAL RESOURCES

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susceptible to contamination from surface activities. Fractures, fissures and solution openings in the bedrock may connect to public or private water supplies such as wells and springs, making those sources especially susceptible to groundwater contamination.

### **GOALS/STRATEGIES**

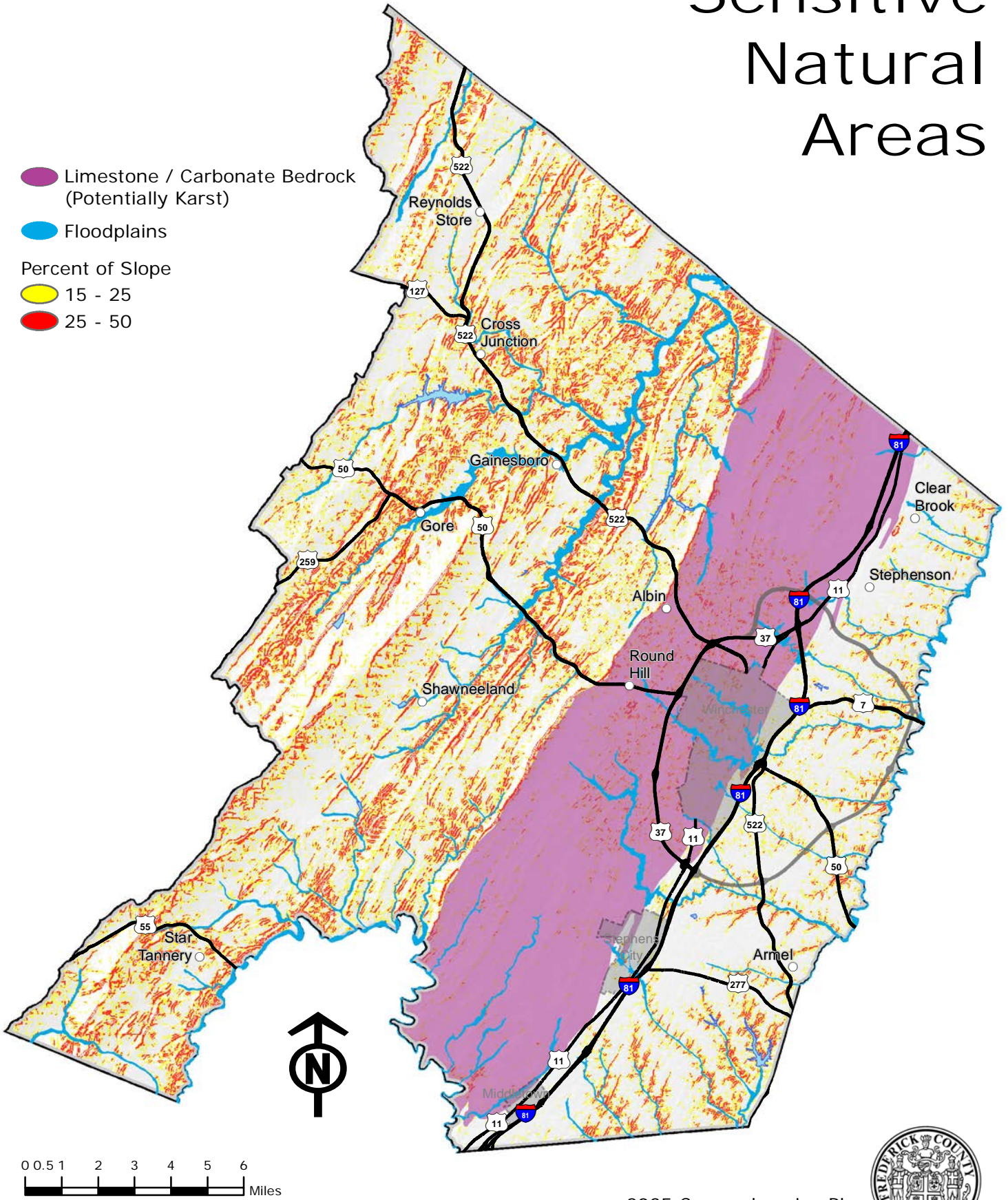
**GOAL:**           **APPROPRIATELY MANAGE IDENTIFIED SENSITIVE NATURAL AREAS.**

**STRATEGIES:**

- Protect floodplains and steep slopes from unsuitable uses and continue to recognize their value for stormwater management and ecological functions.
- Development proposals should be adapted to fit the topography and natural setting of the County.
- Special consideration should be given in areas known for karst terrain prior to changes in land use. Prior to any development activities in areas known to have karst terrain, a geotechnical analysis should be performed by a certified geotechnical engineer and submitted to the Public Works Department for review.



# Sensitive Natural Areas



### **AGRICULTURAL AND FORESTAL AREAS**

Agricultural and forestal lands in Frederick County contribute to the natural environment as well as add to the historic rural character and scenic quality associated with the community. Agricultural lands and forests provide economic benefits related to agriculture, forestry and tourism, and require minimal County services.

Frederick County has an Agricultural and Forestal District program supported by the Code of Virginia. This program allows landowners to voluntarily enroll their lands in a district which limits development. These districts are renewed every five (5) years but property owners can request that their land be removed at any time. The County has seven separate agricultural and forestal districts which contain a total of 11,281.37 acres. The use of conservation easements for the protection of agricultural and forestry lands is increasingly becoming popular and encouraged, in addition to participation in the County's Agricultural and Forestal Districts.

### **GOALS/STRATEGIES**

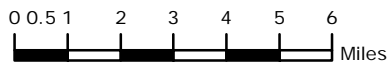
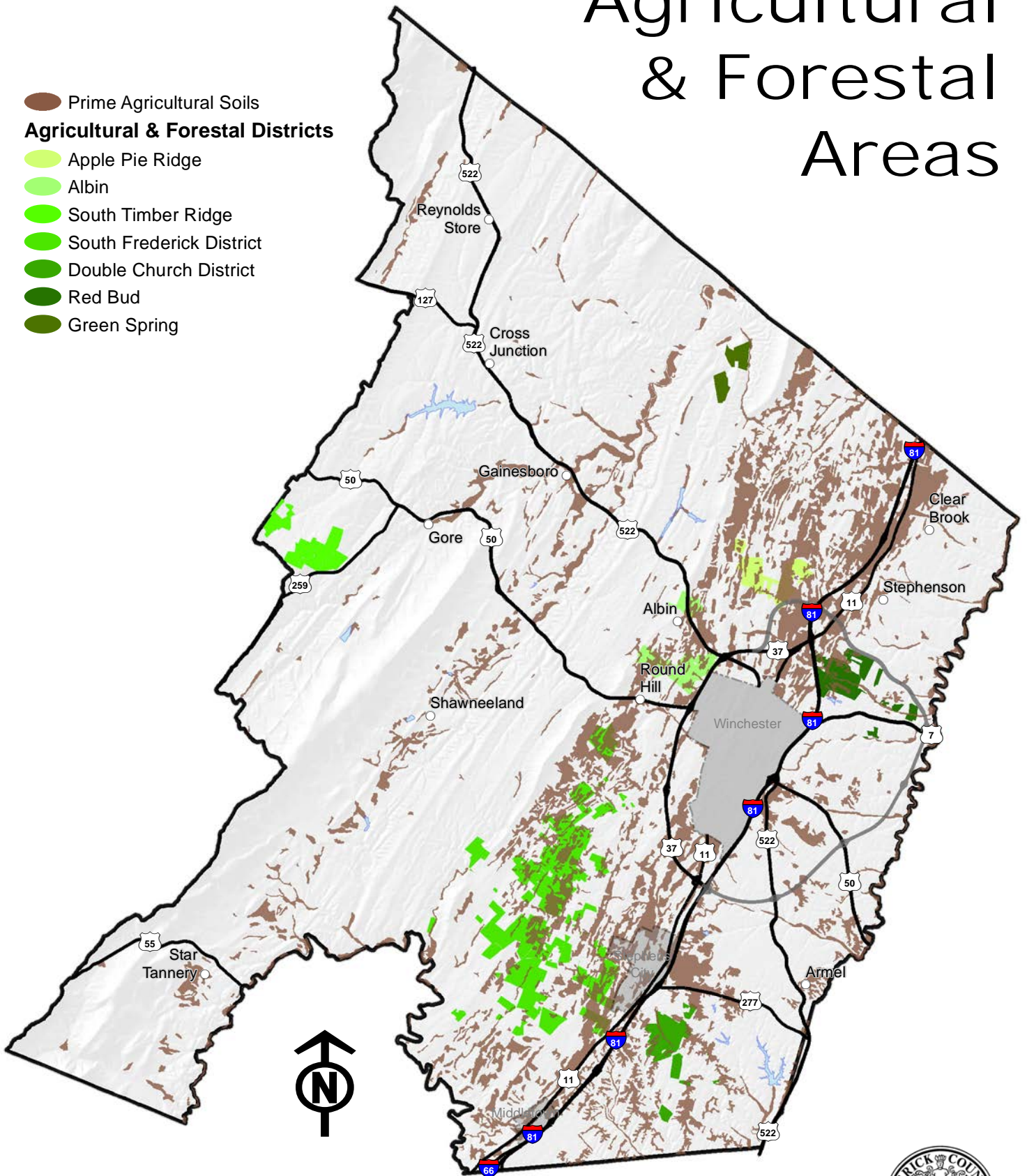
**GOAL:            PROTECT AND PROMOTE FREDERICK COUNTY'S AGRICULTURAL AND FORESTAL AREAS**

**STRATEGIES:**

- Evaluate the existing Agricultural and Forestal Districts program for effectiveness in helping preserve agricultural and forestry resources.
- Encourage and promote opportunities that support the continued use of farmlands and the consumption of locally grown products.
- Develop, promote and support voluntary measures to protect agricultural and forestry resources such as conservation easements, Purchase of Development Rights (PDR) or Transfer of Development Rights (TDR).
- In the Rural Areas, development should be directed away from soils which are well suited for agricultural production.

# Agricultural & Forestal Areas

- Prime Agricultural Soils
- Agricultural & Forestal Districts**
- Apple Pie Ridge
- Albin
- South Timber Ridge
- South Frederick District
- Double Church District
- Red Bud
- Green Spring



### **EROSION AND SEDIMENT CONTROL**

Soils are natural resources that require proper use and conservation. Bare soil is the single greatest source of sediment which can enter waterways through erosion. In many instances, the greatest controllable source of soil erosion is through managing construction activities to reduce exposing the soil to the elements.

It is important to realize that the use of the soil be related to its suitability and limitations. Improper use may result in accelerated soil erosion, ground and surface water pollution, flooding, drainage problems, failed septic systems, construction problems and unproductive agricultural and forestal lands. The most environmentally sensible approach is to consider and adapt to soil types the planning and design of developments.

The 1987 Soil Survey of Frederick County, Virginia by the U.S. Department of Agriculture (USDA) and the Soil Conservation Service includes general and detailed soil maps, descriptions of the soils; and the suitability, limitations, and management of the soils for specified uses. The general soils map can be used to compare the suitability of large areas for general land use while the detailed soil maps along with soil unit descriptions can be used to plan and design a specific site.

The Virginia Erosion and Sediment Control Act and the Frederick County Code require that properties and waters be protected from soil erosion and sedimentation resulting from development activities. The Frederick County Public Works Department is responsible for the implementation and enforcement of these requirements.

### **GOALS/STRATEGIES**

**GOAL:**            **INCORPORATE SOIL TYPES INTO LAND USE PLANNING FOR THE DESIGN OF DEVELOPMENTS TO ENSURE PROPER USE OF THIS NATURAL RESOURCE AND GUARANTEE THAT DURING DEVELOPMENT PROPER EROSION AND SEDIMENT CONTROL MEASURES ARE MAINTAINED.**

**STRATEGIES:**

- Vegetative cover should be encouraged as the most important physical factor influencing soil erosion. The removal of topsoil and permeable soils should be discouraged and when removed, requirements to replace the soils should be enforced.
- Developments should be planned to fit the particular topography, soils, waterways, and natural vegetation on a site to ensure that structures and grading are designed to fit the site.

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## NATURAL RESOURCES

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- Planning that requires the smallest practical area of land be exposed for the shortest period of time (through scheduling and staging project activities) is encouraged.

### **STORMWATER MANAGEMENT**

Urban development changes the nature of streams and drainage. Areas once woodlands or pastures that are developed with roads, parking lots, and buildings, increase the impervious area or imperviousness of the watershed. This process brings changes to the runoff characteristics of surface water, both in quantity and quality.

Stormwater management is regulated by Chapter 79 of the Code of Frederick County "Erosion and Sediment Control Ordinance" as authorized by the Virginia Erosion and Sediment Control Law of Virginia. The Department of Public Works is the agency responsible for the implementation and enforcement of the Stormwater Management Ordinance as managed by the DCR.

Stormwater management seeks to maintain post-development runoff at pre-development levels. Where necessary, stormwater storage systems, such as detention ponds, are required to accommodate a post-development storm with a twenty-five-year frequency

Low Impact Development (LID) is an alternative to conventional stormwater management. LID is a site design strategy with the goal of maintaining or replicating the pre-development hydrologic response through the use of design techniques to create a functionally equivalent hydrologic landscape. Some of the functions include water storage, infiltration, and groundwater recharge as well as management of the volume and frequency of water discharges. Elements of LID include minimizing land disturbance, limiting impervious surfaces, and utilizing runoff reduction practices such as bioretention, permeable pavements and grass swales.

Geology is an important consideration when considering the application of LID practices. In areas of karst terrain, infiltrating LID practices must be carefully planned due to the potential for sinkhole formation. Stormwater treatment and conveyance systems should be directed away from known sinkholes to prevent expansion or possible collapse. Other geologic issues involve the presence of shale which makes infiltration difficult to impossible. While the use of LID may not replace conventional SWM controls, a combination of the two measures makes for a better overall stormwater management program.

### **GOALS/STRATEGIES**

**GOAL:** ENSURE THAT STORMWATER IS MANAGED IN ACCORDANCE WITH THE COUNTY'S EROSION AND SEDIMENT CONTROL ORDINANCE AND VIRGINIA'S STORMWATER REQUIREMENTS, AND WORK TO IMPLEMENT LOW IMPACT DEVELOPMENT (LID) MEASURES WHERE APPROPRIATE.

## NATURAL RESOURCES

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### **STRATEGIES:**

- Encourage the use of semi-pervious or pervious surfaces and other low impact development techniques, where appropriate. Shared parking areas and reduced parking requirements for developments should be utilized to reduce impervious areas.
- Encourage the use of bio-retention whenever possible. Large impervious areas should take advantage of bio-retention in their parking lots.
- Participate in regional efforts to integrate LID runoff reduction and pollution prevention practices in karst areas and areas with shale-derived soils.

### **GREEN INFRASTRUCTURE, GREENWAYS AND TRAILS**

Green infrastructure is the strategically planned and managed networks of natural lands, agricultural and forestal lands, and other open spaces. As an interconnected system, green infrastructure provides greater environmental viability, value, and function than disconnected individual resources. In both rural and urban areas, the green infrastructure concept identifies critical areas for conservation and establishes priorities for protection. It encompasses aspects like greenways, scenic areas, open spaces, biodiversity, and environmental corridors as well as naturally sensitive areas such as floodplains, karst areas and steep slopes.

#### *URBAN AND RURAL OPEN SPACE RESOURCES*

Open space resources in Urban Areas should be designed and created during development. Their value to the Community is determined by their configuration, attributes and relationship to the surrounding areas. Urban open spaces will increase in importance as the County's Urban Development Area (UDA) is more densely developed. Development in the Urban Areas should consider specifically designed open spaces incorporated as amenities to offset the higher densities.

Wooded areas are an important resource and should be considered during planning and designing open spaces. The benefits of wooded include areas the maintenance of ground and surface water quality, groundwater recharge areas, habitat for biological resources, added oxygen to the air, and help protect environmentally sensitive areas. Urban wooded areas provide buffers and potential recreational opportunities. These areas help to preserve the natural scenery and can make the Urban Area a more attractive place to live. Rural open spaces of prime agricultural areas, forested areas, mountainous areas and stream valleys have particular value to the community; and they should be conserved. (See Agricultural and Forestal Lands above)

Inappropriate sites like prime farm land, floodplains, habitats for threatened or endangered species, wetlands and land near wetlands, land near bodies of water and designated park land should be avoided during site selection and development to reduce environmental impacts. Development should be channeled into urban areas with existing infrastructure which would help protect natural resources and that existing natural areas should be conserved and restored to provide habitats and to promote biodiversity.

#### *GREENWAYS*

Greenways are areas of open space, usually linear in nature that form networks of trails. They are often located along streams, within utility easements, and along roadways, and can serve many different purposes. They can help link people to the area's natural, recreational and cultural resources, as well as provide a system of natural linkages for the areas wildlife to preserve biodiversity and protect habitats. When constructed along streams they can help preserve and protect buffers along the streams which can help protect biodiversity and help filter pollutants. Greenways can also provide recreational opportunities such as hiking or

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bicycling provide nature studies such as plant and animal behavior, as well as simply raising awareness of the environment.

### *The Tuscarora Trail*

The Tuscarora Trail is a 249 mile hiking trail situated generally along the mountain ranges to the west of the Shenandoah and Cumberland Valley. It connects to the Appalachian Trail (AT) in Shenandoah National Park and in Pennsylvania northeast of the town of Carlisle.

Approximately 26 miles of the Tuscarora Trail is in Frederick County (see map). Of this total, approximately 11.25 trail miles are protected by easements on private property, 3.75 trail miles are on unprotected private property and 11 trail miles are on public roads.

This trail is an important feature in the County for recreation and for the promotion of tourism. For safety reasons, the County supports the relocation of the trail off of the public roads wherever possible. The County also supports voluntary trail easements for sections of the trail on private property to insure the long-term viability of the Tuscarora Trail.

## **GOALS/STRATEGIES**

**GOAL:** OPEN SPACES IN THE URBAN AND RURAL AREAS OF THE COUNTY ARE IMPORTANT AND NEED TO BE RECOGNIZED, DELINEATED AND PROTECTED.

**STRATEGIES:**

- In urban areas, open spaces should be planned. All types of urban open spaces like greenways, squares, plazas, urban parks, playgrounds and street medians should be considered as part of urban development planning and implemented wherever reasonable.
- In rural areas, open spaces should be protected not only through conservation easements but also transfer development rights programs to ensure that agricultural, forested, and mountainous areas are protected.


**GOAL:** ESTABLISH A NETWORK OF GREENWAY TRAILS FOR CONSERVATION, RECREATION AND TRANSPORTATION THROUGH THE URBAN AREAS OF FREDERICK COUNTY, AND LINK WITH THE TRAILS NETWORK IN THE CITY OF WINCHESTER.

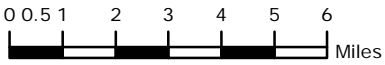
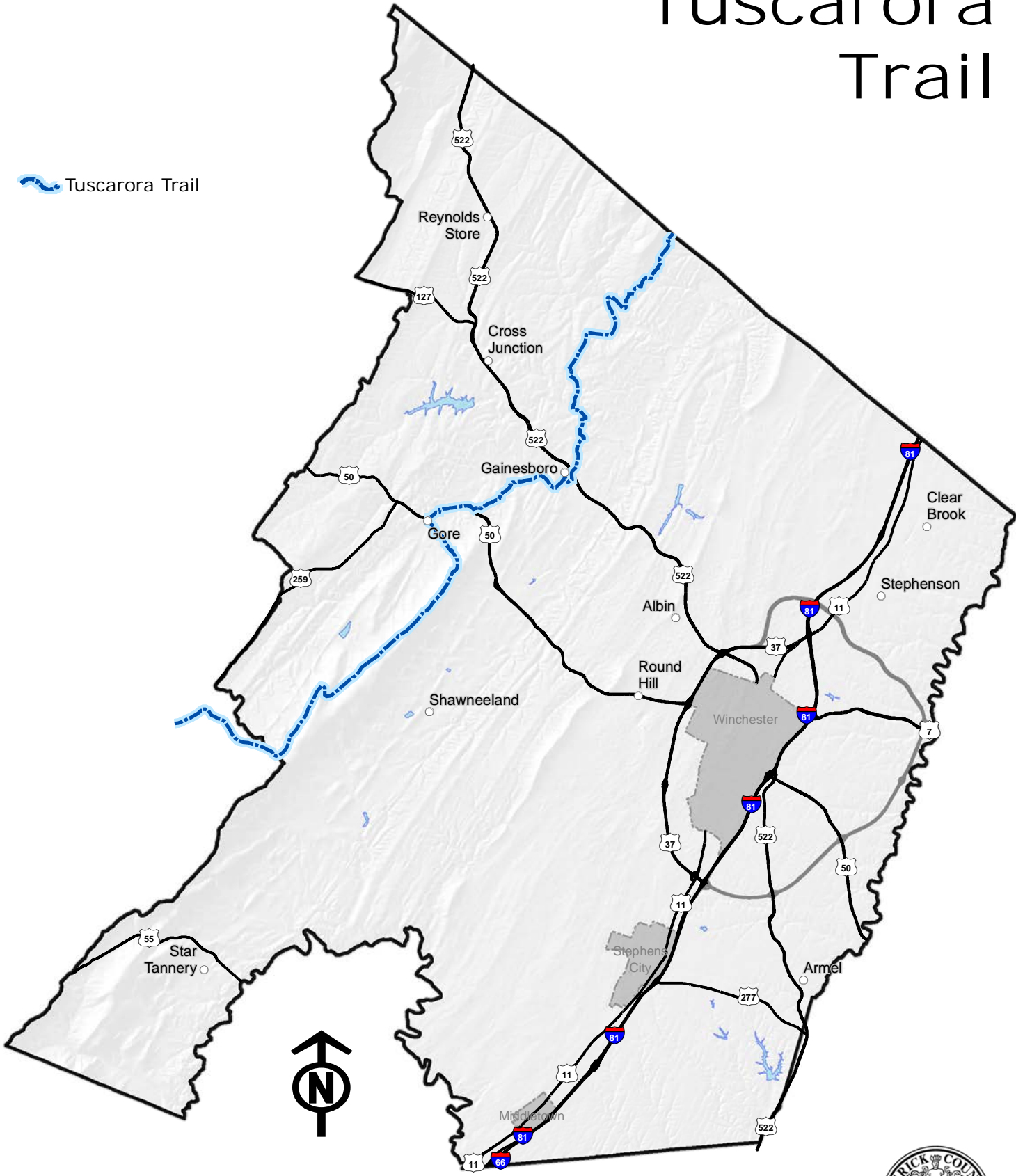
**STRATEGIES:**

- Work with the Parks and Recreation Department, the City of Winchester and other organizations and community stakeholders to develop a greenway network plan that highlights the area's natural and historic resources.
- Ensure that when new developments are planned, connectivity of greenways is included through the project.



# Tuscarora Trail

 Tuscarora Trail



### **HABITAT FRAGMENTATION AND ENVIRONMENTAL CORRIDORS**

Habitat fragmentation reduces available wildlife areas and changes migratory pathways through environmental corridors. Past development has created small separated pockets of open space that sometimes conflict with the needs of local wildlife and their adaptability to these changes. Fragmentation can hinder the safe movement or migration of many species because it forces them to travel over roads and through developments.

### **GOALS/STRATEGIES**

**POLICY:**      **INCREASE THE CONNECTIVITY OF NATURAL AREAS AND ENVIRONMENTAL RESOURCES IN BOTH THE URBAN AND RURAL AREAS OF THE COUNTY TO AVOID FRAGMENTATION OF HABITATS AND MIGRATORY PATHWAYS.**

**IMPLEMENTATION:**

- Environmental corridors should be planned with all development activities to ensure safe movement and protection of species.
- The County should seek to reduce habitat fragmentation by maintaining large contiguous areas of forests, meadows, wetlands and streams.
- Large scale clearing of mature woodlands should be avoided during development activities.

### **LIGHT AND NOISE POLLUTION**

#### *LIGHT*

Cycles of daylight and darkness have ecological consequences. Obtrusive lighting, often referred to as light pollution, obscures our view of the sky and primarily comes from inefficient and misdirected lighting sources. Misdirected lighting causes urban sky glow and glare, is a source of energy waste and can be a nuisance. Simply defined, light pollution is excess or obtrusive light created mainly by humans. Increasing development requires that care be taken to reduce unfocused emissions of light.

#### *NOISE*

Noise pollution is unwanted noise, often described as a displeasing sound that disrupts the activity or balance of human or animal life. The source of most forms of noise pollution is from transportation systems like vehicles, aircraft or railroads. The daily activities of the Winchester Regional Airport are an example, and it is important that land developing around the Airport is respectful of this operation. The Airport Support Area helps designate what types of uses are appropriate in these developing areas to ensure the continued operation of the Airport.

## NATURAL RESOURCES

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Other sources of noise include industrial operations, highway traffic, car alarms, factory machinery and equipment, construction work, lawn care equipment, barking pets, car stereos, and power tools. Urban planning can play an important role in managing noise pollution, and the County must ensure that acceptable levels of noise are maintained. Currently the County only has maximum noise levels for industrially zoned property.

### **GOALS/STRATEGIES**

**GOAL:**           **MINIMIZE LIGHT EMISSIONS TO THOSE NECESSARY AND CONSISTENT WITH GENERAL SAFETY AND RECOGNIZE THE NUISANCE ASPECT OF UNFOCUSED LIGHT EMISSIONS.**

**STRATEGIES:**

- Evaluate current lighting ordinances to assess effectiveness in reducing light pollution caused by up-lighting, excessive lighting, and glare.
- Light emissions need to be minimized to what is necessary and consistent with general safety. Recognition needs to be given to the nuisance aspect of unfocused light emission.

**GOAL:**           **MINIMIZE HUMAN EXPOSURE TO UNHEALTHY LEVELS OF NOISE.**

**STRATEGY:**

- Ensure that with new development, people are protected from unhealthy levels of noise.  
  
Examine types of noise generators and determine if additional ordinances are appropriate.