Chapter 5b – The Natural Resources Plan

Natural Resources Plan Goal

Berkeley County has many natural resources, including forests, streams, productive soils, and a diversity of wildlife. Protecting these resources is a priority for county residents, as they define the character of Berkeley County. In the 2006 comprehensive plan, Berkeley County residents envisioned using a combination of guidelines and regulations, as well as incentives for property owners and developers, to ensure the protection of the county's most sensitive natural, cultural and historic resources. The goal of the natural resources plan is to conserve the character, quality and livability of Berkeley County by preserving its natural assets. The following related objectives were identified in the 2006 comprehensive plan.

Objectives

- Protect and restore groundwater and surface water resources in Berkeley County for continued use by residents and natural systems.
- Provide residents and visitors with a variety of natural resources based recreational opportunities that are easily accessible.
- Protect and improve surface waters and adjacent green spaces for recreation, tourism and scenic value.
- Maintain prime agricultural soils in Berkeley County.
- Promote and protect Berkeley County's natural environment for the benefit of all residents.
- Provide and protect open space in the county.

Natural Resources Profile Summary

The natural environment is an important part of community life. Its characteristics influence local development patterns. For example, fertile soils support agriculture. Its features are scenic, such as North Mountain and Third Hill Mountain, and help define the character of a community. Its diverse systems – vegetation, water and wildlife – are dynamic, providing a stimulating and interactive environment in which to live.

The identification and characterization of Berkeley County's environmental resources is an important part of the planning process. Delineation of these resources serves as a guide for future planning decisions, because natural resources are costly both financially and ecologically to disregard. The following sections of the comprehensive plan identify and describe these areas so they can be considered when making planning decisions. This will ensure that future development in Berkeley County takes place in an environmentally sensitive manner.

Land Based Natural Resources Profile

<u>Physical Geography and Topography Profile</u>

Berkeley County is located in the Ridge and Valley physiographic province, so named because of the alternating, parallel ridges and valleys that are oriented southwest to northeast. Surface rock strata and most of the subsurface rock in the county are sedimentary and consist of alternating belts of limestone, shale and sandstone. The Topography Map in the appendices clearly shows these alternating features. Elevations in the county range from 300 feet at the point where the Potomac River exits the county to over 2,200 feet on Third Hill Mountain.

There are three ridges in Berkeley County: North Mountain, Third Hill Mountain and Sleepy Creek Mountain. North Mountain divides the county into two distinct sections: Back Creek Valley to the west and the Great Valley to the east. Third Hill and Sleepy Creek Mountains are along the western border with Morgan County.

The Great Valley is a major physiographic feature of the eastern United States. It extends approximately 900 miles from New York to Alabama. In West Virginia and Virginia it is known as the Shenandoah Valley. The valley averages about 20 miles wide in West Virginia and is approximately eight miles wide in Berkeley County. Back Creek Valley is named for the creek that created it between North Mountain and Third Hill Mountain. The valley is about five miles wide on the south and seven miles wide on the north.

Steep Slopes Profile

The Slope Map in the appendices shows the location of steep slopes, which are slopes with grades of 15 percent or higher within Berkeley County. The steepest slopes are found on the eastern sides of the mountains, which is primarily due to their underlying geology. They are also found along many of the county's creeks and streams.

The significance of these areas to planning is two-fold. First, if disturbed, they can produce heavy soil erosion and sediment loading in adjacent streams. While this does not necessarily preclude development, additional requirements for addressing stormwater runoff need to be in place in order to minimize erosion and subsequent degradation of surface waters. This type of regulation is generally found in county and/or municipal subdivision and land development ordinances.

Second the use and placement of conventional on-lot sewage disposal systems is impractical on very steep slopes (greater than 24%) because the downhill flow of the effluent is too rapid. Improperly treated effluent is likely to surface at the base of the slope, causing wet, contaminated seepage spots. If there is a layer of impervious material such as dense clay or rock under shallow soils, the effluent may surface on the slope and run downhill unfiltered.

Geology Profile

Berkeley County's underlying geologic formations shape its topography and also determine the characteristics of its aquifers. Rock type, porosity, and rock strata inclinations are just a few of the geologic factors that affect groundwater movement and availability. In addition, groundwater quality is dependent upon the interaction between groundwater and the bedrock. For example, the more soluble bedrock, such as limestone, dissolves in the groundwater, which results in increased hardness values.

Berkeley County is underlain by rocks of the Paleozoic Ages. There are six stages of sedimentary rock present in the County: Cambrian, Ordovician, Silurian, Devonian, and Mississippian. Mississippian exists in a smaller area on the western edge of the County. The majority of the western part of the county is Devonian with two small areas of Silurian in the north and east. Ordovician consumes the eastern half of the county with Cambrian running north/south through the middle of the county. (West Virginia Geological and Economic Survey)

The Geology Map in the appendices shows the location of the six basic geologic formations in Berkeley County. Limestone and shale formations are predominant. Sandstone formations are found along the mountains, and alluvial formations can be found along the southern reaches of Back Creek.

Karst Topography Profile
Approximately 40 percent of Berkeley County is underlain by limestone rock, which is subject to becoming karst topography. This unique topographic feature occurs when carbon dioxide in groundwater forms a weak acid that dissolves calcite, which is a component of limestone and dolomite rock. Acidic groundwater moving through fractures and other spaces within the rock gradually alters small openings, creating large passages and networks of interconnected conduits. Most flow and passage enlargement takes place at or just below the water table, the level below where the ground is saturated with water. The dissolving of bedrock is characterized by both small features (e.g. fractures and fissures) and large features (e.g. caves, sinkholes, and underground streams). With the exception of these openings, however, the limestone is very dense and mostly impermeable, which explains why water may be very abundant at one site but flows only at a trickle in a well a short distance away.

Karst regions require special care because contaminants can flow easily through sinkholes, thus polluting groundwater. Stormwater runoff and sewage disposal provide substantial risk of contamination to the groundwater. In addition, construction activities can destabilize the delicate equilibrium between the surface and underground components of karst, causing altered drainage patterns and sinkhole collapse.

The Geologic Features Map, illustrates the location of Karst formations in Berkeley County. The largest portion of the karst area extends from the Virginia line to the Potomac River, roughly parallel to Interstate 81 east of North Mountain. There is another area along the border with Jefferson County and a small oblong pocket exists in Back Creek Valley. Sinkholes are most common east and west of the Opequon Creek in the northern part of the county where limestone is present. Much of the new development in the county has occurred in these same locations, which has raised serious concerns regarding future water supply. These are discussed in more detail in the water resources section of this chapter.

Mineral Resources Profile
Mineral resources in Berkeley County include limestone, shale, sandstone, and alluvium. They are primarily used to produce high grade metallurgical limestone, structural clay products and cement. The most valuable mineral resource in Berkeley County is the Stones River limestone, a high grade limestone used in steel production for open hearth and blast furnace flux. This limestone averages 98 percent calcium carbonate. This high calcium carbonate and low silica content makes this limestone very valuable in steel manufacturing. Shale and clay from the Martinsburg shale belts are used to manufacture brick and other structural clay building materials by the Continental Brick Company.

Soils Profile
Soil Associations: The Soil Survey of Berkeley County prepared by the Natural Resources Conservation Service describes the soils found across the county and utilizes soil associations to describe how soil depth, slope and drainage affect potential land use. The associations are helpful in attaining a general idea of soil quality, comparing different sections of Berkeley County, and delineating large areas suited to particular issues or uses such as agriculture. According to the survey, there are ten soil associations in the county that are nearly parallel and follow the northeast-southwest landform pattern. Specific soil information can be found at http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm, the soil survey website.

Septic Suitability: Soils are rated according to their absorption capabilities, and range from slight, i.e., few limitations to absorption, to severe, i.e., limitations so difficult to overcome that special designs and additional costs are necessary to safely handle septic waste. According to the Soil Survey, a majority of the soils in Berkeley County (73 percent or approximately 151,000 acres) are rated severe. There are also soils in the county that are classified as slight or moderate and are better equipped to handle septic drainage. These soils are found in the middle of the county with a small area along the eastern border with Jefferson County as illustrated on the Soils Suitability Map in the appendices.

Agricultural Soils: Each soil type is unique in its origin, structure, texture, and composition. Its capacity to support given land use, such as agriculture, is determined by these features. Since agriculture has the most specific soil requirements of our common land uses, these soils are more thoroughly classified according to their productivity.

Prime farmland, as defined by the US Department of Agriculture (USDA), is land that is best suited to producing food, feed, forage, fiber and oilseed crops. It has the soil quality, growing season, and water supply needed to economically produce a sustained high yield of crops when it is treated and managed using acceptable farming methods. According to the USDA, prime farmland soils are usually classified as capability Class I or Class II of the eight classifications.

The Designated Soils Map in the appendices illustrates the estimated location of prime farmland in Berkeley County. USDA 2012 Census data indicates that there are approximately 70,160 acres of prime farmland soil, most of which are located in the Shenandoah Valley. This represents almost 34 percent of the county's total land area. There are also areas along the banks of Back Creek, Opequon Creek and Sleepy Creek. While prime or highly productive soils are often reserved from developable areas, in Berkeley County, these soils are located in some of the most desirable development locations. Protecting them for continued agricultural uses continues to be a significant challenge.

Farmland Protection Program

In June 2000, the Berkeley County Council authorized a resolution creating the Berkeley County Farmland Protection Act signed into law by the state legislature. The seven-member board was authorized to create and administer the Berkeley County Farmland Protection Program (http://berkeley.wvfp.org/) in consultation with the Eastern Panhandle Conservation District (http://www.wvca.us/districts/epcd.cfm). The program establishes uniform standards and guidelines for the eligibility of properties and the ranking criteria used to prioritize funds allocation to purchase conservation easements, or to pay associated costs for the purchased or donated easements. (*The Berkeley County Farmland Protection Program, The Berkeley County Farmland Protection Board, Dec. 2002.)* Minimum criteria necessary for consideration of an easement purchase or donation include being located in the county, meeting specific existing land use, and having a clear title to the property. Additional characteristics of the property are also ranked and evaluated. These characteristics fall under the following headings:

- Imminence of Residential, Commercial or Industrial Development
- Total Acreage Offered for Conservation or Preservation Easement
- Presence of Prime or Unique Farmland, etc.
- Property is Contiguous or Appurtenant to Working Farms
- Ratio of the Asking Price of the Easement to the Fair Market Value of the Easement
- Historical, Architectural, Archaeological, Cultural or Unique Value of the Easement
- Amount of Secured Debt on Property, and Length of Protective Easements

As of the 2006 comprehensive plan, conservation easements were purchased for approximately 1,600 acres through this voluntary program. In November of 2013 the Farmland Protection Board reported it "*holds or co-holds 42 recorded conservation easements totaling 4,233 acres. The Land Trust of the Eastern Panhandle (LTEP) holds three easements separately totaling 271 acres which brings the total in Berkeley County to 4,504 acres protected by all entities*". In a June 2015 Martinsburg Journal article one landowner contributed an additional 205 acres bringing the 2015 total to 4,441 protected acres.

Hydric Soils: Hydric Soils are those that retain water during a portion of the year. As a natural resource, hydric soils provide water storage and infiltration that naturally regulates water sources and flows. These soils are susceptible to compaction and uneven settling when developed. These factors impact land use decisions. Hydric soils in Berkeley County are found primarily in the floodplains of the county's creeks and streams. GIS data from the 2006 comprehensive plan indicated they cover approximately 2,000 acres, just under one percent of the county's land area. Floodplains containing these soils are discussed in more detail in the floodplain section of the water based natural resources profile.

Water Based Natural Resources Profile

Surface Water and Drainage Profile

Surface waters include rivers, streams and ponds. They provide aquatic habitat, carry or hold runoff from storms, and provide recreation and scenic opportunities. They are a dynamic and important component of the natural environment, but ever-present threats such as construction, clear-cutting, mining, overuse, and pollution have required the regulated protection of these valuable resources. The Eastern Panhandle Planning and Development Council's Chesapeake Bay Updates webpage provides access to local resources that can be utilized to protect surface water and drainage areas in the Berkeley County region. http://www.region9wv.com/ChesapeakeBayUpdates.aspx

As shown on The Hydrology Map in the appendices, there are many streams in Berkeley County, all of which drain into the Potomac River. In fact, the entire county lies within the Potomac River Direct Drains Watershed. Approximately, 844 acres (0.4 percent) of the county is covered by some type of water feature. The Potomac River is the most notable and forms the northern border of the county. The Opequon Creek forms the southeastern border of the county and flows northward to the Potomac River. Back Creek meanders northward to the Potomac through the valley that bears its name between North Mountain and Third Hill Mountain in the western part of the county. Other prominent streams include Middle Creek and Mill Creek near Inwood and Tuscarora Creek, which are tributaries of the Opequon Creek and Tillance Creek, a tributary of Back Creek. Meadow Branch, a tributary of Sleepy Creek, is the western-most of the county's surface waters. Sleepy Creek Lake is located along the Meadow Branch within the Sleepy Creek Wildlife Management Area.

Floodplain Profile

Floodplain areas perform a number of critical ecological functions. They absorb, store and release large amounts of water to surrounding soils and groundwater systems. Natural vegetation supported by floodplains helps to trap sediment and absorb excess nutrients from upland surface runoff, stabilize stream banks, and reduce soil erosion. Floodplains also provide habitat for terrestrial wildlife and influence stream conditions for aquatic life. Beyond their ecologic value, many people value the scenic qualities of floodplains areas, particularly for their wildlife and waters.

The Floodplains Map in the appendices (also referred to as Flood Hazard Zones) illustrates the floodplains of the county's primary waterways. They are classified for insurance purposes according to the likelihood of flooding. In Berkeley County, most of the waterways are within the 1-percent annual chance zones (A, AE, AH). The primary difference among the three is related to the method by which base flood elevations are determined. Within these areas, mandatory flood insurance purchase requirements, as established by FEMA (Federal Emergency Management Agency), take effect.

Statewide Flood Protection Plan: (*Executive Summary of the WV Statewide Flood Protection Plan, 2005)*
In 2005 the WV Flood Protection Task Force presented the first West Virginia Statewide Flood Protection Plan. The multi-agency task force was led by the WV Conservation Agency and the US Army Corps of Engineers. The Plan was developed over a period of three years and spells out both long and short term goals, strategies and implementation schedules. The six specific goals the plan addressed were:

- Reduce the unnecessary loss of lives due to flooding.
- Reduce private and public property damages due to flooding.
- Develop technical and administrative tools to manage flood loss reduction and floodplain management.
- Promote technical and legislative tools that will reduce excessive runoff from land conversion activities.
- Reduce personal and economic loss due to flooding while supporting state economic growth.
- Protect the state’s waterways and floodplain environments.

Recommendations of the Statewide Flood Protection Plan focused around 12 key issues and are listed below:

- Floodplain Management: Increase resources in the West Virginia Office of Emergency Services to support local floodplain managers statewide. Require owners of all new structures to obtain a floodplain permit certifying whether or not the structures are in the floodplain. Improve enforcement of floodplain management ordinances.
- Flood Warning System: Improve and expand the network of existing rain and stream gage in the state and connect those instruments to a proposed statewide flood warning system. This system would enable the National Weather Service to issue credible and reliable flood warnings. Provide markers along roads and at stream crossings subject to frequent inundation warning motorists of possible hazards at these locations.
- Floodplain Mapping: Update floodplain mapping to more precisely delineate floodplain areas and create more detailed hydrographic networks to improve flow models and flood risk assessment.
- Flood Damage Assessment: Designate a single agency or point of contact where flood damage data from federal and state resources could be stored. Develop a system that integrates the capability of Geographic Information Systems (GIS) with flood damage data so that damage information could be used as the basis for flood protection planning.
- Building Codes, Permitting and Enforcement: Continue to support and adopt updates of International Building Code, which covers residential building, plumbing, mechanical, fuel-gas and private sewage disposal requirements and meets minimal flood-resistant design standards. Provide education and technical assistance to the public on the regulatory permit process.
- Environmental Impacts of Flooding: Enact legislation that recognizes the attributes and hazards of the state’s floodplains and the need for stricter enforcement of floodplain ordinances. The legislation should declare floodway zones to be off-limits to new development (with some exceptions), and encourage federal agencies to evaluate all proposed projects for effects on the state’s floodplains. Legislate stricter enforcement of regulations for anchoring floatable materials in the floodway and flood fringe. Convene a “Stream Summit” to formulate a standard classification of stream quality in the state. Enact legislation that supports local regulation of

stormwater runoff volume. Enact guidelines for the emergency removal of stream debris to avoid long-term environmental damage. Fund studies for identification of stable stream reaches that require protection from development.

- Stream Crossings and Access Roads: Establish guidelines for the sizing, installation and maintenance of culverts, drainage structures and stream or river crossings. Identify ownership of abandoned stream crossings and move to demolish unused crossings.
- Dredging: The practice of local stream dredging to reduce the damages associated with large regional floods should be terminated. Channel modifications projects (which includes some dredging) where economically justified and environmentally sound should be supported to reduce flood damages. Allocate funds for stream restoration projects that can reduce flood damages. Allocate funds for stream restoration projects that can reduce flood damages and return the natural functions of damaged streams and ecosystems.
- Resource Extraction: The Task Force supports the recommendations of the study conducted by WVDEP regarding mining. In addition, the Task Force recommends the WV Division of Forestry accelerated revisions to Best Management Practices to reduce the impacts of forestry operations on flooding and develop BMPs on areas severely burned by wildfire.
- Stormwater Management: The Task Force recommends that all counties implement a stormwater ordinance to control the quantity and quality of stormwater and to guide the development and implementation of a stormwater management plan. It is recommended that a State agency inspect stormwater facilities and serve as a back-up for local inspection and enforcement of regulations on design, installation, operation and maintenance of these facilities. It is also recommended that special stormwater regulations be prepared for karst areas in West Virginia.
- Education: Encourage state, county and local officials to take the Federal Emergency Management Agency independent study course related to flooding, flood mitigation and floodplain management. Encourage education outlets to develop classes and curriculums that address floodplain and flood issues. Provide visible markers to identify for the public the Base Flood Elevation level.
- Existing Flood-Prone Structures and Facilities: Evaluate the major watersheds in the state to identify opportunities to construct upstream retention facilities for flood control and water supply. Evaluate the existing municipalities in the state to identify opportunities for protection in place of those communities serving as the economic and political centers of their respective counties. Establish a voluntary program of permanent acquisition for structures within the designated floodways and a voluntary program of flood-proofing and relocations to address existing structures in the flood fringe areas.

Countywide Floodplain Protection

Berkeley County adopted and made effective a Floodplain Ordinance in July of 2009. This ordinance is based upon a state wide model ordinance and, in conjunction with the 44 CFR (Code Federal Regulations) many of the twelve key issues listed above are addressed. Additional resources provided by the state are available at http://www.dhsem.wv.gov/MitigationRecovery/Pages/Floodplain-Management.aspx.

An updated model state floodplain ordinance is under review and an updated county version is anticipated to be available in 2016. A complete copy of the currently adopted ordinance can be found on the Berkeley County website www.berkeleywv.org.

Watershed Profile
A watershed is the land area from which water drains toward a common watercourse in a natural basin. As previously mentioned, all of Berkeley County falls within the Potomac River Direct Drains watershed. This watershed is further divided into several "sub-watersheds". The Surface Drainage Watersheds Map shows each sub-watershed along with the number of acres of land in which each drains.

Watershed Associations: Residents and conservation groups alike have recognized the importance of Berkeley County's water resources. There are numerous organizations that are working to improve and maintain watersheds throughout the county and the eastern panhandle. The following is a brief summary of some of the organizations that have been involved in watershed management in Berkeley County.

- The West Virginia Department of Environmental Protection (http://www.dep.wv.gov/): is a statewide agency that, among many roles and responsibilities, coordinates watershed protection plans throughout the state. This following is a link to The Back Creek Watershed Protection Plan, finalized in June 2014 and submitted to the West Virginia Conservation Agency. http://www.dep.wv.gov/WWE/Programs/nonptsource/WBP/Documents/WP/BackCreek_WPP.pdf

- The West Virginia Conservation Agency: is a statewide agency whose mission is to provide for and promote the protection and conservation of West Virginia's soil, land, water and related resources for the health, safety and general welfare of the state's citizens. The Eastern Panhandle district office for this agency is located in Martinsburg and more information regarding their services can be found on their website http://www.wvca.us/.

- The Blue Heron Environmental Network, Inc. is a non-profit environmental/conservation education organization. For the past 13 years, this group has been monitoring Back Creek and its tributaries. The organization has also worked closely with state, federal, and local agencies, local businesses, and educational institutions to educate the general public of the importance of caring for and keeping watersheds clean. The organization continues to work to have Back Creek designated as a Wild and Scenic River.

- Interstate Commission of the Potomac River Basin (www.potomacriver.org): was established in 1940. Its mission is to enhance, protect, and conserve the water and associated land resources of the Potomac River basin and its tributaries through regional and interstate cooperation.

- Chesapeake Bay Foundation (www.cbf.org): is a non-profit organization with a mission to improve the Chesapeake Bay watershed. It was founded in 1967 and serves throughout the Chesapeake's 64,000 square-mile watershed. The Foundation serves as a watchdog, representing the Chesapeake conservation lobby to business, government, and the public. The Chesapeake Bay Foundation also actively restores native habitats and filtering mechanisms (such as wetlands, oyster beds, forests, etc.)

- Soil & Water Conservation Society (www.swcs.org): was established in 1943, its mission is to foster the science and art of natural resource conservation.

- US Fish & Wildlife Service (www.fws.org): has as its mission to work with others to conserve protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The National Conservation Training Center (NCTC) is located on the banks of the Potomac River in adjacent Jefferson County.

- West Virginia Rivers Coalition (www.wvrivers.org): seeks the conservation and restoration of West Virginia's exceptional rivers and streams. It has worked with DEP to help improve public participation components of NPDES permitting.

Source Water Assessment and Protection Profile
In 2001, a diverse team of citizens, local, state and federal officials, and university scientists formed the Berkeley County Source Water Assessment and Protection (SWAP) Team to address increasing concerns about the county's water supplies. Their purpose was "to examine existing and potential threats to the county's source water and to make recommendations to mitigate those threats."(*Berkeley County Source Water Assessment and Protection Project Final Report, March 2004*)

Potential threats were broken down into the following categories, each with accompanying recommendations, which range from regular inspections of septic and sewer systems, to site design standards that minimize storm water impacts and provide natural filtration.

- Wastewater
- Septic and Sewer Systems
- Septage (collected materials from septic tanks)
- Sludge (treated residue from wastewater treatment facilities)
- Stormwater and Impervious Surfaces
- Other Pollutant Risks
- Agricultural Threats
- Loss of Open Space

It was recommended that the county appoint a Water Resources Advisory Council. This group would have been responsible for advising the County Council and the Berkeley County Public Service Water District as they began to implement the team's recommendations, as well as to take other actions that may be required to preserve the county's source water. A related publication, "Drinking Water Protection: A Citizen's Guide to Getting Involved" was completed by the West Virginia Rivers Coalition to help county residents understand the factors that influence source water in Berkeley County and things they can do to help protect it. A copy of this publication is provided at the end of this document.

The Advisory Council would have been responsible for spearheading the implementation of the West Virginia Potomac Tributary Strategy Implementation Plan in Berkeley County (*West Virginia Potomac Tributary Strategy Implementation Plan, Dec. 2005*) This plan was completed as part of an agreement among the states in the Chesapeake Bay watershed (Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia) to reduce the amount of nutrients and sediment flowing into the Bay. Cap Load Allocations (CLAs) for nitrogen, phosphorus, and sediment were established and partners agreed to develop and carry out voluntary Tributary Strategies to reduce pollutant loads to CLA levels by 2010. The complete document can be accessed through the following WV Conservation Agency website link.
http://www.wvca.us/bay/files/bay_documents/11_13298_ImplementationPlan_06_29_07_ps_matrix.pdf

The Strategy Implementation Plan used a decision matrix that included nine weighted factors in order to determine which watersheds would receive priority in an implementation timeline. Two of the top five priority tributaries were located in Berkeley County: Opequon Creek and Rockymarsh Run. It was anticipated that project teams would be organized in the priority watersheds. The teams were to be charged with a variety of tasks, including working with stakeholders, surveying and mapping the watershed to target nonpoint source project sites, and coordinating many of the activities and programs recommended in the plan. Ideally, a representative from the Advisory Council should have been on the Project Team(s). According to the Berkeley County Council webpage, this Water Resources Advisory Council does not exist. However, information regarding source water assessment programs that could impact the Berkeley County area can be obtained at: http://www.wvdhhr.org/oehs/eed/swap/ or by contacting the local Office of Environmental Health Services in Kearneysville, WV.

Water Quality Profile

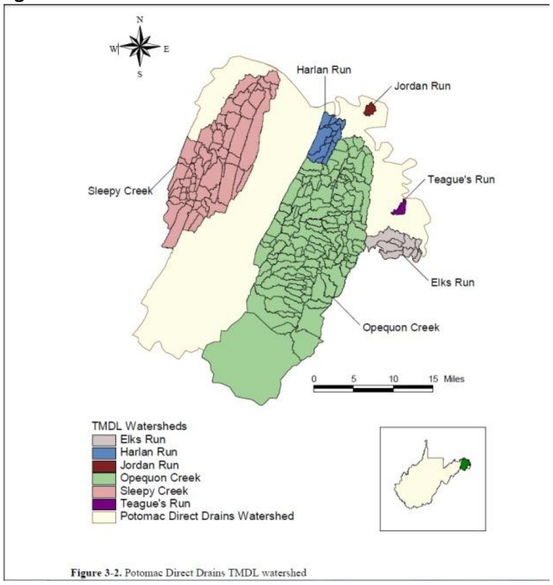
The West Virginia Department of Environmental Protection's Division of Water and Waste Management (DWWM) is currently responsible for the restoration and maintenance of water quality of the state's waters. In 1994, the Environmental Quality Board (formerly the Water Resources Board) developed water quality criteria for each kind of use designated for the state's waters. These uses include the following and are set forth in the *Code of State Regulations, Title 46, Series 1 (Requirements Governing Water Quality Standards*)

- The propagation and maintenance of fish and other aquatic life
- Water contact recreation
- Public water supply
- Agriculture and wildlife uses
- Industrial uses

The most recent assessment of the waters of the Potomac River Direct Drains Watershed was approved in January 2008. Results were compiled and are available online at www.wvdep.org. Most of the sub-watershed is covered by agricultural uses; however, residential and other development has been converting farm and forest land into more urbanized areas. This activity combined with the sensitive Karst topography within the watershed, appear to be having a significant negative impact on water quality.

The assessment team evaluated water quality and other stream health indicators at sites throughout the Potomac Direct Drains watershed, illustrated in Figure 5b-1. The samples collected indicated that many of the streams within the subwatershed were impaired according to the West Virginia Stream Condition Index. A majority of the samples were also in violation of the WV water quality criterion for fecal coliform bacteria also were from the Opequon Creek sample sites. This has been associated in part to karstic drainage patterns, intensive agricultural activities, and intensive urbanization of portions of the Opequon Creek sub-watershed. The report recommends that future research should target both sewage and livestock waste problems in order to help prioritize enforcement activities.

Figure 5b-1 Potomac Direct Drains TMDL watershed



Source: January 2008 Potomac Direct Drains Watershed TMDL Report

The Clean Water Act requires each state to develop a list of streams that are water quality limited and not expected to meet the water quality criteria even after applying technology-based controls. This list is commonly referred to as the 303(d) List. Berkeley County watersheds that appear on this list are illustrated in Figure 5b-1. The stream name and criteria affected are listed in Table 5b-1. The impaired streams of the Opequon Creek watershed, that are situated entirely in Berkeley County from their beginning to where they empty into the Opequon Creek are Hoke Run, Eagle Run, Tuscarora Creek, Evans Run, Buzzard Run, Middle Creek, Goose Creek, Three Run, Mill Creek, and Torytown Run. Table 5b-1 lists their impairment and additional information is available on the West Virginia DEP website www.dep.wv.gov.

Table 5b-1 Impaired Streams in the Potomac Direct Drains Watershed

Stream Name	Criteria Affected	Cause	Impaired Length (mi)	Reach Description	2002 List	2008 List
Elk Branch	CNA-Biological Fecal Coliform Sedimentation	Unknown	4.5	Entire length	Yes No	Yes Yes Yes
UNT/Potomac River RM 12.8 (Teague's Run)	CNA-Biological Fecal Coliform Sedimentation	Unknown	1.5	Entire length	Yes No	Yes Yes Yes
Opequon Creek	Aluminum (discharge) CNA-Biological Fecal Coliform Sedimentation	Unknown	30.7 30.7 30.7	Entire length Entire length Entire length	No Yes Yes	No Yes Yes Yes
Hoke Run	Biological Fecal Coliform Sedimentation	Unknown			No No	Yes Yes Yes
Eagle Run	CNA-Biological Fecal Coliform Sedimentation	Unknown	1.2	Entire length	Yes No	Yes Yes Yes
Tuscarora Creek	CNA-Biological Fecal Coliform Sedimentation	Unknown	11.6	Entire length	Yes No	Yes Yes Yes
Dry Run	CNA-Biological Fecal Coliform Sedimenation	Unknown	4.6	Entire length	Yes No	Yes Yes Yes

Stream Name	Criteria Affected	Cause	Impaired Length (mi)	Reach Description	2002 List	2008 List
Evans Run	CNA-Biological Fecal Coliform Sedimentation	Unknown	5.8	Entire length	Yes No	Yes No Yes
Shaw Run	Biological Fecal Coliform Sedimentation	Unknown			No No	Yes Yes Yes
Buzzard Run	Biological Fecal Coliform	Unknown			No No	No Yes
Hopewell Run	CNA-Biological Fecal Coliform Sedimentation	Unknown	3.5	Entire length	Yes No	Yes Yes Yes
UNT/Hopewell Run	Biological Fecal Coliform	Unknown			No No	Yes Yes
Middle Creek	CNA-Biological Fecal Coliform Sedimentation	Unknown	11.7	Entire length	Yes No	Yes Yes Yes
Goose Creek	CNA-Biological Fecal Coliform	Unknown	3.0	Entire length	Yes No	No Yes
Three Run	Biological Fecal Coliform	Unknown			No No	No Yes
Mill Creek	CNA-Biological Fecal Coliform Sedimentation	Unknown	11.4	Entire length	Yes No	Yes Yes Yes
Sylvan Run	CNA-Biological Fecal Coliform Sedimentation	Unknown	4.5	Entire length	Yes No	Yes No Yes
Torytown Run	CNA-Biological Fecal Coliform Sedimentation	Unknown	2.4	Entire length	Yes No	Yes Yes Yes
Turkey Run	Biological Fecal Coliform Sedimentation	Unknown			No No	Yes Yes Yes
Silver Spring Run	CNA-Biological Fecal Coliform Sedimentation	Unknown	3.2	Entire length	Yes No	Yes Yes Yes
Harlan Run	CNA-Biological Fecal Coliform Sedimentation	Unknown	7.2	Entire length	Yes No	Yes Yes Yes
Tullis Branch	Biological Fecal Coliform Sedimentation	Unknown			No No	Yes Yes Yes
Sleepy Creek	Fecal Coliform	Unknown			No	Yes
Indian Run	Fecal Coliform	Unknown			No	Yes

Source: 2006 Comprehensive Plan; WV DEP, Potomac Direct Drains Watershed TMDL Report 2008
Note: Indented streams are part of the above named stream's watershed.

Groundwater Profile

The growth in Berkeley County is placing pressure on the groundwater in terms of both quantity and quality. Approximately one half of the county receives its drinking water from either the Berkeley County Public Service Water District or the City of Martinsburg. The other half of the county depends on private wells for its drinking water. Unlike the public water, all the non-public water is from residential wells.

The spatial distribution of the groundwater in Berkeley County, both within and between geological units is very pronounced. When the recharge under normal and modest drought conditions is considered, groundwater quantity and quality is vulnerable. The heterogeneity of groundwater and its recharge must be addressed for growth to continue at current levels. Too often, building approval in Berkeley County is based on the belief that water availability is the same throughout the county. With low density homes, this concept is workable, but the aggressive high density growth challenges the application of this approach. Over subscription of the ground water in those areas of marginal supply will eventually result in entire subdivisions being without water.

Providing public water throughout the county would be prohibitively expensive. A more reasonable approach is restricting high density growth to areas which can economically be serviced by public water and with imposing restrictions on the density of growth in other places. The level of the density should be based on a thorough assessment of the capacity of groundwater to support the planned development, including the local recharge of the groundwater.

The most pressing question regarding groundwater in Berkeley County is the size, extent, robustness, and sustainability of the various groundwater sheds. By knowing this land-use, managers can determine where aggressive growth cannot be sustained and controls on density are warranted. Associated questions are the interconnection between the groundwater sheds and location and nature of the recharge. While not as daunting a question, the presence of bacterial contamination and the source of the bacteria are important. To ensure that an adequate supply of contamination-free drinking water is available, it is necessary for the county to take aggressive action.

As has been mentioned above, groundwater is perhaps the most important resource in the county. It is imperative that both the quality and quantity of this resource be preserved. Education is an important component of this preservation as is the proper assessment prior to large scale development. The 2009 Berkeley County Subdivision Ordinance includes a WV DEP groundwater protection permit as one of its required outside agency approvals. A better understanding of the details involved in this permit will help determine if this permit requirement meets the needs of the recommendations above or if additional information needs to be obtained to make sound decisions regarding groundwater protection and sustainability.

Wetland Profile

The Hydrology Map in the appendices illustrates the location of the U.S. National Wetlands Inventory in Berkeley County. Many wetlands are located along the county's streams; however, there are pockets of wetlands throughout the county.

Wetlands are unique environments that are transitional areas between terrestrial and hydrologic systems. As a component of both systems, they perform a variety of important functions and are in a state of constant change. Wetlands help to maintain surface stream flow and groundwater recharge. They moderate stormwater runoff and downstream flood crests because they are natural water storage areas. Wetlands provide important habitat for many species of plant and animal life.

There are multiple problems associated with developing on wetlands soils. Wetlands located in floodplains are often flooded. Draining or filling in of upland wetlands removes natural water storage, which yields increased water flows downstream. Wetland soils are sensitive in two ways. First, they are easily compacted, resulting in uneven settling of structures. Second, wetland soils with low permeability and high groundwater tables are not suitable for the installation of on-lot septic systems due to the risk of surface and groundwater contamination. Wetlands are protected by the US Army Corps of Engineers and the West Virginia Department of Environmental Protection.

Air Quality Profile

The Clean Air Act provides the principal framework for national, state, and local efforts to protect air quality. Under the Clean Air Act, the U.S. Environmental Protection Agency (EPA) is responsible for setting standards, also known as national ambient air quality standards (NAAQS), for pollutants which are considered harmful to people and the environment. These pollutants include ozone, particulate matter, sulfur dioxide, carbon monoxide and nitrogen dioxide. The major sources of these pollutants are cars, power plants, and heavy industry. The EPA is also responsible for ensuring that these air quality standards are attained through national standards and strategies to control pollutant emissions from automobiles, factories, and other sources.

The EPA's Air Quality Index (AQI) reports on levels of the NAAQS pollutants present in the air. An AQI value is given for each monitoring site and pollutant. Martinsburg is one of the West Virginia monitoring sites. The overall AQI for a site is the highest index value of any of the pollutants. Exposure to these pollutants can make it difficult for some people to breathe, especially people with asthma and other respiratory problems. As the level of any of these air pollutants rises beyond health standards, precautionary health warnings are triggered.

According to the 2004 West Virginia DEP's Division of Air Quality (DAQ) Annual Report, new health based standards were set by EPA for 8-hour ozone pollution and for particulate matter in 1997. In 2003, the DAQ confirmed which areas of West Virginia were not meeting the 8-hour ozone standard. Berkeley County was identified as a potential non-attainment area, but was deferred because it voluntarily entered into an Early Action Compact, which required areas to identify and implement control strategies earlier than would otherwise be required. In addition, Berkeley County was designated as a maintenance area for the critical pollutant fine particulate matter in late 2014. This designation required Berkeley County to perform a conformity analysis for transportation projects in the region that are deemed regionally significant. The complete conformity analysis document can be accessed via the following link http://www.hepmpo.net/PDF/2014_AQConformityAnalysis.pdf on the Hagerstown Eastern Panhandle MPO website.

Air Quality Early Action Compact Support

Continue to support the implementation of the Air Quality Early Action Compact. In 2003, the West Virginia DEP Division of Air Quality (DAQ) identified the Eastern Panhandle counties of Jefferson and Berkeley as a potential non-attainment area. However, the counties voluntarily entered into an Early Action Compact, which required areas to identify and implement control strategies earlier than would otherwise be required. An updated Air Quality Master Plan was made available by Region 9 in January 2015. The county should continue to work with DAQ staff to meet the program requirements on schedule. Additional information regarding air quality initiatives in the region is available at http://www.region9wv.com/AirQualityInitiative.aspx.

Vegetation and Wildlife Profile

West Virginia's vegetative and wildlife resources are a vital part of its history, its character and its ecological health. Vegetation, particularly forests, performs several vital functions for the local ecology. It provides habitat, both food and shelter, for local wildlife. It circulates nutrients between soil and the atmosphere. It stabilizes soils prone to erosion and filters nutrients, pollutants, and sediment from runoff, particularly along stream banks. Furthermore, forests are productive sources of timber. Berkeley County is in the central forest region. Oaks and associated hardwoods are the dominant species with pines generally found in shale areas.

The West Virginia Wildlife Diversity Program (WDP) and the Natural Heritage Program (http://www.wvdnr.gov/wildlife/wdpintro.shtm) are responsible for those species listed by the federal government as threatened or endangered, as well as non-game wildlife and their habitats. Wildlife

Management Areas (WMAs) are a key component of a multi-faceted program that seeks to conserve the state's non-game wildlife, as well as inform and educate the general public about these special resources.

The Sleepy Creek WMA covers 22,928 acres in Berkeley and Morgan Counties. It is located approximately six miles southeast of Berkeley Springs and eleven miles west of Martinsburg. Oak-hickory forest covers 3,500 acres while Virginia pine-oak forest blankets the majority of the area. Sleepy Creek is primarily managed for dear, turkey, grouse, squirrel and raccoon, with wild turkey the featured game species. Sleepy Creek Lake, which covers 205 acres, contains a good sport fishery for largemouth bass, bluegill and crappie. Boat launching facilities are situated at the dam spillway and near the midpoint of the lake. The area also has a rifle range. Seventy-five camping sites are available and trailers over 17 feet are not recommended due to the graveled roads. Water and vault toilets are available and a nominal camping fee is charged. The WMA is owned and managed by WVDNR.

A 2003 report from the Blue Heron Environmental Network indicated that there is a large and diverse variety of endangered, rare and unique forms of plant and wildlife species throughout the Back Creek Watershed. The Harperella, was one of the more prominent endangered plant species mentioned in this report and was known to exist in only 4 water bodies in the Maryland, West Virginia, Pennsylvania area. Back Creek was one of those four water bodies. The West Virginia Division of Natural Resources continues to monitor and inventory wildlife and plants and in 2015 the division implemented a State Wildlife Action Plan. This plan references Species of Greatest Conservation Need, Environmental Stresses and Conservation Actions in Berkeley County. There are 52 Priority 1 Species and 81 Priority 2 Species listed in the Conservation Focus Area of Sleepy Creek and Back Creek (Western Berkeley County). There are 68 Priority 1 Species and 134 Priority 2 Species listed in the Conservation Focus Area of the Greater Shenandoah Valley (Eastern Berkeley County). Berkeley County is not only home to the Harperella plant but also the Shale barren rock cress plant, the James Spiny Mussel, and the Madison Cave Isopod, all of which appear on the West Virginia threatened or endangered species list. The complete State Wildlife Plan document can be accessed on the division's website or through the following link http://www.wvdnr.gov/Wildlife/Action_Plan.shtm.

Scenic Features and Vistas Profile

Berkeley County has many rich vistas from all roadways and regions of the county. There are several driving routes that have been designated within Berkeley County. As defined by the National Scenic Byways Program, the scenic quality is a visual experience derived from the view of natural and manmade elements of the environment.

Sections of State Secondary Roads 9, 45, and 51 in Berkeley County are designated as the George Washington heritage Trail Byway, which follows the footsteps of America's first president. The Byway completes a loop through Jefferson, Berkeley, and Morgan Counties. In Berkeley County, the Byway goes through Martinsburg, Hedgesville, Inwood, Gerrardstown and Shanghai. Scenic byway designation can help to preserve scenic locations and corridors making the designated road segments eligible for federal funds for improvements.

2006 Summary of Natural Resources Action Strategies

- Continue to use the Berkeley County Farmland Protection Program as the primary means for protecting agricultural lands in the county.
- Include overlay zones in the land use ordinance to protect steep slopes, groundwater, sinkholes, Karst regions, watersheds, and floodplains by preventing development in these areas.

- Utilize the Natural Resources Protection Areas on the Growth Management Map to provide a basis for developing a resource protection district that would prevent permanent uses from being developed within these areas.
- Provide property owners information about Best Management Practices (BMPs) they can use to protect sensitive resources, including riparian buffers, native landscaping, and forest management techniques. Protection of Berkeley County's natural resources will depend heavily on the actions of the private land owners. The county should initiate a "Keep Berkeley Green" or similar public outreach and education program that will provide residents with the information they need to do their part to protect the environment. There are currently many organizations that provide information about Best Management Practices (BMPs), including WVU Cooperative Extension Service, WV Division of Natural Resources (DNR) and Division of Forestry, the Conservation Fund, the Natural Lands Trust, and the Chesapeake Bay Foundation. The initiative could be as simple as a set of links from the county's website or as sophisticated as a BMP library that would be available at the planning commission's offices or online
- Prioritize the continued development of the county's GIS database as a critical tool for implementing natural resource protection strategies. Many of the recommendations in this plan will require accurate geographic data in order to implement them. Accurate delineation of sensitive resources will provide a reliable and predictable basis for decisions about the location and nature of new development.
- The creation and maintenance of an electronic database, including a digital map of all of the tax parcels in the county will provide accurate information for developers and the planning commission to make better decisions during the development review process.
- Develop a network of greenways that can serve to protect surface waters, connect open spaces, and meet recreational needs at the same time. As proposed in the Transportation Plan, the county should work with residents and the Parks and Recreation Board to develop a county-wide Greenways and Water Trails network. The goal would be to establish an interconnected network of greenways and land and water trails that would both preserve special natural and historic areas and also provide opportunities for residents and visitors to enjoy them. This strategy will require a coordinated and committed effort by a wide variety of organizations, including citizen groups, land trusts, businesses, and state and federal agencies. However, the final result would be a source of community pride and well worth the efforts needed to make it a reality.
- Institute an on-site management system to manage the functionality of the septic and alternative waste systems in use in Berkeley County.
- Assess the robustness of the groundwater in any area proposed for development and use this information to determine the number of home sites in a particular area. In those areas without an assessment of the amount of availability of groundwater and which are not on public water, development should be limited to a lower housing density in order to protect groundwater resources.

2016 Highlights

- USDA 2012 Census data indicates that there are approximately 70,160 acres of prime farmland soil, most of which are located in the Shenandoah Valley. As of Summer 2015, The Farmland Protection Program conservation easements were up to 4,441 protected acres.
- The Back Creek Watershed Protection Plan, was finalized in June 2014 and submitted to the West Virginia Conservation Agency.

- The West Virginia Potomac Tributary Strategy Implementation Plan was updated in June 2007 in an effort to reduce the amount of nutrients and sediment flowing into the Chesapeake Bay.
- Many of the 2006 natural resources action strategies refer to regulations and incentives that have been and will continue to be addressed by the Berkeley County Subdivision Ordinance. As of the writing of this plan, Berkeley County has three valid subdivision ordinances: 1975, 2004 and 2009.
- A Floodplain Ordinance, based upon a state wide model ordinance, was adopted and made effective in July 2009 by the Berkeley County Council.
- A Stormwater Management and Sediment and Erosion Control Ordinance was adopted by Berkeley County in January of 2010.
- The 2009 Berkeley County Subdivision Ordinance includes a requirement for a WV DEP groundwater protection permit.
- Berkeley County was designated as an air quality maintenance area for the critical pollutant fine particulate matter in late 2014. An updated Air Quality Master Plan was made available by Region 9 in January 2015.
- The West Virginia Division of Natural Resources implemented a State Wildlife Action Plan in 2015. This plan references Species of Greatest Conservation Need, Environmental Stresses and Conservation Actions in Berkeley County.
- Complete copies of the adopted ordinances can be found on the Berkeley County website www.berkeleywv.org.
- An ordinance including zoning options was shared with the public and was defeated in the general election on two separate occasions. The first attempt to pass a zoning ordinance was defeated several years prior to the writing of the 2006 Comprehensive Plan. The second attempt to pass a zoning ordinance was defeated in 2010.
- The county assessor's office has made available a tax parcel map that can be accessed by the public. This map is updated on a regular basis and can be accessed through the following website: http://www.theassessor.org/.

Looking Forward to 2026

- Purchases should continue towards conservation easements through the Farmland Protection Program.
- An evaluation of the impaired streams on the 303(d) List should be performed in order to determine Best Management Practices for water quality improvement of these streams.
- Efforts are underway by the Planning Commission and the County Council to bring all subdivision proposals under one set of regulations. This process should be complete in July 2018. The Subdivision Ordinance adopted in 2009 is also under review and a re-write of the ordinance is targeted for 2016 as well.
- An updated version of the Stormwater Management and Sediment and Erosion Control Ordinance is anticipated to be available in 2016.
- An updated Floodplain Ordinance is anticipated to be approved and adopted in Summer 2016.
- Evaluation of the WV DEP groundwater protection permit will help determine if this permit is meeting the needs of Berkeley County in regards to groundwater preservation or if additional steps need to be taken.
- Berkeley County is home to the Harperella plant, the Shale barren rock cress plant, the James Spiny Mussel and the Madison Cave Isopod, all of which appear on the West Virginia threatened or endangered species list. Steps will need to be taken to ensure protection through compliance with the Federal Endangered Species Act.

- Sewer and septic service upgrades, as outlined in The Infrastructure Plan chapter, need to be considered.
- Impaired stream water quality data, more recent than 2008, needs to be obtained. This will assist in determining if any improvement in the quality of impaired streams has occurred.
- Region 9 will continue to play a critical role in community outreach programs regarding Best Management Practices for groundwater, surface water and other natural resource preservation through initiatives such as increasing the Urban Tree Canopy of Berkeley County.
- Define a process for verifying the presence of a wetland on individual parcels, prior to any grading or construction taking place that could potentially destroy the wetland. This process could be similar to the floodplain verification process, if mapped wetland data is available. There is also a need to document the steps involved in notifying the appropriate agencies in order to enforce the protection of wetlands, when they are present, according to the requirements of the Federal Clean Water Act.