Environment

Urban development patterns in Christiansburg are strongly influenced by the area's physical characteristics: topography, drainage, floodplains, sensitive soils, and the location of active agricultural and forested areas. These feature help form and define the character of the man-made environment and guide future development of preservation areas, riparian zones, and green or open space. In recent years, large scale development has transformed vacant, agricultural, and wooded lands within Town. With less vacant land available, developers must now utilize infill development strategies in an effort to protect natural resources and preserve green spaces. Preserving and enhancing the Town's natural resources through education, regulation, and service provision helps to ensure appropriate growth patterns and minimize development problems over the long term.

Primary Environmental Goal

Preserve and enhance the natural resources of the Town through education, regulation, and service provision.

Natural Resources

Christiansburg lies in the Great Valley Subprovince of the Ridge and Valley Physiographic Province of the Appalachian Mountains. Its bedrock is primarily carbonates (limestone and dolostone) with lesser amounts of siltstone, shale, and sandstone. Carbonate bedrock layers are typically uneven and produce karst landscapes characterized by sinkholes, caves, and rock outcroppings. The uneven bedrock can pose complications for building site development, particularly in excavation and foundation procedures. Soil type is closely related to geology and can significantly affect development. Steep slopes, high erodibility, shallow soils, poor drainage, and ponding are soil conditions that limit suitability for future development. According to the Soil Conservation Science (SCS) Soil Survey for Montgomery County, the Groseclose-Poplimento-Duffield unit and the Caneyville-Opequon-Rock Outcrop unit are two major soils groups in Christiansburg. Sinkholes, slow permeability, high potential for shrink-swell activity, and high erosion potential in steep areas are common in the Groseclose-Poplimento-Duffield soil areas. Sinkholes, subsurface drainage, high erosion potential, and steep slope are common in the Caneyville-Opequon-Rock Outcrop soil areas. The SCS Soil Survey for Montgomery County outlines suitability characteristics for all soils present in Christiansburg. The Town currently requires submission of shrink-swell soil testing results for all new construction to ensure soil suitability.

Christiansburg's topography is characterized by broad areas of relatively low slopes of up to 15 percent; steeper portions may be found along Crab Creek and in the limited regions along the northern, southern, and eastern corporate limits. Slopes surrounding the Town can be severe, exceeding 25 percent and presenting challenges for large-scale development. Christiansburg also lies approximately 25 miles of an active seismic area in Giles County. Historic records do not indicate seismic activity in the immediate vicinity and most earthquakes to date have been minor.

Natural Resources Goal

Improve the visual landscape, reduce pollution, and reduce and slow stormwater runoff by increasing the tree canopy in Town. Limit development on karst topography especially where

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sinkholes are present. Limit development on steep slopes to avoid erosion, sedimentation, landslides, and increased stormwater flow. Recognize unique development opportunities and restrictions on varying soil types. Encourage or require green techniques including low-impact development.

Implementation Strategies

- Limit clear-cutting and tree removal in the development process.
- Encourage the retention of existing trees and wooded lots and the planting of additional trees during future development.
    - Create regulations regarding tree preservation and planting in the Zoning and Subdivision Ordinances.
- Protect existing trees along public streets and trails whenever possible.
- Identify karst areas using existing sinkhole data and information gathered from the public.
- Require recognition of critical features in development plans and locations for future development.
- On parcels where karst topography is present on some or part of the property, require Best Management Practices to be established pre-development to avoid karst areas throughout the construction process.
- Discourage development on parcels with mostly or all karst topography.
- Require recognition of critical features in development plans and on locations for future development.
- Limit development on sites with steep slope and prohibit development that creates steep slopes.
    - Regulate and limit development on slopes greater than 15%.
    - Closely regulate drainage and erosion on sites with steep slopes during and after the construction process.
- Ensure soil type identification for all new developments and verify the use of safe development practices.
    - Continue to require shrink-swell soil testing submission for new construction.
- Enforce regulations for developments relating to soil percolation, infiltration, and runoff.
- Examine proposed developments for methods of impact reduction.
- Create incentives for utilizing low-impact development techniques.
- Educate citizens regarding karst terrain, steep slopes, soil types, and the urban tree canopy.
- Encourage environmental education courses in rain barrel building, rain garden planting, stormwater runoff reduction, and composting methods.

Stormwater, Water Quality, and Watersheds

Approximately 63% of Christiansburg is drained by Crab Creek. The remainder of the Town is drained by Slate Branch and the North and South Forks of the Roanoke River. Crab Creek and Slate Branch are within the New River Basin which drains into the Gulf of Mexico. The North and South Forks are within the Roanoke River Basin which drains to the Atlantic Ocean.

Watersheds Map

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Due to the prevalence of carbonate bedrock (limestone and dolostone), the presence of underground drainage ways in Christiansburg is widespread. These paths are highly susceptible to contamination from surface sources. This karst terrain creates the potential for rapid movement of polluted groundwater due to its relatively unimpeded flow through the underground cave system. In addition, storm drainage greatly affects this system.

Water quality within the Town is tested by the Virginia Department of Environmental Quality (DEQ) according to federal regulations. DEQ annually monitors Virginia's rivers, lakes and tidal waters for more than 130 pollutants including polychlorinated biphenyls (PCBs). PCBs are a manmade chemical domestically manufactured for use in industrial and commercial applications until their ban in 1979. According to the EPA, PCBs cause cancer in animals as well as damaging immune, reproductive, neurological, endocrine, and other biological systems. Waters that do not meet water quality standards are designated as impaired in the Virginia Water Quality Assessment Integrated Report. DEQ develops plans called Total Maximum Daily Loads (TMDLs) to restore and maintain water quality for these impaired waters, generally within 8-12 years of designation. These TMDLs report the total pollutant each water body can assimilate while still meeting standards. From these TMDLs, Wasteload Allocations (WLAs) are assigned to point sources of pollution within a jurisdiction.

Slate Branch is considered an impaired water body according to the DEQ. Crab Creek has WLAs for two sources of pollution: bacteria and sediment. DEQ is currently developing a TMDL Implementation Plan (IP) for Crab Creek. TMDL IPs are designed to address all water quality problems within a watershed and describe actions to implement WLAs noted in the TMDL. North Fork has WLAs for two sources of pollution: PCBs and bacteria. South Fork has WLAs for two sources of pollution: PCBs and sediment. In addition to meeting the WLAs associated with TMDLs, the Town must also create and implement TMDL action plans as part of MS4 permit requirements.

The Town operates a stormwater management program to control the quantity and quality of stormwater from storm events. Effective stormwater management controls flooding and erosion, protects water resources by decreasing contamination, reduces habitat destruction, and limits infrastructure damage. Stormwater management encompasses both green infrastructure practices and traditional piped infrastructure.

Green infrastructure incorporates vegetation and soil into the built environment managing stormwater onsite, at the point of contact, to mimic natural predevelopment processes. According to the Environmental Protection Agency (EPA), in addition to traditional stormwater management benefits, green infrastructure can also reduce smog and other pollutants, improve wildlife habitats, and increase property values.

Christiansburg's Municipal Separate Storm Sewer System (MS4) is used to collect, convey, detain, treat, and release stormwater runoff. The Town operates this system in order to support public health, safety, and to protect the environment. Christiansburg's MS4 facilities include both traditional piped infrastructure and green infrastructure elements. For additional information concerning the Town's MS4 program, please refer to the Infrastructure Services chapter.

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Within the MS4 program, the Town implements an Erosion and Sediment Control Program to support public health and safety and protect the environment. The Erosion and Sediment Control Program primarily focuses on land disturbances created by land development and redevelopment activities.

The Town's Floodplain Ordinance governs the use of land within the floodplain. The floodplain boundaries are based upon Flood Insurance Studies prepared by the Federal Emergency Management Agency (FEMA) for Montgomery County. Although development within the floodplain is discouraged, a number of properties developed prior to FEMA floodplain regulation exist along Crab Creek, Town Branch, and Walnut Branch. Most of the commercial and industrial floodplain properties are located along Reading Road and Depot Street while most of the residential properties are located along the south side of Montgomery Street. The 100-year floodplain is unsuitable for development and is targeted for green space protection and recreational uses.

Floodplain Map

Water Quality, Watersheds, and Stormwater Management Goal
Preserve and improve water quality within Town. Protect the quality and reliability of the regional water supply system. Protect the designated floodplain areas from erosion, sedimentation, and pollution. Preserve fragile habitats such as wetlands. (For more information on wetlands see Appendix X) Expand the use of green infrastructure Best Management Practices (BMPs) for stormwater management. Operate and maintain existing stormwater management infrastructure in a manner that reduces flooding and stormwater pollution. Execute the MS4 Program Plan in accordance with the state permit including the operation of an effective Erosion and Sediment Control Program. Improve and replace existing stormwater management infrastructure according to an adopted and updated capital improvement plan. Construct new stormwater management infrastructure in a manner that reduces stormwater runoff, reduces stormwater pollution, and protects the environment.

Implementation Strategies

- Meet individual WLAs for each watershed according to appropriate TMDLs.
    - Create and implement TMDL action plans as part of MS4 permit requirements.
- Expand the use of green infrastructure BMPs in the land development process.
    - Encourage the use of rain gardens, permeable pavements, green roofs, and urban tree canopy to reduce stormwater runoff.
    - Encourage on-site water infiltration systems using natural vegetation and natural filtration systems for new developments.
- Encourage natural plantings on critical slopes to reduce erosion and runoff and promote water quality.
- Preserve and improve water quality and protect the quality and reliability of the regional water supply system.
    - Encourage stream restoration projects.
    - Establish stricter standards for buffers between water bodies and impervious surfaces and structures.
- Adhere to the Regional Water Supply Plan and update it as needed.

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    - Ensure the Regional Water Supply Plan accounts for estimated quantities and impacts of outside demand for Town water supplies in the future.
- Create comprehensive watershed-based stormwater models to assess infrastructure needs.
    - Utilize the watershed models to identify system weaknesses and analyze proposed modifications to and improvements of system infrastructure.
- Maintain a capital improvement plan, accounting for system needs identified by modeling, improvements to reduce existing flooding, and improvements needed as a result of aging infrastructure.
- Develop a stormwater taskforce with staff and citizens to address stormwater issues.
- Create a permanent funding mechanism for stormwater management.
    - Consider the creation of a stormwater utility.
- Maintain standards and specifications for design and construction of stormwater management infrastructure.
- Consider adoption of more stringent stormwater regulations.
- Actively oversee and inspect construction of new stormwater management infrastructure.
- Reduce stormwater runoff and prevent flooding at existing sites by requiring upgrades with redevelopment or rezoning.
- Encourage improvements to stormwater facilities for existing neighborhoods through BMPs such as bioretention, rain gardens, and rain barrels.
- Enforce Town Code regarding illicit discharges in the stormwater system in an effort to keep storm drains free of debris and operating at maximum capacity.
- Identify new strategies and resources to maintain maximum stormwater system capacity and operations.
- Retain and expand the urban tree canopy to reduce stormwater runoff.
    - Limit clear-cutting and tree removal in the development process.
    - Encourage the retention of existing trees and wooded lots and the planting of additional trees during future development.
        - Create regulations regarding tree preservation and planting in the Zoning and Subdivision Ordinances.
    - Protect existing trees along public streets and trails whenever possible.
- Minimize private sewage facilities to the extent practical.
- Encourage the County to limit development outside the Town limits to large lots unless the developer can connect to the municipal sewage system.
- Restrict improper development in the floodplain through the enforcement of the Floodplain Ordinance.
- Implement Riparian buffers to assist in water infiltration, soil stabilization, and bank restoration along rivers and creeks.
- Cooperate with state and federal agencies in the preservation of wetland areas.
- Identify fragile habitat areas within forested and open land.
- Educate the public in methods of recognizing and protecting fragile habitats.
- Designate fragile habitats and prohibit development within them.

Open Space

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Christiansburg is committed to the creation, preservation, and maintenance of open space including parkland. Open space is generally considered any unimproved area of land set aside for public or private use. Open space may also include active recreational facilities such as playground equipment, multi-purpose fields and swimming pools that are a portion of the overall open space. Additionally, open space may include incidental parking and access roads. While the Department of Parks and Recreation and the Department of Aquatics serve the recreational needs of Town citizens with parks, programs, and facilities, open space is managed publicly and privately by multiple groups. Through development guidelines and strategic investment, the Town can link open spaces to create neighborhood parks in underserved areas.

Open Space Goal

Preserve and expand open space within Town.

Implementation Strategies

- Require dedicated open space for all new developments and for changes in land use.
- Encourage the addition of open space in neighborhoods where open space is currently limited.
    - Establish an ecological park and passive recreation area near the Historic Cambria District and Crab Creek.
- Interconnect open space areas. See Transportation chapter.
- Transform underutilized gray space into open space.
    - Return underutilized parking lots to open space.
- Require and enforce maintenance of open spaces.
- Expand public ownership of open spaces and greenways within the Town.
- Accept and encourage conservation easements within the Town.
- Plan for a trail network to connect public places, recreation areas, and other open spaces. See Transportation chapter.

Pollution Control

Preservation of air quality, reduction of noise and light pollution, and litter control are vital to protect the environment and maintain quality of life.

Pollution Control Goal

Preserve and improve air quality. Reduce noise and light pollution. Reduce litter in Town.

Implementation Strategies

- Enforce regulations to limit vehicle idling.
- Monitor air quality periodically.
    - Acquire appropriate equipment for air quality testing.
- Strengthen regulations in the noise ordinance prohibiting noise pollution.
- Require developments with high noise pollution risk to use noise reduction strategies during construction.
- Require developments with high noise pollution risk to implement permanent noise reduction strategies.
- Develop uniform standards/regulations for outdoor lighting.
- Install low-impact, low-glare street lights for public projects.
    - Consider requiring International Dark-Sky Association Fixture Seal of Approval lighting to minimize glare and reduce light trespass.

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- Increase signage prohibiting litter.
- Increase enforcement of laws concerning littering.
- Encourage adopt-a-highway and other litter clean-up programs.
- Create designated pet walking zones with bags and trash cans for clean-up.

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