

LAND RESOURCES

Geology and Soil Characteristics

The uppermost bedrock of the French Creek watershed is derived from sedimentary materials laid down during the Devonian Period and the younger Mississippian and Pennsylvanian Periods (Figure 7). Shales and siltstones of the Devonian Canadaway and Conneaut Formations underlie the northernmost sections of the watershed. The Cattaraugus shales, sandstones, and redbeds also of Devonian age underlie most of southern Erie County and northern Crawford County. Crawford County portions of the watershed also contain sandstones and shales of the Pocono Formation (Mississippian Period) and southern Crawford County uplands are associated with the Pottsville Group (Pennsylvanian Period). Pottsville shales and sandstones, along with those from the Pocono Group, make up the bedrock of the Mercer and Venango County portions of the watershed as well (Shepps *et al.*, 1959).

An important note for the water quality of French Creek is the absence of the coal-containing Allegheny Group (Pennsylvanian Period). This fact has allowed French Creek to escape the fate of coal mining and associated abandoned mine drainage, which has decimated streams to the south and east.

Soils are formed through the interaction of five major factors. These soil-forming factors are: (1) parent material, (2) climate, (3) relief, (4) living organisms, and (5) time. The degree to which the soils are influenced by the individual factors of soil formation varies from place to place (U. S. Department of Agriculture, 1960). Soils of the French Creek watershed have been forming from glacial material (till and outwash) for only approximately 15,000 years since the last glaciation (Figure 8). This relatively young soil has not had time to form distinctive layers and primarily assumes its characteristics from glacial parent material, relatively wet climate, and organic material.

Soils in the glaciated French Creek watershed are generally of two primary categories:

- Gravelly soils of outwash terraces, floodplains, and moraines formed from stream deposits and glacial outwash.
- Soils of upland areas formed from the weathering of glacial till.

The outwash terraces are associated with the lowlands around stream channels. These are comprised of gravelly and sandy soils. Glacial outwash is formed from materials carried away from glaciers by meltwater. These soils may range from saturated to droughty depending on the level of the water table and the percent slope. The steep soils tend to be droughty while the soils in depressions are very poorly drained. These soil types include a small percentage of muck and peat producing areas northwest of Corry where bog and fen wetlands are present. The soils of this general area were historically used for intensive farming. Potatoes were the principal cash crop. Corn, small grains, and alfalfa were grown on the well-drained and moderately drained soils (U. S. Department of Agriculture, 1960). Dairy farming was the most common type of farming on the more poorly drained soils. Although many farms still exist, including some dairy operations, much of the agriculture in the watershed has been lost and portions of this land

have reverted to forest. The better draining sloping and moderately steep soils are used as a source of sand and gravel.

The upland areas in the glaciated portion of the watershed are rounded hills surrounded by the glacial outwash terraces. In general, these soils range from poorly drained in level areas to excessively drained in steep areas and ridge crests where the soil is thin. The soil is underlain by moderately calcareous till, forming a mantle that is slowly permeable to water resulting in a high water table. Most of the soils of this general area were historically used for dairy farming and livestock production. Corn, hay, and small grains were the principal crops but often did not do well due to wet fields. Many of the dairy farming operations no longer exist and much of this land has reverted to forest.

Silty and clayey soils of glacial lakebeds also occur in a few locations in the northern portions of the watershed. These areas indicate the previous existence of a lake, which captured the finest silt and clay particles of glacial outwash and filled in over time.

Portions of the extreme southern reaches of French Creek in Venango County have very steep sided stream valleys associated with them. These areas were not reached by glaciers and exhibit very different topography and consequently, soil types. The floodplains are largely deposited alluvial material, which is usually well drained. The stream valley hillsides are well drained, stony soils underlain by shale, siltstone, and sandstone. The increased relief in this portion of the watershed has not favored agriculture and consequently many ridges are heavily forested.

Within these general soil classifications exist many soil types that vary greatly from one area to another. It is important to consider the soil type in a particular area when considering farming, development, or any project, which could impact the watershed if done incorrectly. It is also important to consider soil types when implementing Best Management Practices (BMP) and riparian restoration projects through streambank stabilization. Some soils are much more erodable than others. Other factors, like grade of slope, are also important in determining appropriate land uses.

Ownership

Publicly owned lands in the French Creek watershed are considered to be those owned by the Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission (PGC), Pennsylvania Fish & Boat Commission, U. S. Fish & Wildlife Service, and other government agencies including county and local municipalities (Figure 9). Publicly owned lands represent only about four percent of the total land area in the French Creek watershed.

There are no DCNR State Parks in the watershed. There are several state parks within a short drive of French Creek. Presque Isle State Park lies to the north in Erie County, Pymatuning State Park lies to the west in Crawford County, Maurice K. Goddard State Park lies just outside of the watershed in Mercer County, and Oil Creek State Park lies to the southeast in Venango County. There is a small section, 127 acres, of the Cornplanter State Forest, owned by DCNR, in the French Creek watershed in Crawford County near the village of Townville.

Figure 7. Surface Geology in French Creek Watershed

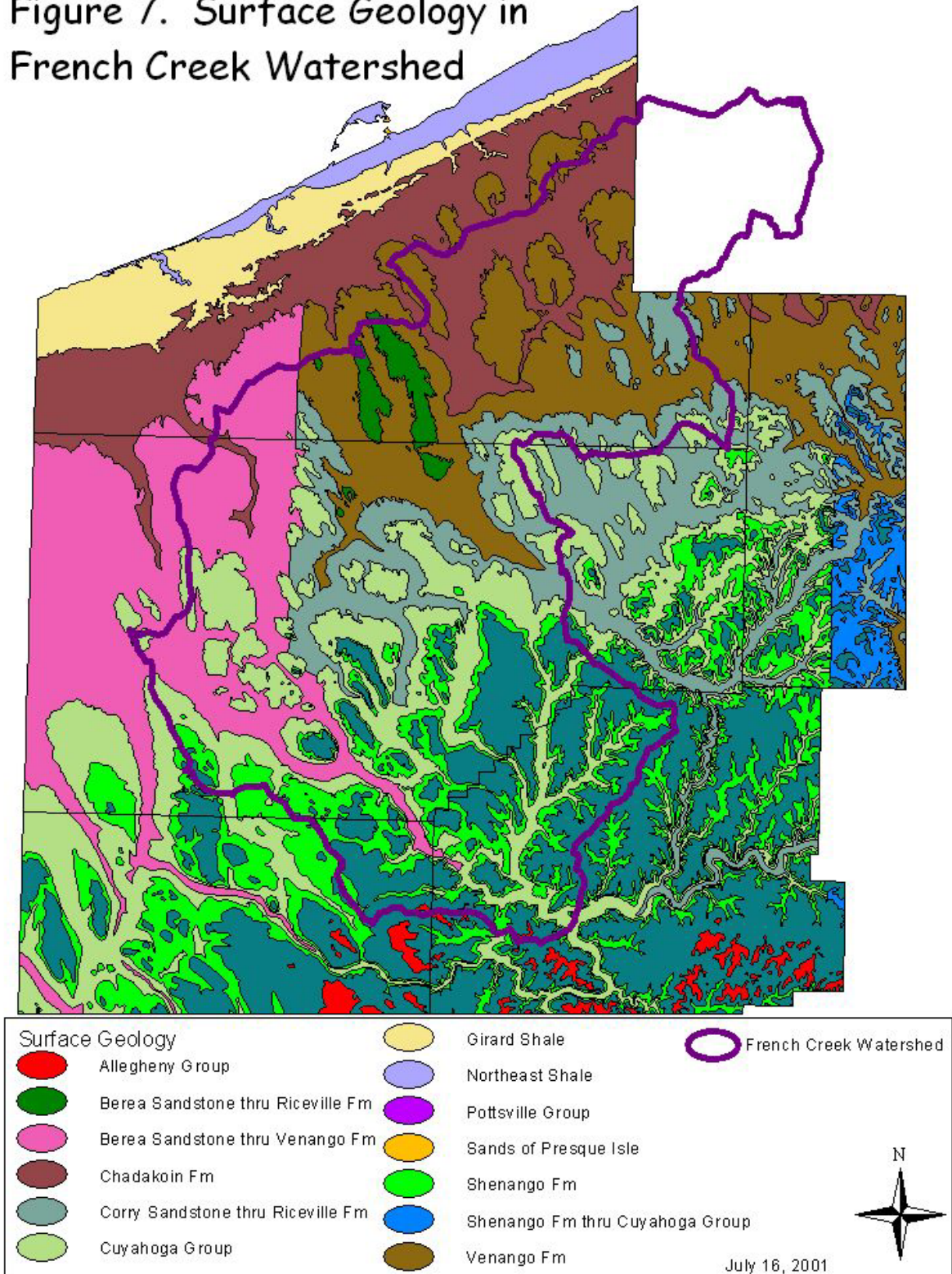


Figure 8. Soil Types in French Creek Watershed

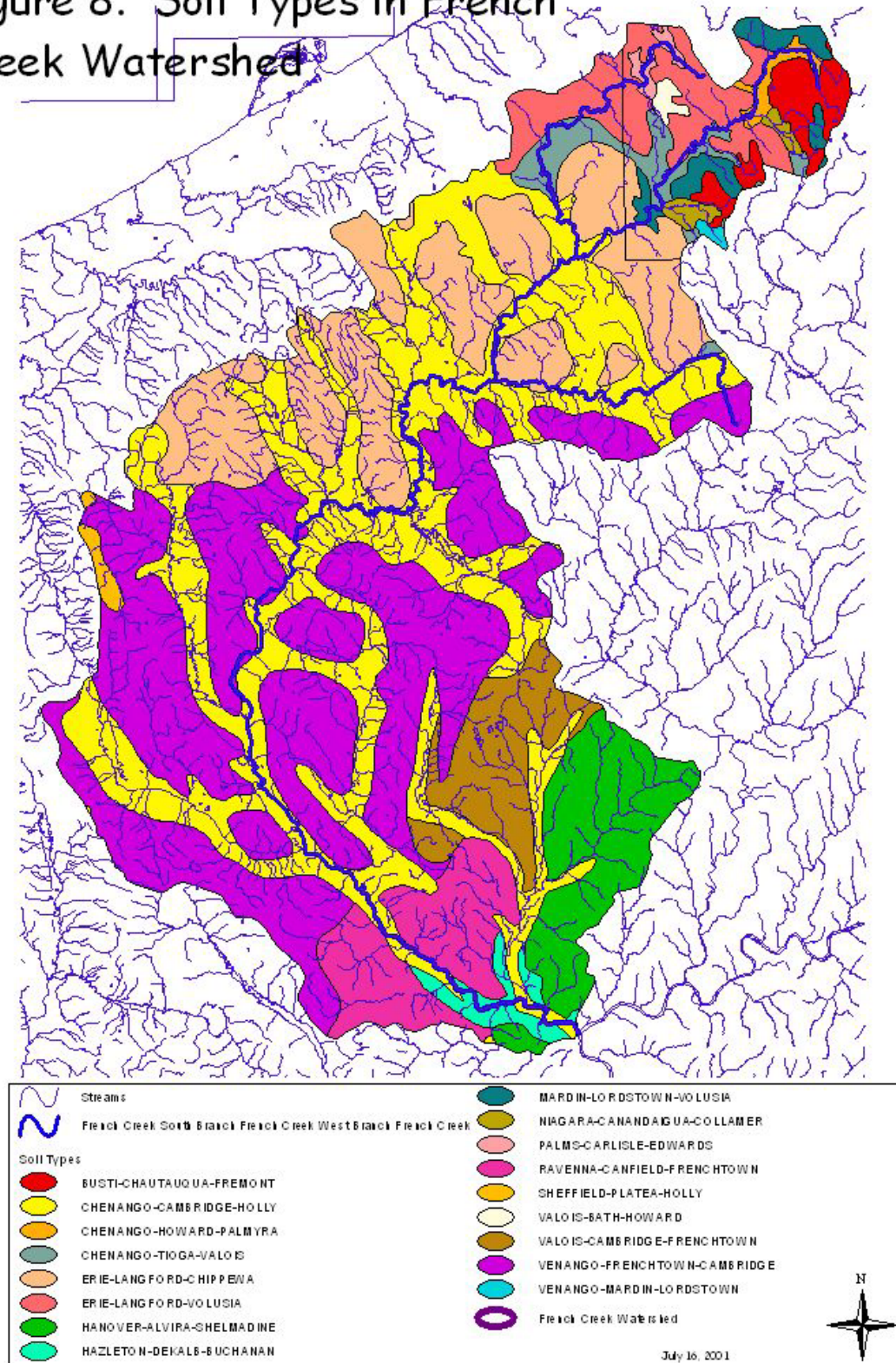
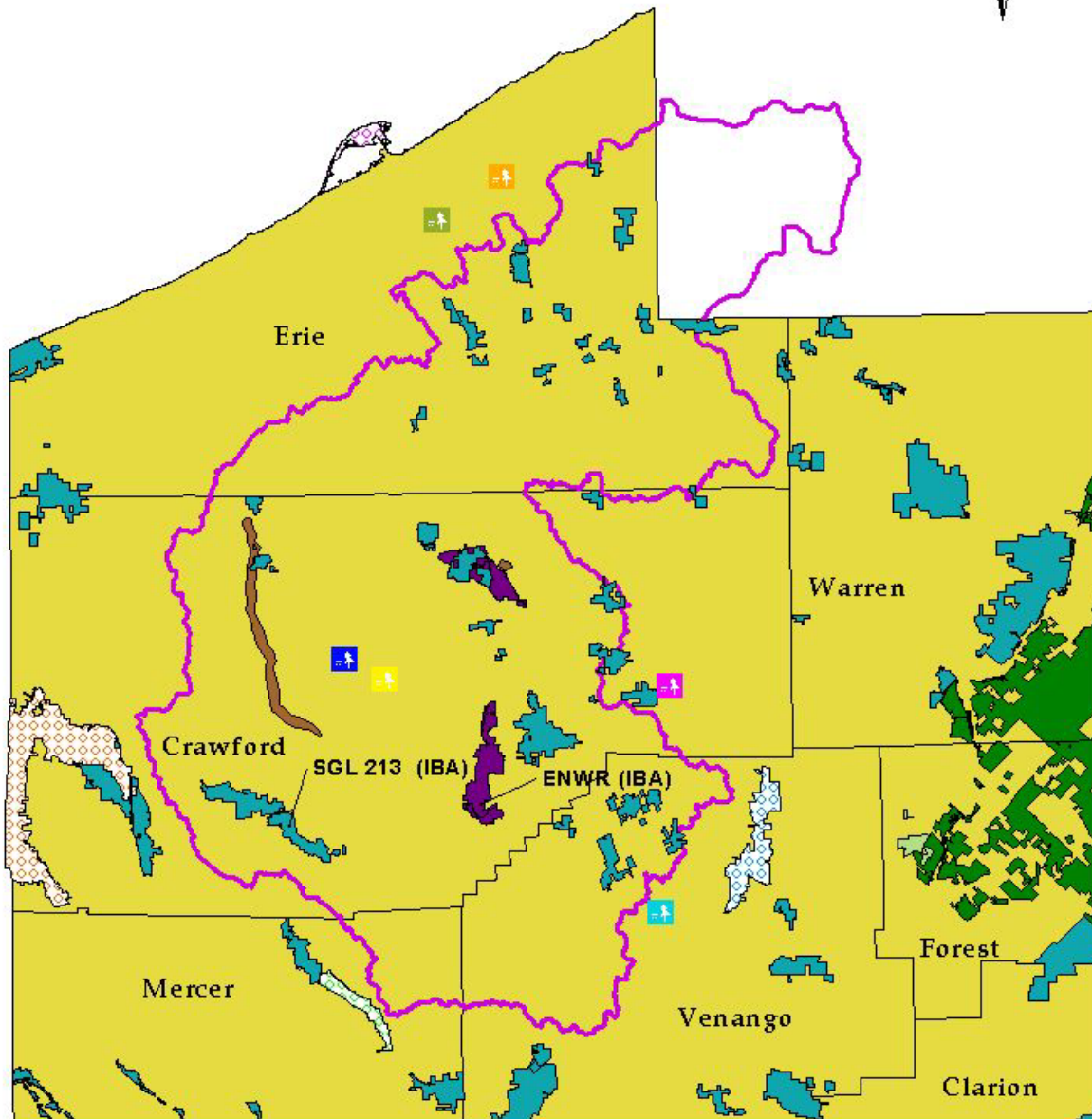


Figure 9. Public Lands



The PGC owns approximately 21,340 acres in the French Creek watershed. These State Game Lands (SGL) are comprised of relatively small, noncontiguous parcels spread throughout the watershed (Table 2).

Table 2. State Game Lands Within the French Creek Watershed

SGL #	Acreage	Township	County
96	4972.8	Cherrytree, Jackson, Oakland, Plum	Venango
270	2186.64 (in part)	Deer Creek, French Creek	Mercer
102	383.6	Amity, Union	Erie
109	1676.8	Greene, Summit, Waterford	Erie
154	1415.91 (in part)	Wayne	Erie
155	390.7	Venango	Erie
161	234.6	Greene	Erie
162	591.37	Amity	Erie
163	332.71 (in part)	Greenfield	Erie
167	627.4	Amity, Venango	Erie
190	391.09	Amity, Waterford	Erie
191	1223.8	Greenfield, Venango	Erie
192	333.3	Washington, Waterford	Erie
218	1351.22	Greene	Erie
69	4496.01	Randolph, Richmond, Troy	Crawford
85	114.9	Rockdale	Crawford
122	2649.26 (in part)	Athens, Steuben	Crawford
146	526.19	Richmond	Crawford
144	647.53 (in part)	Sparta, Concord	Crawford, Erie
152	499.4	Cussewago	Crawford
199	1131.97	Athens	Crawford
200	154.1	Richmond	Crawford
269	589.5	Cussewago	Crawford
277	971.89	Rockdale, Venango	Crawford
213	5574.08	Greenwood, Union, Vernon	Crawford
Source: PA Game Commission			

The PFBC owns or leases several access areas to French Creek and various lakes within the watershed. In addition, the PFBC operates two fish culture stations near Union City and Corry.

The largest tracts of contiguous, publicly owned land in the watershed belong to the USFWS Erie National Wildlife Refuge. Two separate divisions totaling 8,800 acres are situated in the Crawford County portion of the watershed. The northern 3,600-acre Seneca Division lies in the Muddy Creek sub-basin near Cambridge Springs. The southern 5,200-acre Sugar Lake Division straddles the Sugar Creek and Woodcock Creek sub-basins and is located east of Meadville.

Other agencies like the United States Army Corps of Engineers (USACE) operate public access areas on water bodies such as the Union City Dam Reservoir and Woodcock Creek Lake. All of

these agency-owned properties plus several small municipal parks represent all publicly owned lands in the French Creek watershed.

Western Pennsylvania Conservancy owns 1102.82 acres in the watershed, which are available for public use. In addition, Conneaut Lake/French Creek Valley Conservancy (CLFCVC) owns 72 acres and holds conservation easements on an additional 150 acres in the watershed. In total, about 96 percent of the watershed is in private ownership. This fact places special emphasis on community supported conservation programs for overall protection of the watershed.

Critical Areas

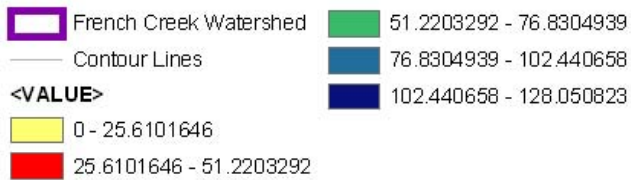
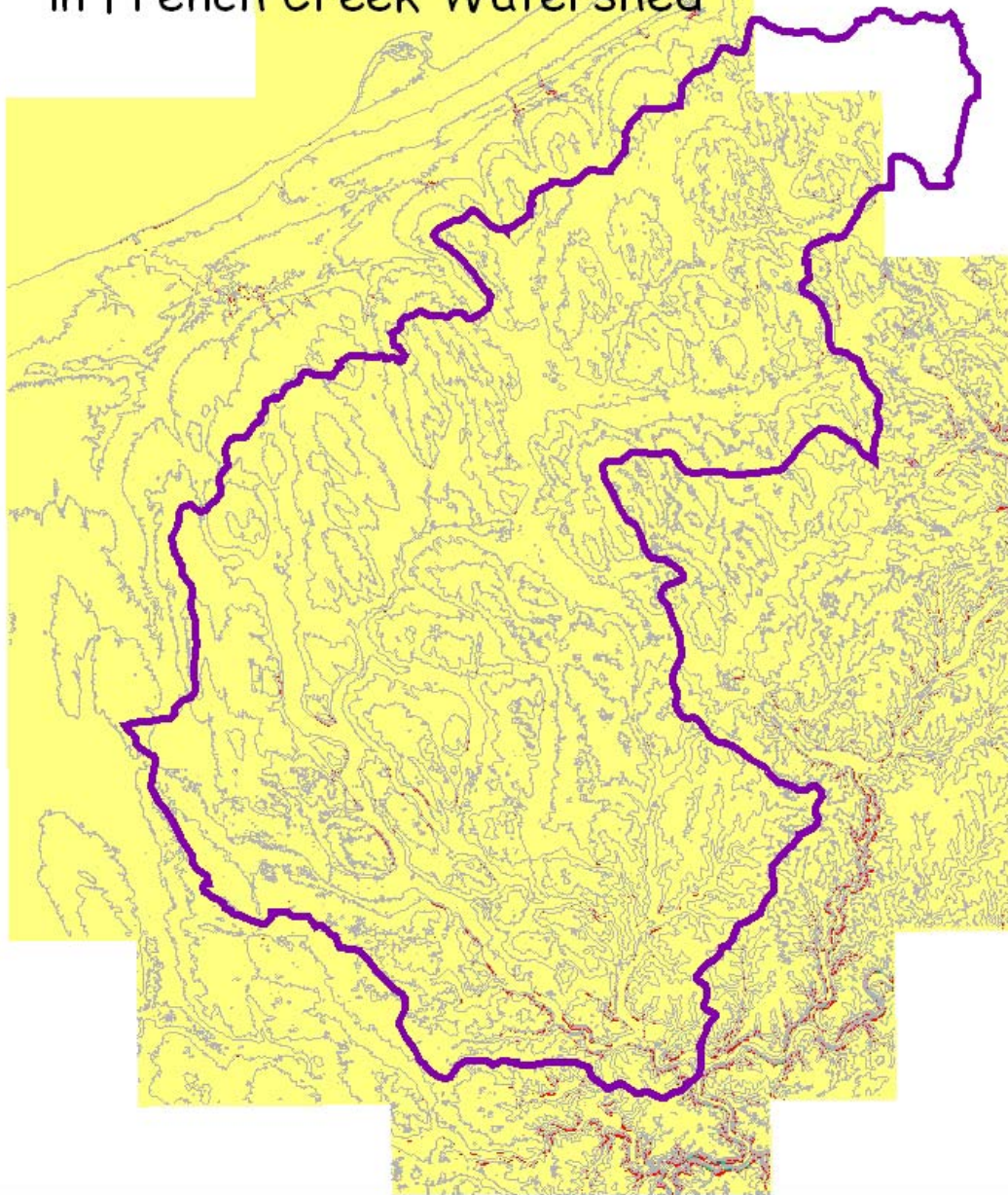
A critical area is one that, due to its nature, has constraints on the types of activities or development that may occur there. Examples of critical areas include erosion prone areas, stream banks, steep slopes, sinkholes, and karstic areas.

Steep slopes are critical areas that often present the potential for severe erosion and landslides. Due to the rolling topography of much of the French Creek watershed, steep slopes are not common. There are some instances of steeply sloped valleys associated with southern portions of French Creek and some of its tributaries that lie outside of the glaciated portion of the watershed (Figure 10). These slopes are normally wooded and pose little threat for erosion. Improper timbering practices or poor land use decisions can alter these steep slopes causing an increase in erosion or likelihood of landslides. This is particularly true of areas where roads or railroad beds are cut into steep slopes, leading to the potential for severe erosion.

French Creek's glacial history has led to ancient, well-defined stream channels being filled with glacial till causing present streams to meander through shallow stream valleys. It is important to note that the meandering of French Creek is a natural occurrence and in itself does not represent a problem. Loss of riparian buffers, alterations to hydrology, and improper land uses have led to large-scale erosion problems along many sections of the banks of French Creek and its tributaries. These human-induced factors have led to many areas of highly eroded stream banks along French Creek and its tributaries. This pattern of erosion and shifting stream channels is evident along the main branch of French Creek in Venango and Amity townships, and Wattsburg Borough in Erie County and elsewhere. These municipalities have worked to stabilize the stream channel using a combination of rock riprap and root wads. Many stream segments through the highly agricultural Erie and Crawford Counties have lost protective riparian buffers and consequently exhibit severe erosion of stream banks. Compounding this problem further downstream may be the increase in bank-full flows caused by the flood prevention dam near Union City on French Creek.

Natural stream movement often causes problems for roads and railways that are built too close to streams. There are many areas in the French Creek watershed where travel corridors were built along stream banks and probably continue to be built too close to streams. The result of natural stream movement is erosion of roads and rail beds necessitating the use of riprap to reinforce these areas. Riprapping is often done when emergency subsidence demands immediate attention. Normally rock or cement is used to stop further streambank erosion. Riprapping tends to transfer

Figure 10. Slopes Greater than 25%
in French Creek Watershed



the stream's energy to other locations downstream where increased erosion may occur. Often these projects are undertaken without thought to the impacts to downstream areas.

Landfills

Currently there are two permitted landfills in the French Creek watershed. Kebert Landfill is a demolition landfill south of Meadville in West Mead Township, Crawford County. International Paper operates a permitted landfill near Lowville, in Venango Township, Erie County. This landfill receives wastes from the International Paper plant in the City of Erie, outside of the French Creek watershed. Landfill permits are granted and monitored by the Waste Management Program of the Pennsylvania Department of Environmental Protection. Currently, DEP is conducting an inventory of older individual or abandoned municipal dumpsites.

Potential Hazard Areas

Hazardous Waste Sites

There are no current Superfund sites within the French Creek watershed as identified by the National Priorities List maintained by the U. S. Environmental Protection Agency (EPA). These sites are regulated under Section 111 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Under this legislation, EPA also identifies potential hazardous waste sites, which pose a threat of release of hazardous substances, pollutants, or contaminants. There are several potential hazardous sites in the French Creek watershed (Appendix C).

Mining Operations

Due to a lack of coal deposits, the French Creek watershed has escaped the degradation from abandoned coal mine drainage that has claimed the biological integrity of many Pennsylvania waterways. However, the glacial processes that shaped the northwestern Pennsylvania landscape left the area rich in sand and gravel deposits. These deposits are actively mined to provide material for roadways and other construction projects. Sand and gravel mining occurs throughout the French Creek watershed with much of it concentrated in the northern portions (Figure 11). This may be due to the close proximity to Erie's port, however other areas of the watershed will be more actively mined as these northern deposits are depleted. Open-pit gravel mining has the potential to alter the chemical properties of groundwater by exposing it to acid deposition and/or removing the alkaline bearing material. Surface runoff may also see an increase in sediment loads and pollutants from inadequately maintained mining operations. In addition, alterations in hydrology are a threat to wetland and aquatic organisms that rely on specific natural flow regimes.

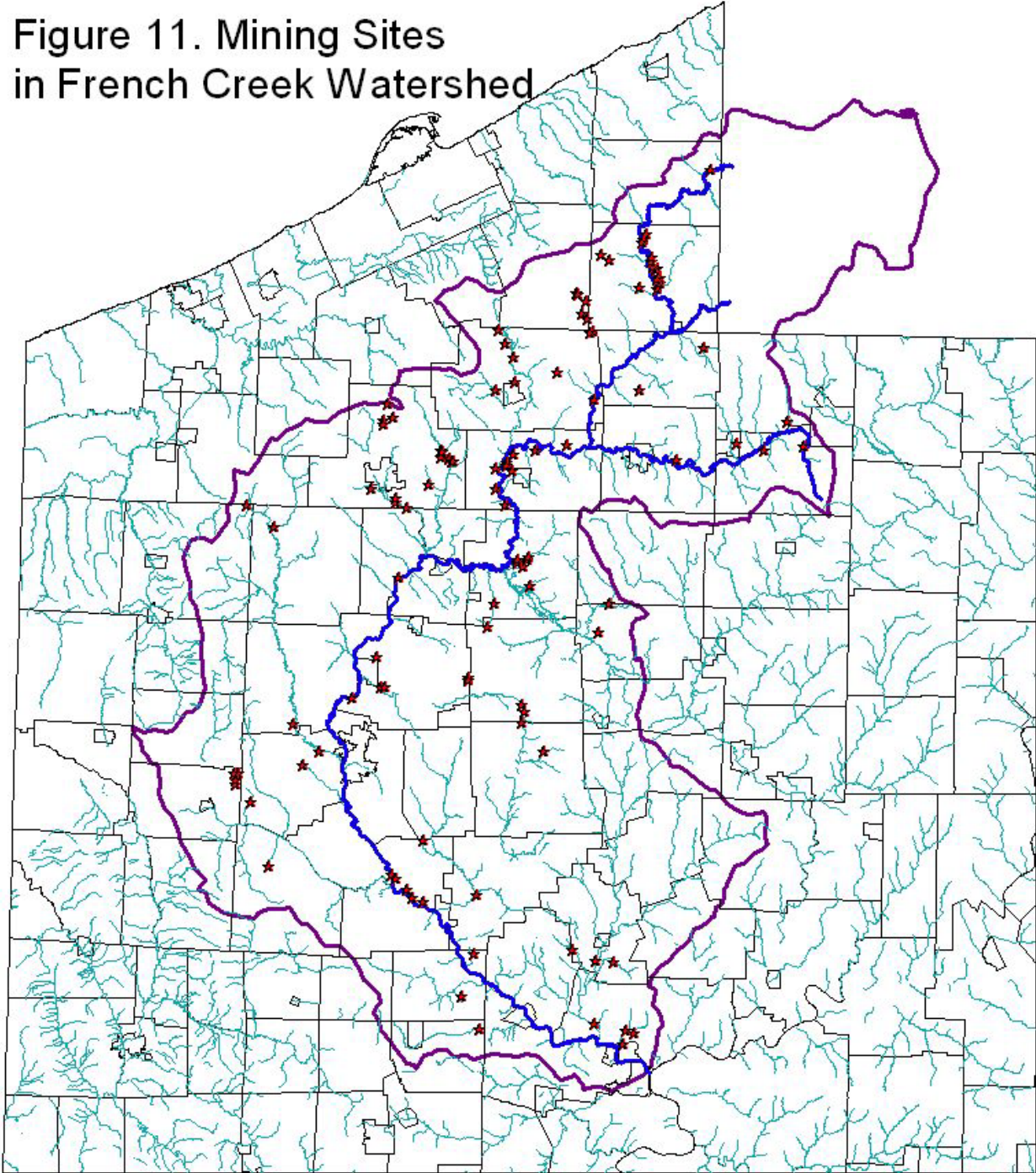
Oil and gas drilling also occurs throughout the French Creek watershed (Figure 12). Historically, southern areas of the watershed were actively drilled for oil production. Areas in southeastern Crawford and Venango counties are historically famous for oil production. Presently, gas wells are much more common in the French Creek watershed than oil wells. Many areas throughout the watershed have active wells and a high number of abandoned wells

also exist. Abandoned oil and gas wells have the potential to leach brine into groundwater and surface water. Aside from high salt concentrations, brine also contains heavy metals and other pollutants that can seriously degrade water quality. All mining operations in the French Creek watershed are permitted and monitored by DEP Bureau of Mining in Knox, Pennsylvania (Appendix D).

Natural Erosion and Depositional Patterns

The relatively young stream valleys of the French Creek watershed are a result of glaciation filling in original stream valleys with till and modern streams now re-cutting these areas. Much of French Creek and its tributaries are low to medium gradient streams that tend to meander across wide, shallow stream valleys following the least resistant pathway through the gravelly till, probably often coinciding with the location of original stream valleys. This natural tendency to meander is often compounded by human impacts on the landscape. Loss of riparian zones and alterations in flow regimes due to loss of wetlands, increases in impervious surfaces, removing forests, and damming all have the potential to increase erosive forces in flowing streams. Much of the work currently being done in the watershed to address these problems only attempts to fix the symptoms of erosion problems instead of looking for the causes. It is imperative to gain a better understanding of the natural flow patterns of French Creek in order to more effectively control erosion and sediment deposition.

Figure 11. Mining Sites in French Creek Watershed



★ Mining Sites Source: PA DEP

French Creek

Streams

Municipalities

French Creek Watershed



Figure 12. Oil & Gas Wells and Fields in French Creek Watershed

