

II. LAND RESOURCES

A. SOIL CHARACTERISTICS

Factors responsible for soil variations within the study area include the composition of parent material, climate, topographic relief, flora and fauna that live in the soil, human influences, and the length of time that these factors have affected the development of the soil. These particular soil dynamics have created soil associations within the watershed basin that consist of eight major soils and numerous combinations of minor soils (Table II-1). Soil data for this project were compiled from the Indiana and Armstrong County Soil Surveys (Haagen & Martin, 1971; Ruffner & Weaver, 1965).

Soil Association	Characteristics	County
Monongahela-Allegheny-Pope-Philo	Medium textured soils on terraces and floodplains.	Indiana
Gilpin-Wharton-Cavode	Medium textured soils on moderately sloping to moderately steep valley slopes and broad, gently sloping hilltops and benches.	Indiana
Gilpin-Wharton-Upshur	Medium textured and moderately fine textured soils on broad gentle uplands, on gently sloping and moderately sloping benches and hillsides.	Indiana
Dekalb-Clymer-Ernest	Very stony medium textured and moderately coarse textured soils on steep valley slopes, on ridges, and on broad, gently sloping ridgetops.	Indiana
Gilpin-Weikert-Ernest	Medium textured and moderately coarse textured soils on moderately sloping to steep valley slopes and narrow to broad rolling ridgetops.	Indiana, Armstrong
Weikert-Gilpin	Well drained, shallow and moderately deep, steep and very steep soils on uplands.	Armstrong
Rainsboro-Melvin-Steff	Moderately well drained to poorly drained, deep, nearly level to gently sloping soils on terraces and floodplains.	Armstrong
Rayne-Ernest-Hazelton	Well drained and moderately well drained, deep, gently sloping to moderately steep soils in low lying areas on ridgetops and hillsides.	Armstrong

Table II-1 - Soil Associations in the Upper Crooked Creek Watershed Study Area

Indiana County

Floodplain and terrace soils along Crooked Creek and Plum Creek, the major tributary to Crooked Creek, are predominately of the Monongahela-Allegheny-Pope-Philo Association. These soils are typical

of floodplains and terraces in the region and are composed of medium-textured soils that are moderately well- to well-drained. Monongahela-Allegheny-Pope-Philo soils are often used for agricultural production. Among many other factors, crop types on these soils can vary in relation to the frequency of flooding in the area.

The remaining portions of Crooked Creek watershed in Indiana County are primarily comprised of the Gilpin-Weikert-Ernest Association. This association is composed of medium-textured and moderately coarse-textured soils on valley slopes and rolling ridgetops. Although these soils are typically present on rolling hills with narrow to broad ridgetops, the association also borders numerous small streams and stream cut valleys. Much of the association is not in productive use, but isolated areas have been used for Christmas tree farming and dairy farming operations. The gently sloping Ernest soils are only slightly limited for residential development. Steep slopes severely limit agricultural use within the remaining portion of the association.

Small sections of the watershed in Indiana County are composed of three different soil associations. These include the Gilpin-Wharton-Cavode, Gilpin-Wharton-Upshur, and Dekalb-Clymer-Ernest Associations. The Gilpin-Wharton-Cavode association is composed of medium-textured soils located on moderately steep valley slopes and broad, gently sloping hilltops and benches. Because of the gently sloping nature of this association, much of it is currently used for agricultural production. The Gilpin-Wharton-Upshur association is composed of medium-textured and moderately fine-textured soils on broad gentle uplands, gently and moderately sloping benches, moderately sloping and moderately steep hills, and narrow rolling hilltops. Most of the soils of this association are used for farming with some areas being fallow or planted with Christmas trees. The Dekalb-Clymer-Ernest Association is composed of very stony, medium-textured and moderately coarse-textured soils on steep sloping valleys, ridges, and ridgetops. Because of the stony nature of the soils and the relief on which they are located, farming and development is limited. Therefore, almost all of this association is covered in woodland area.

Armstrong County

The predominate soil type within the Armstrong County portion of the project area is the Rainsboro-Melvin-Steff Association. These soils are moderately well to poorly drained with deep horizons and are situated primarily on level to gently sloping terraces and floodplains. Although this soil association is occupied by much of the development in Armstrong County, it is otherwise moderately to severely land use limited because of flooding and a seasonally high water table. The Armstrong County portion of the watershed also contains areas of the Gilpin-Weikert-Ernest Association.

Two other soil associations, the Weikert-Gilpin and Rayne-Ernest-Hazelton Associations, make up the remainder of the Armstrong County portion of the study area. The Weikert-Gilpin Association is composed of well-drained, shallow to moderately-deep, steep and very-steep soils on uplands. Because of their prevalence on steep slopes and drought-ridden areas, land use on these soils is severely limited. Therefore, most land areas composed of this association are wooded. The soils of the Rayne-Ernest-Hazelton Association are well-drained and moderately well-drained, deep, gently to moderately-steep sloping soils in low lying areas on ridgetops and hillsides. Water table levels are seasonally high in some of this soil's coverage area. The Rayne-Ernest-Hazelton Association creates moderate limitations for urban development, but most other land use within the Rayne-Ernest-Hazelton Association is productive farmland.

B. GEOLOGY

Both the Indiana and Armstrong County portions of the Crooked Creek watershed are located in the Appalachian Plateau Physiographic Province, Pittsburgh Low Plateau Section, consisting of moderate to low amplitude open folds (Pennsylvania Department of Conservation and Natural Resources [DCNR], 1999a). The bedding of the Pittsburgh Low Plateau Section is smooth and undulating with numerous narrow, shallow valleys along the creek including some high, level terraces. Elevations within this section can range from 660 to 1700 feet. Local upland relief is generally less than 200 feet (DCNR, 2000).

Most of the floodplains along the valleys of Crooked Creek's mainstem are underlain by Pennsylvanian Allegheny Group sequences (Figure 4), a cycle of sandstone, shale, limestone, clay, and coal. Upland areas are composed of the Conemaugh Group, primarily the Glenshaw Formation with isolated areas of the Casselman Formation. Glenshaw sequences consist of cyclic shale, sandstone, red beds, thin limestone and coal along with four marine limestone or shale horizons. The Casselman Formation is similar but lacking marine horizons and pure limestone (Pennsylvania Department of Environmental Resources [DER], 1980).

The Crooked Creek watershed is also located within the Main Bituminous Coal Field of Pennsylvania (DCNR, 1999b). Extensive areas of operating surface mines, old stripping areas, and reclaimed strip mine areas are dispersed throughout the landscape (DCNR, 2000a). Coal that is or has been mined within watershed is primarily high volatile bituminous coal.

In addition to being situated within coalfields, the watershed is also located within the Pennsylvania shallow gas field (DCNR, 1999c) and contains numerous gas wells. In fact, in 1998, Indiana County was the largest producer of natural gas in the state, outputting 22,561,467 thousand cubic feet (Mcf). Armstrong County was not far behind, producing 7,145,578 Mcf of natural gas in the same year (DCNR, 2000b).

C. AGRICULTURAL AREAS

1. Prime Agricultural Soils

The USDA, Natural Resources Conservation Service (NRCS), has designated prime agricultural soils in both Armstrong and Indiana counties. Prime agricultural soils have superior combinations of both physical and chemical characteristics that result in high agricultural production with minimal input of fertilizers, labor, and pesticides. These soils are often composed of deep productive layers, are well drained, and are level to nearly level.

Because of their high quality physical and chemical elements, land areas with prime agricultural soils are also leading sites for development. Keeping this in mind, it is imperative that prime agricultural soils are delineated and acreage is calculated when planning for future development of the region. Otherwise, much of the land well suited for agricultural production could be lost.

The majority of Crooked Creek watershed's agricultural areas are concentrated within valley and lowland sections, occurring less frequently on the hills and ridge tops. The location of agricultural areas are shown in Figure 5.

2. Agricultural Security Areas

Agricultural Security Areas (ASAs) are active and viable farmlands that have been enrolled in a statewide program to restrict specific types of development on designated agricultural properties. An ASA designation is administered by local municipalities and counties, and although designation does not result in tax relief for landowners, ASAs protect farmland areas from indiscriminant condemnation, allow for future farming of the land, and absolve the areas from legislation that would be detrimental to farming operations. Altogether, a minimum of 250 acres is required for ASA designation, and timber is not included on the designated land. However, the properties that lie within the ASA acreage do not have to be contiguous. Renewals for ASA designation must be submitted every seven years.

A list and acreage of all ASAs within the watershed are presented in Table II-2 (Pennsylvania Department of Agriculture, Bureau of Farmland Protection, 2000a).

3. Farmland Preservation

In addition to ASAs, state and county governments can also purchase conservation easements of prime agricultural lands located within ASAs. The goal of easement purchases is to preserve the productivity of prime agricultural production lands, in perpetuity. Although neither of the counties in the watershed have farmland in the easement program, Indiana County has recently developed an Agricultural Lands Preservation Board, and Armstrong County has begun to develop a county program and has appointed a Board to oversee its development (Pennsylvania Department of Agriculture, Bureau of Farmland Protection, 2000b). These boards function primarily to administer the Agricultural Conservation Easement Program and to assist landowners from “nuisance law” mitigation, such as odor control from farmlands. Indiana County’s board is preparing to complete their first easement purchases, while Armstrong County will be able to complete their first easement purchases in a few years, after the board is established.

D. OWNERSHIP

Public land accounts for approximately 780 acres (<1 percent) of the land within the watershed and includes institutional buildings and facilities, boat access sites, open space, county and local parks, and community recreational facilities. These areas are discussed further in the Cultural Resources Section of this report. The remaining acreage is privately owned and is dedicated to industrial uses such as rail corridors, mining operations, light manufacturing; commercial businesses; and privately owned residential dwellings and farms.

County	Township	# Of Farmers	Acreage
Armstrong	South Bend*	21	3,292
Armstrong	Plum Creek*	32	4,033
Indiana	White*	15	1,464
Indiana	Rayne*	99	12,390
Indiana	East Mahoning*	65	9,785
Indiana	Cherryhill*	37	5,456
Totals	6	269	36,420

* Township extends beyond study area boundary

Table II-2 - Agricultural Security Areas Within the Upper Crooked Creek Watershed Study Area

E. LANDFILLS

According to PADEP (2000a), there are no active permitted landfills within the watershed. The nearest facility is the Evergreen Landfill (PADEP Permit #100434) located in Center and Brush Valley Townships, Indiana County (PADEP, 2000b). The majority of the waste generated in Indiana and Armstrong County is disposed of at this facility (Commonwealth of Pennsylvania, 1999). One inactive landfill was identified within the Crooked Creek watershed. This facility, once operated by Richard Sanitation, is located just south of Marion Center off of PA Route 403.

F. HAZARD AREAS

1. Waste Sites

An inventory of hazardous and toxic waste sites was conducted for the entire Crooked Creek watershed using the U.S. Environmental Protection Agency's (USEPA) Right-to-Know Network database (USEPA, 2000). This query system identifies waste management facilities listed within the following regulatory databases:

- Resource Conservation and Recovery Information System (RCRIS)
- Comprehensive Environmental Response, Cleanup, and Liability Information System (CERCLIS)
- Toxic Release Inventory (TRI)

Comprehensive results of this database search, as well as descriptions of the federal environmental legislation regulating each of these facilities, can be referenced on the Right-To-Know Network at www.rtk.net (USEPA, 2000).

RCRIS Sites

The Right-To-Know Network database was used to identify any Large Quantity Generators (LQG) located within the watershed. LQGs are operations that produce >2,200 lbs. of hazardous waste in any given month of the year. Results of this search indicated that no LQGs were located within the Crooked Creek watershed. This information was current as of March 2000.

A review of RCRIS was also used to identify the number of Small Quantity Generators (SQG) and Waste Transporters (WT) located within the watershed. A total of 35 SQGs were identified in or adjacent to the Crooked Creek watershed. One SQG within the watershed was noted as having 3 violations and 2 penalties in 1985 (USEPA, 2000). According to the RCRIS report, fees were paid in debt to the violations during the same year. No WTs were identified in the watershed.

No RCRIS listed Storage, Treatment, and Disposal (STD) facilities were located within the watershed.

CERCLIS Sites

The Comprehensive Environmental Response, Cleanup, and Liability Information System (CERCLIS) database provides listings of regulated hazardous waste sites along with the federal environmental legislation

related to these sites. Using a CERCLIS query, no Pennsylvania Superfund Sites (NPL) or active CERCLIS sites were identified within the Indiana or Armstrong County sections of the watershed.

Toxic Release Inventory

The Toxic Release Inventory (TRI) is a public information Right-To-Know report that supplies information concerning chemical releases and discharges associated with manufacturing industries. One industry was identified as releasing arsenic and chromium within the watershed (USEPA, 2000). No violations regarding these discharges were noted, and all facilities are assumed to be in compliance with applicable regulations.

2. Illegal Dumping

Unregulated dumping of refuse at non-permitted sites has been identified as a major issue within the study area. However, because illegal dumping often occurs along hillsides and hidden areas, it may not be readily recognized as an environmental hazard. Apart from decreasing the aesthetic character of the watershed, illegally dumped trash along Crooked Creek and its tributaries can wash into the stream during normal rainfall events creating polluted, and sometimes hazardous, water quality conditions. Flooding makes for an even greater hazard as debris is carried off hillslopes into the stream. However, exposed and unexposed trash need not lie along a streambank in order to decrease water quality. Rainwater can wash over the debris, leaching contaminants from oil cans, aerosol bottles, and other trash, into groundwater supplies.

The Indiana County Chapter of Pennsylvania CleanWays, a Pennsylvania non-profit organization, assists communities with identifying and cleaning illegal dumpsites along with maintaining sites that have been part of past clean-up efforts. PA CleanWays is similar to the Adopt-A-Highway program, but focuses on debris sites along non-state roads and adjacent areas. Currently, PA CleanWays is conducting an inventory of, and mapping illegal dumpsites in the county, which includes the Indiana County portion of the study area (Figure 6). From these inventories, locally driven strategies can be developed to raise public awareness, clean up, and maintain these areas. Sample inventory forms are located in Appendix C.

3. Abandoned Mines/Quarries

Numerous abandoned coal mines, ranging from smaller family-owned facilities to corporate operations encompassing hundreds of acres, occupy the Crooked Creek watershed.

Historic resource extraction associated with underground deep mines and surface mines has left a legacy of coal refuse piles, scarred landscapes, and abandoned mine shafts throughout the watershed. Underground mine pools occupying abandoned deep mines threaten both ground and surface water quality. When the highly pyritic coal and bedrock from the mining operation is exposed to oxygen and moisture, a series of chemical reactions ensue. These reactions typically result in elevated acid and dissolved metal levels in the water draining the mine. The presence of mine drainage is generally identified by a reddish precipitate on the stream substrate. This precipitate is a result of ferric hydroxide, or “yellowboy”, which falls out of solution when the pH elevates above 3.5. An easily visible example of this within the Crooked Creek watershed is the open-borehole discharge at Tanoma. In addition to posing a threat to anglers wading the stream, this borehole, a result of previous mining, is a large source of yellow-boy in the watershed. At this time, however, remediation efforts are in place at the borehole.

The locations of abandoned mine problem areas and discharge sites are illustrated in Figures 7 & 8, and some of the proposed reclamation strategies are discussed in further detail under the Water Resources Section of this document. However, a comprehensive identification of all mine locations within the watershed was not within the scope of this project.

Another potential danger to water and air quality identified within the watershed is coal refuse piles. The largest refuse pile identified within the watershed was Air Products Ernest Coal Refuse site dating to the early 1900s. This site has been historically problematic as a result of water from the refuse site being gathered and stored in a temporary holding pond. This water often leaches into the spoil pile and discharges acidic effluent into McKee Run. Two large seeps above and below the refuse pile also discharge AMD and raw sewage, which emanates directly from the deep mine below the pile. However, according to Horrel (2000), Air Products has removed approximately 25 percent of the pile, replacing it with cogen ash to increase the alkalinity of the discharge. The goal of this project is to eventually construct contoured ash wetlands at the site in order to improve the water quality in McKee Run.

4. Active Mines/Quarries

One permitted, non-coal mining operation was identified in the Crooked Creek watershed. This operation is currently active and consists primarily of shale quarries (D. Wissinger & R. Stitt, Ebensburg District Mining Office; A. Buzzard, Greensburg District Mining Office, personal communication, June 2000).

In addition to the non-coal mining operations, 28 active coal mining permits were identified within the watershed (D. Wissinger & R. Stitt, Ebensburg District Mining Office; A. Buzzard, Greensburg District Mining Office, personal communication, June 2000). These permits were issued for deep and strip mining operations, coal preparation, and reprocessing. Twenty-six of these permits were in force, while the remaining two have not been initiated, or were inactive, forfeited, or regraded. Figure 8 illustrates the areas where active mining was occurring during the preparation of this report. A list of the identified coal and non-coal mining permits is located in Table II-3.

5. Sinkholes

Sinkholes in Pennsylvania are generally associated with karst topography. Karst areas are composed of carbonate bedrock, such as limestone, dolomite, or marble, that remains in dissolution for long periods of time. Water that has gradually infiltrated the underlying bedrock will weaken rock joints and eventually cause the ground surface to collapse. This subsidence results in varying sized sinkholes across the landscape. Often, sinkholes can cause subsidence of power lines, buildings, or any structure supported by the ground surface.

Most sinkholes associated with karst topography in Pennsylvania are generally located in the central and eastern portions of the state, as a result of the definitive bedrock. According to Kochanov (1999) and a DCNR database query, no karst formations or associated sinkholes are located within the Crooked Creek watershed. Sinkholes associated with past mining practices have been reported but were not identified as a major concern in the watershed.

G. CRITICAL AREAS

No critical areas were identified within the project study area.

Permit Number	County	Township	Permittee	Status	Operation	Permit Type
32910103	Indiana	Armstrong	Big Mac	Active	Surface Mining	Coal
32803037	Indiana	Armstrong	Kent 53	Active	Surface Mining	Coal
32841312	Indiana	Armstrong	Keystone Coal Company	Active	Deep Mining	Coal
32841313	Indiana	Armstrong	Keystone Coal Company	Active	Deep Mining	Coal
32841323	Indiana	Armstrong	Keystone Coal Company	Active	Deep Mining	Coal
32921301	Indiana	Washington	Keystone Coal Company	Active	Deep Mining	Coal
32841321	Indiana	Washington	Keystone Coal Company	Active	Deep Mining	Coal
32971302	Indiana	Washington	Rosebud	Active	Deep Mining	Coal
3274301	Indiana	Washington	Manor Mines	Active	Surface Mining	Coal
32950109	Indiana	White	Dunamus	Active	Surface Mining	Coal
32950201	Indiana	White	Cambria Recycling	Active	Refuse Recovery	Coal
32841307	Indiana	Rayne	Tinoma Deep Mines	Active	Deep Mining	Coal
32840701	Indiana	Rayne	Tinoma Deep Mines	Active	Refuse Pile	Coal
32970110	Indiana	Rayne	Mears Enterprises Inc	Active	Deep Mining	Coal
32970902	Indiana	Rayne	Mears Enterprises Inc	Active	Refuse Pile	Coal
32910101	Indiana	Rayne	TLH Coal Co.	Active	Surface Mining	Coal
32990107	Indiana	Rayne	Amerikohl Mining	Active	Surface Mining	Coal
03841305	Armstrong	Plum Creek	Keystone Coal Company	Active	Surface Mining	Coal
03831305	Armstrong	Plum Creek	Keystone Coal Company	Active	Surface Mining	Coal
03951601	Armstrong	Plum Creek	Keystone Coal Company	Active	Cleaning Plant	Coal
03181303	Armstrong	Plum Creek	TJS Mining	Active	Deep Mining	Coal
03901304	Armstrong	Plum Creek	TJS Mining	Active	Deep Mining	Coal
03961302	Armstrong	Plum Creek	TJS Mining	Active	Deep Mining	Coal
03840701	Armstrong	Plum Creek	TJS Mining	Active	Refuse Pile	Coal
03870701	Armstrong	Plum Creek	TJS Mining	Active	Refuse Pile	Coal
03851601	Armstrong	Plum Creek	TJS Mining	Active	Cleaning Plant	Coal
03980103	Armstrong	Plum Creek	Parkwood Resources	Active	Deep Mining	Coal
03980103	Armstrong	Plum Creek	Dutch Run Coal	Active	Surface Mining	Coal
03862601	Armstrong	Plum Creek	Glen Flemming Construction	Active	Surface Mining	Non Coal
3200----	Armstrong	Plum Creek	Rosebud	Pending	Deep Mining	Coal

Table II-3 - PADEP Mining Permits within the Crooked Creek Watershed Study Area