Cherry River Watershed Assessment

Fifth Level Watershed #0505000506

Gauley Ranger District
of the

MONONGAHELA NATIONAL FOREST

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Introduction

Intent of Watershed Analysis

A watershed analysis, as applied on the Monongahela National Forest (MNF), is a procedure to identify the interactions, processes, and functions of resources such as water, soils, plants, trees, animals, and human influence on a watershed scale. Knowing and better understanding these relationships will help us set priorities for social, economic and ecological needs when planning future activities in the area. It will also help us to better determine the effects of our management. The watershed scale was chosen because it is a well-defined land area having unique features, and it allows us to analyze the interrelationships of various resources in an entire watershed.

The watershed assessment sets the stage for future project analyses; it does not result in a decision. It is designed to allow for future changes based on new information and data that become available or as other issues develop. This report covers six basic steps:

- Characteristics of the watershed – the dominant physical, biological, and human processes.
- Issue identification with key questions – the main resource concerns, conditions, and activities.
- Reference condition description – establishes the historical uses and health of the identified resources and serves as a comparison to the current condition.
- Current condition description – describes the health or existing state of identified resources as they relate to the issues.
- Interpretation of the changed conditions and probable causes – summarizes the main findings of the previous steps and explains the significance of any changes.
- Management activity recommendations – outlines potential projects to maintain or restore the health of the identified resources within the framework of the MNF Land and Resource Management Plan (Forest Plan) management prescriptions. The objective is to move the area toward a Desired Future Condition (DFC) using standards and guidelines described in the management prescriptions.

The findings within this document serve as a foundation to develop site-specific project proposals, associated effects analysis, and decision documents.

Chapter 1

CHARACTERIZATION OF THE CHERRY RIVER WATERSHED

The majority of the Cherry River Watershed is in Nicholas and Greenbrier counties, with smaller portions in Pocahontas and Webster counties (Map 1-1, p. 1-16). The headwaters of the watershed begin approximately 1.5 miles east of the Pocahontas/Greenbrier County line and the watershed continues west to the confluence with the Gauley River located approximately 7 miles northwest of Richwood. The Gauley River flows into the New River at Gauley Bridge, Fayette County, WV and forms the Kanawha River that enters the Ohio River near Point Pleasant, WV.

The Cherry River Watershed covers approximately 106,080 acres (165.7 sq. mi.). National Forest (NF) land in this watershed is on the Gauley District and encompasses 28,374 acres (27 percent of the entire watershed). Private land covers approximately 77,706 acres (73 percent of the entire watershed), the majority of which is to the south of NF land. Map 1-2 (p. 1-17) shows the sub-watershed and land ownership boundaries.

The assessment area is a fifth order watershed (#0505000506, using Natural Resource Conservation Service system) and includes five sixth order sub-watersheds:

- North Fork Cherry River
- South Fork Cherry River
- Cherry River Composite (South Fork Cherry to Laurel Creek)
- Laurel Creek
- Lower Cherry Composite (Laurel Creek to Mouth)

Elevations range from about 1,900 feet at the junction of the Cherry River with the Gauley River to 4,500 feet at an unnamed knob near the head of Left Branch, along the northeastern boundary of National Forest in the watershed. The climate is characterized by average precipitation of 53 inches (reading at Richwood). At Richwood (elevation 2,200 feet) the average high temperature is 62.9°F; average low is 38.9°F. Midsummer average high is 81.9°F and low 57.6°F. Midwinter average high is 41.1°F and low 19.2°F. Temperatures in the higher elevations would be about 3.5°F degrees cooler for every 1,000 feet gain in elevation. (Information from U.S. Weather Bureau at Charleston 2001).

Most of the National Forest Lands within the watersheds lie within an area underlain by bedrock of primarily the New River formation and to a lesser extent the Kanawha formation, both Pennsylvania age. Smaller amounts of Upper Mississippian system bedrock (Mauch Chunk Group) occurs along portions of the North Fork Cherry River, and a few of its headwater tributaries such as Bear Run and Left Branch. Private lands are also dominated by Pennsylvania age bedrock, but have considerably more Mauch Chunk bedrock along the streams and mid-to-lower slopes, especially in the watershed of the South Fork Cherry. In the Pennsylvania age system, bedrock is primarily composed of sandstone, with some shale, siltstone and coal. In the Upper Mississippian system, bedrock is dominated by shales and sandstones, and with a few thin limestone beds.

The Pennsylvania age surface bedrock is typically low in calcium carbonate minerals that make it low in acid buffering capacity. These portions of the watershed characteristically have acid-forming rock and acid soils, which make streams slightly to strongly acidic. Streams within portions of the North Fork in particular are strongly acid, especially east of Coats Run. Acid deposition is also affecting streams, and appears to be having a long-term effect of lowering stream pH and alkalinity, and thus lowering overall aquatic productivity. There is some evidence, however, that the lithology of the New River and Kanawha Formations become shaleier in the western portions of the Cherry River Watershed. These shales appear to contain more of the carbonate minerals that contribute alkalinity to streams, making them less acid and more productive for aquatic biota. Stream chemistry does improve in the western portion of the watershed, west of Coats Run, although streams are still somewhat acidic.

The watershed contains all or parts of 12 opportunity areas (OAs) under three management prescriptions (see Map 1-3, p.1-18 and Map 1-4, p. 1-19), as described in the Forest Plan. Table 1-1 lists the Opportunity Areas (OA) and Management Prescriptions (MP) with percentage of acreage in the watershed.

MP 2.0 (about 13 acres or <1 percent of NF land in this watershed) emphasizes:
- A continuous forested scene.
- Wildlife species primarily associated with shade tolerant vegetation.
- Primarily shade tolerant hardwood trees for fiber and sawtimber achieved through unevenaged silviculture.

MP 3.0 (about 11,444 acres or 40 percent of NF land in this watershed) emphasizes:
- Large, high quality hardwood trees for lumber and veneer, hard mast production, and scenic attributes.
- A variety of forest views.
- Wildlife species tolerant of disturbances, such as deer, grouse, and gray squirrel.
- A primarily motorized recreation environment.

MP 6.1 (about 16,915 acres or 60 percent of NF land in this watershed) emphasizes:
- Remote habitat for wildlife intolerant of disturbance.
- A semiprimitive and nonmotorized type of recreational environment.
- A mix of forest products.
- A strategy for management of sites reverting from hardwood to conifer and the intermingled high site hardwood types.

Table 1-1 – Distribution of Management Prescriptions and Opportunity Areas

OA #	OA Name	MP	NF Acres	Total Acres	% of NF Land in Watershed	% of All Land in Watershed
22.001	Snakeden Mt.	2.0	7	7	<0.1	<0.1
22.004	Dogway	2.0	6	6	<0.1	<0.1
23.005	Holcomb	3.0	3,418	4,899	12.0	4.6
23.006	Cherry River	3.0	2,966	6,905	10.8	6.5
23.007	Briery Knob	3.0	2,279	3,520	8.0	3.3
23.010	Bear Run	3.0	2,781	2,781	9.8	2.6
26.106	Desert Branch	6.1	3,010	3,016	10.6	2.8
26.107	Summit Lake	6.1	5,243	5,243	18.4	4.9
26.108	Rabbit Run	6.1	4,073	4,073	14.3	3.8
26.109	Frosty Gap	6.1	4,164	4,165	14.6	3.9
26.110	Spruce Run	6.1	427	427	1.5	0.4
26.112	Sugar Knob	6.1	0	71,038	0	67
	TOTAL		28,374	106,080	27	

Current conditions, reference conditions, desired conditions and objectives are described within each core topic. The core topics and sub-topics for this analysis are:

- Ecologic Land Types
  - Soils
  - Erosion Processes
- Air Quality
- Hydrology/Stream Channels
  - Morphology
  - Flow Rates
  - Storm Flows
- Water Quality
  - Sediment
  - Acidity (pH)
  - Temperature
- Aquatic Resources
  - Fish
  - Riparian Habitat
- Vegetation
  - Threatened/Endangered/Sensitive Flora
  - Forest Type/Size/Density
  - Agriculture/Openings
- Wildlife
  - Threatened/Endangered/Sensitive Fauna
  - Management Indicator & Emphasized Species

- Human Uses
  - Recreation
  - Minerals – Gas/Oil/Coal
  - Special Uses
  - Roads/Trails
  - Heritage Resources
  - Landlines
  - Private Land

ECOLOGIC LAND TYPES

The Cherry River watershed falls entirely within the M221Bc – Southern High Allegheny Subsection. Within this subsection there are three Land Type Associations within the Cherry River watershed, LTA Bc01, LTA Bc02, and StRp. LTA Bc01 is comprised of approximately 95,488 acres or about 90% of the Cherry River watershed. The distinguishing feature of the Allegheny Plateau is the vast area with highly dissected topography, northern hardwoods and mixed mesophytic, productive sites. Landforms consist of broad ridges with steep (20 to 60 percent slopes) hill and mountain sideslopes. The geology is made up of Pennsylvanian sandstone/siltstone/ shale and includes a portion of the red shale from Mauch Chunk Formation in the eastern portion of the watershed. Primary erosion processes include surface erosion (sheet, rill, and gully) and landslides. Landslides are estimated to underlie 21 to 50 percent of the landscape. Soils that exist over the Mauch Chunk formation are highly erodible and are prone to mass movement. Soils are primarily moderately deep (20 inches) to very deep (greater than 60 inches.) Very deep colluvium may exist on some footslopes that may be up to 25 meters deep. Soil Families include: Gilpin-Dekalb-Buchanan, Gilpin-Buchanan, and Cateache-Shouns-Belmont. The soil temperature regime is mesic. Plant communities are sugar maple, beech, sugar maple-beech, red oak, sugar maple-basswood, sugar maple – red oak, and cherry and tulip poplar are prevalent as well in this LTA. Plant communities are discussed in greater detail in other sections of this assessment. On average, these are the most productive sites on the forest, containing northern and mixed mesophytic hardwoods. Although these sites are very productive, Mauch Chunk soils (Cateache-Shouns-Belmont) are highly erodible and require special consideration when building/maintaining roads.

There are interspersed areas of Bc02 Allegheny Plateau Red Spruce-Frigid soils at elevations greater than 3,800 feet. LTA Bc02 is comprised of approximately 4,943 acres or about 4.7 percent of the Cherry River watershed. Landforms consist of broad ridgetops and mountain shoulders. Elevations range from 4,000 to 4,500 feet. Pennsylvanian age sandstone, siltstone, and shale dominate the geology. The primary erosion process is surface erosion. Soil families Mandy-Snowdog-Gauley soil series. In general, frigid soils are tied to soil temperatures commonly existing at higher elevations (> 3200 feet). However, in the Cherry River Watershed and in other places on the forest microclimatic conditions are created by aspect, high mountain shading, and cold air drainage. In this instance frigid soils may exist as lower than expected elevations and corresponding vegetative cover types grow on them. Vegetation associations on these soils include red spruce, red spruce – hemlock, yellow birch, and American beech. Soils are shallow, acidic, and nutrient poor. This LTA was adversely affected by turn-of-the-century logging and burning, and is still recovering. Coal underlies some areas; strip-mining has had an adverse effect. (DeMeo, Tracy, Wright 1998)

The LTA mapped, as StRp is land that has been strip-mined for coal reserves and is mostly in private ownership. There are approximately 3,061 acres or about 2.9 percent of this LTA in the Cherry River watershed. In general, strip mine areas have been disturbed to the point where the soil material or overburden is removed to the bottom of the coal layer that was mined. Most of these areas have been reclaimed and seeded to grasses. In some reclaimed mining areas, shrubs and trees are beginning to invade from adjacent undisturbed areas. The soil material in that area does not resemble the soil material adjacent to it in undisturbed areas. It is expected that the soil would be less productive than the soils in the undisturbed area.

The area has been further subdivided into many ecological land types (ELT) on the basis of soils, aspect and potential vegetation types. Although there are many ELTs, the main potential type is similar throughout this watershed. The potential vegetation types within the Bc01 LTA are: on the ridges and side slopes -- Sugar Maple/Beech types; mostly along the stream courses in the lower elevations -- Hemlock/Rhododendron; and in rocky areas -- Yellow-Birch/Rhododendron. Potential vegetation types in Bc02 are primarily Red Spruce and Beech with some areas of Sugar Maple/Beech.

Soils/Geology

Information for the soil resource is located in the County Soil Survey Reports for Webster (1998), Nicholas (1992), Pocahontas (1998), and Greenbrier (2002 anticipated publication) Counties. The USDA Natural Resource Conservation Service, Soil Survey, is the author of these documents in cooperation with the USDA Forest Service, West Virginia University Agricultural Experiment Station and local county authorities. The county soil survey report provides a map of the soil types (map units) at a scale of 1:24,000, soil map unit descriptions, typical soil series descriptions for the county, and soil map unit interpretations for various land management activities and soil properties. Soil characterization data for series used in this watershed is limited.

Current analyses of the soil resource are conducted using the forest GIS database system and field visits to the watershed. A digital layer of the soils exists for all ten counties within the forest proclamation boundary. There is also a digital layer depicting the sensitive soils available in the GIS database. Soils rated as sensitive require mitigation measures beyond those in the Forest Plan that are routinely applied during project implementation.

Soil chemistry data is stored in a National Soil Survey Center laboratory database. Currently, the forest soil resource program is designing a soil chemistry-monitoring program for FY2003. During FY 2003, soil samples will be taken from the sub-watershed, Desert Branch, and analyzed for their susceptibility to acid deposition and current nutrient status. These soils will be monitored pre and post timber harvest for a period of five years. These results will be available after each field season.

The principal stratigraphy for the Cherry River Watershed includes the lower Pennsylvanian Pottsville Group and the Upper Mississippian Mauch Chunk Group.

Formations	Group
Ck – Kanawha Formation Cnr – New River Formation Cp – Pocahontas Formation	Pottsville Group
Cbl – Bluestone Formation Cpr – Princeton Formation Ch – Hinton Formation	Mauch Chunk Group

Generally throughout this watershed, high elevation areas are capped with Pottsville Group (Gp) and valleys are exposed Mauch Chunk Gp. Recent alluvial deposits (Qal) have collected along major stream channels. The younger Kanawha Formation (Fm) is dominant in the northern part of the Watershed. The New River Fm appears throughout the Watershed but not in the major valley areas. The Pocahontas Fm occurs in the South and Eastern part of the Watershed in areas transitioning from peaks to valleys. In general, the Mauch Chunk Group outcrops on the lower slopes and are found throughout the major valley areas of the Cherry River Watershed.

Erosion Processes

Early historic logging and more recent mining activities in the mid-1900s have significantly impacted the landscape. Wasteful logging practices at the turn of the 20th century left large amounts of woody debris on the forest floor and were followed by severe fires that caused significant soil erosion (Lewis 1998).

The effects of soil erosion to streams and water quality via sediment production are discussed in the hydrology report of the watershed assessment and will not be repeated here. Chapter 3 discusses the potential erosivity of the soils.

Air Quality

Although the area is generally characterized by unstable air masses that move quickly through the area, early morning fog is not uncommon, particularly during the summer. These inversions usually are short lived; however, they provide additional moisture to the soils and vegetation. Local emission sources include residential wood burning, burning of slash and land clearing on private land, small local industries, and vehicular traffic.

Acid deposition in the form of sulfates (mainly from industrial emissions such as electric utilities) and nitrates (mainly from vehicle emissions) is causing acidification of soils and streams in the Cherry River watershed. Acid precipitation develops when rain or snow mixes with the sulfate and nitrate gases or particulate matter in the atmosphere and enters the soils and streams. This acidification may have long-term negative impacts on the terrestrial and aquatic ecosystems.

Visual quality has been impaired by the increase of atmospheric sulfates (the largest contributor to haziness) in the Southern Appalachian Region. A limit on emissions from electric utility and industry sources required by the 1990 Clean Air Act should reduce sulfur dioxide emissions over the next several years (SAMAB 1996).

HYDROLOGY/STREAM CHANNELS

Morphology

Stream channels within the assessment area are primarily first and second order streams with moderate to high gradients, low sinuosity and limited floodplain development. Channels are generally comprised of boulder, rubble and cobble substrates, have few high quality pools, and a limited occurrence of large woody debris (lwd). Low gradient reaches may exhibit high levels of fine sediment.

Streams and rivers within the Cherry River Watershed are primarily steep gradient mountain streams. Many of the smaller perennial streams within National Forest Lands are A channel types (Rosgen classification system) with high gradient, low sinuosity, and limited floodplain development as they flow down off the mountainsides to the river (Rosgen 1996). The North Fork of the Cherry is also a high gradient stream, and mostly well entrenched within the narrow valley walls. The Cherry River main stem is a low gradient river, starting at the confluence of the North and South Forks in Richwood and flowing approximately ten miles to its confluence with the Gauley River.

Flow Rates

Stream flows within the watershed tend to be highly variable, dependent upon the season and precipitation patterns. Stream flow has been influenced by land uses in the Cherry River Watershed. Timber harvest activities that remove more than 20 percent of the basal area in a watershed within one year may temporarily increase runoff rates. A decrease of evapotranspiration and modest increases in annual runoff could occur. As the trees regrow after harvesting, flow rates return to near normal within one year or so after a light thinning and within five to ten years after clearcutting (Patric 1984).

Storm Flows

Storm flows within the area are characterized as intense and frequent. Streams are flashy in their response to larger storms, especially the more intense storms. Streams tend to rise rapidly under those conditions and fall rapidly as well, returning to base flow rather quickly. Major frontal weather systems and tropical storms from the south can carry very substantial quantities of rainfall. The largest 24-hour rainfall event for this area that occurs once each year (on average) is about 2.5 inches. However, periodic storms occur with much greater amounts and intensities of rainfall. For example, in 2001 a mid summer storm occurred in the watershed of the North Fork Cherry River that was estimated at up to ten inches of rainfall within four days. Other major storm events are fairly frequent, and generally occur during the dormant season of the year (November through mid-May), when evapotranspiration losses are minimal. This further adds to rapid storm runoff. Growing season storms and floods are not uncommon.

WATER QUALITY

The Cherry River is a free flowing river with no impoundments of the main channel system. Numerous perennial and intermittent streams provide water flow to the Cherry River. The North Fork Cherry is the primary water resource for the City of Richwood, with Summit Lake (an impoundment of Coats Run) used as a secondary resource in times of low water. South Fork Cherry is used as a water source for emergency purposes only. (personal communication with Richwood Water Works, 2001).

Data and other information are available, or were collected, for this report. Fieldwork was done in portions of the watershed to document stream and riparian conditions, and identify sources of erosion and stream sedimentation. Some existing information on those conditions was already available, in the Cherry River Opportunity Area resource report for water and riparian resources (1993). More recently, the Desert Branch Environmental Assessment (2002) documented conditions within the North Fork Cherry River Watershed. Water quality data is available for a portion of the streams within the watershed, mostly for the North Fork Cherry River and its tributaries. This data is presently maintained by the Monongahela National Forest aquatics personnel in the Forest Supervisors office. Data on stream liming activities and locations is maintained by the West Virginia DNR in Elkins.

Sediment

Water quality concerns are usually associated with sedimentation of streams, water temperature, and pH. Some human use factors causing sedimentation in the Cherry River Watershed are home and industrial sites, mining, agriculture, grazing, logging, and the associated network of private, state, and federal roads. In a study on the Fernow Experimental Forest near Parsons, WV using West Virginia Best Management Practices with conventional logging equipment, sediment export during timber harvest activities doubled in the first year the area was logged. In that study, sediment export levels returned to normal by the third year following completion of timber harvesting. Projected long term sediment export from three entries during a 100 year period for logging operations indicated less than 5 percent of the total sediment export would be from timber harvest activities (Kochenderfer, Edwards, and Wood 1997).

Fine sediment levels within the streams that form the sub-watersheds are variable. No data is available for fine sediment on streams within private lands, and only limited observations of fine sediment conditions in streams within the National Forest were made for this assessment. Within streams on private lands, fine sediment levels are likely fairly high, but this has not been substantiated. High levels of fine sediment would be expected based on the nature of land management on those private lands (extensive mining and timber management), the number of roads and skid roads needed to support those activities, and the extensive mileage of roads that closely follow stream channels.

Acidity (pH)

The Pennsylvania age surface bedrock is typically low in calcium carbonate minerals that make it low in acid buffering capacity. These portions of the watershed characteristically have acid-forming rock and acid soils, which make streams slightly to strongly acidic. Streams within portions of the North Fork in particular are strongly acidic, especially east of Coats Run. Acid deposition is also affecting streams, and appears to be having a long-term effect of lowering stream pH and alkalinity, and thus lowering overall aquatic productivity. There is some evidence, however, that the lithology of the New River and Kanawha Formations become shaleier in the western portions of the Cherry River Watershed. These shales appear to contain more of the carbonate minerals that contribute alkalinity to streams, making them less acid and more productive for aquatic biota. Stream chemistry does improve in the western portion of the watershed, west of Coats Run, although streams are still somewhat acidic.

The Mississippian age surface bedrock is substantially higher in minerals which contribute to stream alkalinity, although some streams may still be slightly to moderately acidic, or may be subject to acidification on an event basis (storm runoff or snowmelt events).

Temperature

Stream shading is critical in maintaining or reducing water temperature. Recently adopted riparian guidelines ensure stream shading by imposing no timber harvesting within 100 feet along each side of perennial and large intermittent streams, 50 feet along each side of small intermittent streams, and 25 feet along each side and above ephemeral stream channels. Planting of trees/shrubs suitable for riparian conditions may be recommended in areas where there currently is no stream shading.

AQUATIC RESOURCES

Fish

The Cherry River and tributaries reportedly supports 29 species of fish. The majority of fish (21) are native species and eight species have been introduced into the watershed. Fish species that have been reported in the watershed or have been introduced at one time does not necessarily reflect the current species composition in the watershed. With the variability in habitat conditions, stream flows and water quality, the existing species composition may not presently contain all species previously identified, but will most likely fluctuate as conditions do.

Riparian

An essential aspect of managing aquatic resources is the protection of riparian areas adjacent to stream channels. Riparian areas provide a number of functions for the maintenance of fish habitat including stream shading, bank stability, and a source of large woody debris and smaller organic inputs.

VEGETATION

Approximately 2,200 species of vascular plants, growing without cultivation, are located in the State of West Virginia (Strausbaugh and Core 1977). The Monongahela National Forest is slightly larger than ten percent of the total area of West Virginia, but contains over 75 percent of the vascular plant species found in the State (Clarkson, Duppstadt, and Guthrie 1980). More than 20 commercial tree species and over 30 non-commercial trees and shrubs can be found in the Cherry River Watershed.

Threatened/Endangered/Sensitive Flora

There are no threatened or endangered plants known to occur in the Cherry River watershed. Sensitive plants that have been found through botany surveys and forest inventory include:

- Harned's swamp clintonia (*Clintonia alleghaniensis*)
- Long-stalked holly (*Ilex collina*)
- Butternut (*Juglans cinerea)*

Forest Type/Size/Density

Plant communities characteristic of this area include the following series or associations:

1) sugar maple
2) sugar maple-beech
3) beech
4) sugar maple-red oak
5) red oak
6) sugar maple-basswood (cove hardwoods)
7) red spruce
8) red spruce-hemlock
9) yellow birch

This watershed has been managed for over 100 years through commercial logging activities. Most of the logging completed at the turn of the century was done by railroad using the clearcut harvest method, resulting in the even age forest present today. Selection harvesting during the 1950s left stands of trees that were high graded (cutting the large, high quality trees while retaining the small and/or low quality trees). To correct the high grading, clearcutting was again used during the 1960s and early 70s on a much smaller, more regulated scale. Three percent (1,325 acres) of National Forest in this watershed is less than 31 years old (represents two 15-year age classes).

Red spruce continues to decline as fast growing hardwood species out compete this slower growing, shade tolerant tree. Concerns over the continuing decline of this species have been discussed in numerous research papers. To date there is no conclusive evidence of any single cause contributing to the decline. (DeHayes and Hawley 1992; Friedland, Hawley, and Gregory 1985).

Agriculture/Openings

Numerous grassy openings exist on private lands on reclaimed mine areas. The Desired Future Condition (DFC) on National Forest Land is to attain 5 percent of the area in grassy openings scattered through out the watershed.

WILDLIFE

This watershed contains a diversity of habitat types including forests, rivers, one man-made lake, beaver ponds, and open/shrubby field areas. The elevation varies from 1,900 feet to about 4,500 feet. The high elevation spruce forests provide habitat for species such as red-breasted nuthatch, snowshoe hare, and saw-whet owl. This area is within the Cranberry Wildlife Management Area and also contains a section of the Cranberry Black Bear Sanctuary. The majority of National Forest Land in this area is forested. Openings, consisting of meadows, grazing areas, agricultural fields, and reclaimed mines are provided on adjoining state and private lands. Intensive logging in the past decade on adjacent private industry lands provides numerous acres of early successional forest habitat.

Threatened/Endangered/Sensitive Fauna

Threatened and endangered species that occur in the area include the West Virginia northern flying squirrel. There is one record of a juvenile male Indiana bat found under a bridge within this watershed, although subsequent monitoring through mist net surveys have resulted in no additional captures. There are no caves within this watershed. There are historical records of mountain lion and wolf, but these have been hunted to extinction.

Management Indicator and Emphasized Species

Management Indicator Species (MIS) were selected to represent important game species, threatened and endangered species, species of unique interest, and species that represent other habitats.

HUMAN USES

Recreation

Present recreation uses of the area include hiking, biking, picnicking, fishing, hunting, driving for pleasure, wildlife viewing, cross country skiing, gathering of forest products, nature photography, and camping.

15.6 miles of the North Fork Cherry River were found to be eligible for Wild and Scenic River designation. A decision has not been made regarding designation, but if it were to be designated, its probable classification would be recreational (1995 Wild and Scenic River Study Report and EIS on Twelve Rivers in the MNF, see section 3, pages 1,4,13-15, G-1, G-3, G-16). The South Fork of the Cherry River was considered also, but it was found to be ineligible at the time of the study (G-17).

Approximately 20 miles of the Highland Scenic Highway are within this watershed.

Minerals/Gas/Coal

In the Cherry River Watershed, the National Forest System (NFS) lands make up about 28 percent of the land surface. Of the federally owned portion of the surface, the United States owns about 17 percent of the mineral estate with the remainder being privately owned. The predominant resource of coal in the Watershed area would come from the unmined portion of the New River Fm.
Gas resources typically could be expected to come from two geologic formations in this region – the Oriskany Sandstone and the Tuscarora Sandstone. Given the proper structural feature, these two formations could be expected to yield natural gas resources. There is no known oil potential in the watershed.

Heritage Resources

The area is rich in upland resources that would have made it attractive to prehistoric peoples. These resources include numerous sources of fresh water, land and riparian transportation routes (including the Pocahontas Trail), access to lithic materials, game, and a wide variety of flora. Numerous rockshelters would have provided excellent long- or short-term encampment locations.

Historic Euro-American use of the landscape was focused primarily on logging and mining, activities that started in the late 19th century; these activities, centered at the town of Richwood, boomed around the turn of the 20th century, and withered after about 1920. Historic logging and mining activities have significantly impacted the landscape. In particular, early logging practices caused significant soil erosion and loss. However, the forest has regenerated significantly under the stewardship of the Forest Service since the 1920s.

Special Uses

Occasionally, there is a need for private property owners or businesses to access their land through national forest. Special use permits are negotiated and written to allow some of these uses on National Forest Lands. Other uses, such as utility right-of-way corridors are also permitted. All special use permittees must meet the same environmental standards as those applied to Forest Service facilities.

Roads/Trails

The existing road system is not adequate to access all areas of the national forest that have active management prescriptions. In addition, some existing roads from previous land use activities are no longer needed. A long range transportation plan needs to be developed to determine future access needs and which existing roads should be abandoned, obliterated, or used for some other purpose such as linear wildlife openings or trails.

Numerous trails exist on National Forest Land for various users such as hikers, mountain bikers, and horseback riders. (Map 1-5, p.1-20).

Landlines

Landlines are the property boundaries that delineate National Forest Lands from private lands. Location and maintenance of property boundaries, using standardized survey methods, have not kept pace with deterioration. Occasionally, occupancy or timber harvest trespass occurs due to the difficulty of locating these lines on the ground. The Forest Plan specified that all landlines should be surveyed and marked to standard by the year 2020. Maintenance of the landlines should follow a ten-year cycle.

Private Land

Private land ownership in the southern section of the Cherry River Watershed is primarily held and managed by industrial timber companies. MeadWestvaco owns approximately 30,000 acres in this area. Their primary harvest method is even-aged management, with single tree selection being done in designated ecosystem management zones. Habitat diversity zones 300-400 feet wide, where no clear-cutting is done, are maintained by only thinning or individual tree selection. A buffer of at least 100feet is retained on each side of perennial and intermittent streams on MeadWestvaco lands. West Virginia Best Management Practices are followed for ephemerals. MeadWestvaco managers experience several problems in common with the National Forest, including trash dumping and ATV trespass. Some beech scale disease has been found in the Big Laurel drainage. Although some MeadWestvaco lands have had some advanced populations of gypsy moth, there has not been any large-scale defoliation in this watershed to date. They have not noticed any population of hemlock woolly adelgid in this area. (personal communication 2001 with Sam Connolly and Bruce Brenneman, MeadWestvaco)

Plum Creek Timber Company recently purchased The Timber Company and now owns approximately 28,000 acres of private land in the southern section of the Cherry River Watershed. Management by The Timber Company consisted primarily of regeneration harvesting. A 100 feet, no machine buffer area is practiced along perennial streams. It has been recently noted that some sugar maple trees have been dying and beech bark scale disease has been noticed in the area. They have noted no gypsy moth problems. (personal communication 2001 with Bob Radspinner and Steve Yeager, Plum Creek Timber Company).

Chapter 2 – Issues

Issue Identification Process

The development of high priority issues is important to focus the scope of a watershed assessment. Key questions that address the issues further refine the assessment.

This chapter covers current high priority issues and key questions identified within the Cherry River Watershed by internal review of the area. The issues and key questions are organized by core topics.

Erosion Processes/Sedimentation

- What erosion processes are dominant within the watershed?
- Where have they occurred or are they likely to occur?

Air Quality

- Does acid deposition have the potential to affect soil nutrient status through acidification?

Hydrology/Stream Channels

Road construction and maintenance, timber harvesting, and mining have reduced channel complexity through the addition of sediment and reduction of large wood falling into the stream channel. Some of these effects are a result of turn-of-the-century logging, and streams are still in recovery from that large-scale logging.

- What are causes of current, unstable hydrologic processes within the watershed?
- What are the sources of accelerated erosion/deposition processes, and what aquatic resources effects are they having?
- What aquatic and riparian resource restoration is needed within the watershed?
- What are the dominant hydrologic characteristics (total discharge, peak flows, minimum flows) and other notable hydrologic features and processes in the watershed (cold water seeps, groundwater re-charge areas)?
- What are the basic morphological characteristics of streams and the general transport and deposition processes in the watershed?
- What activities will occur in the Cherry River Watershed that may correct existing sediment sources or create additional ground disturbance and exacerbate the problem?
- What activities might occur that degrade riparian habitat conditions and reduce the potential for recruitment of large woody debris and fish habitat improvement?
- How are the current riparian conditions contributing to existing channel conditions?

Water Quality/Aquatic Resources

The Cherry River Watershed provides the water resource for Richwood and surrounding communities. It also provides important habitat to fish and aquatic invertebrates. Riparian habitat is a critical component needed by many wildlife species. Timber harvest activities around the turn of the century affected riparian areas throughout the watershed by cutting and removing most of the trees along streams. Today most stream systems still lack sufficient levels of large wood debris to provide quality fish habitat.

- What beneficial uses dependent on aquatic resources occur in the watershed?
- Which water quality parameters are critical?
- What is the current water quality and are there problem areas?
- What could be done to improve riparian and fish habitat conditions?
- Are current riparian conditions affecting stream shading and water temperatures?
- What activities will occur in the Cherry River Watershed that may correct existing sediment sources and/or create additional ground disturbance and exacerbate the problem?
- What activities might occur that reduce riparian habitat conditions and reduce the potential for recruitment of large woody debris and fish habitat improvement?
- How is water quality being affected by land uses and acid deposition?

Vegetation

Management activities such as timber harvest, road building, gas well development, and the introduction of non-native diseases, insects, and plants may have changed species composition or altered the biological diversity of the watershed.

- What is the array and landscape pattern of plant communities and seral stages in the watershed?
- How does the current condition compare with the historic range of variability?
- What processes caused these patterns (fire, wind, soil erosion, insects, diseases, timber harvesting, agriculture)?
- How does the current condition affect future land management objectives?
- Have botany surveys been completed? Have any threatened, endangered or sensitive (TES) plants been found in the watershed?
- What effect does recent past and current management activities on private land have on future management plans on National Forest Land?
- Are there opportunities to balance age classes, reduce stocking density, and improve forest health through active management activities?

Wildlife

Management activities such as timber harvest, road building, agriculture, and the introduction of exotic species may have affected wildlife species habitat in the watershed.

- How fragmented is the Cherry River Watershed, in terms of percent open land and percent forested land? Is the area too fragmented for some species?

- What is the relative abundance and distribution of TES species, featured species, management indicator species, or other species of concern and their habitat?
- Will certain types of management or no management have a negative effect on TES species and/or their habitat? Are there key areas in the watershed where management activities might benefit or harm TES species?
- Are there opportunities to improve the habitat for TES or other species?
- Is there a conflict between timber harvest goals and habitat requirements, TES or other species that occur within the watershed?
- Are we meeting the population objectives for management indicator species? Are the population objectives for game species appropriate?
- Are we meeting recovery plan objectives for TES species?
- Are current riparian areas in suitable condition to support riparian species?
- Are human recreation pressures having negative effects on TES/wildlife species and their habitats?
- Are we monitoring threatened or endangered populations based upon the Forest Biological Assessment and Biological Opinion given by the USDI Fish and Wildlife Service?

Human Uses

The use of the watershed for mining, recreation, timber harvest, mineral production, and associated roads and trails contributes to the economic health of local communities.

- What are the major human uses of this watershed? Where do these uses occur in the watershed?
- Have heritage resources surveys been completed to locate prehistoric and historic cultural sites?
- Where are prehistoric sites likely to occur in the watershed?
- How does the distribution of different kinds of sites (i.e., sites containing different kinds of functional and temporal information) vary?
- What physical condition is known sites in?
- How do site locations correspond with anticipated patterns of disturbance (e.g., from projects, development, public use/access, or natural processes)?
- What are the locational characteristics of sites with significance to contemporary Native Americans?
- Where are these kinds of sites likely located within the watershed?
- What condition are these sites in?
- What kinds of features will make the greatest contribution to our knowledge about the nature/condition of past ecosystems, and associated land-use histories?
- What types of sites would be likely to contain these types of features?
- In what locations/settings would these types of sites have the greatest likelihood of preserved features?

Private Land

Approximately 72 percent of the Cherry River Watershed is in private land holdings. Characterization of the uses and impacts on private land will help in the determination of cumulative effects in future analyses.

- What management actions are occurring on this portion of the watershed?

CHAPTER 3

REFERENCE AND EXISTING CONDITIONS

The Cherry River Watershed is a fifth level watershed (HUC #0505000506) approximately 106,080 acres in size. The watershed is further subdivided into five 6th level sub-watersheds including the North Fork Cherry River, the South Fork Cherry River, Laurel Creek, the Cherry River composite (between the South Fork and Laurel Creek) and the Lower Cherry River composite (between Laurel Creek and the mouth). The majority of the watershed is in private ownership (77,706 acres), with National Forest System lands (28,374 acres) primarily located within the North Fork Cherry and the lower Cherry River sub watersheds. The South Fork Cherry River and Laurel Creek sub watersheds are almost entirely on private lands. The Cherry River Watershed overlays 4 counties: Pocahontas, Greenbrier, Nicholas, and Webster.

ECOLOGIC LAND TYPES

M221Bc – Southern High Allegheny Subsection

Bc01 – Allegheny Plateau LTA

LTA Bc01 is comprised of approximately 95,488 acres or about 90 percent of the Cherry River Watershed. The distinguishing feature of the Allegheny Plateau is the vast area with highly dissected topography, northern hardwoods and mixed mesophytic, productive sites. Landforms consist of broad ridges with steep (20 to 60 percent slopes) hills and mountain sideslopes. The geology is made up of Pennsylvanian sandstone/siltstone/ shale and includes a portion of the red shales from Mauch Chunk Formation in the eastern portion of the watershed. Primary erosion processes include surface erosion (sheet, rill, and gully) and landslides. Landslides are estimated to underlie 21 to 50 percent of the landscape. Soils that exist over the Mauch Chunk formation are highly erodible and are prone to mass movement. Soils are primarily moderately deep (20 inches) to very deep (greater than 60 inches.) Very deep colluvium may exist on some footslopes that may be up to 25 meters deep. Soil Families include: Gilpin-Dekalb-Buchanan, Gilpin-Buchanan, and Cateache-Shouns-Belmont. Annual precipitation is approximately 53 inches. The soil temperature regime is mesic. Plant communities are sugar maple, beech, sugar maple-beech, red oak, sugar maple-basswood, sugar maple – red oak, and cherry and tulip poplar are prevalent as well in this LTA. Plant communities are discussed in greater detail in other sections of this assessment.

Bc02 – Allegheny Plateau Red Spruce – Frigid Soils LTA

LTA Bc02 is comprised of approximately 4,943 acres or about 4.7 percent of the Cherry River Watershed. Landforms consist of broad ridgetops and mountain shoulders. Elevations range from 4,000 to 4,500 feet. Pennsylvanian age sandstone, siltstone, and shale dominate the geology. The primary erosion process is surface erosion. There is only one soil family in this LTA: Mandy-Snowdog-Gauley soil series. In general, frigid soils are tied to soil temperatures commonly existing at higher elevations (> 3200 feet). However, in the Cherry River Watershed and in other places on the forest microclimatic conditions are created by aspect, high mountain shading, and cold air drainage. In this instance, frigid soils may exist at lower than expected elevations and corresponding vegetative cover types grow on them. Vegetation associations on these soils include red spruce, red spruce – hemlock, yellow birch, and American beech.

StRp – LTA Strip mine

The LTA mapped, as StRp is land that has been strip-mined for coal reserves and is mostly in private ownership. There are approximately 3,061 acres or about 2.9 percent of this LTA in the Cherry River Watershed. In general, strip mine areas have been disturbed to the point where the soil material or overburden is removed to the bottom of the coal layer that was mined. Most of these areas have been reclaimed and seeded to grasses. In some reclaimed mining areas, shrubs and trees are beginning to invade from adjacent undisturbed areas. The soil material in that area does not resemble the soil material adjacent to it in undisturbed areas. It is expected that the soil would be less productive than the soils in the undisturbed area.

GEOLOGY

The Cherry River Watershed sits in the low plateau area of the Allegheny Plateau which is characterized as a low energy, low amplitude fold geometry containing very small reverse fault displacements, if any. The beds are all shallowly dipping with respect to the Kovan Syncline and Webster Springs Anticline at no more than 5 degrees. Local variation in dip magnitude and direction is common. The surface rocks along the crest of the Webster Springs Anticline are predominantly New River Fm with some exposures of the upper Mauch Chunk along the North Fork of the Cherry River. Outcropping rocks along the Kovan Syncline are again predominantly New River Fm with upper Mauch Chunk exposures along the valleys of the North and South Forks of the Cherry River (Behling, undated).

Pennsylvanian – Pottsville Gp

The Kanawha Fm is described as an interbedded sandstone and shale with a general thickness of 250 feet. This formation is generally described as containing massive gray sandstones, gray sandy and dark carbonaceous shales, and coals.

The New River Fm is also described as an interbedded sandstone and shale with a general thickness of 600 feet and thickening to 950 feet in the southern end of Greenbrier County. It is further divided into rock units that include generally mineable coal. This includes a 10 – 30 foot thick section of the Sewell coal. This formation is generally described as containing massive gray sandstones, gray sandy and dark carbonaceous shales, and mineable coals.

Table 3-1. Geologic Formation Descriptions

<table>
<tr><th colspan="7">Cherry River
Generalized
Geologic Column</th></tr>
<tr><th>Period or System</th><th colspan="2">Series</th><th>Map Symbol</th><th>Thick. Feet</th><th>Total Feet</th><th>Description</th></tr>
<tr><td>Recent</td><td colspan="2"></td><td>Qal</td><td></td><td></td><td>Unconsolidated Clays and Gravels. (River Wash)</td></tr>
<tr><td rowspan="3">Upper Carboniferous Pennsylvanian</td><td rowspan="3">Pottsville Group</td><td>Kanawha Fm</td><td>Ck</td><td>250+</td><td>250</td><td>Massive gray sandstones; gray sandy and dark carbonaceous shales; coals; fresh or brackish water; fauna; plant fossils.</td></tr>
<tr><td>New River Gp</td><td>Cnr</td><td>600 - 950</td><td>1200</td><td>Massive Gray Sandstones; gray sandy and dark carbonaceous shales; mineable coals; fresh or brackish waters; fauna; erratic boulder in Sewell coal; plant fossils</td></tr>
<tr><td>Pocahontas Fm</td><td>Cp</td><td>0-340</td><td>1540</td><td>Massive Gray Sandstones; grey sandy and dark carbonaceous shales; mineable coals; fresh or brackish waters; fauna; plant fossils</td></tr>
<tr><td rowspan="3">Lower Carboniferous Mississippian</td><td rowspan="3">Mauch Chunk Group</td><td>Bluestone Fm</td><td>Cbl</td><td>80 - 675</td><td>2215</td><td>Red, green and variegated shales; green, gray and brown massive and flaggy sandstones; thin streaks of coal; marine fauna and plant fossils; poorly exposed</td></tr>
<tr><td>Princeton Fm</td><td>Cpr</td><td>20-80</td><td>2295</td><td>Massive gray - brown Ss, with pebbles; p. sorted; plant fossils.</td></tr>
<tr><td>Hinton Fm</td><td>Ch</td><td>500 - 850</td><td>3145</td><td>Red, green and variegated sandy shales; green, thin limestones; red and brown sandstones; massive sandstones at base (Stony Gap); marine and plant fossils</td></tr>
</table>

The Pocahontas Fm is also described as an interbedded sandstone and shale with a maximum thickness of 300 feet in Greenbrier County. It is further divided into rock units, which include generally mineable coal. This formation is generally described as containing thinning out rock layers in most areas of Greenbrier County and the coal beds are described as lenticular.

Discussions with the Forest Geologist, Linda Tracy, about the geology that underlies the Cherry River Watershed revealed that the Pottsville Geology, which is considered to be poorly buffered and contains little minerals that provide alkalinity to the system upon weathering, may be different in stratigraphy across the forest. The lithology of the New River and Kanawha Formation of the Pottsville Group become shaleier in the western portions of the Gauley Ranger District. These shales appear to contain minerals that contribute alkalinity as evidenced by higher pH surface waters as compared to other dominantly Pottsville geology watersheds. This is also supported by a decline in the Northern Red Spruce component on this portion of the forest. Therefore, western portions of LTA Bc02 may not have red spruce growing in it because resource conditions (soil chemistry, seed source, and climate transitions) may not be optimum for the growth of red spruce.

Mississippian – Mauch Chunk Gp

The Bluestone Fm is predominantly red shale with some thin green sandstone interbedded and can vary in thickness from 80 to 675 feet. There are two thin lenticular coaly shales within 100 feet of the Pottsville Fm. The Bluestone Fm is not subdivided into smaller sections. The Bluestone Fm is generally described as containing red, green and variegated shales, green gray and brown massive and flaggy sandstone, and thin streaks of coal. The Bluestone Fm is not well represented in outcrop as when exposed it quickly weathers to clay rich soils.

The Princeton Fm is characterized as a gray to brown coarse grained sandstone which grades to a conglomerate in places. It is very poorly sorted sand and pebbles with silica or limonite cementing. The Princeton is a characteristic marker bed for this area and varies in thickness from 20 to 80 feet. The Princeton Fm is generally described as containing massive gray and brown sandstones with variegated and poorly sorted pebbles.

The Hinton Fm is predominantly a shale member with some sandstone and limestone interbedded and varies in thickness from 500 to 850 feet. The Hinton is divided into two sections. The Avis Limestone and the Stony Gap Sandstone. The Hinton Fm is generally described as containing red, green and variegated sandy shales, thin limestone, red and brown sandstones, with a massive sandstone at its base (Stony Gap).

Erosion Processes/Soils

Present-day erosion processes are primarily streambank erosion, sheet, rill, and gully erosion in some areas. Minor mass wasting in the form of landslides (mainly evident on cut and fill slopes associated with roads), soil humps (formed from the root wads of tree blow down), and soil creeps within the watershed.

Table 3-2. Erosion Hazard Potential

EROSION HAZARD RATING	**ACRES**
Severe	65,916
Moderate	3,615
Slight	2,548

Soils in the Cherry River Watershed are sensitive for flooding, hydric soil designation, slippage, slopes greater than 50 percent, wetness (moderately well drained or wetter), and prime farmland. To calculate acreages of slopes greater than 50 percent, 30m Digital Elevation Model software was used. The table below lists the approximate acres for each sensitivity group. Map 3-1 shows the actual locations of the sensitive soils.

Table 3-3: Sensitive Soils

SENSITIVITY GROUP	ACRES
Slopes greater than or equal	2,008
to 50 percent	17
Slippage	888
Flooding	499
Prime farmland	296
Hydric soils	25,385
Wetness	

SOIL FAMILIES DESCRIPTIONS:

Mandy-Snowdog-Gauley: dominantly frigid soils formed in material derived from level-bedded sandstone, siltstone, and shale.

The majority of this map unit is within Monongahela National Forest. About 95 percent of this unit is wooded and used for timber production, recreational activities, and wildlife habitat. Red spruce is the dominant species on the ridgetops, knobs, and the upper sides slopes that have west aspects. Hardwoods are in the more protected areas of the unit. The main limitations of these soils for most uses are the slope, the stones on the surface, the depth to bedrock, and a seasonal high water table. These soils are found on strongly sloping (4-16 percent slopes) to very steep (>45 percent) slopes. They range from moderately deep to very deep, and from well drained to moderately well drained. These loamy soils are formed in sandstone, siltstone, and shale and are found on mountainous uplands and foot slopes. The landscape is characterized by rough, rugged mountainous topography. It is a greatly dissected, high plateau with broad, gently sloping (1-8 percent slopes) ridgetops, knobs, and very steep (>45 percent) side slopes. It generally is at elevations of more than 4,000 feet. Several major streams have their sources in this map unit. Sandstone outcrops with stones and boulders on the surface are common. The native vegetation is dominantly red spruce, red maple, yellow birch, and American beech. Also "heath barrens" that are dominated by mountain laurel, huckleberry, blueberry, and great rhododendron are in scattered areas of the unit.

The **Mandy** soils are moderately deep and well drained. These strongly sloping (4-16 percent slopes) to very steep (>45 percent slopes) soils are on ridgetops and the upper side slopes. They formed in material weathered from interbedded siltstone, shale, and fine-grained sandstone. They have a very dark brown, medium textured surface layer and dark yellowish brown and yellowish brown, medium textured subsoil.

The **Snowdog** soils are very deep and moderately well drained. These steep (20-60 percent slopes) soils are on the lower side slopes, foot slopes, and benches. They formed in colluvium derived from shale, siltstone, and sandstone. They have a very dark brown, medium textured surface layer and a dark brown and yellowish brown, medium textured subsoil that is very firm and brittle in the lower part.

The **Gauley** soils are moderately deep and well drained. These strongly sloping (4-16 percent slopes) to very steep (>45 percent slopes) soils are on broad ridgetops under dense stands of red spruce. They formed in material weathered from sandstone. They have a black, coarse textured surface layer and dark reddish brown and strong brown, medium textured subsoil.

The minor soils in this map unit are the well drained Briery soils and Udorthents in disturbed areas, the somewhat poorly drained Leatherbark soils on broad ridgetops, the very poorly drained Medihemists in depressions on broad flats, the poorly drained Trussel soils on foot slopes and benches, and the well drained to poorly drained Udifluvents and Fluvaquents on flood plains.

Cateache-Shouns-Belmont: derived from level-bedded sandstone, siltstone, shale, limestone, or chert.

About 75 percent of this unit is wooded and used for timber production, recreational activities, and wildlife habitat. Sugar maple, American beech, black cherry, northern red oak, and a few red spruces are on the upper two-thirds of the landscape. Black locust, black walnut, and shagbark hickory are on the lower third of the landscape. Cleared areas of the unit generally follow the limestone geology. Most of the cleared areas are used for pasture with the less sloping areas being used for the production of winter feed. A few limestone quarries are in the unit. The main limitations of these soils for most uses are the slope, the stones on the surface, and downslope soil movement. These soils are found on gently sloping (1-8 percent slopes) to very steep (>45 percent) slopes. They range from moderately deep to very deep, and are well-drained loamy soils formed in siltstone, limestone, shale, and some sandstone. They are found on mountainous uplands and foot slopes. The landscape is characterized by broad, strongly sloping (4-16 percent slopes) ridgetops with very steep (>45 percent) side slopes, broken by long, narrow, moderately steep benches, and gently sloping (1-8 percent slopes) to steep (20-60 percent) foot slopes. Drainage ways have cut into the side slopes forming very steep coves. Stones and boulders are common in this unit. Sandstone and limestone outcrops are in bands across some of the slopes. The native vegetation is dominantly northern hardwood forest.

The **Cateache** soils are moderately deep and well drained. These gently sloping (1-8 percent slopes) to very steep (>45 percent slopes) soils are on ridgetops and side slopes. They formed in material weathered from dark reddish brown siltstone, shale, and fine-grained sandstone. They have a very dark brown, medium textured surface layer and dark reddish brown and reddish brown, medium textured subsoil.

The **Shouns** soils are very deep and well drained. The gently sloping (1-8 percent slopes) to very steep (>45 percent slopes) soils are on foot slopes and benches and in coves.

They formed in colluvial or alluvial material derived from sandstone, siltstone, shale, and limestone. They have a very dark grayish brown, medium textured surface layer and a brown, reddish brown, and dark reddish brown, medium textured subsoil.

The **Belmont** soils are deep and well drained. These gently sloping (1-8 percent slopes) to very steep (>45 percent slopes) soils are on benches and side slopes. They formed in material weathered mainly from limestone with some interbedding of sandstone, siltstone, and shale. They have a very dark grayish brown, medium textured surface layer and dark yellowish brown and dark brown, medium textured subsoil. The minor soils in this map unit are the well-drained Culleoka soils on uplands and the well-drained Udorthents in areas that have been disturbed by road construction and urban development.

Gilpin–Buchanan: Gently sloping (1-8 percent slopes) to very steep (>45 percent slopes), well drained and moderately well drained, stone and very stony soil found on uplands and foot slopes.

This general map unit consists of soils on rugged uplands and foot slopes, mostly in the northern and southeastern parts of Nicholas County. The landscape is characterized by a rough, mountainous topography. It is a strongly dissected plateau that has broad and narrow ridges and steep or very steep side slopes. Sandstone rock outcrops, stones, and boulders are common on the surface. Slope steepness ranges from 3 to 70 percent. This map unit makes up 49 percent of the county. It is about 53 percent Gilpin soils, 28 percent Buchanan soils and 19 percent soils of minor extent.

Gilpin soils are moderately deep, well drained, and gently sloping (1-8 percent slopes) to very steep (>45 percent) slopes. These stony soils are on uplands. They formed in acid material weathered from interbedded shale, siltstone, and sandstone. They have a dark brown; medium textured surface layer and yellowish brown, medium textured subsoil.

Buchanan soils are very deep, moderately well drained, and moderately steep (10-30 percent slope) to very steep (>45 percent slope). These very stony soils are on foot slope. They formed in acid material that moved downslope from areas on uplands. They have a very dark grayish, moderately coarse textured surface layer and a yellowish brown, medium textured subsoil that is mottled in the lower part.

Of minor extent in this map unit are Cedarcreek, Dekalb, Fenwick, Fiveblock, Kaymine, and Lily soils on uplands. Chavies, Craigsville, and Pope soils are found on the floodplains.

The issue of soil acidification begins for the Cherry River Watershed in the chemical composition of the geology that primarily underlies it. The Pennsylvanian sandstone/siltstone/shale (The Pottsville Geology – Kanawha and New River Formations) are nutrient poor. Weathering input varies from very little to no calcium or magnesium entering into the system. The concern for the Cherry River Watershed is in the theorized effects of acid deposition to soils that would be sensitive to acidification.

Air Quality

The Monongahela National Forest is primarily affected by air masses from the west and southwest, although weather does come from the southeast often in times of tropical airflows and hurricanes. Most of the air masses derive from the Ohio River Valley and are transported to central West Virginia. Upon meeting the Allegheny Mountains, the air masses rise and cool whereupon precipitation falls (orographic uplifting).

Air quality has been the subject of research and monitoring at the Fernow Experimental Forest (FEF) for a number of years. Monitoring of air quality has been conducted on the FEF and at locations more distant: Clover Run (about 8 miles northwest of FEF), and Bearden Knob (approximately 13 miles east of FEF). Rainfall pH values have been monitored at FEF with an average pH of 4.2 (Adams, et. al., 1994). Rainfall without acid contaminants generally has a pH of about 5.7 (Morrison, 1984).

Acid deposition has been the most intensively studied of the major air pollutants on the FEF. Formed by the burning of fossil fuels, sulfur dioxide (a bi-product from mainly electricity generating coal-powered plants and the manufacturing industry) and nitrogen oxides (a bi-product mostly from vehicle exhaust emissions, petroleum refineries, and home/office/building heating) can transform into weak acids in the atmosphere and return to earth as acidic deposition in the form of rain, fog, cloud and dry particles. There are relatively few industrial sources locally, although emission from automobiles and trucks can contribute significant amounts of nitrogen. Most of the pollutants that are deposited on the Monongahela National Forest come from the west (the Ohio River Valley industrial complex).

The FEF participates in the National Atmospheric Deposition Program (NADP), a nation-wide precipitation chemical monitoring program. The results of this program demonstrate that some of the highest levels of nitrogen and sulfur found in the eastern U.S. are deposited on the Fernow Experimental Forest via wet deposition. Deposition in bulk precipitation is approximately 10 to 14 lb/N/ac/yr and 12 to 15 lb/S/ac/yr (1998). Dry deposition is estimated to be approximately the same as wet deposition. The greatest deposition occurs during the growing season (Gilliam and Adams, 1996.) Recently deposition has been changing in Tucker County. Sulfate deposition at the Nursery Bottom has declined by almost 33 percent since 1989 (NAPAP, 1998). This change is attributed to the 1990 Clean Air Act Amendments. Nitrogen deposition trends are not as clear, but appear to be increasing. Deposition of basic elements (Ca, Mg) has decreased since the late 1970's as fly ash and particulate emissions have decreased (NADP/NTTN data; adp.sws.uiuc.edu).

The relationship between air quality and soil nutrient status is complex. Research has developed many models to help predict the effects of acid deposition on soils. Predicted effects include decreasing soil pH, loss of macronutrients in soils, and mobilization of heavy metals. Continued research in the 1990s documents distinct decreases in soil calcium over the past four to five years in both the Northeast (Johnson et. al., 1994a) and

Southeast (Richter et. al., 1994.) where acid deposition has been perceived to be a concern. However, these decreases were attributed primarily to the uptake of calcium by trees in excess of inputs from weathering. As forests mature, soils naturally acidify due to the uptake and storage of nutrients by the above ground biomass. The vegetation stores more and more of the nutrients in the above ground biomass as time goes on, and only upon death and decomposition of that biomass are those nutrients returned to the soil to be utilized by new growth and organisms. In addition, researchers and land managers also know that both acid deposition (Markewitz et. al., 1998) and a decline in atmospheric deposition of calcium may have also contributed to the decrease in the availability of soil calcium in the East (Johnson et. al., 1994b.) Several studies have suggested that forest whole tree harvesting could also reduce calcium availability through the removal of calcium stored in trees, which could lower the growth rates of the regenerating stand (Federer et. al., 1989; Hornbeck et. al., 1990). However, relationships among acid deposition, calcium/nutrient availability, forest productivity, and soil productivity remain uncertain because of many of the unknowns about the relationships of inputs and outputs of soil calcium/nutrients and roles that other soil properties play in nutrient cycling and soil productivity (USGS, 1999; Grigal, 2000.)

Timber harvesting is an activity in this watershed because of the highly fertile soils. It is not known how susceptible the soils in the Cherry River actually are to acid deposition. Timber harvesting is known to remove nutrients from soils however it cannot be said with certainty that the amount of soil nutrient removal associated even with very intensive harvests, including whole tree removals, would deplete soil nutrient levels to an extent such that regrowth would be impaired. Although some research would suggest that soil nutrient depletion should occur following biomass removals (Federer et.al, 1989; Hornbeck et.al, 1990; Weetman and Weber, 1972; Boyle et. al., 1973, Silkworth and Grigal, 1982; Federer et.al, 1989), follow-up research has not shown that to be the case (Knoepp and Swank, 1997; Johnson et al., 1997; Johnson and Todd, 1998). Although frequently hypothesized, nutrient deficiencies as a result of over story removal have not been reported in eastern hardwood forests (Adams, 1999). The literature has suggested that less intense harvests would be mitigation to potential soil nutrient depletion concerns (Adams et al., 2000). The types of harvests analyzed by researchers are often worst-case scenarios of removal of total biomass, such as whole tree harvesting, reviewed by Federer et al., 1989. Timber harvesting on the Monongahela National Forest does not allow whole tree (total biomass) removal. Additional factors of traditional harvest practices on National Forest Land would serve to ameliorate potential effects of soil nutrient depletion.

Hydrology/Stream Channels

Streams within the assessment area have evolved in soils formed from sedimentary rocks, predominantly sandstone, shale, and siltstone of the Pennsylvanian System, that influence their channel characteristics and buffering capacity. Topography within the watershed ranges from the highest point on an unnamed knob located east of Frosty Gap and near the head of Left Branch (approximately 4,500 feet elevation), to approximately 1,900 feet at the mouth of the Cherry River. The elevation difference within the watershed is a maximum of approximately 2,600 feet.

Precipitation measured at Richwood between 1987 and 2001 averaged about 53 inches annually (National Weather Service), but the upper portions of the Cherry River Watershed may exceed 60 inches per year. Stream flow is flashy due to the topography and soil/geologic characteristics. Also, intense summer storms and large frontal system storms are common, as are periodic drought conditions, adding to the wide range of flow conditions in these streams. Periodically, high precipitation events and flooding are generated from maritime tropical air masses that move into the watershed from the east. Channels have developed under these land and precipitation conditions, and have also been influenced by past and present land uses.

Reference Condition

Reference conditions within the Cherry River Watershed can only be speculated upon, since all the sub-watersheds, and the streams that drain them, have been substantially impacted by past activities, and to some extent present day land use. The dominant land use that has affected how streams and watersheds look today is the turn of the century logging and access development. Recent land management activities, on private lands in particular, are likely having substantial watershed impacts. Most of that private land activity occurs in the Laurel Creek, Little Laurel Creek and South Fork watersheds, and involves timber management and mining for coal. A small amount of coal mining has also occurred on National Forest Lands, mostly east of Coats Run, but the amount of watershed disturbance has been relatively small. The present day transportation system, and older access roads and trails, also contribute to changed watershed conditions. And acid deposition is having an impact on soil and stream chemistry. All these activities act to modify watershed processes, and riparian and aquatic conditions from their past, or reference conditions.

Morphology

Stream channel morphology in the late 1800's, before the extensive timber harvesting occurred, could have been expected to be substantially different than the channel shape and condition of today. In general, channels would have exhibited more stable forms, with narrower width and more quality habitat features. There would have been considerably more large woody debris in the channels, contributing to long-term morphological stability, habitat quality and complexity. Channel profiles would have been more stable, with greater channel roughness to dissipate energy. Non-perennial headwater channels, and small perennial channels would have exhibited more of a step-pool profile. Less channel incision would exist, and floodplain function would have been improved. Channels would have been better "connected" to their floodplains, and floodplains would have performed their natural function of storing floodwaters more efficiently than in some present day locations. This would reduce flood energy within the channels, reducing the amount of bank erosion and instability. Overall, channels would tend to be narrower, and base flows deeper.

Flow Rates

Reference conditions of streamflow would also be somewhat different than flows, as they exist today. The primary factors that control those differences today are the amount of present day roads, skid roads, old woods roads and railroad grades, compaction, historic and present day timber harvesting, and surface mining. Streamflow would have been somewhat less flashy in the reference condition, because there would have been less channel extension from the present and old transportation network, and less compaction from a variety of land uses. It is likely that base flows and low flows would have been somewhat greater than the present day condition, because the effective drainage density (length of channel per unit area) would have been less, and soil infiltration would have been greater.

Mining, especially on private lands, has been occurring over the last 50 years or so. Surface mining has left land in a cleared condition for an extended period of time. The reference condition would have been a nearly intact forest throughout nearly all of the areas that have been mined. Mined lands likely yield more water to streamflow in the growing season, because evapotranspiration losses are less in the cleared land condition. In the reference condition evapotranspiration losses would have been greater, so streamflow in those sub-watersheds may have been slightly less during the growing season. The amount of this effect would have been relatively small. However, greater infiltration and soil storage would have existed in the reference condition, because roads and compaction from mining would have been absent. So to some extent, there would have been offsetting factors in those areas where roads and grassy openings from mining now exist.

Timber harvesting, as we know it today, would not have existed in the reference condition. Although the native inhabitants cut trees for firewood and lodging they most likely took longer periods of time to harvest the trees. Intensive timber harvesting in the east has been found to increase the annual water yield from the harvested area, with the majority of those increases occurring in the growing season and mostly as increased base flows and low flows. But those water yield increases are relatively small and short term, with streamflow returning to pre-harvest levels usually within three to ten years (Hornbeck and Kochenderfer 2000). In the reference condition, streamflow would have been unaffected by timber harvesting (due to the length of time it would take to cut enough trees over a large enough area with primitive stone tools), so yield increases most likely would not have occurred. The truck and skid road transportation systems and old railroad grades did not exist, so precipitation would have infiltrated and been detained more efficiently.

Overall, streamflow in the reference condition was very likely to have been somewhat more evenly distributed and not as flashy. Soil moisture storage was greater and release to the stream channels was slower. Base flows were likely greater than the current condition, as well as low flows. But the magnitude of this difference is difficult to predict. Greater base flows and especially low flows under the reference condition, combined with narrower channels and more large woody debris, would have maintained better quality habitat in the streams.

Storm Flows

Storm flows in the reference condition would have been unaffected by the land uses that came later. Land uses thought to have the greatest influence are the existing transportation system, old roads with inadequate drainage, lands cleared by mining, and timber harvesting. By far the great majority of mining and recent timber harvesting has occurred on the private lands. In general, storm flows would have been slightly to moderately less (less volume) in the reference condition because of the undisturbed nature of the sub-watersheds. Storm runoff would have been less concentrated and slower, with a greater percentage of the precipitation being detained in the soil for slower release. The greatest difference between the current and reference conditions would likely have been for the smaller to moderate sized storm events. Also, floodplain function would have been improved in the reference condition, and a greater proportion of flood flows would have occupied the floodplain, reducing the erosive energy within the stream channels.

On National Forest Lands, storm peak flows in the reference condition may not have been substantially different, compared to the current condition, for the major, flood-producing storms, particularly during the dormant season when most floods occur. Overall, smaller storm flows or longer storm flow duration, and greater floodplain storage in the reference condition would have meant less erosive energy within the stream channels. In general stream channels would have been more stable, with less channel bank erosion and sediment deposition within the channel. Aquatic habitat would have been higher quality because of the greater bank stability, less sediment deposition, lower fine sediment, and other habitat features.

Existing Condition

Morphology

Streams have developed in response to the soils/geologic/topographic and vegetation conditions within the watershed, precipitation characteristics, and past and present land uses that occur. Streams exhibit a combination of stable and unstable forms, which reflects the influence of natural stream processes and the effects of certain land uses within the sub-watersheds. Channel bank erosion occurs on some portions of all channels, and there are sections of channel deposition as well. Some of this is a natural process, and part of the "dynamic equilibrium" nature of streams. However, the effects of roads and other land uses, riparian clearing, and within channel modifications such as loss of large woody debris may contribute to channel changes from more stable to less stable forms.

The morphology of streams within the assessment area has been affected to some extent by the past and present land uses. Some channel bank erosion is part of the natural stream process, and some is likely to be the result of a combination of land use effects, particularly early 1900's timber harvesting in the watershed, mining, and transportation system developments. Accelerated channel bank erosion is occurring in portions of the North Fork of the Cherry River, and in the Cherry River as well, partially in response to some of these influences. State highway 55 closely follows the North Fork and the Cherry River for nearly all of their channel lengths, and is very likely having some effect on channel morphology and stability. Also, some tributaries have eroded and contain unstable channel segments, some of which can be attributed to increased runoff from old and present day transportation facilities. Roads follow portions of the stream channel system along Morris Creek (State Road 94), the state road in Handle Factory Hollow, Joes Branch road, and small portions of National Forest roads along Bear Run and Rabbit Run. Old travelways follow portions of stream channels in many other tributary watersheds. But many Forest Roads in the National Forest within the Cherry River Watershed are well located and stable, and are likely having little or minor effects on channel morphology/stability.

In recent decades, National Forest timber harvesting has been conducted in both the North Fork and Lower Cherry composite watersheds. Since 1983, approximately 3,675 acres of commercial timber harvest has been conducted on federal lands within the North Fork watershed, which represents about 15 percent of that total watershed acreage. In the Lower Cherry composite watershed, approximately 522 acres have been harvested during this entry period. Most of those harvested acres were located away from the mainstream channels, and used best management practices and other National Forest management standards to minimize adverse effects. Some effects on channel stability and morphology are expected to have occurred, but would have been fairly limited and mostly in small non-perennial headwater channels.

A small amount of old mining has occurred in the watershed of the North Fork, and still contributes to a limited degree to degraded watershed condition. These old mines are reclaimed or abandoned, and are fairly small but do collectively occupy some hundreds of acres. Effects are primarily sediment related, but may also include isolated segments of unstable stream bank and with morphology effects. Most of this occurs in the Hamrick Run watershed, resulting from older mining in the 1950s, and more recent mining done during the mid-to-late 1980s.

Timber roads, mine roads and old skid roads on private lands in the South Fork Cherry, Laurel Creek, and Little Laurel Creek watersheds are likely having similar, but more substantial effects on channel morphology and stability. This is because the amount of watershed disturbance activity is so much greater. Much of the road system in those watersheds closely follows the main stem and tributary channel system, and there has been extensive timber harvesting on the slopes within those watersheds. Some mining has also occurred there, with substantial numbers of acres disturbed. The extensive road, timber road, and skid road network within those watersheds is likely a substantial source of stream sediment, and contributing to loss of channel stability.

Floods occur frequently in the Cherry River Watershed and are a substantial impact in terms of upland soil erosion, stream and river channel erosion, and sediment/bedload transport and deposition within the channel system. Floods therefore play a major role in channel morphology and stability, and much of this effect is natural. But some flood related channel instability and morphology change can be made worse when the channel is in an unstable condition to start with. Flood "recovery" or repair activities can frequently exacerbate problems in stream channels; such as in road related flood recovery work, by deepening or widening channels, and depositing berms of river rock and gravel along the stream bank. These natural and human-caused processes are working in the Cherry River system. The section on storm flow discusses floods in more detail.

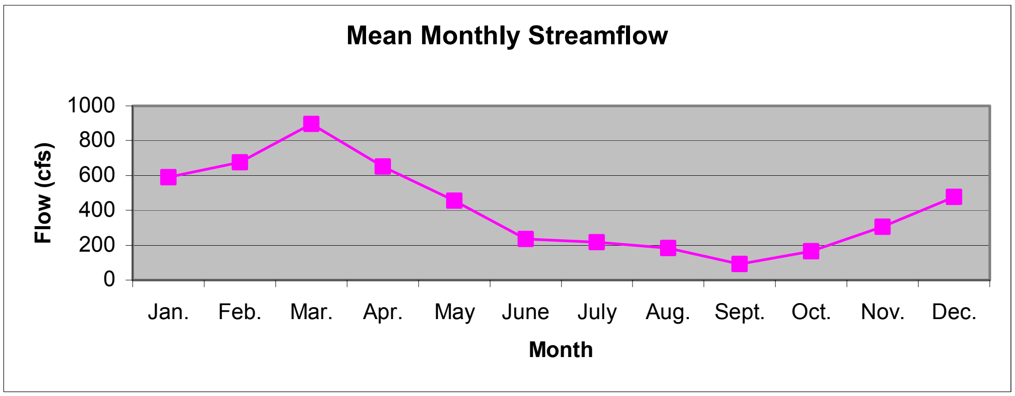
The morphological effects of these changed conditions is that in some cases stream channels may become more entrenched, reducing the ability of the floodplain to store water during times of flood. But in some other channel reaches sediment deposition occurs, and channel widening can result. Accelerated channel erosion increases bedload and deposition downstream, and is an increased source of fine sediment to fish-bearing streams. Sometimes split channels can develop when high bedload and channel widening is a problem. These processes are affecting portions of the channels within the assessment area.

Flow Rates

Streamflow within the various subwatersheds tends to be highly variable, dependent on seasonal and precipitation characteristics, and possibly the influence of land management activities within the watershed. Local streamflow data from the Cherry River gauge at Fenwick (period of record 1929-1969 and 1979-1982) indicates the variable and seasonal nature of streamflow. During this period of measuring streamflow, annual streamflow ranged from a low of 197 cubic feet per second (cfs) in 1930, to an annual high of 604 cfs in 1954. Precipitation characteristics would account for most of this wide range between years. Seasonal variability is also demonstrated in the data for Cherry River at Fenwick, reflecting typical patterns of monthly and seasonal high and low flows throughout the year. On average, January through April are the months of highest streamflow during the typical year, with March being the highest (896 cfs). August through October are the months of lowest streamflow, all averaging less than 200 cfs, with the September being the lowest at 92 cfs. Such seasonal variability is influenced by precipitation patterns, and by water loss due to evapotranspiration during the vegetative growing season. Also, snowmelt in the late winter and spring contributes substantially to higher stream flows. As mentioned, streamflow tends to be not only variable, but also flashy, responding quickly to the influence of topography and soils, soil moisture conditions at the time of precipitation, rainfall amounts and intensity, and land uses.

Table 3- 4, Graph 1. Monthly Streamflow Statistics for the Cherry River at Fenwick. Mean monthly stream flow reported in cubic feet per second for the period of record (1929-69, 1979-82).

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean monthly flow	590	677	896	651	457	236	218	184	92	164	307	478



Streamflow has been influenced by land uses in the Cherry River Watershed. Mining, especially on private lands, has been occurring over the last 50 years or so. Surface mining has left land in a non-forest condition for an extended period of time. Mined lands likely yield more water to streamflow in the growing season, because evapotranspiration losses are less in the non-forest land condition. Roads associated with increased harvest activities in the South Fork, Little Laurel Creek, and Laurel Creek subwatersheds, increase runoff rates, decrease the influence of evapotranspiration, and likely create modest increases in annual runoff to some extent.

On National Forest Lands, very little long-term clearing of lands has occurred, except for roads, so long-term changes in streamflow associated with conversion of forest to some other land use are not expected. Changes in streamflow from timber harvesting can be substantial, but are of relatively short duration (from five to ten years or less). Most of the streamflow change due to timber harvesting occurs in the growing season and primarily causes a temporary increase of low flows and base flows through reduced evapotranspiration losses. Changes in flow rates depend on the size, intensity, harvest method, and location of cutting. At least 20 percent of the basal area within a watershed must be removed within one year to cause any measurable change in flow rate (Patric 1984). The total acres harvested within a watershed are what contribute to these flow rate changes, not unharvested areas downstream.

Runoff rates are also affected by compaction or reduced infiltration within the watershed, such as in a limited amount of grazing land, on highways, roads and skid roads, mined lands and other uses that substantially disturb and compact soils. State highway 55 is a major linear disturbance that has modified and compacted soils, intercepts subsurface water, and increases runoff rates particularly during storm runoff. Also, roads and other facilities that intercept surface water and shallow groundwater have the effect of concentrating and speeding flow away from the upper portions of the watershed (leaving less water available for soil storage and floodplain recharge). This likely is having the effect of increasing flows during storm runoff and snowmelt situations, but also reducing base flows and low flows, as well. Thus, flows are re-distributed to a less even flow condition. The magnitude of this effect is not well known, but could be substantial in some localized portions of the sub-watersheds, and within the watershed as a whole. The most pronounced flow effects would occur in those sub-watersheds with the most intensive development and management. On National Forest Lands, some of these changed flow conditions may also occur, but would be on a much smaller scale and more dispersed throughout the watershed.

Private land development and disturbance within the watershed is likely to be affecting stream flows to a much greater extent than conditions within the National Forest. The city of Richwood and other municipal/domestic and industrial development and roads along the river corridor are having streamflow effects by reducing infiltration and floodplain recharge, and speeding concentrated runoff. Private land timber management and mining are having these same effects, mostly in the large private landholdings south of Richwood. However the extensive and on-going timber harvesting in those watersheds is also likely to augment low flows and base flows in those watersheds, as described above, thus offsetting some of the effects of reduced infiltration and faster runoff.

These changes in flow conditions are likely having an effect on the morphology of the upper non-perennial streams, and to some extent the downstream perennial streams as well. Altered flows also increase the fine sediment supply to aquatic habitats, and during low flows the available aquatic habitat is reduced, putting an even greater stress on aquatic biota.

Storm Flows

Streams are flashy in their response to larger storms, especially the more intense storms. Flow tends to rise rapidly under those conditions, and will fall rapidly as well, returning to base flow conditions rather quickly. Major frontal weather systems and tropical storms from the south or east can carry substantial quantities of rainfall. Other major storm events are fairly frequent, and generally occur during the dormant season of the year (November through mid-May), when evapotranspiration losses are minimal. This further adds to rapid storm runoff. Examples of recent dormant season precipitation events include the November 1985 flood, and the January and May 1996 floods. However, growing season storms and floods are not uncommon

Two separate flood events occurred in the Cherry River Watershed in late July 2001. A very intense thunderstorm tracked across the middle and upper parts of the North Fork Cherry River on the afternoon of July 26. Twelve-hour recorded rainfall amounts ranged from 2.5 to 4.5 inches over the county that day. In Richwood, 2.8 inches was recorded that day. Another widespread storm passed through the area on July 28 and 29. Recorded rainfall amounts from this storm system ranged from 5.5 to 6.1 inches. Because of the general nature of the two storms, it may be inferred that the area received between 8 to 10 inches of rain over the four-day period. Rainfall over the previous month had been above average so soil moisture was likely high before these storms. Richwood measured 14.3 inches of rainfall for the month of July. The rainfall volume and intensity overwhelmed the river channel's capacity to transport flow and sediment, and considerable channel damage occurred. The flood flows accelerated channel bank erosion, and mobilized huge amounts of sediment and river bedload, scouring some reaches of channel, and depositing in other reaches. Substantial upland erosion also occurred.

Past and recent floods are a substantial impact within the North Fork and the watershed as a whole, in terms of upland soil erosion, stream and river channel erosion, and sediment/bedload transport and deposition within the channel system. Floods are naturally occurring factors within streams and rivers, especially in the mountains, and they play an important role in channel sediment relationships, sediment flushing, creating and distributing habitat, floodplain development, etc. In managed but predominantly well-forested watersheds, floods, especially large floods, are controlled primarily by the characteristics of the storm events themselves. For the major flood events in this part of West Virginia, the over-riding factor of significance in valley flooding is the magnitude and intensity of the storm, and other topographic factors like soil depth and slope steepness. Forested land use conditions have less effect on downstream flooding for major flood events, because the size and timing of the precipitation event dominates the flood characteristic. More drastically disturbed or intensively managed lands with greater compaction, extensive and poorly-located road systems, and inadequate surface runoff control measures can substantially add to storm flow and sometimes peak flows, especially during the growing season and for the more routine storm runoff events.

Certain land uses that reduce the soil infiltration and water holding capacity, and reduce riparian vegetation, contribute to increased storm flow and storm flow effects on stream channels. Road development can act to extend the channel system within the watershed, concentrating flows and speeding runoff to downstream areas. Ground-based timber harvest activities can have some of these effects as well, through skid-road development. Extensive watershed harvesting of timber can sometimes alter the hydrology and storm flow characteristics of the watershed. Grazing and agriculture frequently have detrimental effects on streams through soil compaction and reduced infiltration, and loss of healthy riparian vegetation. Mining drastically disturbs the land, and alters watershed hydrology and storm flow characteristics. Municipal development that occupies floodplains and riparian areas, eliminates streamside vegetation, drastically compacts the soil or paves over it, causing reduced infiltration and increasing surface runoff by concentrating storm runoff from roads and ditch lines.

Normal forest management practices in the eastern United States generally have a small to modest effect on storm flow volume, but a less clear effect on storm peak flows (Reinhart et al, 1963; Kochenderfer et al, 1997; Edwards and Wood, 1994; Hornbeck, 1973; Hornbeck and others, 1997; Hewlett and Helvey, 1970). Studies where an entire small watershed area (less than 100 acres or so) was harvested (in some cases herbicides were used after logging to keep the watershed from revegetating) documented storm flow increases. These documented effects were only for the treated watersheds, not for downstream areas. Storm flow increases were almost always of relatively short duration, usually only five to ten years or less (depending on the harvest treatment), and most of the increase occurred during the growing season, not during the dormant season. Removal of all the vegetation within a watershed rarely (if ever) occurs on managed National Forest Lands. Storm flow effects related to normal, recent National Forest management practices within any given sub-watershed would not be great because most of the sub-watershed areas are primarily forested, and a relatively small amount of harvesting has taken place over the last 25 years on National Forest Land. The developed road system on National Forest Land in this watershed is also much less dense than on private land.

On the private lands south of Richwood, it is difficult to predict what effect the extensive management of those watersheds has had on storm flows and peak flows. More intensive or widespread timber harvesting, involving greater ground disturbance, is likely to produce storm flow and peak flow increases. Mining and timber harvest activities within the watersheds in private ownership is much more intensive than on the National Forest. Storm flow effects in those private watersheds are expected to be much more substantial, but it is not possible to quantify the differences.

Other types of activities and land uses are likely to produce different storm flow effects. Activities that change the land use for a longer period of time would likely extend the duration of a storm flow effect, particularly if compaction or runoff concentration occurred. Mining impacts would likely produce longer-term storm flow increases, but would depend on how runoff was controlled. Roads and highways that concentrate flows and reduce soil water storage would speed storm flow runoff, and increase storm flow volume (and peak flows as well under some situations). Those effects could persist for the long term. State highway 55 is likely having these effects in both the North Fork and the Cherry River main stem. Also, from Richwood downriver, there are likely some storm flow and peak flow effects of the city and other municipal development occupying the floodplain and lower slopes, with the substantially reduced infiltration that occurs there.

These types of storm flow effects are occurring within the Cherry River Watershed. Storm flow increases would tend to destabilize channels, increase channel bank erosion, increase deposition of sediment in some reaches of the channels, and increase fine sediment over the long-term. (Over the short-term, higher storm flows can flush fine sediment out of the smaller, higher gradient streams.)

Water Quality

Reference Conditions

Reference conditions within the Cherry River can only be speculated upon, since all the sub-watersheds, and the streams that drain them, have been substantially impacted by past and present day land use. Reference conditions for water quality would have reflected the undisturbed condition of the sub-watersheds. Essentially none of the present day human-caused conditions (such as roads, mining and conventional timber harvesting) that affect water quality in these sub-watersheds would have existed under reference conditions.

Sediment

Sediment conditions in streams would have been controlled mostly by natural processes, and not influenced by the variety of land clearing and disturbance activities that exist today. Natural processes would have included all of the types of erosion that occur today (sheet, rill, gully, slides, stream bank, etc), but in different proportions and amounts. Riparian areas would have been largely intact (except for locations of native villages and subsistence agriculture) leading to improved channel stability. Overall, bedload sediment and fine sediment are likely to have been at moderately to substantially lower levels, and suspended sediment during storm flow conditions would have also been lower. Aquatic habitats throughout the Cherry River Watershed would have exhibited a higher quality because of the reduced sediment conditions. The aquatic community in general would benefit, and trout reproduction would have been maintained at a higher level.

Acidity (pH)

Stream acidity under reference conditions would have been governed by the natural buffering capacity of the soils and bedrock, and by the natural acidity of precipitation and the influence of vegetation. In general, the pH of most streams was probably slightly to moderately higher, especially within the North Fork watershed, although the magnitude of this effect is not known. In the reference condition, no mining had yet occurred and there was no added acidity to streams from those sources. In the reference condition, acid deposition, as we know it, did not exist (although precipitation was still acidic). Acid shock events from summer storms and snowmelt runoff were not a problem. Streams within the North Fork watershed and some others as well, were better buffered and maintained a higher pH, despite their natural tendency to be acidic and low in fertility, because of the soil/geology characteristics described earlier. The aquatic community would have been healthier under those reference conditions.

Temperature

Stream temperatures under the reference condition would likely have remained lower during summer low flows, particularly within the main stem Cherry River, and possibly in the major watersheds occupied by private land south of Richwood. This would be due to the combined effect of a more intact riparian forest, generally narrower channel width in some stream reaches, and maintaining greater base flows. Lower summer stream temperatures would have benefited the native aquatic community.

Existing Conditions

Water quality in the streams of the Cherry River Watershed ranges from moderately good to very poor. Streams on the private land portions of the watershed have not been inventoried for this assessment, but their water chemistry is likely to be somewhat better than many of the tributaries of the North Fork. This is because of the more alkaline nature of the ground and soil water coming from the Mauch Chunk geology, which is more prevalent in the lower watershed elevations within those private lands, and provides moderately well-buffered water to streamflow.

Streams within the National Forest Lands are largely located in the more acid geology of the New River Formation, giving rise to poorly buffered streams with moderate to low pH and little to no acid neutralizing capacity. Other water chemistry components of fertility would also be low. This is largely a natural phenomenon related to geology and soil type. However, these watersheds are lacking in calcium carbonate minerals, making them poorly buffered and susceptible to further acidification from acid deposition. The portion of the North Fork Cherry River Watershed most susceptible appears to be the streams to the east of Coats Run, while to the west of Coats Run stream chemistry appears to improve modestly. All these streams are likely somewhat susceptible to acid deposition impairment, but with streams to the east being most susceptible. This appears to coincide with the geologic trend toward shaleier bedrock with greater alkaline bearing minerals. Also, small amounts of acid mine drainage within the North Fork are having an effect on stream chemistry in several of these tributaries, particularly in Bear Run. The West Virginia DNR is treating a number of streams in the North and South Forks with limestone fines to raise the pH and increase alkalinity, primarily to reduce the effects of acid deposition in those streams and the main channels. One of those streams treated with limestone fines is Bear Run.

Sediment

Streams within all the sub-watersheds are impacted by sediment, and have varying levels of fine sediment. Some of those sediment conditions are a natural phenomenon of watershed processes, soil and geology type, topography and channel characteristics. Some other streams have elevated sediment from past and present land uses. Sediment is delivered to these streams through channel bank erosion, and through sheet and rill erosion of upland slopes and roads. Some gully erosion occurs below roads and old mines where flow concentration has altered drainage patterns, increasing substantially the sediment supply to channels. But in general, the larger the watershed and/or the steeper the channel gradient, the greater the stream-power to transport fine sediment out of that reach.

Within the National Forest, elevated fine sediment conditions occur in some streams. High levels of fine sediment can impair fish populations, as discussed in the Aquatic Resource section of this analysis. Some of these streams appear to have higher levels of fine sediment as a natural condition of the soils and topography in those watersheds. The streams in the western portion of the watershed characteristically are dominated by the Buchanan soil type that occupies nearly all of the lower slopes, riparian areas and stream banks. The Buchanan soil is high in sand, and most of these streams are very high in sand sized fine sediment. This appears to be somewhat independent of past and present land management, although earth-disturbing activities have the potential to exacerbate the situation. In other North Fork tributaries, riparian soils are different and some of these streams are much lower in fine sediment. Soil type and watershed management history both play a part in stream fine sediment conditions.

Sediment source areas associated with past management occur within most of the sub-watersheds that make up National Forest Lands, but some are having little effect. Land disturbances that have the greatest potential for sediment effects include existing and old roads, some timber harvest skid roads, old mines and mine access roads. Some of the known sediment sources include portions of roads near Hamrick, Rabbit, Holcomb and Left Branch Runs. Runoff coming from the old Carpenter Run mined area has been captured by the old road, turned into a gully, and carries sediment to Carpenter run. A mine pond and an old tailings pile from old mines near Hamrick Run are blown out and eroding, and need treatment. Sediment is originating from other small mined areas.

Roads and various land uses have effects on hydrologic processes, erosion sources and in-channel conditions. Accelerated channel erosion is occurring in some stream reaches, leading to deposition in others. Increased bedload primarily from channel bank erosion has led to widened channels in some segments of the North Fork. State highway 55 and its maintenance is a source of increased fine sediment, and are likely contributing to increased bedload in the North Fork during storm runoff. A recent slide along the North Fork channel bank at Forest Trail 236 created an unstable channel, increased sediment, and slightly increased bedload in the river.

Sediment sources are extensive within the private lands, and likely to be having substantial effects in Laurel Creek, Little Laurel Creek, and South Fork. It is known that large portions of those watersheds are actively managed, but no site-specific information on sediment conditions has been obtained for this assessment. However, the road locations, acreage impacted, and intensity of those activities indicate a high potential for erosion and sedimentation of streams. Unconfirmed reports are that the South Fork is high in sediment during storm flow conditions.

In the summer 2001 flood that was discussed earlier, accelerated channel bank erosion was accompanied by upland erosion, increasing fine sediment and bedload supply. Considerable damage occurred to National Forest roads, private roads and the state road and highway system. Damage to roads was in the form of ruts, rill and gully erosion, major blowouts, deposition, plugged culverts, ditch line erosion, slumps, and slides. The Rabbit Run road FR730 sustained severe ditch line and road surface erosion, in multiple locations. The Hamrick Run road washed badly. Some other roads were damaged, but the most severe damage occurred along State Highway 39/55. Substantial sediment entered the river from runoff related erosion, slumps, and slides along the highway, numerous other roads, and the river banks themselves.

All of these natural and land-use related sources of erosion and sediment impact streams. Fine sediment levels in streams are increased, and aquatic habitats are generally impaired to varying degrees. Despite the current high sediment condition that exists in some of these streams, there are no streams in the Cherry River Watershed that are listed on the State's 1998 303(d) List for reasons of sediment impairment or biological impairment.

Acidity (pH)

Nearly all streams within the assessment area are considered by the State to be meeting water quality standards for acidity, despite their apparent susceptibility to acid deposition, and the Acid mine drainage (AMD) effects in upper Bear Run. Acid deposition effects are likely occurring in some watersheds and tributaries on the private lands, but the more alkaline bedrock of the Mauch Chunk geology forms the stream bottoms and lower slopes throughout much of the three largest watersheds south of Richwood, making those larger streams much less susceptible.

As described above, there is a natural trend toward slightly to moderately greater watershed buffering and improved stream pH and fertility, going from east to west on National Forest Lands within the watershed. Although that trend leads to streams with lower susceptibility to acidification, they are still considered to be somewhat susceptible, at least on an acid event basis, because of their marginal pH and alkalinity condition.

The effect of today's acid deposition situation on the aquatic community in many of the tributaries to the North Fork may be small to substantial, depending on the local watershed conditions. Many of these streams have little to no buffering capacity, and water chemistry suggests acidification processes are at work. AMD is not a major problem on the National Forest Lands in the watershed, but small amounts are likely affecting portions of Bear Run. The occurrence of AMD problems on private lands is not known. Although the State considers most streams in the area to be meeting water quality standards for acidity, acid deposition is believed to be having some effect on water chemistry in most of the streams on National Forest Lands, and likely in many streams on the private lands as well.

Small areas of old contour strip mining, surface mining and some deep mining have occurred in the North Fork. For the most part that mining occurs along Hamrick Run and in the upper part of Bear Run. The only known AMD of any significance is in Bear Run, and the volume is not great (15 to 87 gallons per minute, measured twice). There are four mines associated with the Bear Run Mines. Acidic water discharge from these mines ranges from a pH of 3.6 to 3.8. Recent water quality monitoring has shown that this AMD in the head of Bear Run is likely having some adverse impact on water quality in the upper reaches of Bear Run, but the downstream extent of that effect is unknown. The

State treats two locations in Bear Run with limestone fines, downstream from the AMD source.

Recent (2001/2002) water quality monitoring in a number of tributaries of the North Fork have documented the acid sensitivity of these streams. Water chemistry shows that many of the tributaries have low pH and very low acid neutralizing capacity (low alkalinity), and other measures that indicate susceptibility to acid deposition impacts. Many of the tributaries have pH between 4.4 and 5.5, and essentially no alkalinity. These streams are not being treated with limestone fines. Tributaries that are treated with limestone fines have much higher pH and alkalinity. The North Fork main stem typically has moderate to good pH (6.3 to 7.7) and moderately good alkalinity, but is receiving limestone treated water from the tributaries and in the main channel as well. Also, available stream chemistry data from a small number of streams supports the theory that streams become slightly more alkaline to the west of Coats Run. But all these streams, in the absence of liming, are moderately to strongly acid and susceptible to acid deposition impacts, especially on an acid runoff event basis.

Table 3-5: Water Quality Data North Fork Cherry River and Tributaries

Stream Name	Sample Collected	pH	ANC (ueq/l)	Calcium (mg/l)	Sulfate (mg/l)
No. Fk. Cherry R	fall 2001	6.97	183.1	4.1	4.5
(above Left Branch)	spring 2002	6.53	31.9	1.9	4.2
Bear Run	fall 2001	4.66	-24.5	6.9	45.4
	spring 2002	4.74	-18.0	2.5	18.7
Carpenter Run	fall 2001	4.49	-39.2	0.8	5.4
	spring 2002	4.42	-44.6	0.7	5.2
Rabbit Run	fall 2001	4.52	-37.6	0.7	4.8
	spring 2002	4.40	-49.1	0.7	5.2
Hunters Run	fall 2001	5.49	-4.1	1.0	4.5
	spring 2002	nd	nd	nd	nd
Desert Branch	fall 2001	5.83	5.7	1.7	4.4
	spring 2002	5.35	-0.8	1.1	4.3
Bear Run (LS)	fall 2001	7.58	609.1	13.0	11.0
	spring 2002	6.84	56.4	2.7	6.9
Rabbit Run (LS)	fall 2001	7.98	1515.0	27.2	6.6
	spring 2002	7.27	166.0	4.6	5.4
Coats Run (LS)	fall 2001	7.99	1504.4	8.4	4.0
	spring 2002	7.25	141.4	3.7	3.6
No. Fk. Cherry R (LS)	fall 2001	7.62	332.8	7.0	6.4
(near Big Run)	spring 2002	6.35	27.8	2.3	5.5
No. Fk. Cherry R (LS)	fall 2001	7.73	568.2	10.5	6.2
(near Ranger Station)	spring 2002	6.95	85.4	2.7	5.0

ANC is acid neutralizing capacity.
ueq/l is micro equivalents per liter.
mg/l is milligrams per liter.
LS indicates that stream site is influenced by limestone fines treatment.
Nd indicates no data.

West Virginia Department of Natural Resources personnel placed a total of 739 tons of limestone sand at strategic locations in Bear Run, North Bend Picnic Area on North Fork Cherry River, and Eagle Camp in September of 1997. Limestone sands were again added to these sites in May 1998; in May 1999 (≈ 702 tons); in June 2000 (≈ 514 tons); and in May 2001 (≈ 292 tons). The table below shows the changes in pH levels downstream from where the limestone sands were placed:

Table 3-6: pH Levels of Streams Treated with Limestone Sands

Site	10/97	4/98	10/98	4/99	10/99	4/00	10/00	3/01
Eagle Camp	5.36	5.75	6.22	6.25	6.42	6.13	6.59	5.9
Picnic Area	5.79	6.63	7.01	6.88	6.97	6.87	7.68	6.44
Bear Run	5.97	6.48	6.81	6.76	6.81	6.6	7.21	6.12

The following streams have also been receiving limestone sand treatments, and pH levels recorded, in the lower reaches beginning in 2000 (the upper reaches have not been treated):

Table 3-7: pH Levels of Treated and Untreated Stream Reaches

Site	3/00	11/00	3/01	11/01
Upper Hamrick Run (u)	--	4.57	4.42	4.59
Lower Hamrick Run (t)	6.61	7.13	6.71	7.21
Upper Rabbit Run (u)	4.69	4.56	4.31	5.06
Lower Rabbit Run (t)	7.08	7.30	6.92	7.66
Lower Coats Run (t)	6.61	6.96	6.27	7.09
Upper Hacking Run (u)	5.66	5.69	5.40	6.23
Lower Hacking Run (t)	7.00	7.01	6.89	7.66

u = untreated stream reaches
t = stream reaches treated with limestone sand

Despite acidity-related problems, nearly all of the streams in the watershed are considered by the State of West Virginia to be meeting water quality standards. Designated uses of the surface waters within the watershed include public water supply (Category A use designation in the North Fork Cherry), propagation and maintenance of fish and other aquatic life (Category B), and water contact recreation (Category C). In addition, the entire length of the Cherry River, and its North and South Forks are designated trout waters (Category B2). The only streams that are listed for acidity related problems in the State's 1998 303(d) List of "water quality limited waters" are Carpenter, Windy, and Armstrong Runs, which are tributaries of the North Fork. Limestone fine treatments are occurring in a number of streams throughout the North Fork to treat the watershed as a whole for acid deposition impairment, but none of the three streams on the 303(d) list are treated with limestone because of inadequate access.

Temperature

There are no streams within the watershed that are listed in the state 303(d) list as temperature impaired. Some streams on private lands are believed to have impaired habitat quality from increased water temperature, but no temperature data was collected for this assessment. Part of this effect is related to reduce quality of riparian habitats (riparian clearing for timber, mining, and roads along stream channels), and it also is related to increased sediment loads in streams. As deposition occurs, aquatic habitats become simplified and channels may widen and become shallower. Wider, shallower stream channels are more susceptible to temperature increases during the critical summer and early fall months when low streamflow occurs together with higher daytime temperatures and more intense solar radiation. The streams most likely to be impaired are the Cherry River main stem, and portions of those watersheds where extensive road development has occurred.

Aquatic Biota

Reference Condition

No reference, or undisturbed, watershed conditions exist within the Cherry River drainage in which to compare and contrast the existing conditions to. Without that baseline, we have to speculate what conditions might have been like prior to the changes that have occurred from increased acid deposition, timber harvesting, road development and other activities in the watershed.

Fish

Native brook trout were probably in greater abundance although pressure from native inhabitants may have had an effect on the fish population. Sensitive non-game species may also have been in greater abundance.

Riparian Habitat

Prior to the logging that occurred in the late 19^{th} and early 20^{th} century, spruce was more prevalent in the watershed and streams flowed through densely forested riparian areas (except in the wider floodplains where native villages or subsistence agriculture may have been located). The lwd that would fall into the stream channels from these riparian forests were probably more mature and larger diameter than the stands comprising the riparian areas today. Larger trees fallen in the stream channel are generally more stable (not easily moved by flood waters) and last longer (do not decay as rapidly) than smaller diameter trees. We can also speculate that spruce was a greater component of lwd than what we see today and conifers generally decompose slower in streams than hardwoods. With the natural recruitment of lwd, channels were more stable, had greater habitat complexity, pool development and cover. There were probably more reach types characterized as step pool and/or pool-riffle than the dominance of plane bed reaches under current conditions. With no roads to modify storm flows and increase erosion, stream channels would be more stable and have lower levels of fine sediment than what we find today. Lwd structure within ephemeral and intermittent channels increased channel roughness, which would dissipate stream energy and store sediment, nutrients, organic matter and moisture within the watershed. Stream shading in forested riparian areas result in cooler water temperatures.

Erosion in an undisturbed watershed would be less due to the lack of roads and other ground disturbing activities. Fine sediment levels within the stream channels in turn would likely be lower than what we observe today.

Existing Condition

With the extensive clear cutting that occurred around the turn of the last century, most of the trees that provided wood for stream channels were removed and without the continued recruitment of lwd to stream channels, habitat complexity and channel stability were reduced in many streams. Today, streams within the Cherry River Watershed have levels of lwd that are less than what we would expect to occur naturally. Stream surveys conducted in 1991 typically recorded less than one piece of lwd per 100 feet of stream lengths in channels that we would expect to have ten or more pieces per 100 feet. Since those surveys, the recruitment of wood does not appear to have added substantial amounts of lwd to the stream channels and floods have moved and re-arranged lwd in many of the streams. The natural recruitment of lwd to stream channels should increase though as riparian forests continue to mature, which in turn will improve the habitat conditions and channel stability. The retention of trees along stream channels, including intermittent and ephemeral channels, is an important element for restoring the function of the watershed and improving fish habitat quality.

Fish

Fisheries resources can be characterized by the physical, chemical and biological components that make up the aquatic ecosystems in the Cherry River Watershed. Physical attributes are natural factors such as the geology, topography, precipitation, soil and vegetation characteristics that influence the channel shapes, stream flow patterns and water qualities that govern fish populations within the watershed. These natural characteristics are in turn affected by land management activities that can alter the natural characteristics of the soil, water, air and vegetation in the watershed. The combination of natural variation and management activities shape the quality of aquatic habitat within the watershed and affect the biological potential of the streams. Discussions of the geology, soil, water and vegetation characteristics can be found in greater detail in other sections of this assessment.

The natural factors currently exhibiting the greatest influence on the fisheries resources in the Cherry River Watershed are the geology of the watershed and recent precipitation patterns. The geology is largely Pennsylvanian sandstone/siltstone/shale, which results in poorly buffered soils and streams that are susceptible to acid deposition (see sections on Soils and Water Quality).

Currently, acid deposition, and to a lesser extent acid mine discharge, have resulted in streams with pH levels lower than what would be expected naturally, especially in the eastern half of the watershed. Many of these streams can no longer support fish or their productive potential has been reduced due to the acidic conditions. To mitigate the influence of acid deposition, streams in the North Fork Cherry and South Fork Cherry River subwatersheds are treated with limestone sand to neutralize the water and raise the pH level. The streams on NFS lands that receive limestone sand include Left Branch, Bear Run, Hamrick Run, Rabbit Run, Coats Run (above Summit Lake), Hacking Run and the North Fork Cherry River main stem.

The geology and topography of the watershed also result in soils sensitive to erosion and result in streams with elevated sediment levels, especially in the Buckhannon soil type located primarily in the western portion of the watershed. High levels of fine sediment can impair fish production by reducing spawning success, rearing habitat and macroinvertebrate populations that are a food source for fish.

Another natural factor, flooding, is currently influencing the fisheries resources in the watershed. Flooding in recent years, including July 2001, has affected stream channel characteristics and most likely fish populations. The watershed is subject to intense storm fronts that result in flashy flows within the smaller tributaries that feed the larger streams. Management activities can also influence runoff patterns by compacting soils and reducing the rate that water can soak into the watershed. As a result of recent floods, stream channels within the Cherry River Watershed show evidence of scouring, bank cutting and bedload deposition that have altered channel characteristics and fish habitat. Immediately following floods, fish populations are often reduced due to the displacement of fish downstream. However, depending upon the severity and timing of the flood, fish populations can quickly rebound as if rejuvenated by the floods.

Other factors affecting the quality of the fisheries resources in the Cherry River Watershed include impacts to stream channels and riparian areas from land management activities such as timber harvesting, roads, strip mines, agriculture and community development. Riparian areas are important for fish habitat by providing stream shading, bank stability and as a source of large woody debris. Large woody debris (lwd) is an important component of forested streams, and as trees fall into a channel their trunks provide a number of stream functions such as increasing habitat complexity, dissipating stream energy and increasing channel stability.

The Cherry River and tributaries reportedly supports 29 species of fish (Table 3-8). The majority of fish (21) are native species and eight species have been introduced into the watershed. The list represents fish species that have been reported in the watershed or have been introduced at one time, and does not necessarily reflect the current species composition in the watershed. With the variability in habitat conditions, stream flows and water quality, the existing species composition may be a sub-set of the overall species list, and will fluctuate as conditions do.

Typically, the greatest species diversity is found in the larger stream reaches, with the smaller, colder headwater streams supporting fewer species. Headwater streams that support fish may only have one species present, where the lower reaches of the larger streams may have 14-15 fish species. None of the fish reported in the Cherry River Watershed are federally listed as threatened or endangered, but three fish, the candy darter (*Etheostoma osburni*), the Kanawha minnow (*Phenacobius teretulus*) and the New River shiner (*Notropis scabriceps*) are considered to be sensitive.

Chipps (1993) collected candy darters in the Cherry River main stem, the South Fork (S.F.) Cherry and Laurel Creek in 1991. Recent sampling efforts by the WVDNR have also reported collecting candy darter in the S.F. Cherry in 1998, and one specimen in the North Fork (N.F.) Cherry in 2001.

The Kanawha minnow is considered to be relatively rare in West Virginia (Stauffer et al. 1995), and in the Cherry River Watershed only two specimens have been recorded from Laurel Creek in 1978 (Chipps 1993). Several sampling efforts in Laurel Creek since then have failed to find Kanawha minnow, and they are considered extirpated from the Cherry River at this time (Dan Cincotta, WVDNR, personal communication 2002).

Stauffer et al. (1995) reported that New River shiner had been collected in the N.F. Cherry and S.F. Cherry. These collections were probably from efforts by J. Addair in the 1940's, and New River shiner have not been collected in the Cherry River system since then (Dan Cincotta, WVDNR, personal communication 2002). They are considered to be disappearing from the Gauley River drainage, and can no longer be found in the N.F. Cherry and S.F. Cherry River.

The combination of natural and management related factors have resulted in a decrease in habitat quality and fish productivity in the watershed. In order to sustain a sport fishery, a number of streams are treated with limestone sand to mitigate the influence of acid deposition on water chemistry, and hatchery fish are stocked at a number of sites to support angling pressure. Summit Lake, a 43-acre reservoir created on Coats Run, supports both coldwater and warm water game fish, and is a supplemental water source for Richwood.

Table 3-8. Fish species reported in the Cherry River Watershed.

Species	Native	Species	Native
Bigmouth Chub	Y	Longnose Dace	Y
Blacknose Dace	Y	New River Shiner	Y
Blackside Shiner	Y	Northern Hogsucker	Y
Bluegill	N	Rainbow Trout	N
Bluntnose Minnow	Y	River Chub	Y
Brook Trout	Y	Rock Bass	N
Brown Trout	N	Rosyface Shiner	Y
Candy Darter	Y	Rosyside Dace	Y
Central Stoneroller	Y	Silver Shiner	Y
Creek Chub	Y	Smallmouth Bass	N
Fantail Darter	Y	Striped Shiner	N
Greenside Darter	Y	Tiger Trout	N
Johnny Darter	Y	Tonguetied Minnow	Y
Kanawha Minnow	Y	White Sucker	Y
Largemouth Bass	N		

Riparian Habitat

The existing Forest Plan developed guidelines for managing and protecting riparian habitat. Additional guidelines to protect riparian habitat have recently been adopted on a forest-wide basis. The new guidelines exceed West Virginia Best Management Practices for controlling soil erosion and water siltation. Previous Forest Plan and present WV Best Management Practices (BMP) guidelines allow for some tree harvest and removal in riparian habitat. The new Monongahela National Forest guidelines establish minimum distances for no tree harvest/removal zones of 100 feet (measured from the edge of the stream bank) on each side of perennial and large intermittent streams, 50 feet on each side of small intermittent streams, and 25 feet on each side of and above ephemeral stream channels.

Vegetation

Reference Condition

Evidence of human habitation in the New World, based on radiocarbon-dated evidence, began 14,000 to 12,000 years before present (B.P). Cultivation of agricultural crops, such as various forms of squash, began in the eastern woodlands about 5,000 B.P. Indications of intensive plant husbandry (with native cultigens such as sunflower, knotweed, bottle gourd, little barley, and tobacco) by Native Americans began around 3,500 B.P and were well established in some areas around 2,000 B.P. Archaeological sites with wood, seed charcoal and pollen from plants that require disturbance (such as ragweed, goldenrod, sumac, and eastern redcedar) indicate significant subsistence agriculture beginning around 4,000 B.P. and becoming common around 2,000 B.P. Widespread cultivation of maize, beans, and squash began around 1,000 B.P in the eastern woodlands. Most of these Native American agricultural areas were established in the flood plains where sediment deposition from flooding assisted in soil fertility renewal. It is well known that extensive agricultural fields were in place for several hundred years in the eastern woodlands prior to the arrival of European settlers in the 15th century (Peacock 1998). Although it is not known if the floodplains of Cherry River provided subsistence agriculture fields for Native Americans, it is important to note the disturbance of the eastern hardwood forest did not originate with colonial settlement.

Various uses of eastern hardwood trees by Native Americans included seed production (acorns, chestnuts, hickory nuts, etc.) and felling of trees for firewood and construction of dwellings. Management of the eastern hardwood forest through the use of fire was important to native Americans for establishing forage for game animals and at times for driving the game towards groups of hunters. There is general agreement that these large populations of original inhabitants were advanced enough to significantly alter the vegetation of this region through the use of fire for subsistence agriculture, hunting, range management, and travel (Brown 2000).

More than 90 percent of the original Appalachian forest was dominated by hardwoods (Carvell 1986). The red spruce/fir forest was a major forest type, at higher elevations, prior to settlement by people of European origin. It is estimated over 1.5 million acres of spruce/fir forest covered the higher elevations of the Southern Appalachian Mountains in West Virginia, North Carolina, and Tennessee prior to European settlement. By 1860 this area was reduced by half. At the turn of the 20th century only 225,000 acres of the spruce/fir forest remained and by 1920 the number of acres had been reduced even further, to about 100,000 (USDA Forest Service 1975).

Slash and burn agriculture along with the practice of “deadening” (girdling trees) were the primary methods for growing crops and grazing livestock. Most agriculture in the area was on a land rotation basis (when a parcel of land would no longer support agriculture use another parcel of land was selected) since commercial fertilizers were not readily available and modern farming practices that limit erosion were not utilized. These methods were practiced by the first settlers and continued for several generations.

Existing Condition

A tree inventory of 1,000 acres was completed at the turn of the 20th century in the headwaters of the Cherry River (West Virginia Geological Survey, 1910). All trees listed below over 18-inch diameter were recorded. The following table compares that inventory with a recently completed inventory in the headwaters of the North Fork Cherry River.

Table 3-9: Comparison of Inventoried Species by % of Total

Species	**1910 Inventory (%)**	**2001 Inventory (%)**
White Oak	<1	0
Chestnut Oak	4	0
Chestnut	7	0
Red Maple	15	11
Sugar Maple	33	3
Beech	9	15
Birches	5	6
Gum	<1	0
Cherry	2	25
Poplar	2	0
Magnolia	0	5
Basswood	5	2
Cucumber	4	6
Ash	3	<1
Hemlock	10	9
Spruce	<1	18

The species inventoried (white oak, chestnut oak, and gum) in 1910 indicate the area was on a drier site, while the lack of red spruce suggests this inventoried site was at a lower elevation than the inventory of 2001. In the estimated 1,000-acre inventory 22,173 trees over 18-inch diameter were recorded in the 1910 inventory. The 2001 inventory recorded an estimated 21,263 trees over 18-inch diameter on approximately 1,087 acres. The higher amount of black cherry in the 2001 inventory suggests that thinnings have favored this high value tree by leaving it to grow to maturity. American chestnut was not recorded in the 2001 inventory because the chestnut blight kills young chestnut trees before they can reach the larger diameter classes.

Threatened/Endangered/Sensitive Plants

Botany surveys were conducted on National Forest Land in the Cherry River Watershed during past project planning in Holcomb OA in 1992, and in the Cherry River OA in 1993, and Desert Branch OA in 2001. There are no known occurrences of any threatened or endangered (T&E) plants in this watershed. The following sensitive plants are known to occur:

- Harned's swamp clintonia (*Clintonia alleghaniensis*)
- Long-stalked holly (*Ilex collina*)
- Butternut (*Juglans cinerea)*

Forest Type/Size Class/Age Class

The uniformity of potential vegetation types are reflected in the relative uniformity of the existing vegetation types listed as the Forest Type in Table 3-11. Over one-half of forested land in national forest ownership is classified as mixed hardwood forest types (89). Although the mixed hardwood type usually designates cove hardwoods, in this area it is used for stands with a variety of species such as sugar maple, black cherry, red oak, birch, beech, red maple, basswood, white ash, and yellow poplar along with other tree species. Striped maple is a common understory tree along with sugar maple and beech.

*Timber Resource Management Activi*ties

Extensive timber harvesting occurred in this watershed prior to National Forest (NF) ownership. Construction of railroads in West Virginia doubled in the 1880s and doubled again in the 1890s allowing access to and transportation of the timber resource. By 1917 rail lines covered 3,705 miles in the state. The number of sawmills in West Virginia reached a peak in 1909 at 1,524. Production of lumber was highest in 1910 with mills employing 26,000 workers and producing 1,500 million board feet of lumber (Lewis 1998). Logging at the turn of the century clearcut the large majority of this portion of the state. For this reason the forest we have here today is mostly even-age (see Table 3-13).

Over 90 percent of NF land is between 61 to 105 years old. Timber harvests for the purpose of multiple use management continues under NF ownership. Listed below are timber sales that have been completed within the Cherry River Watershed since 1983.

Table 3-10: List of Timber Sales in the Cherry River Watershed completed since 1986

Sale Name	**Sub-watershed**	**Acres Regenerated**	Total Acres **Harvested**	**Year Completed**
Bear Run	North Fork	28	530	1992
Briery Knob Spruce	North Fork	0	86	1988
Camp 29	North Fork	86	1,035	1988
Coats Run	North Fork	73	649	1991
Curtin Run	Lower Cherry	10	258	1998
FIACFOS	North Fork	0	10	1997
Frosty Ridge	North Fork	0	40	1988
Frosty Road	North Fork	38	79	1986
Frosty Spruce	North Fork	0	30	1988
Frosty Trail	North Fork	0	26	1988
Hacking Run	North Fork	0	614	1986
Hacking Run	North Fork	24	24	1993
Hamrick Run	North Fork	0	58	1986
Holcomb Run	Lower Cherry	84	254	1997
Hunters Haven	North Fork	34	230	1997
Rabbit Run	North Fork	8	264	1992

A timber sale on National Forest Land in the Desert Branch area of the North Fork Cherry River sub-watershed is in the planning stage. The Gauley Ranger District plans to sell this timber sale sometime in fiscal year 2003. Approximately 93 acres are planned for regeneration harvest and 973 acres of thinning for a total of 1,066 acres.

Timber harvesting also continues on private land. Within the Cherry River Watershed, an estimated 11,840 acres have been harvested in 178 timber sales since 1992 by 21 separate landowners (Stasny, 2001; WV Division of Forestry, 2001). These harvests have been mostly clearcuts on MeadWestvaco and Plum Creek Timber Company (previously known as The Timber Company) lands. Diameter limit cuts and selection cuts are the most common harvest methods on other private lands. Diameter limit harvest methods remove most of the trees above a certain diameter measured at about one foot above ground level. The selection harvest method removes only individual trees that have been marked for cutting.

In the early to mid-1960s, clearcutting became a valuable silvicultural tool on National Forest Land to correct individual tree harvests that were resulting in high grading (the practice of cutting the best/largest trees and leaving lower quality and/or smaller trees). The use of clearcutting became highly controversial in the 1970s (mostly due to visual concerns of clearcutting large tracts of land), resulting in a temporary timber harvest moratorium and the creation of the National Forest Management Act and the National

Environmental Policy Act. The clearcut harvest method continues to be a valuable silvicultural tool on the Monongahela National Forest, although at a much reduced level.

Most of the areas clearcut in the 1960s and 70s resulted in stands of overcrowded trees (too many trees trying to live in one area). Natural mortality can eventually reduce this overcrowding; however, through the utilization of timber stand improvement (TSI) techniques it is possible to select which trees will live and which trees will die. These TSI treatments are used to improve the health and increase the growth of the residual trees. One method of TSI is a non-commercial thinning in a crop tree release (CTR). Crop trees are selected based on species, mast capability, health, potential wood value, and form. The stands in this area that were treated with CTR are now, or within the next five years will be in the poletimber size class. There is the potential to further improve the health and growth of these stands through commercial and non-commercial thinnings utilizing other various TSI methods.

Many stands that were clearcut in the Cherry River Watershed in the 1980s and early 90s are now overcrowded with young trees. These stands will be ready for a non-commercial thinning using the CTR method within the next five years. Most of these stands are presently in the sapling stage of growth.

MNFLMP Standards and Guidelines for Management Prescription 3.0 indicate that forest diversity will be enhanced by the dispersal of different types and ages of vegetation. For high productive sites, which include most of the acreage in this watershed, there should be 10-20 percent of the area in seedling/sapling stands, 15-30 percent in pole stands, and 50-75 percent in sawtimber stands. The recommendation for low productive sites is to have 13-25 percent of the area in seedling/ sapling, 20-38 percent in poles, and 38-67 percent in sawtimber. These percentages were determined based on establishing an even distribution of age classes under even-aged management methods. Timber stands on medium to high productive sites grow out of the seedling/sapling stage within 20 to 30 years and may attain sawtimber size between 50 to 60 years of age. On low productive sites a timber stand may remain in the seedling/sapling stage for up to 40 years and not attain sawtimber size until 80 years of age. The normal rotation age for high site mixed hardwood stands is 200 years and 120 years for black cherry, when the age classes are in balance. Rotation ages for low sites are 150 years for mixed hardwood stands and 100 years for black cherry. However, until the age classes are balanced, stands must be at least 70 years old to be considered for a regeneration harvest. There is an opportunity in the next five years to continue to balance age classes by utilizing even-age regeneration harvests and to improve the structure, diversity, and health of many stands through commercial thinning.

Table 3-11: Cherry River Forest Type Acres by Sub-watershed

Forest Type	**North Fork** Cherry River	South Fork Cherry River	Cherry River Composite	Laurel Creek	Lower Cherry River Composite	Total Acres
0#	1948	30161	14535	27192	3870	**77706**
2	15	50	0	0	0	**65**
3	4	0	0	0	6	**10**
5	14	0	0	0	0	**14**
13	607	43	0	0	0	**650**
52	0	0	0	0	11	**11**
53	0	0	0	0	12	**12**
55	121	0	0	0	5	**126**
56	1319	29	17	0	1265	**2630**
59	312	0	0	0	1313	**1625.3**
81	4979	18	0	0	93	**5090**
83	1029	3	0	0	0	**1032**
85	50	8	0	0	0	**58**
87	1963	263	0	0	0	**2226**
89	11197	110	50	0	3121	**14478**
92	67	0	0	0	0	**67**
99	133	15	0	0	20	**168**
Water	112	<1	0	0	<1	**112**
Total	**23870**	**30700**	**14602**	**27192**	**9716**	**106080**

*See Appendix B for list of codes
#Private owned land includes forested land, openings, and water bodies

Table 3-12: Cherry River Size Class Acres by Sub-watershed (NF land only)

Size Class	**North Fork** Cherry River	South Fork Cherry River	Cherry River Composite	Laurel Creek	Lower Cherry River Composite	% of National Forest Land	Total **Acres**
Water	112	<1	0	0	<1	<1	**112**
Open/Brush	133	15	0	0	20	<1	**168**
Seedling/ Sapling	546	9	0	0	313	3	**868**
Poletimber	1456	67	18	0	261	6	**1802**
Sawtimber	19674	449	49	0	5252	90	**25424**
Total	**21921**	**540**	**67**	**0**	**5846**		**28374**

Even-age regeneration methods may include two-age, clearcutting, and/or shelterwood harvests. A two-age harvest results in a residual basal area of 15 to 30 square feet of trees mostly in the poletimber and small sawtimber (8 to 16 inch dbh) size classes. The next entry for a regeneration harvest in stands receiving a two-age treatment would not occur for another 60 to 100 years. A clearcut harvest results in all trees over 1inch dbh being cut with the exception of about five trees per acre are left for wildlife purposes. Another regeneration harvest would not occur in a stand receiving a clearcut treatment for 120 to 200 years. A shelterwood harvest results in a residual basal area of 30 to 50 square feet of trees mostly in the small and medium sawtimber size classes (12 to 22 inch dbh). Reentry in a shelterwood harvest would normally occur within 5 to 15 years after the initial harvest to remove the remaining sawtimber size trees if there is sufficient regeneration of desirable trees. With the exception of trees designated to remain, all other trees over 1inch dbh are cut in a regeneration harvest.

Table 3-13: Cherry River Age Class Acres by Sub-watershed (NF Land only)

Age **Class**	**North Fork** Cherry River	**South Fork Cherry River**	**Cherry River Composite**	**Laurel Creek**	**Lower Cherry River Composite**	% of **NF Land**	Total **Acres**
Water	112	<1	0	0	<1	<1	**112**
Open/Brush	133	15	0	0	20	<1	**168**
0-15	347	8	0	0	175	2	**530**
16-30	199	1	0	0	138	1	**338**
31-60	1456	67	18	0	261	6	**1802**
61-75	3419	3	49	0	1413	17	**4884**
76-105	16254	446	0	0	3835	73	**20535**
106+	1	0	0	0	4	<1	**5**
Total	**21921**	**540**	**67**	**0**	**5846**		**28374**

One type of commercial thinning is called an Overstory Removal (OSR). An OSR is usually done in a stand that has received a commercial thinning within the past 10 to 30 years. The first thinning may result in a substantial amount of regeneration, normally of tree species that are tolerant of shade such as sugar maple. The OSR harvest removes most of the overstory and releases the regeneration.

Insects, Disease, and Non-Native Invasive Plants

The role of non-native insects, diseases, and invasive plants as disturbance factors has increased in the past century due to the introduction of these pests from other countries. Some of the species known to influence the structure and pattern of vegetation are discussed below. The species listed here are not all inclusive of non-native insects, diseases, and invasive plants that may be present in the Cherry River Watershed.

<u>*Insects*</u>

Gypsy Moth (*Lymantria dispar L.*) was introduced, from France, to the United States in 1869. The first defoliation outbreak occurred in 1889 (McManus, Schneeberger, Reardon and Mason 1989).

A population crash of the gypsy moth, caused by the fungus *Entomophaga maimaiga*, kept the population under control for the past few years. High humidity, frequent periods of rain, and fairly constant temperatures between 14°C to 26° C are needed for the fungus to germinate and spread (Reardon and Hajek 1998). An increase in the number of gypsy moth egg masses on the Forest this past year is resulting in a population build-up causing defoliation in numerous "hot spots" in the eastern section of Pocahontas County. The population increase, due to dry spring weather for the past two years, should not cause significant tree mortality this year. However, a continued increase in the population with successive years of defoliation may cause extensive tree mortality. A return to a control program may be necessary to slow the spread of this insect and reduce tree mortality.

Oak trees (especially of the white oak group) are the preferred host for this insect pest. Less than 5 percent of the trees on National Forest Land in the Cherry River Watershed are oak. Almost all of these are in the red oak group. This area is considered to be low risk for massive defoliation by gypsy moth caterpillars.

Hemlock Wooly Adelgid (HWA) (*Adelges tsugae)*: This sapsucking insect, introduced to the United States from Asia in 1924, was detected in Pocahontas County in 1993 (Hutchinson 1995). The insect feeds on twigs causing the foliage to discolor and drop prematurely. Defoliation and death usually occurs about four years after a tree is infested. Eastern and Carolina Hemlocks are highly susceptible to this insect and no resistant trees have been located to this date. Several common predators (including the Japanese Ladybug) of the adelgid have been released and may prove to be an effective control (Kajawski 1998; Montgomery and Lyon 1996). Severe cold weather also seems to control HWA. In January 1985 and the winter of 1993-1994 severe cold weather (-20° to -28° F) greatly reduced HWA populations (Souto, Luther, and Chianese 1995). Infestations of HWA are not apparent above the Hudson River corridor in New York. It appears cold weather may be a limiting factor in the spread of this insect although a more recent study showed up to 5 percent of HWA survived temperatures of -30°C over a 24 hour period (Parker et al, 1998).

<u>*Disease*</u>

Beech Bark Disease (BBD): The beech scale insect (*Cryptococcus fasigua*), native to Europe, arrived in Nova Scotia around 1890. By 1932 trees in Maine were dying from BBD. The disease results when the bark is attacked by the beech scale, then invaded by fungi, primarily *Nectria coccinea var.faginata* and *N.galligena* which eventually kills or severely injures beech (Houston and O'Brien 1983). Beech trees over eight inches diameter are more severely affected then smaller trees. Mortality occurs in about 30 percent of the trees that are infected. Up to 90 percent of the remaining beech trees in a stand become severely injured and do not produce quality wood (Leak and Smith 1995), while less than 1 percent of beech trees are resistant. It appears there are greater disease levels in stands containing hemlock (Gavin and Peart 1993). Hemlock provides high shade and moisture preferred by the fungi that attack the tree after infestation by the scale.

The advancing front of the scale is presently in the Cherry River Watershed. Cutting infected and high-risk trees would provide an opportunity to salvage some of the material and improve the health and diversity of the stand (Ostrofsky and Houston 1988).

Chestnut Blight (*Cryphonectria parasitica*): This fungus (probably introduced through the importation of chestnut trees from Asia) was first reported in the United States in 1904. Within 50 years, the fungus occupied the entire range and had killed 80 percent of the American chestnut (Kuhlman 1978). Nearly all the remaining live trees were infected with the fungus and dying. Prior to the infestation, the American chestnut was a major component of the eastern hardwood forest comprising 25 percent of all tree species on over 200 million acres from New England to Georgia (MacDonald, Cech, Luchok, and Smith 1978; and Schlarbaum 1989). This tree, which once grew up to 120 feet tall and over 7 feet in diameter, now rarely attains heights over 30 feet with diameters up to 6 inches before the fungus kills the stem and the process starts over when the tree resprouts. A few resistant trees have been found. There is hope that some time in the future the American chestnut will return, as a valuable timber and wildlife tree, to the eastern hardwood forest (Newhouse 1990). An opportunity exists to plant disease resistant chestnut in this area.

Butternut Canker: A decline in butternut trees was first discovered in southwestern Wisconsin in 1967. In 1979 the cause of the decline was found to be a newly described species of fungus (*Sirococcus calvigignenti-juglandacearum).* Although the origin of this fungus is not known, evidence suggests it was introduced in the early 1960s. Forest inventory data from North Carolina and Virginia shows that 77% of the butternut trees have been infected with the fungus. Fungal spores are spread by rain, wind, and possibly insects. There may be some resistance to the disease as some healthy butternuts have been found growing directly next to infected trees. Other trees have been found with fewer cankers or with cankers that have closed-over by callus (Ostry 1997).

<u>*Non-native Invasive Plants*</u>

Multiflora Rose *(Rosa multiflora* Thunberg.): Also known as Japanese Rose, this species has been widely planted for erosion control and wildlife benefits. It was brought to the United States in the 1880s by horticulturists. This shrub forms dense thickets impenetrable by humans or large animals and is highly competitive for soil nutrients. It grows just about anywhere except in standing water or extremely dry areas. Control methods include mowing several times per year for two to four years, burning early in the growing season with follow-up burns for several years, digging up the plant with the entire root, or applying glyphosate, or other approved herbicides, to the cut stems or foliage.

Autumn Olive *(Elaeagnus umbellate* Thunberg.): This shrub was introduced from East Asia in the 1830s for revegetation of disturbed areas. It has prolific fruiting ability. The fruit (and seed) is eaten and dispersed by birds. Autumn olive can thrive in poor soils and does not require much moisture to survive. When cut or burned, it sprouts and grows--rapidly forming a dense shade cover that makes it difficult for sun-loving plants to compete with it. This plant does not grow well on wet sites or under forest shade conditions. Control methods include pulling up seedlings and sprouts when the ground is moist or applying glyphosate, or other approved herbicides, to cut stems or foliage.

Tartarian Honeysuckle *(Lonicera tatarica* L.): Most bush honeysuckles are natives of Europe or eastern Asia and have been cultivated in the United States since the mid-1800s. This plant was valued for its fragrant flowers and berries eaten by birds, which then disperse the seeds into other areas. Honeysuckles can form dense shrub layers and interfere with the germination and growth of native plants. Control methods include digging up the plant and entire root and repeated burning or cutting during the growing season. Cutting should be done twice per year, once in the spring and once in the summer. Any cutting during the dormant winter months would increase resprouting. Applying glyphosate near the end of the growing season to the foliage or freshly cut stumps is an effective control method.

Garlic Mustard *(Alliaria officinalis)*: Native to Europe, this biennial plant is one of a few alien herbaceous species that can invade and reduce native deciduous forest understory species. It was first recorded in the U.S. about 1868 on Long Island, NY. Garlic mustard has historically been used as a potherb and contains high amounts of vitamins A and C. It is most common in river associated habitats but can also invade drier, upland forests. Seeds germinate in late winter/early spring when most other native herbaceous plants are still dormant. A single plant can produce thousands of seeds that may remain viable in the soil for up to five years. The best control method (if hand pulling is not practical) is to prevent initial establishment by cutting flowering stalks at ground level. Cut plants should be removed from the infested area. Once it is well established, the plant is extremely difficult and costly to control. Because the chemicals in garlic mustard appear to be toxic to some butterfly species eggs and larvae, some butterfly species may be adversely affected by this plant by mistaking it for a native toothwort.

Tree of Heaven *(Ailanthus altissima)*: Native to central China, this plant was introduced to the U.S. by a Philadelphia gardener in 1784. It is usually found in disturbed areas, especially near cities, but may also invade undisturbed areas. The tree is able to reproduce from seed, stump or root sprouts. The seed is very light and is easily dispersed by wind. One tree can produce 325,000 seeds per year. Lifespan of this tree is usually less than 50 years but it grows rapidly (attaining a height of over 60 feet) and manufactures a substance that is toxic to other plants. Numerous methods of manual, mechanical, and chemical control can be used to reduce the spread of this plant. The best control method is to pull the seedlings when the soil is wet and loose before they are large enough to produce seeds.

Purple Loosestrife *(Lythrum salicaria)*: This plant occurs exclusively in wetland habitats. Although it is not known if this plant occurs in the Cherry River Watershed, it is listed here because once established it becomes highly invasive and is extremely difficult to eradicate. Native to Eurasia, it was brought to Canada and the northeastern United States in the early 1800s. Pure, dense stands of up to 80,000 stems/acre choke out native plants and endanger not only other plants but amphibians as well. One stalk may produce up to 300,000 seeds that are spread by wind and water. In addition, purple loosestrife propagates vegetatively by root or stem segments. Control in its native country is by herbivorous beetles that feed on its roots and leaves. Hand removal is possible in small populations except after flowering, which would aid in scattering the seeds. Pulled plants should be bagged on site and removed since root or stem segments left behind would produce more plants. Once the plants are removed from the area they should be burned. Several treatments with herbicides registered for aquatic use may also aid in control. Care should be taken when using herbicides to avoid contact with non-target native plants since the native plants will be needed to recolonize the area.

Research Natural Areas

A yellow poplar Research Natural Area containing approximately 112 acres is located below Summit Lake between State Route 39/55 and Forest Road 77.

Wildlife

Reference Condition

The national forest in this watershed has historically been mostly forested land. There have been changes over the years from timber harvest, fires, clearings for settlement, and mining, but for the most part the area has remained mostly forested. The spruce forest was more extensive in the past than currently, so the animals unique to that habitat type were more numerous.

Mountain lions, wolves, bison, elk, and fishers were at one time common here but were hunted to extinction. In 1969, eight fishers were reintroduced into Pocahontas County, but it is unknown if this population has flourished. The bison, once common in precolonial days along the major river systems, was eliminated in the state by 1825. Elk were gone by 1890, and the last wolf in the state was killed in 1900. Although occasional reports of sightings of wild mountain lions recur, their presence in the state has not been confirmed. Porcupines once were present in the high coniferous forests, but they disappeared as the spruce declined. The beaver was once abundant throughout the state, but was extirpated by 1923. It was reintroduced during the 1940s in several counties, including Pocahontas. Since that time, it has proliferated and is again fairly common on the national forest.

Some records are available which give an indication of wildlife species present before European settlement in Nicholas and adjacent counties. The woods sheltered and fed a world of animal life: bears, deer, panthers, wolves, foxes, wildcats, raccoons, otters, minks, beaver, weasel, skunks, groundhogs, squirrels, rabbits, muskrats. Elk and buffalo were found occasionally in the early days. Bird life was prolific. Opossums, rats, and mice followed the settlers from the east where they had their natural habitat or had been imported from Europe. Red fox brought from England by Va. Sportsmen soon became an associate of the native gray fox. Gauley River and its largest tributaries teemed with catfish, trout, eels, suckers, chubs, sunfish and minnows. Bass and pickerel were not brought into these waters until many years after the country was settled. Turtles, frogs, toads, lizards and snakes were common everywhere. Razorback hogs roaming the woods for mast were plentiful, and had much to do with ridding the country of snakes as they ate rattlesnakes. Fleas, bees and houseflies were not native to the forest but came with the settlers. Wild bees found in the woods had escaped from the colonies and spread through woods ahead of settlements. Great flocks of passenger pigeons were seen in the early fall days. (From history of Nicholas Co., W.F. Brown, 1954. The Dietz Press, Inc., Richmond, VA)

Existing Condition

Habitat within this watershed is varied and therefore contains habitat for a wide array of wildlife. Conifer accounts for about ten percent of the trees in the watershed. The high elevation spruce provides habitat for unique species such as red-breasted nuthatch, saw-whet owl, snowshoe hare, and West Virginia northern flying squirrels, golden-crowned kinglet, and blackburnian warbler. A variety of forest types are found within this watershed due to a range in elevation from approximately 1,900 to 4,500 feet, varying slope aspects, flat ridgetops and broad valleys offering a diversity of tree and shrub mast species for wildlife including: oaks, aspen, butternut, hawthorn, black cherry, serviceberry, dogwood, and sassafras. American chestnut is still present as an understory species.

Adjacent land owned by MeadWestvaco and Plum Creek Timber Company provides an estimated 9,100 acres of early successional habitat or nearly 9 percent of the Cherry River Watershed.

Water sources – Forest Plan guides for MP. 3.0 recommend at least one permanent natural or artificial water source will be maintained per square mile. For MP 6.1, four water sources per square mile will be provided if possible. (Forest Plan, pages 136 & 177). Intermittent streams in the higher ridges would provide water sources during wet seasons.

Permanent openings – About one percent of national forest in the Cherry River Watershed is open or brushy area including grazing allotments, wildlife openings, roads, and beaver dam areas. Adjoining state and private land, however, contains meadows, grazing land, and agricultural fields and reclaimed strip mines that provide additional habitat for species needing open conditions.

The City of Richwood is contained within the watershed boundaries. Although some wildlife habitat is provided within the city limits, these conditions would not be considered ideal. Species common to these areas would be those adaptive to residential areas, such as English sparrows, starlings, house finches, mallards, skunks, rabbits, chipmunks, gray squirrel, mice, several species of bats, opossum, and raccoon. Beaver also use the river within the city limits.

Unique wildlife habitat features: This watershed contains one 43-acre man-made lake. Because large bodies of standing water are not common in this or adjacent watersheds, it would seem that this would provide a unique habitat unavailable elsewhere in the area to waterfowl. However, large numbers of waterfowl have not been seen there. A few loons, mallards and mergansers are occasionally observed, as well as an occasional osprey seen taking fish from the lake.

Exotic species: The most notable non-native species observed in this area are birds: European starlings, house finches, and house sparrows, mainly in the residential areas.

Pat Keyser of MeadWestvaco (2001) gave the following information specific to wildlife populations on the private timberlands in the Big Laurel, and South Fork drainages. Deer populations are approximately 25 deer/square mile, more in the lower elevations than higher. Spruce stands have probably half that density. Herb ivory is not impairing regeneration. There is a thriving bear population with relatively high densities. Grouse populations are good to very good. Beaver are scattered but good in lower gradient streams. Turkey populations are of low density. Red and gray squirrels are common. Wood rats are probably present in rock outcrops, but no specific studies have been done. There has been no bat mist netting studies done on WestVaco lands. There are good brook trout populations; limiting factors seem to be lack of large woody debris, competition with rainbow trout, along with acidification. Sedimentation doesn't seem to be a problem. Snowshoe hares have been released on Cold Knob. MeadWestvaco prohibits dog training on their land from May to August, although this is not strictly enforced.

Threatened/Endangered/Sensitive (TES) Animals

Threatened and endangered (T&E) animal species that are known to occur in this watershed include the West Virginia Northern Flying Squirrel. Other T&E species for which there is potential habitat include the Indiana bat and bald eagle.

West Virginia Northern Flying Squirrel (WVNFS) – The preferred habitat of the WVNFS in the southern Appalachians is conifer/northern hardwood ecotones or mosaics consisting of red spruce and fir associated with beech, yellow birch, sugar maple/red maple, hemlock and black cherry (NFS Recovery Plan, 1990). Until the late 19th century, spruce forests covered more than 200,000 hectares of the state, but these forests were almost completely eliminated by logging from 1880 to 1920 (Millspaugh 1891; Clarkson 1964). Records from 1983 indicate that at that time spruce forests occupied about 24,000 hectares in the state (Stephenson and Clovis 1983). Recent studies indicate that red spruce has been declining since the 1960s. The exact cause is unknown, although acid deposition is being considered as a contributing factor (Stephenson 1993).

The WVNFS has been captured in many nest box surveys in the eastern high elevation spruce forests in this watershed. Mixed conifer and northern hardwood forest types with conifer as a component, cover approximately 10 percent of the Cherry River Watershed. Table 3-11 lists the acres by forest type by sub-watershed containing conifer/northern hardwood forest. The majority of this area would be considered suitable WVNFS habitat. Some stands contain conifer, but not in sufficient amounts to be considered suitable habitat. To support the aims of the Northern Flying Squirrel Recovery Plan (FNSRP 1990), efforts should be made where possible in this watershed to manage marginally suitable habitat to enhance its conifer content. Because little research has been done on the effects of silvicultural management on the WVNFS, opportunity exists in suitable habitat to study the effects of management, i.e., releasing conifer, or enhancing yellow birch.

Indiana bat – There are no caves within this watershed. No caves within 5 miles of this watershed have been noted to host Indiana bats during hibernation. These bats are known to forage in upland areas. Maternity sites are in mature hardwood forests. During bat mist netting in this watershed, one juvenile male bat was found during a bridge survey. Subsequent bridge surveys and mist netting around this site were negative for Indiana bat captures. This bat capture was during early August in a very dry summer. It is possible that this could have been a bat migrating back to a winter hibernaculum. At this time, no confirmed maternity colonies have been found on the Monongahela National Forest.

Bald eagle – This area contains one 43-acre man-made lake. It receives heavy recreation use from anglers, campers, and hikers. No bald eagles have been sighted at this lake, other than an occasional sighting during migration. There is no other potential habitat within this watershed. The only known bald eagle nests with in the state of West Virginia are in the northeastern counties.

Sensitive Species

Species on the Region 9 sensitive species list that have confirmed occurrence within the project area include the candy darter, Appalachian darter, New River shiner, Allegheny woodrat, green salamander, hellbender, and timber rattlesnake. Other sensitive species that may occur within this watershed include southern rock vole, eastern small-footed bat, Appalachian water shrew, northern goshawk, loggerhead shrike, and Diana fritillary. Goshawk surveys using taped calls were done in this watershed during May/June 2001. No goshawks were observed during these surveys; a second survey will be done in spring 2002. A section of one Breeding Bird Survey route goes through a section of this watershed. No loggerhead shrikes have been observed on this route.

Management Indicator Species (MIS)

The Monongahela Forest Plan lists MIS that were selected to represent important game species, T&E species, species of unique interest, and species to represent other habitats. The objectives were to maintain viable population levels (for TES species), or to reach desired population objectives for other species. (See Forest Plan, L-1).

MIS Species within the Cherry River Watershed:

Virginia big-eared bat (VBEB) – is not known to be present within this watershed. There are no caves within this project area or within a 5-mile radius that support summer or winter populations of this species. No VBEB were captured on bat mist netting done within this watershed.

Indiana bat – there are no confirmed maternity colonies within this watershed. One juvenile male was captured during a bat survey on a bridge on the Cherry River. No Indiana bats were captured on subsequent mist netting or bridge surveys in this watershed. No Indiana bats have been captured in other mist netting on the Gauley District.

The most common bat species captured during bat mist netting or bridge surveys in this watershed include little brown bat, big brown bat, northern long-eared, eastern pipistrelles, and red bats. A few hoary bats were captured. One Indiana bat was captured on a bridge survey.

Cheat Mountain salamander – is not known to be present within this watershed. Dr. Thomas Pauley has surveyed all areas on the Gauley District that he felt had potential habitat. No Cheat Mountain salamanders were found.

Wild Trout – native brook trout are found in several tributaries in the Cherry River watershed. Placement of limestone sands by WVDNR in the North Fork Cherry River and its tributaries should improve native brook trout habitat by decreasing the effects of acid deposition.

Black bear – are present within this watershed. The Cranberry Wildlife Management Area manager feels that black bear populations in this watershed are stable to growing (Dale 2001). Part of the Cranberry Black Bear Sanctuary is located in this Watershed. No bear hunting, dog training or dog running is allowed in the Sanctuary.

Wild turkey – populations are probably steady in the lower elevations of the western side of the watershed. Populations would be lower in the higher spruce elevations that are not primary habitat.

White-tailed deer - based on the antlered buck kill in the Cranberry Wildlife Management Area, deer populations are estimated to be approximately 10-20/sq.mi. in this watershed. (WVDNR 1998; WVNDR 1999).

Gray squirrels – scarce in higher spruce elevations. Abundant in lower elevations. Populations have increased because of good mast year last year.

Varying hare – present in watershed, probably in isolated populations. A spot survey was done in several stands, which had been cut to enhance varying hare habitat. A few pellets were found, indicating presence of the hare in the area, but no indication of numbers present.

In WV, the snowshoe hare inhabits dense thickets of rhododendron and other low-growing shrubs with numerous small openings close to cover. They feed on beech, birch, blueberry, brambles, grasses, cranberry, maple, serviceberry, and rhododendron. Because a diversity of vegetation in mountains provides a variety of woody browse and cover, in sharp contrast to the extensive uniform vegetation of aspen, alder and spruce in its northern range, the vegetation-dependent snowshoe hare does not exhibit the strong cyclic fluctuations of its northern relatives (Stephenson 1993).

MIS Associated Species

No specific surveys were done for general species within the wildlife associations of the MIS species (Forest Plan L-2). These associations were reviewed, and the following information is available on some of those species.

Based on observations of the DNR area manager, bobcats are common throughout. Gray fox are common throughout; red fox are more common on the western side of the watershed, although they probably do run the roads in the higher elevations. Raccoons, opossum, and mink are all common. Beaver are common and increasing in numbers. (Dale 2001)

Neotropical Migratory Birds

Partners in Flight (PIF) have developed priority bird species and habitats for physiographic areas across the U.S. The MNF lies in the Mid-Atlantic Ridge and Valley (Physiographic area 12) (Rosenberg 2000). Table 3-14 shows the priority birds and habitats in this region, and their probability of occurrence in this watershed according to point count surveys done on the Gauley District and also on WV Breeding Bird Atlas data (1994).

Table 3-14: Neotropical Migratory Bird Occurrence Probability

Habitat and Species	**Probability of occurrence in watershed**
Early successional habitat	
Bewick's wren	Rare in the state; no breeding observations in watershed; has been recorded during migration
Golden-winged warbler	Present, but not abundant, in lower elevations
Prairie warbler	Present, but not abundant, in lower elevations
Whippoorwill	Although present in state, few to no observations in this watershed
Mature deciduous forest	
Cerulean warbler	Present, but uncommon above 2,000'
Worm-eating warbler	Present, but not common
Louisana waterthrush	Present, but not common
Wood thrush	Common to abundant in deciduous forests
Northern hardwood /spruce-fir forests	
Black-throated blue	Common in the higher spruce elevations
Blackburnian warbler	Common in the higher spruce elevations
Grassland	
Henslow's sparrow	No point counts have been done specifically in grassland areas on district; however, one USFWS BBS route goes through some sections of open pasture with no recorded observations; rare in state.

Wildlife Items of Concern

Year-round dog training – In the past, dog training in this state was limited to several months of the year. Recently, state laws were changed to allow dog training all year round. This means that dogs are being trained in the woods during the breeding season when wildlife species are very vulnerable. Young animals, such as bear, deer, turkeys, grouse, bear, owls, and ground-nesting songbirds, are at risk of being injured or killed by dogs, or separated from their mothers. Songbirds nesting in the low understory are at risk of being knocked out of their nests. Dogs let loose in adjacent areas cross over into the bear sanctuary. One option to resolve this problem would be to close public lands to dog training during the spring/early summer months.

ATV trespass – ATV trespass is common in this watershed with trails observed off roads into wooded areas.

Trash dumps – Many areas in this watershed are used as sites to dump trash, such as old washers, furniture, tires, cars, etc. Broken glass, sharp metals, and toxic materials can cause injury to wildlife. One option for resolution would be to develop partnerships with local landowners and volunteer groups to do cleanups, develop education programs to discourage future dumping, and work with local authorities to patrol these areas in an effort to catch offenders.

Feeding - Picnickers and campers frequently feed or leave out food purposely to feed bears and other wildlife. Wildlife becomes habituated to this resource. Subsequent damage to campers, coolers, tents and vehicles leads to complaints. Bears have frequently been trapped by WVDNR agents, and moved to other locations. Repeat offenses have resulted in the execution of “trouble bears”.

Fragmentation

Generally, permanent habitat fragmentation is not an issue in West Virginia. Permanent habitat fragmentation occurs when forested land is converted to another use such as roads, grassy openings, or construction of buildings for residences, offices, and other commercial uses where trees once covered the landscape. Over 75 percent of West Virginia is forested. The Monongahela National Forest is over 90 percent forested. Temporary habitat fragmentation occurs when forested land is harvested through regeneration cuts. The effects of this temporary habitat fragmentation are relatively short-lived. Timber harvesting restrictions on National Forest Land that limit the amount of acres regenerated, the size of each cut, and distances between cuts, make it highly unlikely that any temporary fragmentation would be sufficient enough to cause adverse impacts to wildlife that require interior forest habitats.

Human Uses

Heritage Resources

The vast majority of the watershed has felt the impact of human use. Some impacts, although not currently measurable, occurred between the 18th and early 20th centuries. These would have included impacts to forest tree species age and diversity, wildlife populations, soils, viewsheds, fragmentation/openings ratios, and the demographic profile of the area (Indian-to-colonial at low-to-moderate population density). The most dramatic changes, however, took place after the incorporation of the Cherry River Boom and Lumber Co. in 1901.

Reference Conditions

The conditions described in the terrestrial reference condition for this area for the distant past is integral to understanding the presence of people on the landscape for the last several thousand years. Studies of pollen and spore analyses from the region and comparative data (e.g., Carbone 1976; Davis 1983; Wilkins 1977) indicate that a southward displacement of boreal floral and faunal species followed the terminal glacial retreat. Pockets of tundra vegetation, dominated by spruce, fir and pine, extended from the north into the uplands region of the Appalachian range between 25,000 and 15,000 BP (before present). The transition to more modern flora begins between 12,500 and 10,000 BP with an increase in deciduous forest, with species including oak and ironwood present. This period coincided with the first probable human use of the region. This epoch also saw the extinction of many faunal species including elephants, camel, mastodon, giant bison, giant peccary, giant beaver, ground sloth, and woodland musk ox. By 10,000 BP the transition to a mixed coniferous-deciduous forest had begun.

By 7,500 BP mixed hardwood forests were present on the Allegheny Plateau, with the expansion of birch, oak and hickory communities. Continued warming trends led to mixed hardwood forests at higher elevations. Around 5,000 BP spruce forests experienced resurgence in Pennsylvania and West Virginia, probably indicating the spread of diverse open forest canopies and bog settings (i.e., the growth of *Picea rubens*). Modern climatic conditions were probably in place by around 3,000 BP, although various peaks-and-valleys in temperature and moisture regimes continued to the present. This affected both the vegetation mixes and fish/wildlife species and by direct extension, subsistence patterns for people.

Human use of the landscape during the PaleoIndian and Early/Middle Archaic sequences (ca. 11,000-6,000 BP) was largely restricted to hunting/gathering/fishing, and establishment of domestic sites. The bedrock types in the study area may have encouraged quarrying for raw material to make stone tools. The presence of numerous potential campsites in the form of rock shelters also may have encouraged human use of the landscape at this time.

The implications of the early prehistoric period on the reference condition of the watershed are minimal. Some modification of plant communities occurred through harvest and selective protection; some animal populations were controlled through hunting and trapping; and the use of fire as a habitat management tool may have occurred. However, by and large, human populations are perceived to have been too small during the early periods (Paleo-Indian and Early/Middle Archaic) to cause significant effects on the environment.

In contrast, Late Archaic and Woodland Period societies (ca. 6,000 BP to 1600+ AD, including early European colonization/contact) had increasingly noticeable impacts on the environment. Larger populations, new technologies, an evolving subsistence strategy, and associated increases in the size and duration of occupation of villages, all led to deeper and more widespread human impacts. The major activities that changed the environment were: the intentional encouragement and protection of plant communities; burning to open up the understory and enhance game habitat, targeting berry and mast species, and contributing to an oak presence; the adoption of horticulture and agriculture over the last 2,000 years, requiring cleared gardens and fields, many near streams and rivers; and biodegradation of local environments associated with, for example, long-term village locations.

In summary, subsistence activities and residential sites would have had an effect on the health and diversity of the forest community, size and behavior of wildlife species, and fragmentation of the forest. It also increased sedimentation rates in the streams near villages. The Native American population was displaced through disease and war, starting in the 17th century. The effect of smallpox on the Native American was enormous; by some estimates more than half the pre-European population was killed by smallpox before they had even laid their eyes upon a wagon. Thus, the pre-Contact patterns of their lifestyle are now known only through archaeology, oral history and a handful of early settlers' or explorers' accounts.

Historic Conditions

The European presence on the landscape changed everything. Colonization of the region began in earnest after more than a century of socio-economic disruption, demographic decline, disease, and three wars involving Indians and Europeans. A series of forts and trading posts were established in this portion of what was then Virginia between 1760 and 1791. After the conquest and pacification of the Ohio Valley tribes in the 1790s, the earliest towns were chartered; the first and nearest to the watershed was Edmunton (later Beverly). The area around Marlinton, first settled in the 1750s, remained thinly settled and relatively undeveloped until the late 19th century. Beginning in the 1890s, the promise of growth and prosperity through the exploitation of coal and timber, aided by rail transport, saw the birth of numerous planned communities in West Virginia. Richwood, purchased and platted by the Cherry River Boom and Lumber Company, was founded in 1901, just a decade after the purchase and platting of Marlinton in 1891 by the Pocahontas Land Development Company.

The next few decades witnessed more major changes to the landscape and impacts on the environment than the cumulative impact of 12,000 years of Native American land-use. By some estimates, upwards of 30 billion board feet of timber were cut in West Virginia between 1870 and 1920 (Clarkson 1964). The area was also subjected to slash fires and was more severely flooded as a result of increased surface runoff. Recognizing the devastation brought about by unregulated logging, President Wilson declared the boundaries of the Monongahela National Forest in 1920. Subsequently, significant reforestation was accomplished through the efforts of the Civilian Conservation Corps in the 1930s. Under the stewardship of the National Forest, the area is once again thriving, albeit with significantly altered floral, faunal, sediment, and hydrological regimes.

Exhaustion of the forests, coupled with the Great Depression, brought about a precipitous economic and social decline. Many towns and small communities were abandoned. Within the assessment area, the infrastructure aspects of this settlement/industrial system (i.e., homes, farms, schools, mill sites, transportation systems, etc.) tend to cluster around Richwood. Within National Forest System lands, much of this infrastructure now exists only as archaeological sites and some "cultural landscapes".

Current Conditions

Given the current state of research in the watershed area, it is not possible to characterize in any meaningful way prehistoric use of landscape. This inability is due to the fact that no site evaluations (beyond administratively dismissing Isolated Finds and severely disturbed sites) have been conducted. Thus, while many sites have been identified, we do not know when they were occupied or what types of activities their inhabitants were engaged in. Some of the previously recorded sites have a very high potential for yielding important information on prehistoric utilization of the area. Until these sites are evaluated, however, our knowledge of the prehistory of the project area will remain unknown. It is known that the area has a high potential for locating prehistoric resources based on the results of previous surveys, coupled with the facts that the project area lies near the confluence of three major rivers and that the northern boundary follows a well-used transportation route during pre-colonial and early colonial times.

The results of previous archaeological surveys indicate that most historic period activity in the area was related to resource extraction, particularly mining and logging. A comparatively small proportion of historic period sites located in the watershed were devoted to human habitation. The former community of North Bend was recently located in the project area, and investigation and evaluation of it would in all likelihood provide important information on the historic period occupation of the project area. The historic period occupation of the area was, and continues to be, focused on the town of Richwood.

There are numerous sites and features left on the landscape. They are the correlates to the standing architecture and functional outbuildings of the historic economy. We would therefore expect the remains of communities, houses, barns, outbuildings, mills, blacksmith shops, schools, logging camps, mining structures, etc. to still be identifiable.

Also, the footprints of transportation systems, and vegetative "artifacts" in the form of complete and partial cultural landscapes (apple orchards, pine plantations, sugar bushes, openings, and more) will likely be located. Their distribution is heavily biased toward the main transportation arteries.

Cultural resource surveys were conducted over a portion of the watershed assessment area, in order to determine more accurately the types and locations of sites that may be affected by construction disturbance related to watershed improvement and other Forest Service management activities. Potential ground-disturbing impacts related to watershed improvement include alterations to roads, drainages and riparian systems. Road alterations may consist of creating new roads or improving or closing existing roads. Drainage improvements may include enlarging existing culverts and drainages, and constructing more cross-drains. Potential riparian modifications include the construction of in-stream structures, as well as stream bank stabilization. Other potential Forest Service activities include the implementation of ongoing land management plans such as timber sales, mineral and natural gas leasing, among others.

Other potential threats to the integrity of historic and prehistoric sites (discovered and undiscovered) include:

- unregulated development on private lands
- natural/anthropic processes such as erosion
- vandalism/looting

Currently, the nature, extent, and scope of potential impacts in the Watershed Assessment Area have yet to be decided upon. Therefore, it is not possible to identify specific areas that require archaeological survey. The work reported on here thus represents an attempt to provide a broad characterization of the types and density of cultural resources to be found in the project area.

The most recent survey of the assessment area located additional archaeological sites. Prehistoric sites ranged from small lithic scatters covering only a few square meters to large base camps that extend over several thousand square meters. Unfortunately, only one of the prehistoric sites yielded diagnostic cultural material, indicative of the age of the site's occupation. This material consisted of a single constricted stemmed projectile point dating to the Late Archaic period (c. 3000 to 1000 BC). Historic sites consisted primarily of the remains of activities associated with resource extraction. These include railroad grades and other transportation-related features, and logging and mining camps. A single historic period home site was located.

A total of 36 Heritage Resource surveys have been conducted either wholly or partially within the current watershed assessment area between 1981 and 1998. The total area in acres covered by these surveys is shown at the base of Table 3-15.

Table 3-15: Previous Surveys in the Cherry River Watershed Assessment Area

Project Name	Total Acres	Acres in Current Project Area
Hacking Run TS	666	666
Music Run TS	443	179
Camp 29 TS	4590	4590
Cabot No. 3 Gas Well	1	1
Cabot No. 7 Gas Well	2	2
Cabot No. 3 Alternate Gas Well	2	2
Non-C.E. Silviculturist Certification Candidate Project	168	168
Left Branch-Eagle Camp Roads	11	6
Coats Run TS	331	296
Road	1	1
Summit Ridge TS	32	32
Vicki Energy Mine	2	2
Hamrick Run TS	58	58
Road No. 946 Borrow Pit	1	1
Briery Knob Energy Core Drill Project	1	1
GP Polar Tipple Site Land Exchange	65	39
Rabbit Run TS	1276	1276
Coats Run Road	71	71
Hewitt Prospecting	3	3
Eagle Camp TS	1131	1131
Hamrick Run Coal Co. No. 2 Coal Mine	1	1
Summit Fisherman’s Trail Parking Lot	1	1
East Bear Run TS	1700	1577
Curtin Run TS	250	220
Natural Gas Replacement HT-8	50	36
Goose Hollow TS	295	4
Hacking Run Clearcut	23	23
Gauley Ranger District Office Construction	2	2
Hunter’s Haven TS	357	346
Forest Road 99A	1	1
Hunter’s Haven Temporary Road	1	1
Queer Branch TS	315	72
Cherry River OA	484	447
Holcomb OA	620	446
Gauley River and Frosty Gap OAs	4226	3226
North Bend Pine Salvage Sale	2	2
TOTALS	**17184**	**14930**

This previous survey data indicates that all but one of the heritage surveys were project-driven. Surveys have been conducted primarily for timber sales, followed in order of importance by energy extraction, roads, and lands**.**

A total of 75 heritage resources have been recorded previously in the Cherry River Watershed Assessment area. Of these, 30 represent the remains of prehistoric resource exploitation and/or habitation, while 41 represent Euro-American historic period activities; two represent multicomponent prehistoric/20th century deposits, while two sites date to the 19th century. Heritage sites include old sawmills, school, home sites, bridge, cemetery, railroad grades, logging camps, other campsites, rock shelters, lithic scatter, mines, and unidentified structures.

It should be noted that many of the sites were recorded in 1977 and 1978 during the initial Cultural Resources survey of the Forest. This survey involved checking old maps and West Virginia Geological Survey site records for sites on Forest Land. It did not involve any fieldwork. Of the 31 "archivally-located" sites recorded in the watershed, seven were subsequently located in the field, while six were not; 18 remain to be looked for. Given the fact that the total success rate on the District for locating these "archival" sites is approximately 60 percent, it is likely that many of the sites on record will not be located.

As previously mentioned, numerous sites have already been recorded in the Cherry River Watershed Assessment Area. These sites have, however, only been identified and avoided during Forest management activities (flagged and avoided); their true potential to aid in understanding the long-term ecological conditions of, and human impact to, the watershed have not been realized. Potential for sites in the assessment area is high. Given the previous patterns of site location in the watershed, and the relative ubiquity of water, any area (e.g., bottom, bench, terrace, saddle) with a slope of 10 percent or less has the potential to yield both prehistoric and historic resources. There is a strong trend towards prehistoric sites horticultural/agricultural (and fishing) village/base-camp sites along the lower terraces and floodplains; lithic workshops and/or quarries (at outcrops); "traditional use" sites at higher elevations and vistas; and hunting/gathering sites scattered throughout the area. There are so few burials known throughout the state that there is no reliable pattern that can be inferred at this point.

Except in flood plains and core areas of historic development, existing sites should have retained much of their physical integrity. However, it should be noted that extensive and severe damage has occurred to numerous sites in the area, some on Forest Land, due to the actions of enthusiastic amateur archaeologists in the 1950s and 1960s. Speculation for locating additional sites is that many of the same factors making an area attractive in the past (e.g., water, vistas, drainage, slope) makes them attractive today. Thus, an increased emphasis on site discovery (vs. site area avoidance) during "compliance" archaeology would increase our sample size.

No sites have been intensively evaluated or investigated to date. Preservation of features within sites that contain organic (or carbonized) remains is relatively uncommon in the region's acidic soils, but can occur, particularly in protected locations. Historically, frequent large-scale flooding events have probably reduced the preservation potential of valley-bottom sites, but first and second order terraces, and bedrock-protected streamside locations, may offer good preservation potential. Within prehistoric archaeological sites, fire hearths and storage pits tend to retain the greatest amount of organic or carbonized/organic materials for analysis. In addition, natural features such as ancient ponds, bogs, and wetlands offer the opportunity to do palynological cores reflecting changes, which may complement such analyses. Just about all site types have the potential to have hearths (which may contain the charred remains of nuts, seeds, bones, wood). Storage pits are generally associated with more sedentary, horticultural societies, both later in time and generally lower in elevation than other sites types/time periods.

The floodplains along the Cherry, Gauley, and Cranberry have been well scoured over time, and the slopes in much of the watershed would be prohibitive (or at least discouraging) for agriculture; therefore, these areas may not have good potential for the presence or preservation of such features. Finally, we know that the highest elevations have little or no potential or history for long frost-free seasons; so, by process of elimination, we would expect that the lower hills would be prime “preservation” areas for sites with features associated with agricultural/horticultural settlements.

Minerals

With the introduction of powered equipment in the 1930’s for underground mining operations and again in the 1940’s for surface mining operations, coal mining production in the watershed area increased. The surface disturbance of mining is visible on modern topographic maps. More recently, however, coal production has tapered off due to economic reasons.

Mining operations on NFS from the 1930’s and into the 1970’s have altered topography and hydrology in the Watershed. At some mining locations, benches cut into hill slopes have disrupted normal surface runoff and Groundwater flows. The surface disturbance creates a concentration of water flowing over the mine bench as well as the loose mine spoil (soil and rocks) located down gradient of the mine bench. The impact of water concentration off the mine bench is an increase in sediment transport to the streams.

Additionally, some underground mines appear to have effects in that they accumulate groundwater. Groundwater flowing to these underground mine workings come in contact with exposed rock/coal surfaces. The groundwater leaches out minerals, which in turn may further acidify the water. When the mine works are filled, this water flows out on the surface and into receiving streams contributing increased acid load into the Watershed.

Mining activity is heaviest south of the North Fork Cherry River Watershed boundary on private land. Inactive mines within the national forest portion of the watershed are found at 16 locations.

Table 3-16: List of inactive mines on National Forest Land in Cherry River Watershed

Mine Site #	Mine Site Name	Quad Name	Type of Mining
MF-1012	Hamrick Run High Wall	Fork Mountain	Underground
MF-1013	Bear Run Mine	Lobelia	Underground
MF-1014	Bear Run Mine	Lobelia	Underground
MF-1015	Bear Run Mine	Lobelia	Underground
MF-1016	Bear Run Mine	Lobelia	Underground
MF-1017	Cherry River Mine	Camden on Gauley	Underground
MF-1018	Briery Knob Highwall	Lobelia	Surface
MF-1019	Windy Run Mine	Fork Mountain	Underground
MF-1020	Armstrong Mine	Fork Mountain	Underground
MF-1042	Armstrong Run Deep Mine	Fork Mountain	Underground
WV-1666	Fork Mountain Highwall	Fork Mountain	Surface
WV-1567	Fork Mountain Highwall	Fork Mountain	Surface
	Cherry River Mine	Craigsville	Underground
	Cherry River Mine	Craigsville	Underground
	Cherry River Mine	Craigsville	Underground
	Ten Mile Branch	Fork Mountain	Underground

There was no reported production of natural gas in Greenbrier County from 1979 to 1999 according to West Virginia Geological and Economic Survey (WVGES). Nicholas County reported an average annual production of 2,500,000 (Mcf) of gas from 1979 to 1999. There were an average of 279 wells in production from 1979 to 1999. None of this production was obtained from the watershed area.

According to WVGES a well was drilled near the southern perimeter of the watershed. It was characterized as a non-productive well in a deep zone. This well was drilled in the early 70's. (Cardwell, 1982, pg 143 & 147)

Mineral materials removal potential in the watershed is negligible and not expected to change in the foreseeable future. It consists of an occasional request for a personal use permit to remove a few tons of native stone from the land surface.

Recreation

Present recreation uses of the area include, but are not limited to hiking, biking, picnicking, fishing, hunting, driving for pleasure, wildlife viewing, cross country skiing, gathering forest products, nature photography, and camping.

The Summit Lake Recreation Area is recognized as an ancillary facility to the Highland Scenic Highway National Byway. As such, funds are available through the TEA-21 program. Approximately 20 miles of the Highland Scenic Highway, beginning at Richwood on State Route 39, are located within the Cherry River Watershed.

The section of North Fork Cherry River from Darnell Run to ½ mile above the Richwood city limit (15.6 miles) was found to be eligible as a "Recreational" river (USDA Forest

Service 1995) under the Wild and Scenic River Study Report (WSRSR) for twelve rivers on the Monongahela National Forest. The portion of the Highland Scenic Highway along State Route 39/55 follows the river and crosses it 3 times.

Although the South Fork Cherry River was found to be ineligible for wild, scenic, or recreational classification in the WSRSR, it was identified for study by the National Park Service in the Nationwide Rivers Inventory (NRI) in 1981. The Forest Plan requires that any river listed in the NRI be managed so as not to preclude a potential classification as a "wild" river.

Special Uses

Special uses and easements in the Cherry River Watershed include the following:

- Hope National Gas Co. – pipeline right-of-way occupying 8:43 acres.
- Southern Bell Telephone & Telegraph Co. – 15 feet telephone & telegraph R/W occupying six acres.
- Monongahela West Penn Public Service Co.- 60 feet right-of-way electric transmission and distribution line.
- Tristian Hinkle - Pasture - Use and maintenance of plot #2 for hay crop & pasturing of maximum two animals units of cattle on 3.84 acres.
- Daniel & Martha E. Barker - Pasture for maximum one animal unit of cattle for grazing season, May 1 through November 1, annually on 1.14 acres.
- Cherry Hill County Club Golf Course on 5.75 acres.
- Sewell Coal Co. Operation and maintenance of processing plant, bridge approach, RR sidings and two settling ponds on 6.36 acres.
- Monongahela Power Company – operating and maintaining a 7200 volts powerline across US Tracts 372 and 885 for 50 feet wide right-of-way on 44.17 total acres.
- Monongahela Power Company – Construction and maintenance of a 20 feet powerline to furnish electric service to USFS radio installation being 255 feet long carrying 7200 volts. Expires 2009.
- Bell Atlantic (May 12, 1966) – 6' wide underground telephone line on 1.0 acre.
- West Virginia Department of Highways – road right-of-way 132' wide and 1.43 mile length along Route 39 from Richwood to Greenbrier County line.
- John J. Esker – road right-of-way for access to private property along Route 39 – North Fork Cherry River – 12 feet wide for 0.04 miles.
- John D. Hicks – road right-of-way for high-water bridge & approach for access to private property along Route 39 – North Fork Cherry River – 16 feet wide for 0.03 miles.
- T. E. Morrison - road right-of-way for access to private property along Route 39 – North Fork Cherry River – 16 feet wide for 0.03 miles.
- H. H. Perrine – road right-of-way for access to private property along Route 39 – North Fork Cherry River – 16 feet wide for 0.03 miles.
- H. H. Spencer, Jr. – road right-of-way for access to private property along Route 39 – North Fork Cherry River – 16 feet wide for 0.03 miles.

- Gerald & Lucille Shawver – road right-of-way for access to private property along Route 76.2 – Cranberry River Road – 66 feet wide for 0.54 mile.
- Charles & Goldie Myers – 66 feet wide right-of-way for 0.08 miles.
- S. R. Doss – 15 feet wide right-of-way for 0.02 mile to access private property.
- Monongahela Power Company – 30' 7200 volts powerline across US Tract 372, 100 feet in width and portion 33 feet in width.
- Monongahela Power Company – powerline for providing electrical service to private residence of Clifford Lyons - 39 acres.
- Bell Atlantic – 6 feet wide underground telephone line to provide service to public along Rte 39.
- J. Kevin Kessler – 12 feet wide right-of-way for 0.06 miles to access private property off of Route 99/2.
- Robert S. Hodovan – cultivation and production of garden crops on 1.7 acres.
- Nicholas County Board Of Education - service building and road right-of-way to access building.
- Hope Gas, Inc. – 0.09 acres for 543 feet of 3-inch carrier gas pipe buried below road surface.
- Monongahela Power Company – 35 feet width 7200 volt powerline for 700 feet; 30 feet for 3745 feet in length; 37 feet for 4869 feet on 44.17 acres.
- Bell Atlantic – 0.8 acres for underground telephone line to service public along Route 39.
- City of Richwood - installation and maintenance of a 6-inch cast iron conduit for water transmission purposes to city of Richwood – 0.01 miles.
- West Virginia Department of Highways – 132 feet wide right-of-way for 1.03 miles on Route 39 from Richwood to Greenbrier County line.
- West Virginia Department of Highways – 66 feet wide right-of-way for 0.5 mile on Route 39 from Fenwick to Richwood.
- Arlene Roach – 20 feet wide right-of-way for 0.07 mile off Route 20.
- Earl M. Spencer – 14 feet wide right-of-way for 0.02 miles.
- Georgia Pacific – Easement for 20 feet logging road and 30 feet access road.
- Unknown Third Party – Easement for 30 feet electric transmission lines.
- State Road Commission - Easement for road right-of-way for State Route 39 being 60 feet in width.
- Weather Station – special use for rain gauge on Mike’s Knob.
- Sewell Coal Company - access to private land along road marked "unknown” for 33 feet wide right-of-way for 1.19 mile off of Route 29/4.

Roads

Table 3-17: State Routes

Road **#**	**Miles**	**Opportunity Area**	**Remarks**
SR 7	2.8	Cherry River	Paved
SR7/3	0.6	Cherry River	Dirt/Gravel
SR 7/4	1.5	Cherry River	Paved
SR 15/6	0.8	Holcomb	Dirt/Gravel
SR 20	8.9	Holcomb/Cherry River/Sugar Knob	Paved 2 Lane
SR 29/4	1.8	Spruce Run	Dirt/Gravel
SR 39	≈20.0	CherryRiver/BrieryKnob/DesertBranch Summit Lake/Rabbit Run/Bear Run	Paved 2 Lane
SR 39/5	2.2	Summit Lake	Paved 2 Lane
SR 39/12	1.5	Cherry River	Gravel
SR 39/17	1.5	Desert Branch	Paved/Gravel

Table 3-18: Forest Service Specified Roads

Road #	Miles	Opportunity Area	Remarks
FR 76	2.4	Cherry River	Open – paved 2 lane
FR 77	3.1	Summit Lake/Frosty Gap	Open from SR 39/5 to FR 99 junction
FR 84	1.7	Holcomb	Closed/Gate
FR 99	7.8	Briery Knob	Open 10/15 – 12/31 to middle gate
FR 99A	0.5	Briery Knob	Closed/Gate
FR 99B	0.3	Briery Knob	None
FR 223	3.8	Bear Run	Open
FR 223B	2.0	Bear Run	Closed/Gate
FR 249	1.2	Spruce Run	Open
FR 388	0.2	Desert Branch	None
FR 399	1.3	Summit Lake	Open – Road to Campground
FR 399A	0.3	Summit Lake	None
FR 730	6.6	Rabbit Run	Closed/Gate
FR 730A	1.2	Rabbit Run	Closed/Gate @ FR 730
FR 731	2.6	Frosty Gap	Closed/Gate (Class Q hunter permit)
FR 786	1.2	Summit Lake	Closed/Gate @ FR 99
FR 788	1.7	Summit Lake	Closed/Gate
FR 848	0.1	Snakeden	None
FR 878	1.8	Summit Lake	Closed/Bunker
FR 907	0.1	Holcomb	Open 7/15 – 4/15
FR 908	4.7	Holcomb	Closed/Gate
FR 914	0.5	Briery Knob	Closed/Gate
FR 914A	0.1	Briery Knob	None
FR 941	1.5	Summit Lake	Closed/Gate
FR 942	0.2	Spruce	Closed/Gate
FR 943	0.8	Summit Lake	Closed/Gate
FR 944	0.8	Summit Lake	Open to gate at parking area
FR 945	0.1	Summit Lake	None
FR 946	3.7	Desert Branch	Closed/Gate
FR 955	0.1	Summit Lake	Closed/Gate

Table 3-19: Woods Roads

Road #	**Miles**	**Opportunity Area**		**Road #**	**Miles**	**Opportunity Area**
G41	1.3	Cherry River		G157	0.5	Briery Knob
G46	0.6	Cherry River		G158	0.5	Briery Knob
G47	1.6	Briery Knob		G210	1.9	Cherry River
G48	0.9	Briery Knob		G211	0.3	Cherry River
G56	1.0	Briery Knob		G212	0.5	Cherry River
G93	0.1	Briery Knob		G213	0.2	Cherry River
G94	0.9	Briery Knob		G214	4.4	Desert Branch
G106	0.2	Spruce Run		G215	1.4	Cherry River
G109	0.2	Spruce Run		G216	0.1	Cherry River
G110	1.0	Bear Run		G216a	2.0	Summit Lake
G112	0.8	Bear Run		G217	0.8	Summit Lake
G113	2.3	Bear Run		G218	2.3	Summit Lake
G114	2.0	Bear Run/Rabbit Run		G219	0.5	Summit Lake
G115	0.5	Bear Run		G220	0.3	Summit Lake
G125	4.5	Frosty Gap		G222	1.7	Summit Lake
G127	2.9	Frosty Gap		G225	1.1	Summit Lake
G130	3.4	Frosty Gap/Bear Run		G226	2.7	FrostyGap/RabbitRun
G136	1.9	Frosty Gap/Bear Run		G227	1.6	Frosty Gap
G137	0.7	Holcomb		G228	0.9	Frosty Gap
G138	0.3	Holcomb		G229	1.0	Rabbit Run
G139	0.2	Holcomb		G302	0.7	Holcomb
G140	0.5	Holcomb		G308	3.8	Holcomb
G141	1.1	Holcomb		G311	0.6	Holcomb
G151	1.5	Briery Knob/Summit Lake		G330	1.8	Rabbit Run
G152	0.4	Briery Knob		G331	2.0	Rabbit Run
G153	0.3	Briery Knob		G332	0.5	Rabbit Run
G154	0.6	Summit Lake		G333	0.5	Bear Run
G155	0.4	Summit Lake		G743a	1.1	Summit Lake
G156	0.4	Summit Lake				

Landlines

There are 49.8 miles of landlines delineating National Forest Land boundaries in the Cherry River Watershed. Approximately 37.1 miles of these boundary lines meet survey standards and are maintained. About 12.7 miles of these boundary lines do not meet survey standards and their location may not be evident on the ground.

TEAM COMPOSITION

The core interdisciplinary team for the Cherry River Watershed Assessment includes:

Tom Cain – Fisheries Biologist
Glen Juergens – Silviculturist
Michele Jones – NEPA coordinator
Patty McClure – GIS Technician
Ron Polgar – Forestry Technician
Jo Wargo – Wildlife Biologist

The extended interdisciplinary team includes:

John Calabrese – Archeologist
Stephanie Connolly – Soils Scientist
Barry Edgerton – Hydrologist
Linda Tracy– Geologist
Gene Clare – Geologist Trainee
Bill Kerr – Landscape Architect

CHAPTER 4
SYNTHESIS AND INTERPRETATION

The Interdisciplinary Team met on Wednesday, September 25, 2002 to discuss the Cherry River Watershed Assessment to determine any significant difference, similarity, or trend between the reference and existing conditions. Discussions centered on the core topics of the assessment and the capability of the system to achieve key management plan objectives.

SOILS/EROSION PROCESSES

Areas with Mauch Chunk soils have high erosive potential. The concern over the erosive process in these areas will shape or limit management activities to protect Mauch Chunk soils.

The erosive potential of areas in the Pottsville geology is not a big concern. Use of the Forest Plan standards and guidelines would allow for most management activities given the low erosive process of the soils in this series. However, some isolated steep areas in the watershed should be given additional consideration if any projects are expected to occur.

AIR QUALITY/ACID DEPOSITION

Acid deposition on soils with Pottsville geology is causing acidification of streams in this area of the watershed. The ability of the soils to buffer acidification, in conjunction with management activities, will shape what/how/where management takes place.

Long-term solutions to this problem are best provided by substantially reducing the sources of acid deposition. This means reducing the amount of air pollution emissions, which is a National problem in scope, and beyond the ability of the Monongahela National Forest to manage. Although the Clean Air Act mandated pollution reductions, and some measures of air quality have improved within the region in recent years, acid deposition continues at rates that are believed to be damaging the more sensitive watersheds. Some of these watersheds may be losing base cations in streamflow at unsustainable rates. The existing effects in some watersheds are expected to persist for a long time, and this is likely to be true in many of the tributaries of the North Fork.

HYDROLOGY

Recent flood events accompanied with past management activities (including timber harvest, roads, mining, trails, etc.) within the watershed are causing additional sediment deposition and channel scour that is impacting channel stability. Protection and improvement of channel integrity should be a highlight in management of this watershed. Natural watershed processes are impaired. Watershed condition is below its potential, and streams within the North Fork and the watershed as a whole are stressed aquatic ecosystems. Much of the stream channel system within the watershed has been impaired through flow and sedimentation effects. Some stream channel reaches have degraded into less stable forms, indicating flow and sediment that are out of balance.

Intense, extensive management on private lands in the South Fork of the Cherry River has shaped the hydrologic condition as it flows into the main stem. Management planning should consider the cumulative impacts of recent past and on-going private land activities with any proposed activities on National Forest Land.

WATER QUALITY

Acid runoff from deposition and mining activities within the watershed (a municipal water supply source) encourages management that should focus on protection and improvement of water quality. Sediment delivery has occurred from past management activities. It continues to occur on private, state, and National Forest Road Systems and from mining roads/sites. Management activities should focus on reducing or minimizing additional inputs of sediment and removing chronic sources. The cumulative impacts across the entire watershed need to be addressed. Stable landscapes and roads within the watershed would reduce storm runoff and sediment effects.

AQUATIC RESOURCES

Fine sediment loading inhibits aquatic productivity. Habitat complexity from loss of lwd has degraded aquatic habitat. More large wood in stream channels would benefit long-term channel stability, and substantially improve aquatic habitat. Acid deposition and runoff from mining activities is also reducing the quality of habitat for aquatic species. Management activities should focus on minimizing or reducing fine sediment inputs, protection of existing habitat, and creation of additional habitat through placement of lwd in streams. In the short-term, the WVDNR and DEP have undertaken the liming of streams to combat the stream acidification effects of acid deposition. While this does not solve the acid deposition problem, it does provide a way to improve stream chemistry to the point that stream biota can be maintained. This program is expected to continue in the foreseeable future.

VEGETATION

Extensive clearcutting at the turn of the 20th century and active forest management over the past 40 years resulted in today's existing forest. Over 70 percent of National Forest Lands are now between 70 to 100 years old. The current condition allows for achieving a more balanced age class distribution. Harvesting some stands of trees would provide space for young trees to grow, while trees in older stands can be left to mature into old growth habitat. Management activities should focus on continuing the use of silvicultural harvest methods that would maintain or increase the diversity of forest tree and herbaceous species while providing economic opportunities for the local communities through commercial timber sales.

Emerging fronts of non-native insects and diseases are increasing mortality of native trees. Invasive non-native plants threaten to reduce the native forest tree, shrub, and herbaceous species. Pro-active management is needed to reduce the impact and retain the natural biodiversity on forested land.

WILDLIFE

The watershed contains habitat for threatened and endangered species as well as plants and animals on the Region 9 sensitive species list. Management activities should focus on protection and enhancement of these species and their habitat.

Forested stands are mostly in the 70 to 100 year old age classes. These age classes represent the peak mast producing years of most tree species. As these older age classes mature they will begin to decline in their mast production capabilities. Management activities should focus on creating early successional habitat from some of the stands in the 70 to 100 year old age classes (no more than 7 1/2 percent of the watershed) to provide for long term mast production capabilities. In addition, management should determine which stands are best suited for future old growth potential to provide habitat for those species that prefer old growth.

HUMAN USES

The South Fork Cherry River is listed in the National Park Service's Nationwide River Inventory. Forest Plan standards require this stream be managed so as not to preclude a "wild" designation at some future point in time. A ¼ mile wide corridor, on National Forest Land, along each side of the South Fork should be managed to minimize impacts to water quality and scenic attributes.

Human impacts have been present in this watershed for thousands of years. People are an inherent part of this watershed and will continue to have impacts on the resources provided by terrestrial and aquatic ecosystems. Management activities should focus on conservative use of the multiple resources in these ecosystems to ensure a sustainable supply over the long term for animals (including humans) and plants.

CHAPTER 5
FINDINGS/RECOMMENDATIONS/ACTIONS

Table 5-1 contains, by core topic, the findings, recommendations, and actions needed to document and implement management projects for watershed improvement/restoration. Detailed information to support these recommendations can be found in Chapter 3 and/or resource reports provided by Forest Specialists for the Cherry River Watershed. Any deviation from the standards and guides listed in the Monongahela National Forest Land Management Plan (MNFLMP) must be described with appropriate mitigation measures in a NEPA compliance document.

Table 5-1: Findings/Recommendations/Actions

FINDING	RECOMMENDATION	ACTION NEEDED
SOILS/EROSION PROCESSES		
Slides, such as those along FR 84 and FT 236, are causing hazardous unstable soil conditions.	Repair slides and stabilize the road and trail. Look for additional sites with existing or potential erosion/slump/slide hazards.	Repair/Monitor/Maintenance/ - prepare NEPA document – if needed.
Acid deposition from rain and snow is causing calcium to leach out of soils.	For all commercial timber harvests (to address the calcium loss issue) - leave tops of trees in cutting units. In regeneration cuts with soils that have poor buffering capacity, consider cutting and leaving pulpwood trees on the ground. Monitor soil resource conditions to better characterize loss of calcium. Continue monitoring pH and calcium levels in streams.	Prepare NEPA document and monitor.

FINDING	RECOMMENDATION	ACTION NEEDED
HYDROLOGY/STREAM CHANNELS		
Degraded stream channels. Slides along the North Fork Cherry River are continuing to be a source of sediment.	Improve channel stability by using natural design methods and strategic placement of "Rosgen structures". Project sites to be determined through site-specific analysis.	Coordinate with WV Department of Highways/Forest Engineer through maintenance or NEPA document.
WATER QUALITY		
Abandoned/restored mines are discharging sediment and acidic water into streams.	Restore/repair/revegetate abandoned mines in Bear Run, Hamrick Run, Carpenter Run, Tenmile Branch, and Briery Knob. Continue to add limestone sands to streams adversely affected by acid deposition and mine discharge. Continue to sample water quality in affected streams.	Coordinate with WV Department of Environmental Protection (WVDEP) and Division of Natural Resources (DNR). Prepare NEPA document. Monitor & maintenance.
FR 730, 731, and 941 and various woods roads are contributing excessive sediment to nearby streams.	Repair problem areas along roads, identify culverts that are too small and replace with larger culverts. Maintain clean ditch lines and clean debris out of culverts or replace small culverts with larger culverts. Seed bare soil and place silt fences or hay bales to minimize sediment transport. Abandon or obliterate roads not needed for long term transportation plan.	Maintenance or reconstruction – prepare NEPA document – if needed. Monitor.
State Roads 39/55 and 94 are having an adverse impact on aquatic conditions and water quality.	Repair slumps/slides and other problem areas.	Coordinate with WV Department of Highways to repair damages with federal cost/share dollars.
Skid and haul roads used for timber harvesting may contribute additional sediment to streams.	Utilize standards/guidelines in Forest Plan to minimize additional sediment in streams. Incorporate newly adopted riparian buffer strips where needed. Consider helicopter logging on steep slopes or sensitive soils.	Prepare NEPA document and monitor.

FINDING	RECOMMENDATION	ACTION NEEDED
AQUATIC RESOURCES		
Lack of large wood debris (lwd) in stream channels.	Identify areas to place lwd in stream channels or passively recruit lwd by leaving trees in riparian areas. Trees utilized for lwd placement should be directionally felled and selected to minimize solar radiation to streambed.	Monitoring or prepare NEPA document if placing lwd in streams.
Elevated fine sediment levels in some streams.	Continue sediment sampling efforts on National Forest Land. Work with WVDEP and Forest Engineer to locate and repair sediment sources on mines and roads.	Maintenance/restoration/ reconstruction – prepare NEPA document – if needed. Monitor.
Some road culverts may be restricting access to upper stream reaches.	Identify culverts that are restricting passage of aquatic organisms and replace with structures that would allow easier access.	Prepare NEPA document and monitor.
Presence of non-native aquatic species.	Emphasize and encourage the recovery of native aquatic species in the watershed.	Coordinate with DNR.
Presence of sensitive native aquatic species.	Conduct surveys to characterize existing aquatic habitat and population inventories of fish and sensitive aquatic species.	Coordinate with DNR.
VEGETATION		
Presence of non-native invasive plants.	Use only native plant species in seed mixtures, when possible. Develop seed/lime/fertilizer mixtures based soil type, soil pH, and soil fertility. Prepare plan for control or eradication of non-native invasive plants with herbicides, prescribed burning, mechanical treatments or other appropriate method.	Consult with Certified Silviculturist, Forest Botanist, and/or Forest Soils Scientist. Prepare NEPA document and monitor.
Presence of native sensitive plant species.	Determine why plant species are on the sensitive list. Conduct botany surveys. Maintain or increase the sensitive plant populations through protection, management, propagation, and/or planting.	Consult with Forest Botanist and Certified Silviculturist. Prepare NEPA document if needed.
Red spruce forest type has been substantially reduced from reference condition.	Encourage germination of red spruce seeds and release of seedlings and saplings through commercial timber harvests.	Prepare NEPA document and monitor.

FINDING	RECOMMENDATION	ACTION NEEDED
Non-native insects and diseases are changing forest vegetation structure.	Monitor insect and disease locations/infestations. Remove susceptible, diseased, dying, and dead trees through commercial or non-commercial timber or salvage harvests. Recolonize area utilizing natural or artificial regeneration methods.	Prepare NEPA document and monitor.
Over 70 percent of National Forest Land is between 60 to 90 years old.	Utilize even-age management techniques to diversify habitat and mast/browse production capability by providing early seral habitat and a wide range of different age classes.	Prepare NEPA document and monitor.
Commercial timber harvests can improve the health, growth, structure, and diversity of forested land.	Prescribe detailed silvicultural treatments to maintain or improve forest vegetation diversity and wildlife habitat through economically viable commercial timber sales.	Prepare NEPA document and monitor.
Non-commercial thinning potential exists for young stands clearcut in the 1980s and early 1990s.	Use the crop tree release method to select and release healthy, valuable, and well-formed trees.	Prepare NEPA document and monitor.
Butternut trees are not as common due to disease.	Locate potentially disease resistant butternut trees and release them from competition. Plant disease resistant butternut trees in suitable regeneration harvest areas.	Prepare NEPA document and monitor.
WILDLIFE		
Recent survey information is not available for many species.	Construct and place nest boxes for saw-whet owls, bats, blue birds and wood ducks. Conduct surveys for Management Indicator Species.	Secure funding for surveys. Maintain and monitor nest boxes.
Permanent water sources are lacking in some areas of the watershed.	Create ponds in areas where permanent water sources are scarce.	Prepare NEPA document and monitor.
Grassy wildlife openings are lacking, widely scattered or in inappropriate locations.	Create grassy wildlife openings to diversify habitat. Abandon openings in riparian areas.	Prepare NEPA document and monitor.

FINDING	RECOMMENDATION	ACTION NEEDED
Research opportunities exist to improve habitat for West Virginia Northern Flying Squirrels.	Use commercial timber harvests to improve marginal habitat by releasing yellow birch and conifer trees from competition by thinnings. Conduct research study to monitor the effects.	Consult with US Fish & Wildlife Service, obtain incidental take permit, and prepare NEPA document and monitor.
Early successional habitat is lacking for snowshoe hare.	Create ½ to 1-acre openings with commercial timber harvests, if possible, in the forest at higher elevations to increase habitat availability.	Prepare NEPA document, conduct surveys, and monitor.
HUMAN USES		
There is a backlog of maintenance on open roads and trails. Many gated roads lack maintenance.	Develop a more comprehensive and frequent maintenance schedule for all specified system roads and trails. Place roads not needed for immediate use into storage by removing culverts.	Maintenance Plans – Monitor.
Potential to acquire private land at the mouth of Cherry River to protect the riparian resource.	Pursue acquisition or land exchange.	Coordinate with Lands staff.
A pile of strip mine tailings along FR 730 is eroding into Rabbit Run.	Remove pile to an area where it will not enter the stream channel.	Prepare NEPA document and monitor.
A gully is developing on the fill slope of the Hamrick Run strip mine causing mine spoils to enter the creek.	Recontour strip mine bench and place additional culverts to divert water away from stream channel or allow water to infiltrate soil before reaching stream channel.	Prepare NEPA document and monitor.
Concentrated run-off has developed a gully on the fill slope of the Tenmile Branch strip mine causing mine spoils to enter stream.	Recontour strip mine bench and place additional culverts to divert water away from stream channel or allow water to infiltrate soil before reaching stream channel.	Prepare NEPA document and monitor.

FINDING	RECOMMENDATION	ACTION NEEDED
Pre-historic and historic heritage resource sites provide valuable information of past and reference forest conditions.	Continue to conduct heritage resource surveys to locate pre-historic and historic sites. Seek funding to excavate/evaluate some sites to learn more of past and reference forest conditions.	Prepare NEPA document/work plans to evaluate pre-historic/historic sites. Monitor/protect known sites. Consult with representatives of Native American tribes known to occupy/visit this area.

APPENDIX A

GLOSSARY

ACRONYMS/ABBREVIATIONS

CODE DESCRIPTIONS

GLOSSARY

Ecosystem – an assembly of living organisms (plants, animals) and non-living components (rocks, soil, water) considered together with their environment.

Riparian Area – a geographically delineable area with distinctive resource values and characteristics, that are comprised of the aquatic and riparian ecosystems, floodplains, wetlands, and adjacent upland slopes. They are three dimensional areas, extending vertically from below the water table to above the canopy of mature site-potential trees; laterally to the estimated boundary of land with direct land-water interactions; and longitudinally up an down streams and along the shore.

Riparian Ecosystem – a transition area between the aquatic ecosystem and the adjacent terrestrial ecosystems, identified by soil characteristics or distinctive vegetation communities that require free or unbound water. Riparian ecosystems extend away from the bank or shore of aquatic ecosystems to include lands with direct land-water interactions that may affect ecological structure, function, and composition.

Watershed – any land area that forms a basin where runoff from rain and snow melt flow to a common point, such as a stream or lake.

Watershed Assessment (also known as "ecosystem analysis at the watershed scale") – a process conducted by an interdisciplinary team of natural resource specialists to document the processes and interrelationships of a watershed in order to determine its current condition. The purpose being to recommend opportunities for restoration and maintenance needs to enhance or retain biological diversity elements and characteristics.

ACRONYMS/ABBREVIATIONS

BBD – Beech Bark Disease
BBS – Breeding Bird Survey
BMG – Best Management Practices
CTR – Crop Tree Release
DFC – Desired Future Condition
ELT – Ecological Landtype
FR – Forest Road
HSH – Highland Scenic Highway
LTA – Landtype Association
LWD – Large Woody Debris
MIS – Management Indicator Species
MNF – Monongahela National Forest
MNFLMP – Monongahela National Forest Land Management Plan
MP – Management Prescription
NEPA – National Environmental Policy Act
NFSRP – Northern Flying Squirrel Recovery Plan
NTMB – Neotropical Migratory Bird
OSR – Overstory Removal
PIF – Partners in Flight
TES – Threatened/Endangered/Sensitive
T&E – Threatened & Endangered
Tr – Trail
TSI – Timber Stand Improvement
USDA - United States Department of Agriculture
USFWS – United State Fish & Wildlife Service
VBEB – Virginia big-eared bat
WVDNR – West Virginia Division of Natural Resources
WVGES – West Virginia Geological and Economic Survey
WVNFS – West Virginia Northern Flying Squirrel

FOREST TYPE CODE DESCRIPTIONS

Code	Forest Type
2	Red Pine
5	Hemlock
13	Red Spruce/Balsam Fir
16	White Spruce/Balsam Fir/Norway Spruce
81	Sugar Maple/Beech/Yellow Birch
82	Sugar Maple/Basswood
83	Black Cherry/White Ash/Yellow Poplar
85	Sugar Maple
87	Sugar Maple/Beech/Yellow Birch/Red Spruce
89	Mixed Hardwoods
97	Lowland Brush
98	Upland Brush
99	Open

SIZE CLASS DESCRIPTIONS

Size Class	Description
Open/Brush	Fields presently in grass cover or shrubs such as hawthorn with less than ten percent of the area in forest tree covers.
Seedling/Sapling	A forested stand with the majority of trees smaller than 5 inches dbh (diameter breast height).
Poletimber	A forested stand with the majority of trees between 5 to 10.9 inches dbh (for hardwood trees) or 5 to 8.9 inches dbh (for conifer trees).
Sawtimber	A forested stand with the majority of trees larger than 11.0 inches dbh (for hardwood trees) or 9 inches dbh (for conifer trees).

APPENDIX B

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