

NATURAL RESOURCES

STEEP SLOPES

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The diverse topography of Centre County is characterized by extremes in elevation. The highest elevation is 2,600 feet above sea level at the Blair County line in Rush Township. The lowest elevation, 575

feet above sea level, is in the Bald Eagle Creek channel at the Clinton-Centre County Line.

Centre County is made up of two major physiographic provinces. The first is the Allegheny Plateau Province located northwest of US Route 220 and characterized by a forested, elevated plain with deep stream valleys. The eroded foothills at the base of the Plateau (often referred to as the Allegheny Front) define the limits of this Province. In contrast to the sparsely populated Plateau Province is the more rolling and populous Ridge and Valley Province. It begins at the long, narrow Bald Eagle Valley and extends southeast to the border of the County. It is characterized by broad, fertile limestone valleys interrupted by steep forested ridges.

Steep Slopes in Centre County

Steep slopes may be defined as slopes greater than 25 percent. The map in Appendix 1 shows these areas as well as lesser slopes of 11 to 24%. This data is important to land use planning in order to identify areas to preserve and areas appropriate for development.

Significance of Slopes

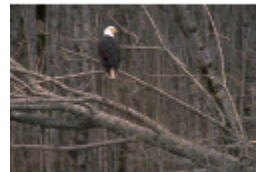
Steep slopes are physical features environmentally critical to our natural systems and they significantly contribute to our open space networks. The County's slopes are forested and 'are among the most important scenic resources in our watersheds'¹.

The connection of our forested slopes to water resources is very important. Streams originating on mountain slopes form the

headwaters of our watersheds. Forested mountains provide recharge of surface water and protect the quality of the water by offering natural filtration systems. And, some community water supplies may be found on these slopes.



As a habitat for wildlife and vegetation, slopes provide travel corridors for many animal species. Wildlife Travel Corridors have been identified as part of the environmental studies for the I-99 and Corridor O projects. The identification of these corridors was based on highway incident records and available wildlife movement records. Vegetation within the corridors not only supports the wildlife but also serves to stabilize the structure of the slopes.



One example of the significance of forested mountains to wildlife, as cited in the *Bald Eagle/Nittany Greenways Plan*, is the designation of Bald Eagle Ridge by the Audubon

Pennsylvania as an important bird area for Pennsylvania. The Plan notes that bird counts warrant special protection of these ridges as flyways and encourages the County to initiate and support efforts to preserve forests and ridges.

Maintaining the integrity of these travel corridors on the ridges and forested slopes is critical to the health of animal populations. Disrupting the corridors may limit the availability of food sources as well as encourage in-breeding.

Recreation opportunities are abundant on forested slopes and provide numerous benefits. Outdoor activities such as hunting, hiking, bird-watching, and low-impact enjoyment of these natural resources are a part of our quality of life here in Centre County. These activities also add to our County's tourism economy.

¹ *Spring Creek Rivers Conservation Plan*, ClearWater Conservancy

All of these functions should be protected as part of a comprehensive open space plan.

Development Problems and Threats

Other than influencing the location of development, the percent slope of a parcel of land² suggests certain development potentials and limitations on the land.

The wide differences in elevation in the various parts of Centre County have resulted in a substantial part of the land area being identified as moderately to steeply sloping. The development potentials can be summarized in five general categories as shown in Figure 1.

Slopes and ridges continue to experience development pressures primarily for residential uses. Permanent and seasonal residences are having more of a visible presence on the sloping sides of ridges.

There are specific problems that have the potential to arise from development on slopes and ridges. First, soils may be unsuitable for proper renovation of on-lot sewage disposal. Contamination of groundwater has the potential to occur. This is the same water that may be used for drinking water. Second, soil erosion and sedimentation problems are often increased in scope when lands are disturbed. Third, most roads that exist in mountainous areas were not designed for residential use and corresponding infrastructure. As a result the required public maintenance is often costly and benefits a small proportion of the local jurisdiction’s residents. And fourth, public services and facilities are probably unavailable to mountain residents, or where required, would be at high public cost.

A siting concern specific to location is any development occurring on soils that have severe limitations for ‘Town and Country Planning’ as noted in the *Soil Survey of Centre County*. Examples of these types of soils include the Andover and Buchanan Series.

SLOPE	% OF COUNTY'S LAND AREA	DEVELOPMENT POTENTIAL
0-5%	32%	Relatively flat, most desirable for development.
6-10%	16%	Can be readily used for development with careful planning. Industrial uses become limited; some agricultural crops approach limitations.
11-15%	17%	Can support residential development if carefully planned. Commercial uses become limited. Industrial uses are severely limited. Erosion becomes a problem.
16-25%	25%	Only feasible developed use is for residences. Development and municipal services costs are high; erosion is a problem.
25% and Over Slope	10%	Very limited value for development.

Figure 1: Development Potential on Centre County’s slopes (Source: *Directions for the Future: Guidelines for Decision Making, A Comprehensive Plan for Centre County, 1979*)

² The percent slope is the vertical rise of land per 100 feet of horizontal distance. That is, a 5% slope means that the land arises 5 feet for every 100 feet of distance across the land.

These soils with high water tables present severe limitations for septic tank absorption fields, dwellings with basements, and local roads and streets. Constructing residences on these soils along the slopes of mountains presents problems for the future homeowner and downslope property owners. This is particularly true when soils are underlain by a 'fragipan' (a dense, brittle horizons that restrict water and root penetration). Water from rainfall or surface water runoff percolating through these soils to the fragipan, flows down slope along the fragipan layer creating lateral seepage. Lateral seepage has the potential to flood basements of residential structures.

Residential development on these slopes also interferes with natural drainage ways and the recharge of groundwater. Hillside runoff of water flows to sinkholes at the base of the mountain providing recharge for water supplies. In addition, disturbance of natural systems can present challenges for erosion control; therefore, development in these environmentally sensitive areas particularly in the mountain gaps should be carefully managed for these reasons.

On the other hand, soils on ridges are generally less productive than valley soils for agricultural purposes. As Centre County continues to grow, residents and local officials are going to face increasingly difficult challenges in the effort to maintain a balance between the natural environment and people's needs, i.e., between protecting natural resources and providing for growth.



With most of the steep slopes in Centre County being forested, timbering is an increasingly important economic activity. With proper management, forest resources can provide sustainable economic activity while improving the quality of the timber available for harvests. Providing for timber harvesting while protecting the sensitive

environmental characteristics of steep slopes will require careful stewardship.

Another human activity that alters the appearance of steep slopes is mineral extraction. Limestone and sandstone are two mineral resources commonly mined in Centre County. Extraction of limestone may be found in quarry pits or at the base of mountains in the form of surface or deep mining. Sandstone extraction may also occur on the mountains. As per the requirements of the *Pennsylvania Municipalities Planning Code*, any noncoal surface mining activity should be consistent with the Noncoal Surface Mining Conservation and Reclamation Act of December 19, 1984.

Man-made slopes are also part of our landscape. The utilization of mineral resources is one way that these slopes are created. Slopes have been created through surface mining of coal. Today, coal mining activities in Centre County are minimal and Surface Mining Regulations for this mineral require the land to be restored to its original contours.

Landslides

"Landsliding is a natural geologic process involving the movement of earth materials down a slope."⁴ Pennsylvania's Bureau of Topographic and Geologic Survey and the United States Geological Survey studied and mapped the Landslide Susceptibility for the state. The area of the state that is most vulnerable is the southwest portion. The majority of Centre County is in the 'generally low' susceptibility category with some areas of high to moderate susceptibility. Specific mapping for Centre County was never completed; however, data is available for the northern and western areas of the County shown in Appendix 2.

There are several 'triggers' for landslide activity which include increased water content, rearrangement of the load on the slope, and earthquakes. Human activity on a slope changes its structure and increases the

⁴ Helen L. Delano, and J. Peter Wilshusen, *Landslides in Pennsylvania, Pennsylvania*, Department of Conservation and Natural Resources, Educational Series 9, 2001

likelihood of a landslide activity in the areas where the susceptibility is moderate to high.

In order to avoid landslide hazards, development should be prohibited from landslide-prone areas. The best and safest alternative is to design around these areas.

Steep Slopes-Regulatory and Non-Regulatory Protection Strategies

Steep slopes are publicly and privately owned. Protecting steep slopes on privately owned property may be done through local regulations which limit development on slopes greater than 15%. Special performance standards could be incorporated into local regulations to protect soils, vegetation and/or other environmental features.

Non-regulatory protections may include conservation easements, purchase of development rights, or acquisition. Another effective approach is to maintain a cooperative relationship with owners of public lands such as Federal and state agencies as well as non-profits and being aware of their land management strategies.

A voluntary option for land owners would be transfer of development rights, whereby, development rights are transferred from a preservation area to development area. To date, no municipality in Centre County has implemented a transfer of development rights program.

Summary

Steep slopes are landmarks woven into our landscapes and are an integral component of our open space network.

The natural systems of steep slopes protect our water quality, recharge our surface water, provide habitat to plant and animal life, create recreational opportunities, and supply drinking water to communities. Protection of steep slopes should be considered as part of any comprehensive planning effort.

Development on steep slopes of 25% or greater should be discouraged, and any proposed development on slopes greater than

15 percent should respect sensitive areas, i.e., natural drainageways, soils with severe limitations for development, and groundwater recharge areas by setting aside these areas during the planning and construction phases of development. In addition, structures built on slopes greater than 15 percent should conform to the site in order to minimize erosion and sedimentation pollution as well as other potential impacts for down slope properties. Utilization of our forests, steep slopes and ridges can present private owner-public use conflicts; however, voluntary cooperation and education are key to overcoming these barriers.

Finally, preserving these scenic viewsheds and protecting the role of steep slopes in our environment should be a priority of the Natural Resources Plan.

**NATURAL RESOURCES
GOAL**

Identify, preserve, and monitor Centre County's environmental natural resources for the benefit of present and future generations.

OBJECTIVES

Promote the wise use and management of the County's natural resources that includes prime agricultural lands, forested areas, and mineral resources.

Protect watershed features such as surface and underground water supplies, streams, floodplains, wetlands, fish and wildlife habitats, and aquifer recharge areas.

Promote and preserve the County's identified natural areas for scenic, educational, historic, environmental, recreation, and tourism purposes.

Use identified natural resource areas and public open spaces to provide guidance with land development activities.

Reduce air, water, land, noise, and visual pollution.

Develop strategies that provide for growth while maintaining a balance with the County's many natural resources: ag lands, sensitive environmental areas, steep slopes, flood plains, scenic views, and high quality surface and ground waters.

RECOMMENDATIONS

Limit development activities on slopes of 25% or greater.

Promote sensitively designed residential development on slopes less than 25%.

Maintain sloping lands for their scenic, watershed, recreational, forested and mineral repository roles.

Incorporate ridges and slopes into open space plans.

Encourage owners of forested land to develop and implement forest management plans that sustain forest resources and enhance the quality of timber resources.

APPENDICES

Appendix 1

(Map of % of Slope in Centre County to be included.)

Appendix 2

(Map of Landslide Susceptibility in Centre County.)