

CHAPTER 6 – SENSITIVE AREAS

Introduction

The rural areas chapter identifies those sensitive natural environmental features, which merit protection from development. These physical features are delineated based on steep slopes, floodplains, wetlands, sensitive soils, forests, rivers, prime agricultural lands, or mineral resources. It is obvious that the intensity of the use of the land is often dictated by the physical attributes of the property. As sensitive areas do not typically follow property lines, these attributes affect numerous adjoining properties, thus creating natural land use patterns. Protection of these attributes may be achieved through incorporation of these features into future development proposals.

Morgan County, by comparison to its adjacent counterparts, has some extensive physical constraints to land use. However, some of these constraints have been overcome or neglected in order to allow development to occur in locations where a more limited approach might be suggested by a site's natural features. This limited approach should require careful development design in order to protect sensitive features and correct existing negative encroachments or prohibitions on development. In order to provide the public with a justifiable understanding of this approach, the ecological and environmental benefits and the potential degradations should be clearly identified and defined. This may ultimately influence what land use types are appropriate for each development proposal.

Steep Slopes

Possibly the most notable and impacting physical feature to future growth and development within Morgan County is the amount of land delineated with steep slopes. Nearly 47% of the County may be classified as having slopes greater than 25%, which is the maximum slope for installation of individual septic systems, and thus the generally accepted limit for structural improvements to property. Another 21% falls within the 15% to 25% range, and nearly 30% is between 8% and 15%. Less than 5% of the County may be classified as relatively flat, containing a slope of less than 8%.

The region most affected by this topographic feature is split between the Cacapon and Central Valley planning regions, along the east and west Cacapon Mountain ridges. The benefit in the Cacapon Planning region exists in the large amount of relatively flat land through its northwest corridor, while the Central Valley Planning region benefits from major water, sewer, transportation and other available services.

While two-thirds of the State land is sloped more than 25%, Morgan County is just under one half, yet more severe than its two eastern panhandle neighbors to the east. The County is located in the physiographic region known as the Ridge and Valley Province. For purposes of describing the topographic conditions, the County may be divided into two types of areas; Mountain Area and Ridge Area.

Mountain Area

The Mountain Area from the west is a series of northeast-southwest rugged mountains separated by narrow valleys. The mountain slopes are gashed by steep runs giving a very rough topography, which continues on to the west.

At the western edge of the Mountain Area is the narrow Potomac Valley, which follows a northeast course parallel to the trend of ridges, but in a meandering channel. This valley is bounded on the Morgan County side by Spring Gap Mountain, Purslane Mountain, and Sideling Hill, which have steep and highly dissected slopes down to the river. The fall from the top of these mountains to the river is 1,220 to 1,400 feet in a distance of one to one and a half miles. In the valley are numerous flat-topped hills rising 800 to 1,000 feet above the valley floor.

Spring Gap Mountain extends from Hampshire County into Morgan County for a distance of three-fourths mile, southeast of Paw Paw. It is a level-topped mountain of 1,800 feet elevation with steep slopes.

Purslane Mountain and Sideling Hill are separated by a high level valley drained by Rockwell Run. Purslane Mountain on the west side of the valley has a level top, 1,700 to 1,800 feet in altitude. The highest point on Sideling Hill is 2,029 feet above sea level located about three miles north of the Hampshire County line. Its west slope is deeply trenched by short steep runs forming very rugged slopes, while on the east; slope erosion has not been as prevalent. The valley on the east side of Sideling Hill is 200 to 300 feet higher than the Potomac on the west. The mountain is cut by a deep gap at the north where the Potomac cuts through.

The valley east of Sideling Hill is separated into two parts by a low transverse divide 800 to 900 above sea level. From this divide, the land slopes generally south to east to the Cacapon River, and north for a distance of five miles to the Potomac River. This valley contains two northeast-southwest ridges, known as Bare and Road Ridges; whose level tops are about 800 feet above sea level.

The east side of the valley is bounded by Tonoloway Ridge, reaching a height of 1,000 to 1,100 feet. Its eastern slopes are almost perpendicular walls to the Cacapon River. It is cut by a wide gap at the south where the river passes through and by a gap three-fourths mile wide at the north where the Potomac cuts through.

The western limit of the Mountain Area of Morgan County is Cacapon Mountain, which is the highest mountain in the area. It begins southwest of Sir Johns Run, on the Potomac, as a ridge 600 feet high and rises over a distance of four miles to 1,545 feet at Prospect Rock. The mountain reaches its highest point in the northern area, at 2,196 feet, five miles southwest of Prospect Rock. It is 2,320 feet high at the Morgan County boundary with Hampshire County.

Ridge Area

The Ridge Area of Morgan County begins at the Cacapon Mountain and extends east across a broad valley broken by parallel low ridges which follow the same course as the mountain. This area exhibits long narrow valleys and ridges as does the area west of Cacapon Mountain; but is dissimilar in that Sleepy Creek cuts across the ridges creating a drainage area of transverse as well as longitudinal valleys. The result of these changes is a very different type of topography than that west of the Mountain.

Warm Spring Ridge extends from the south line of the County north to the Potomac River and beyond into Maryland. The ridge is level topped at 800 to 900 feet at the north and 1,200 at the south. Its slopes are steeper on the east than on the west. The valley between this ridge and Cacapon Mountain is drained to the north by Sir Johns Run and to the south and east to Sleepy Creek Run by Rock Gap Creek. At the south, this valley is drained by Indian Run, which flows north and east to Sleepy Creek.

The eastern slope of Warm Spring Ridge is drained by the north flowing Warm Spring Run. The valley of this run at the north is bounded on the east by Horse Ridge, which is a long level ridge of 800 feet elevation. Further south, this ridge is continued in the form of isolated hills of 900 feet elevation, but natural erosion has destroyed the ridge as a continuous line in the topography.

East of Horse Ridge at the north is the valley of Dry Run, then Pious Ridge, 600 to 800 feet in elevation. The broken continuation of this ridge is Timber Ridge at 900 feet through which Sleepy Creek cuts a gap.

Sleepy Creek Mountain ranges in height from 1000 feet at the north to 1700 feet and ranges from a height of 1800 feet toward the south end of Morgan County. The slopes of this mountain are steep and rugged, but are not cut by run valleys as are the mountains to the west.

Water

Morgan County is located entirely within the Potomac River Basin. All of Morgan County drains north to the Potomac except a small area in the southeast corner. The importance of the County's water resource must be emphasized and evaluated as it continues to become more limited in availability over time, due to varying factors such as increased usage and other measurable impacts.

Rivers and Streams

The Potomac River forms the boundary line between Maryland and West Virginia along the northern line of Morgan County. The River is actually part of the State of Maryland and is under jurisdiction of the Maryland Department of Natural Resources for water quality and river use. From the southwestern corner of Morgan County, the river follows a strongly meandering course northeast 28 miles to the cut through Sideling Hill. The bends are very symmetrical and deeply trenched in the valley. The fall of the river in this section is low, averaging 2.5 feet per mile.

From Sideling Hill, the river flows east to Cacapon Mountain for 5 miles of straight channel with a fall of only 1.7 feet per mile. It then turns northeast to Hancock, curving in a small meander around the ridge near Roundtop on the Maryland side. This meander is nearly a half-mile wider than its former channel. From Hancock, the river flows southeast in a nearly straight channel for 10 miles to the mouth of Cherry Run. The fall of the river from Sir Johns to this point is 1.3 feet per mile.

Along the western end of Morgan County, the streams are small runs which rise on Purslane Mountain and reach the Potomac by short courses. Rockwell Run is the largest of these and follows the high level valley between Sideling Hill and Purslane Mountain, at an elevation of 1,200 to 1,600 feet above sea level, to a transverse gap at the north end of Purslane Mountain, where it turns west toward the Potomac. Its total length is about 5 miles with a fall of 1,140 feet, or nearly 230 feet per mile. Like all of these mountain runs, Rockwell Run averages a relatively small volume of water fed by springs, but in a period of rain becomes a roaring torrent, which can cause rapid erosion.

The Cacapon River is the fourth largest tributary to the Potomac River. Its source is in the highlands of Hardy County, Virginia and it follows a northeasterly course across the eastern portion of Hampshire County through the western part of Morgan County to the Potomac River at Great Cacapon. The total length of its channel is 100 miles and the average fall is 11.8 feet per mile. Its upper reaches have a steep gradient with some falls and rapids, while the lower third is more sluggish and meandering. Within Morgan County, the Cacapon features a gentle gradient and numerous long pools as it transcribes huge, slow-flowing loops through the mountains. The land cover is primarily forested slopes and flood plain terraces. The Morgan County segment is the most developed and platted stretch of the river, with individual residences, vacation cottages, and large subdivision developments dotting the banks.

Sleepy Creek has its source on the west slope of Timber Ridge in the northeastern part of Hampshire County and follows this ridge northeast to Rock Gap, where it crosses the ridge in the southern part of Morgan County. The length of its channel is 42 miles and the average fall is 17 feet per mile. Its drainage basin is broad, extending from Sleepy Creek Mountain to Pious Ridge on the west for a width of 4 to 5 miles and covering nearly 93,000 acres. Its tributary creeks and runs on the west cut through transverse valleys in the ridges to join the main stream, as in the case of Rock Gap, which has cut a deep gorge through Warm Spring Ridge. This watershed is nearly 50% forested with another third in active agriculture use. On the east side of the main creek, the large tributaries such as Mountain and Meadow Runs follow the rock structure.

Sir Johns Run drains the valley between Cacapon Mountain and Warm Spring Ridge. It follows a course parallel to these ridges for 8 miles at a fall of nearly 70 feet per mile. The valley is narrow, its branches short, and the volume of water is small except after rains.

Warm Spring Run drains the valley between Warm Spring Ridge and Horse Ridge. Its length of nearly 11 miles falls at a rate of nearly 40 feet per mile. It follows close to Warm Spring Ridge and is fed by various springs, especially by the warm springs at Berkeley Springs. On the east it has a number of short tributaries, which extend into the divides separating them from the Sleepy Creek drainage area.

Surface Water Quality

As established above, Morgan County has numerous surface water bodies that traverse various parts of the County. Based on the collection of data over time, most of these surface water sources are in healthy condition. Water quality parameters that are evaluated include dissolved oxygen, pH (acid-alkaline balance) temperature, metals, and conductivity. There have been occasional violations of State criterion for fecal coliform bacteria, which is indicative of either human or animal waste entering the stream from houses, septic systems, or agricultural activities.

Specifically, in reference to the Cacapon River, water quality is considered excellent as evidenced by data collected by West Virginia Department of Environmental Protection. Like many of the streams in the Eastern Panhandle that are unaffected by mine drainage, the Cacapon has an excellent pH value. The average acidity, alkalinity, and hardness values are also indicative of high water quality. Oxygen problems are virtually unknown. Only one instance has been recorded in which the fecal coliform standard was violated; and other than minor infractions of copper, iron, lead, silver, and cyanide levels, the parameters have never exceeded the acceptable limits for all other metals for which the State has standards. The Cacapon remains one of the State's highest quality streams.

The potential exists in Morgan County for water quality problems due to sediment loadings which occur after heavy rains in areas of agricultural and increased construction activities. Sediment often includes organic and inorganic pollutants from fertilizers, pesticides, animal wastes, and construction materials. Chemical pollutants may be toxic to fish and may be retained in fish, which have eaten contaminated organisms. Over a period of time, sediment fills watercourses, covering bottom dwelling organisms and contributing to increased flooding potential. By increasing turbidity, or cloudiness of the water, sediment reduces light available for growth of aquatic plants and animals. For all these reasons, sediment offers the potential to significantly reduce the scenic and recreational value of Morgan County.

West Virginia's water quality standards include a criterion for turbidity. This turbidity limitation applies to all earth disturbance activities by measuring stream quality directly above and below the area where drainage enters the affected stream.

Floodplains

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 ecological value, many people value the scenic qualities of floodplain areas, particularly for their wildlife and waters.

In 2005, the West Virginia 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 U.S. 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 addresses are:

- 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

These goals focus around 12 key issues:

- Floodplain management
- Flood Warning System
- Floodplain Mapping
- Flood Damage Assessment
- Impacts of Flooding
- Building Codes, Permitting and Enforcement
- Stream Crossings and Access Roads
- Dredging
- Resource Extraction
- Stormwater Management
- Education
- Existing Flood-prone Structures and Facilities

All floodplains in Morgan County are subject to floodplain regulations as delineated in the Flood Insurance maps developed by FEMA and the County's ordinances, which are updated to comply with State and Federal regulations. The Flood Insurance Program was established by the National Flood Insurance Act of 1968, and provides previously unavailable flood insurance to property owners within delineated areas. The Act prohibits Federal financial assistance for construction projects within non-participating communities. Although Morgan County does participate in the program, concern has been expressed as to the accuracy of published Flood Insurance Program maps. The Federal Program is expected to update the maps at which time the County will provide details of existing flood control dams that may not have been considered in previous mapping of the Berkeley Springs area.

Due to nearly annual flooding in the Berkeley Springs area from Warm Spring Run, the Town of Bath in a joint effort with the Eastern Panhandle Soil Conservation District completed a watershed flood prevention and protection project in 1962. The project applied conservation land treatment measures to 2,200 acres, changed land use on 2,720 acres, stabilized four miles of critically eroding streambanks, and constructed eight single-purpose flood control dams. The eight dams were constructed upstream from the Town to control runoff of about 35% of the flood producing area. Prior to this project the area experienced severely damaging floods in 1936 and 1954. Since that time, however, the project has reduced flood occurrences to minimal impacts of sediment and debris being deposited into yards and occasional water back-up through sewer lines into basements.

In addition to the instance described above floodplain issues exist generally in three areas of the County. While less than 1% of the County land mass is covered by water, it does include a larger percentage covered by floodplain areas. These areas include the north south corridor of the Cacapon River, the much wider north south drainage area of Sleepy Creek, and the east west shore of the Potomac River. Although much of this land is under private ownership, community efforts and regulatory measures have achieved some positive influence in protecting these sensitive areas.

Some positive affects in protection of these sensitive environmental areas, especially adjacent to the many rivers and streams include promotion of riparian buffers through use of trees, shrubs and other vegetation. These buffers should be adequate in stabilizing banks, reducing erosion, and filtering sediments.

Wetlands

Wetlands are unique environments that are transitional areas between terrestrial and hydrological systems. As a component of both systems, they perform a variety of important functions and are in a state of constant change. Wetlands help 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. They also serve as natural filters for reducing pollution of various chemicals and sediment into the waterways.

There are multiple problems with developing on wetland 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, wetlands 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 U.S. Army Corp of Engineers and the West Virginia Department of Environmental Protection.

Groundwater

Precipitation is the main source of groundwater recharge in Morgan County. Although precipitation is intermittent, water is continually moving from storage in the underground rock structures. In general, groundwater movement parallels the land surface, moving from ridges to the valleys, where it discharges into springs and streams.

Water is found in practically all rock formations of the Potomac River Basin, of which Morgan County is a part. However, the quantity of water largely depends on the kind, size and degree of interconnection of the openings in the rock, called fractures. The largest groundwater supplies are available from areas underlain by sandstone and limestone bedrock, which contains fractures and solutional cavities through which groundwater can easily move. The least water is available from shale, which contains very few openings of this type. Shale is more brittle than sandstone or limestone and at greater depths the weight of overlying rock squeezes openings shut.

There are two linear strips of land area on either side of Cacapon Mountain in which groundwater availability is reflected in well yields from 100 to 200 gallons per minute. These areas are coincident with predominately limestone and sandstone bedrock. The remaining areas of the County, which report lower well yields of 1 to 70 gallons per minute are mostly underlain by shale.

The most frequent groundwater quality problem in Morgan County is high mineral content. Groundwater beneath the ridges has a lower concentration of dissolved materials than beneath valleys because the ridges are mainly recharge areas and the valleys are mainly discharge areas. A well on a ridge draws relatively pure groundwater near the beginning of its flow path. A well in a valley draws comparatively impure groundwater, which is near the end of its flow path, has been exposed to bedrock longer, and has picked up dissolved materials along the way. Higher water quality exists among the ridges west of Cacapon Mountain than in the Sleepy Creek Valley to the east. The area east of Cacapon Mountain, where groundwater is characterized as having excessive iron content and hardness, is mostly underlain by shale. Because shale is not very permeable, water moves through it slowly creating the opportunity to dissolve more mineral matter.

The highest possibility of groundwater contamination from surface sources is in limestone areas because of the presence of solutional cavities and sinkholes; through which contaminated water can enter without being filtered through the soil mantle. This type of pollution is more frequently found in the Great Valley of which Berkeley and Jefferson Counties form a part. However, groundwater contamination is by no means limited to limestone areas. Studies in the Potomac River Basin have found high chloride concentrations in water from some wells tapping shale and sandstone near septic tanks and barnyards, indicating that the water may be polluted. Even so, in sparsely populated areas underlain by shale and sandstone, groundwater pollution does not appear to be a major problem.

Maintaining pure groundwater is important for the majority of Morgan County residents who rely on groundwater for drinking and domestic use. It is also important for industry and particularly for those enterprises, which rely on pure spring water such as the water bottling companies in Berkeley Springs, the Ridge State Fish Hatchery, and the baths of Berkeley Springs State Park.

Major Surface Water Bodies

Although there are no major surface water bodies in Morgan County, there are several minor lakes that range in size, and are primarily used for recreational purposes.

Cacapon State Park Lake is located within the 6,000 acre park and includes stocked fishing and non-motorized boating. It is fed by the local stream systems into an impoundment that covers more than 6 acres.

Lake Siri, a 13-acre, spring-fed lake is located between two green mountains adjacent to Coolfont's Treetop House. This private lake is well known for large big mouth bass fishing.

Water Source Protection Organizations

There are numerous residents and groups that recognize the importance of conserving and protecting the County's water resources. These individuals and organizations work to maintain watersheds, not only in Morgan County, but also throughout the region that impacts the Chesapeake Bay. Following is a brief list of some of these organizations.

- The Friends of Cacapon River serve as a resource to the community on issues affecting the Cacapon River watershed. They advocate the establishment of buffer areas along the river to support riparian plants that reduce runoff into the river. This is accomplished by educating land owners to the impact of altering riverbanks, encouraging developers, visitors, and landowners to participate in the stewardship of the river and its watershed and promoting active participation of area schools in developing student programs related to protecting their river. The group monitors activities in the lower Cacapon that could negatively impact the river.
- The Sleepy Creek Watershed Association was formed in July 2000. Its mission is to “protect and preserve Sleepy Creek and its watershed and to educate the community on the value of this precious natural resource in Morgan County, West Virginia.”
- The Interstate Commission of the Potomac River Basin strives to enhance, protect, and conserve the water and associated land resources of the Potomac River basin and its tributaries through regional and interstate cooperation
- The Chesapeake Bay Foundation is a non-profit organization with a mission to improve the Chesapeake Bay watershed. It serves as a watchdog representing the Chesapeake conservation lobby to business, government, and public entities. It also actively restores native habitats and filtering mechanisms such as oyster beds, forests, and other riparian effects.
- The Soil and Water Conservation Society fosters the science of art and natural resource conservation
- The U.S. Fish and Wildlife Service works with others to conserve, protect, and enhance fish, wildlife, and plants in their habitats for continuing benefit of the public. The National Conservation Training Center is located on the banks of the Potomac River adjacent to Jefferson County.
- The West Virginia Rivers Coalition seeks conservation and restoration of West Virginia's exceptional rivers and streams. It has worked with the WV DEP to help improve public participation components of the NPDES.
- The Potomac Water Watch, supported by Friends of Cacapon River, serves the Potomac River Watershed and its tributaries and focuses on fish kills, intersex, emerging contaminants, and endocrinedisrupters.

- The Eastern Panhandle Conservation District is the local extension of the West Virginia Conservation Agency, which serves to conserve natural resources, control floods, prevent impairment of dams and reservoirs, assist in maintaining the navigability of rivers and harbors, conserve wildlife, protect the tax base, protect public lands and protect and promote the health, safety and general welfare of the people.

Sensitive Soils

Soil associations delineate where two or more soil types occur together in a characteristic pattern over a geographic region. Soil types are often combined because the scale of a map does not provide for easy individual delineation of soils. For this reason delineating soil associations is useful for general planning purposes, but is not suitable for site-specific analysis, unless additional site-specific analysis is conducted. Because soils within an association differ in slope, depth, stoniness, drainage and other characteristics, the actual location of physical improvements to property may differ from the general soils associations provided.

Soil Associations

The four major soil associations in Morgan County are classified by their suitability and limitations for various land uses. These limitations allow for flexibility as described above and are most notably measured by their appropriateness for septic systems and erosion control. These soil associations include; Huntington Weikart-Mononghela Association, Lehew-Berks-Dekalb Association, Berks-Litz-Weikert Association, and Dekalb-Laidig-Buchanan Association.

Huntington Weikart-Monongahela - consists of deep and shallow, well and moderately well-drained, medium-textured and moderately fine-textured soils of the floodplains shale uplands, and river terraces. Suitability for cropland is good and for woodland is mostly excellent to fair. There are severe limitations to permitting development in these areas with moderate limitations to roads due to the potential periodic flooding in lower areas.

Lehew-Berks-Dekalb - consists of moderately deep, well-drained, moderately coarse-textured and medium-textured soils of the uplands. Suitability for cropland is fair, though some soils are well suited to orchards. Suitability for woodlands is fair since dryness and low natural fertility cause severe seedling mortality. Limitations on development and roads are moderate primarily due to slope, limited depth to bedrock, and susceptibility to frost action.

Berks-Litz-Weikert - consists of moderately deep and shallow, well-drained, medium-textured, and moderately firm-textured soils of shale and siltstone hill uplands. Suitability for cropland is rated very poor and choice of crops is limited due to low water capacity. Suitability for woodland is poor since dryness and low natural fertility cause severe seedling mortality. Limitations to development and roads are moderate to severe due to steep slopes, limitations to bedrock, and susceptibility to frost.

Dekalb-Laidig-Buchanan - consists of moderately deep, well-drained and moderately well-drained, moderately coarse-textured to fine coarse-textured, mostly very stony soils of the uplands and colluvial slopes (slopes from which soil material, rock fragments, or both, have been moved by creep, slide, or local wash and deposited at the base). Suitability for cropland is very poor because soils are very stony and slopes are mostly steep to very steep. Suitability for woodland is mostly good to fair, although it is poor in dry areas, which create severe seedling mortality. Limitations to development and roads are mostly severe due to steep slopes.

Soil Limitations on Septic Systems

More specific than soil associations are the soil series and soil types within each series. Each soil type is rated according to agricultural productivity and according to properties which affect selected non-farm uses of land.

Chief among non-farm activities is the use of natural soil to renovate sewage effluent from septic drainage fields. The soil material between depths of 18" and 6' is evaluated for septic drain fields by means of a Soil Survey. The soils properties considered are those that affect absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability (the quality that enables soil to transmit water and air), depth to water table or bedrock, and susceptibility to flooding. Slope is a soil property that affects difficulty of layout and construction as well as the risk of soil erosion, lateral seepage, and down-slope flow of effluent.

Limitations on the suitability of a particular soil for septic systems are expressed as slight, moderate, or severe. A rating of severe indicates the soil has serious limitations that are difficult, though not impossible to overcome. A review of all soil-mapping units in Morgan County indicates a severe limitation on the use of septic systems for all but less than 1% of the County's land area.

In practice, the suitability of soil for septic systems is determined on a site-by-site basis by the Morgan County Health Department based upon standards of the State Department of Health. On-site testing includes a percolation test to determine permeability and a 5' excavation to determine depth to bedrock and water table. The excavation must be inspected by the County Health Department Sanitarian to ensure that at least 5' of soil covers the bedrock and seasonal water table. This standard is interpreted liberally in Morgan County where thin layers of soil cover unconsolidated shale, which is often difficult to distinguish from bedrock.

The State Department of Health also sets standards for the use of septic systems to serve subdivisions of two or more lots, and which are less than 2 acres in size with an average frontage of less than 150'. Where a public water system is not available, each lot must be at least 20,000 square feet in area. A minimum 10,000 square foot disposal area must be set aside for installation of the initial absorption field, which includes enough area in reserve for additional absorption fields in case of failure of the initial installation. Disposal area may not be located on slopes exceeding 25%, nor within the limits of the 25-year floodplain. The latter standard has been difficult to evaluate since there is no current mapping of 25-year floodplains for Morgan County.

In 1980, nearly 66% or 2,974 housing units were utilizing septic systems. An additional 9% or 410 housing units were listed as “other”, including outhouses and no sewage disposal systems evident. Only 66 housing units remain without proper sewage systems evident many of which many are listed as seasonal housing. Given the location of many of these dwelling units along waterways and atop steeper slope areas, it is important to monitor both the continued use of these units as well as the transition of these types of units from seasonal use to year-round permanent occupancy.

The lack of adequate sewage disposal facilities usually comes to the attention of the Morgan County Health Department on a complaint basis. Many complaints involve structures without suitable methods of sewage disposal. The remaining complaints include systems in some degree of failure, generally evidenced by sewage coming to the surface of the ground. Methods to alleviate the impact of these issues include the use of either community or public sewerage systems or replacement with new septic systems.

It is well documented that septic systems which are properly installed following appropriate testing on environmentally suitable sites and which are regularly maintained will function properly for an indefinite period of time. Those septic systems within Morgan County that fail do so because of improper installation, poor soil conditions, high water table, or insufficiently sized soil absorption fields. In Morgan County the site evaluation and septic system installation steps allow for practices which may contribute to future septic system problems. The deficiencies identified include; allowing construction prior to site testing for optimum absorption and percolation testing that is only reported to rather than directly observed by the County Health Department.

Where existing septic systems fail and cannot be replaced, and where new sites are found to be unsuitable, alternative individual systems may be appropriate. State regulations allow for alternative sewage disposal systems which compensate for severe soil conditions under certain circumstances. These systems, which include sand mounds and other types of alternative methods are more costly than standard septic systems.

Soil Erosion

The major types of soil erosion in Morgan County are sheet and rill, streambank, and roadbank. Sheet and rill erosion occurs when water flows over a slope without a defined channel. It is a dominant erosive factor for cropland, pasture, surface mine spoils and refuse piles, and various construction activities. Sheet and rill erosion is accelerated by poor vegetative cover and steep topography.

Streambank erosion is the lateral recession of channel banks due to stream conditions. A stream which has not reached its load capacity will obtain sediment from the channel bottom and banks. Lack of channel bank vegetation increases streambank erosion.

Roadbank erosion results from sheet, rill, and gully erosion of the bank, and channel erosion in the adjoining ditch. Poor vegetation on the bank accelerates roadbank erosion.

Factors affecting soil erosion are the natural erodibility of the soil, slope, rainfall patterns, length of slope, and perhaps most importantly, land cover conditions. Compared to other areas in West Virginia, the Eastern Panhandle has soils with slight erodibility, a low rainfall climate, and gentle topography. However, erosion problems in Morgan County appear to be more severe than in the other two Panhandle counties. More than 20% of the land area in Morgan County is defined as having severely eroded soil.

Severely eroding areas were identified in the Comprehensive Survey of the Potomac River Basin prepared by the West Virginia Department of Natural Resources and the U.S. Department of Agriculture in 1981. Areas identified in Morgan County were streambank erosion along the Cacapon River, Sleepy Creek, Sir John's Run, and Warm Spring Run, and sheet and rill erosion from mining activity.

Other sources of sheet and rill erosion include farmlands and construction sites. The Agriculture Water Quality Management Plan outlined in the 1985 Plan, identified severely eroding farmlands in Morgan County, including 1,341 acres of cropland, 795 acres of permanent pasture, and 53,300 feet of farm roads. Construction sites for new housing and subdivision roads have also contributed to soil erosion in the County, especially where proper erosion control techniques have been neglected or ignored. Erosion from these activities has increased from an average of approximately 10 tons per year as development has increased. This has also increased the previous estimate of 100 tons per year under extreme conditions.

Air Quality

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. EPA is responsible for setting standards, also known as national ambient air quality standards (NAAQS), for pollutants such as mercury from coal fired electric generating plants to the west, which are considered harmful to people and the environment. These pollutants also 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 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. 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.

In 2003, the West Virginia Department of Air Quality (DAQ) identified the Eastern Panhandle counties of Jefferson and Berkeley as potential non-attainment areas. The counties voluntarily entered into an Early Action Compact which required areas to identify and implement control strategies earlier than would otherwise be required. This is similar to actions being taken by other

neighboring counties in neighboring states. Although Morgan County has not been identified at this time as a potential non-attainment area, it is important to remain aware of the effect such regulations may have on future growth within the County and surrounding region.

Forest Resources

Forest resources in Morgan County are valuable in several respects. They provide an attractive and healthy environment for many recreational activities such as camping and hiking, around which many public and private recreational and tourism features in the County are established. Forests provide the necessary habitat for wildlife to thrive. It is also superior to both developed and agricultural land in controlling storm water runoff, which is essential to the natural management of the watersheds.

Based on inventories conducted by the U.S. Geological Survey in 1975, there were 121,650 acres of forest in Morgan County, which made up more than 80% of the total County land mass. Of this total, there were nearly 7,000 acres of non-commercial and 114,000 acres of commercial forestland. Commercial forestland is that which is producing or capable of producing crops for industrial wood which is not withdrawn from timber utilization. A comparison of the 1975 and 1980 aerial photographs indicated further areas of early growth forests on land previously devoted to agricultural use, especially in the Sleepy Creek and Central Valley planning regions. By 2000 the total forested areas within the County decreased by merely 1% to 79% or 117,000 acres, and out of approximately 1,130 acres harvested per year, it is estimated that only 130 acres is clear cut for development and agricultural uses.

While forest areas have increased at the expense of active cropland in the areas east of Cacapon Mountain, forestland has continued to be lost to both permanent and seasonal housing, especially in the southern areas of the Central Valley region. Larger residential subdivisions have cleared forestland for access roads, which has divided forests and created erosion problems.

As losses due to development pressure have continued to increase, the number and funding of various state and federal programs has also increased. One such program that may affect Morgan County in the near future is the U.S. Forest Service's Forest Legacy Program. This program currently includes in its 2006 budget, a total of \$1.8 million for the Potomac River Hills project. Funding of this project would allow the West Virginia Division of Forestry to acquire a conservation easement on a 2,400 acre tract of land owned by The Conservation Fund, for the purpose of protecting sensitive lands on Sideling Hill in the Potomac River watershed. This would add a significant boost to the current 194 acres under similar preservation programs.

From a commercial standpoint, most woodland in Morgan County is considered of low productivity, more suitable for pulpwood than for saw timber. The Oak Site Index for Morgan County soil averages from 45 to 60. This index is the average height, in feet, of a well-stocked oak stand 50 years of age. More than 110,000 acres of the County's land area is classified as having an Oak Stand Index of 65 or less.

There are 32 active tree farms in Morgan County that are certified by the American Tree Farm System. These farms account for the majority of commercial harvesting, and include several Christmas tree farms. However, there are just over 20 people employed in Morgan County in this industry.

Christmas tree production offers significant potential for commercial development. In 1980 there were approximately 12 Christmas tree growers with 2 or more acres of production, accounting for a total of nearly 100 acres. As of 2000 that acreage had increased to more than 100 acres. The Soils Survey indicates that over 70,000 acres in the County are suitable for Christmas tree growing.

There are 3 active sawmills in Morgan County, which purchase stumpage and sawlogs of mixed hardwoods and produce lumber, railroad ties, and pallets. This includes one on Poole Road and another on Gloyd Lane. The third sawmill, located on Pious Ridge did not operate in 2005.

Mineral Resources

The predominant bedrock in the County consists of various types of shale. They outcrop on long narrow bands on both sides of Cacapon Mountain and are also exposed by erosion on the summit of the Mountain. The USGS Survey indicates that some of these shales may be adaptable to brick manufacture but careful testing would be required to prove the different locations best suited to this endeavor. Also, given the change in environmental regulations, most sites may prove both cost prohibitive and detrimental to preserving the County's quality of life.

Limestone outcrops are present along the east side of Tonoloway Ridge and the upper west slope of Warm Spring Ridge. This limestone was once quarried and crushed at a small plant on the west slope of Warm Spring Ridge near Berkeley Springs. It made good quality lime and also excellent road material. The USGS Survey indicates several places along Warm Spring Ridge where this stone could produce a large tonnage.

The most important glass-sand district in West Virginia is near Berkeley Springs where the Oriskany Sandstone is quarried. This sandstone outcrops on a number of ridges in Morgan County, being usually much iron stained, impure and often quite hard. However, in Warm Spring Ridge it is a snow-white crumbly sandstone especially adapted to use as glass sand and, through subsidiary companies, attapulgate clay. Corporate headquarters are located near the surface mine north of Berkeley Springs. The company's existing mine, and additional land holdings total 2,786 acres in Morgan County.

The Baird Field is a small area of gas production in western Morgan County. Two producing gas wells were completed in 1967 in an area just west of Hansrote and since that time additional wells have been completed. These wells are listed by the USGS Survey as producing 800,000 to 1.2 million cubic feet per day at depths of more than 4,800 feet in some places.

Unlike most of West Virginia, Morgan County has very limited potential for coal production. Coal stems on Sideling Hill are quite thin and the coal is high in ash and very crumbly on

exposure. Small mines were once opened to supply a small local trade, but even these did not produce enough to continue operations. Coal deposits of the Meadow Branch Field now lie within the Sleepy Creek Public Hunting Area. These deposits are in thicker veins than the Sideling Hill and are of very good quality except for a close admixture of slate.

Agricultural Resources

Agriculture is the second largest land use with nearly 23,000 acres or roughly 16% of the County area. Beef cattle, horses, hay, corn, wheat, and pasture are the principal products. About 250 acres remain in apple and peach orchards. Vegetable production is increasing due to a strong local demand for fresh produce and the close proximity to the Washington D.C. market. The number of farms with horses has also been increasing steadily.

There are approximately 800 agricultural tracts being farmed by 178 agricultural producers. The average tract size is 129 acres with most producers farming several rented tracts to create an economically viable unit. The 2002 Census of Agriculture lists 84 full time farmers in the County. There is 9,500 acres of cropland including annually produced commodity crops and forage corps in rotation. Another 9,000 acres is used for pasture for livestock with the remaining acreage used for farm buildings, barnyards, or idle land. Farm woodlots cover an additional 9,600 acres. Many of the farm tracts are owned by part time residents and are leased to residents that farm full or part time.

Soils in Morgan County farmland vary from thin, droughty shales on ridges tops to rich, deep floodplains and terrace soils. Seasonal high water tables are common on ridge tops and at the base of slopes. The shallow shale soils are moderately productive for forage crops although soil amendments are required to maximize production. The Morgan County Soil Survey published in 2006 shows 6,630 acres of prime farmland. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops. Soils on 7,758 acres have been identified as soils of statewide importance. Generally, this land nearly meets the requirements for prime farmland and can economically produce high yields of crops; however additional management must be utilized because of landscape position or some other limiting factor. An additional 56,540 acres has been designated as locally important farmland by the Morgan County Commission. This designation was made at the request of the Morgan County Farmland Preservation Board with concurrence by the USDA Natural Resources Conservation Service (NRCS) and includes soils that are generally used as pasture and hayland in the Eastern Panhandle of West Virginia.

The Morgan County Farmland Protection Program was established on December 2, 2002 under the authority granted to the Morgan County Commission by WV Code 8A-12. The Morgan County Farmland Protection Board administers the program, which is designed to hold permanent easements that prevent further subdivision of property and prohibit uses of the property that are incompatible with agricultural enterprise. The program goal is to preserve prime and important farmland, encourage stewardship of natural resources, and protect the historical

and scenic features of the County. The program is funded through property transfer fees and matching grants from NRCS. Currently five farms have committed to permanent agricultural easements with these easements completed totaling 719 acres.

Agriculture as a viable land use is increasingly under pressure by adjoining residential development of rural land. The loss of open space forces farmers to utilize marginal lands, which generally are more erodible, droughty, less productive, and cannot be easily cultivated. Residential development in close proximity to agriculture raises the concerns of incompatible land use resulting from dust, livestock and livestock waste, and the presence of chemicals typically used by farmers in the production of crops.

Local residents and organizations recognize and support the agricultural industry in Morgan County for its contribution to the nature and character of the community. The following are some of the groups that provide assistance and services to farmers:

- Morgan County Farm Bureau
- Eastern Panhandle Conservation District
- Morgan County Fair Board
- Morgan County Farmers Market
- Potomac Headwater Resource Conservation and Development Council
- WV Cooperative Extension
- WV University Davis College of Agriculture
- WV Department of Agriculture
- WV Conservation Agency
- USDA Farm Service Agency
- USDA Natural Resource Conservation Agency

Rare & Endangered Species

Morgan County's rare plant and animal species are found in the Sleepy Creek and Cacapon River watersheds. This is also where the County's only endangered species continues to survive. Through the help of such groups as the Sleepy Creek Watershed Association and Friends of Cacapon River, both protection and education of this sensitive environment remains a priority in dealing with the pressures of increased development.

The Sleepy Creek watershed is home to 23 rare plant and animal species as well as one endangered flower species. These rare species have been monitored by the West Virginia Department of Natural Resources over the past several years, and additional measures have been taken to protect the endangered wood turtle, which is found in only eight counties throughout the State. The endangered wildflower; *Harperella* also manages to survive in these watersheds which are one of only ten known populations of this species between Alabama and Maine.

Table 6-1 Rare and Endangered Species

Scientific Name	District	Common Name	2004 Sighting
<i>Acris crepitans crepitans</i>	Sleepy Creek	Eastern Cricket Frog	2
<i>Catocola herodius gerhardi</i>	Sleepy Creek	Pine Barrens Underwing	1
<i>Coragyps atratus</i>	Sleepy Creek	Black Vulture	3
<i>Coreopsis verticillata</i>	Sleepy Creek	Whorled Coreopsis	2
<i>Euchlaena milnei</i>	Sleepy Creek	A Looper Moth	2
<i>Glyceria laxa</i>	Sleepy Creek	Northern Manna Grass	1
<i>Glyptemys insculpta</i>	Sleepy Creek	Wood Turtle	6
<i>Heterodon platirhinos</i>	Sleepy Creek	Eastern Hog Nosed Snake	3
<i>Liparis loeselii</i>	Sleepy Creek	Loesel's Twayblade	2
<i>Neotoma magister</i>	Sleepy Creek	Allegheny Woodrat	2
<i>Oenothera argillicola</i>	Sleepy Creek	Shale Barren Evening Primrose	2
<i>Pandion haliaetus</i>	Sleepy Creek	Osprey	1
<i>Piptochaetium</i>	Sleepy Creek	Blackseed Needlegrass	1
<i>Potamogeton pulcher</i>	Sleepy Creek	Spotted Pondweed	1
<i>Pseudacris triseriata feriarum</i>	Sleepy Creek	Upland Chorus Frog	1
<i>Pseudotriton ruber</i>	Sleepy Creek	Northern Red Salamander	1
<i>Ptilimnium fluviatile</i>	Sleepy Creek	Harperella	1
<i>Pycnanthemum muticum</i>	Sleepy Creek	Blunt-Mountain Mint	1
<i>Schoenoplectus purshianus</i>	Sleepy Creek	Weakstalk Bulrush	1
<i>Solidago arguta var harrisii</i>	Sleepy Creek	Shale Barren Goldenrod	2
<i>Sorex hoyi winnemana</i>	Sleepy Creek	Southern Pygmy Shrew	2
<i>Sylvilagus obscurus</i>	Sleepy Creek	Appalachian Cottontail	1
<i>Veronica scutellata</i>	Sleepy Creek	Marsh Speedwell	1

Source: Sleepy Creek Watershed Association

Although not rare, it is also home to at least eight species of mussels, which are typically more prevalent near the confluence of the Potomac River.

Goals & Objectives

The natural environment and the physical factors affecting it are important to the local quality of life and the local economy. If new development is most efficiently concentrated around existing population centers which provide basic public service and infrastructure, development can occur in the most cost-effective way, while preserving the rural open space, and sensitive areas.

Unplanned growth, loss of farmland and open space, and subdivision of rural land, are among the top concerns for Morgan County residents. Since preventive measures to protect the environment are preferable to corrective measures, this Plan should accentuate goals and objectives which will prevent scattered sprawl in the rural areas, loss of open space, and degradation of the environment.

Goals

The main goals concerning natural resources focus on protecting sensitive areas and the wise use of land. They include:

- Encouraging reduction of the contamination of ground water and protection of the recharge areas for the natural springs in the Town of Bath;
- Protecting rivers and streams and the Chesapeake Bay watershed by promoting riparian buffer zones and minimizing the impact of runoff and erosion on stream systems; and
- Working to protect and limit growth in sensitive areas such as those containing steep slopes, prime agricultural soils, flood plains and waterways, or endangered species of flora and fauna.

Objectives

Accomplishing the following objectives will ensure progress toward these goals:

- Promoting best resource management practices in farming, including riparian buffers, native landscaping, and forest management techniques;
- Encouraging landowners to preserve land along waterways by committing these areas to land trusts, and to protect farmlands and woodlands through agricultural and preservation easements;
- Participating in the development of programs to curtail erosion and limit the release of sediment and nutrients into streams, and increase public awareness of this issue;
- Supporting implementation of the strategies of the Morgan County Water Resource Study;
- Encouraging maintenance of the National Floodplain Insurance Program 100 year floodplain mapping to reflect more recent knowledge of the designated areas, and promote enforcement of the regulations regarding use of these areas;
- Promoting protection of groundwater by directing residential and commercial development away from recharge areas;
- Supporting programs to educate the public about responsible care of the county's natural areas that serve as natural passive and active open space;
- Encouraging development of a long term park, recreation, and environmental resource protection plan focusing on areas where there is increasing development pressure; and
- Preparing to react to the Air Quality Early Action Compact.