

CHERRY RIVER WATERSHED INVESTIGATION REPORT  
Greenbrier, Nicholas, Pocahontas, and Webster Counties, West Virginia

KANAWHA BASIN COMPREHENSIVE SURVEY

UNITED STATES DEPARTMENT OF AGRICULTURE

Economic Research Service  
Forest Service  
Soil Conservation Service

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## KANAWHA RIVER BASIN

### CHERRY RIVER WATERSHED INVESTIGATION REPORT

Greenbrier, Nicholas, Pocahontas, and Webster Counties, West Virginia

February 1967

#### THE WATERSHED IN BRIEF

Cherry River Watershed is located mainly in the northern tip of Greenbrier County, West Virginia. It extends into the eastern corner of Nicholas County, into the southwestern edge of Pocahontas County, and into the southeastern corner of Webster County. See Figure 1. It lies mainly in the Eastern Alleghany Plateau and Mountains Land Resource Area and in the Appalachian Plateau Physiographic Province. The watershed encompasses about 104,770 acres, which is all of Conservation Needs Inventory Watershed West Virginia 7b-13. It constitutes about 1.3 percent of the Kanawha River Basin.

Cherry River flows in a northwesterly direction to its confluence with Gauley River, and that point represents the mouth of the watershed. The drainage pattern is dendritic and is composed of three main tributaries which produce a fan-shaped boundary. The North Fork and South Fork of Cherry join at Richwood to form the main stem. Laurel Creek enters Cherry River at Fenwick, which is approximately three and one-half miles downstream from Richwood or about 6 miles upstream from the watershed mouth. The watershed is approximately 17 miles long and 13 miles wide.

Surface geology is represented predominately by Mississippian Age shales, siltstones, and sandstones of the Mauch Chunk Series and Pennsylvanian Age shales and sandstones with interbedded coals of the Pottsville Series. The regional dip of the formations is generally to the northwest.

The topography is steep. Elevations range from 4,524 feet south of Frosty Cap in the headwaters of North Fork, and 4,518 feet at Briery Knob near the headwaters of South Fork, to approximately 1,870 feet at the junction with Gauley River. The average overall slope of the land ranges from about 10 to 15 percent.

The floodplain is narrow and almost completely lacking in many reaches. The average stream gradients are 1.4 percent on the North Fork, 1.7 percent on the South Fork, and 0.7 percent on Cherry River from Richwood to the watershed mouth.

The more important coal seams within the watershed are the Fire Creek and Sewell seams. These seams are generally well above drainage in the potential site areas, except in the lower portion of the watershed. These coal beds have been extensively mined by surface and sub-surface methods. Mining of these coals is still an important part of the area's economy and apparently will continue to be so in the future.

Richwood, with a population of 4,110 in 1960, is located on West Virginia Highway 39 at the confluence of North and South Forks of Cherry River. Fenwick and Holcomb are other communities in the watershed. They are situated on Cherry River downstream from Richwood in the above order.

West Virginia Highway 39 crosses the northern part of the watershed in an east-west direction. State Highway 20 swings through the northern corner of the watershed roughly in a north-south direction. Secondary and unimproved roads provide access to the rest of the watershed, except for areas in the southern end which are inaccessible. The Baltimore and Ohio Railroad serves the area.

Soils within the watershed are in the Dekalb-Gilpin-Ernest association. These are moderately deep, loamy or silty, mostly stony soils on sloping to very steep acid shale and sandstone uplands and mountains. Narrow bands of well and moderately drained colluvial soils are found at the footslopes and in the narrow valleys. The nearly level ridge and mountain flats are moderately well-drained Cookport with some well-drained Dekalb intermixed. The mountain sides are well-drained Dekalb and Gilpin, with Dekalb making up the larger percentage. One large area of alluvial soil is located on the floodplain of Cherry River from Richwood downstream.

Present land use is approximately as follows: cropland, 2 percent; pasture, 5 percent; forest and woodland, 89 percent; and other - including urban and built-up areas, roads, railroads, and strip mines - 4 percent. Approximately 1 percent of the area has been strip-mined.

Land ownership is as follows: private farm, 8 percent; public land, 28 percent; private non-farm, 60 percent; and other, 4 percent. A large percentage of the private non-farm land is owned by two companies.

Cherry River Watershed lies almost entirely within the Monongahela National Forest. Approximately 29,580 acres (28 percent) of the forest land is in Federal ownership and administered by the Forest Service, USDA. This includes Summit Lake, a 43 acre impoundment, used for recreation and supplemental water supply.

Forested areas are distributed quite evenly over the entire watershed and are predominantly hardwood. Principal types are sugar maple-beech-birch, oak-hickory, and some scattered patches of red spruce. Forest products consist of sawlogs, pulpwood, posts, rails, and some mine timbers.

The principal economic activities are lumbering, coal mining, and some manufacturing.

## WATERSHED PROBLEMS AND NEEDS

Three main water and related land resource problems and needs manifest themselves in the watershed: (1) flood prevention, (2) erosion control, and (3) non-agricultural water management.

### Flood Prevention:

A long history of damaging floods exists. Residents and gaging records indicate that large floods occurred in 1873, 1918, 1926, 1932, 1940, and 1954. A stream gage, located at Fenwick, has produced 35 years of continuous records. A frequency line for the annual peaks indicates that the 1954 flood of record would occur less often than once in each 100 years. The 1932 and 1940 floods have average return periods of 45 and 100 years, respectively. Residents indicate that the 1873 flood was of about the same magnitude as the 1954 flood. The 1918 and 1926 floods were approximately equal in magnitude, but were somewhat smaller than the 1954 flood.

Floods may occur any time during the year, but most of the large floods have occurred during the summer season as a result of high-intensity, short-duration storms.

The Corps of Engineers completed a Local Protection Project on Cherry River in 1958. It consisted of clearing and snagging, realignment, and widening and deepening of about 7,000 feet of the Cherry River channel through Richwood; and bar and boulder removal at three locations in the Fenwick area. It is estimated that this improvement would provide reductions of stages that would range from about one foot at the downstream end to about three feet at the upstream end, if a flood equal to the 1954 flood should occur. It is further estimated that this improvement would safely convey flood flows up to

approximately a forty-year return period. The improved channel is being maintained in good condition. However, a large section of the floodplain remains subject to flooding from infrequent large floods.

Major factors which contribute to the flood hazard are: (1) Restriction in Fenwick created by a highway bridge and a railroad bridge; (2) A highway fill and bridge across the floodplain near Dain; (3) Damages near hydrologic cover conditions; and (4) A relatively short time of concentration above the principal damage reach.

The principal flood damages in the watershed are to roads, bridges, railroads, utilities, schools, and to commercial and urban properties in the city of Richwood and the towns of Dain, Fenwick, and Holcomb.

Under present conditions approximately 400 homes, 60 commercial establishments, 5 school buildings and playgrounds, and various sections of state highways, city streets, railroads, utility fixtures, a sewage treatment plant and a hospital, along with sewer lines, a warehouse, and numerous automobiles, would be subject to damage of approximately \$1,000,000, if a flood equal to the magnitude of the one of July 1954 should occur. See Table 1 for direct and indirect average annual flood damage.

#### Erosion and Sediment:

Improper use and abuse of the forest lands in the past has left it in a relatively poor hydrologic condition. This condition contributes to excessive runoff resulting in erosion, sediment production, and an increase in the frequency of flooding. Since 89 percent of the watershed is forest land, improvement of the hydrologic condition is a major watershed need.

The hydrologic cover condition of the open land varies from poor to good.



TABLE 1

ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE

Cherry River Watershed, Kanawha River Basin

(Dollars)<sup>1/</sup>

Item	Damages
<b>FLOODWATER</b>	
Residential	3,062
Commercial	10,615
Railroad	3,192
Utilities	332
Roads and Bridges	599
Indirect	<u>3,600</u>
<b>TOTAL</b>	<b>21,400</b>

<sup>1/</sup> Adjusted Normalized: "Interim Price Standards for Planning and Evaluating Water and Land Resources." Water Resources Council, April 1966.

Date: February 1967

Soil erosion on the open land is moderate to moderately severe. Over 60 percent of the open land needs additional or complete conservation treatment to reduce soil erosion. Several hundred acres of open land are too steep for agricultural use and should be reforested. There are about 1,100 acres of strip-mine spoil; over 75 percent needs additional or complete vegetative treatment.

Sediment and erosion damages on the floodplain are included in the estimated flood damages.

#### Agricultural Water Management:

No problems or needs of a magnitude requiring project-type action are anticipated in the foreseeable future. Neither irrigation nor drainage is an important consideration in the watershed. Water for livestock and general farm use can be met through existing programs.

#### Non-Agricultural Water Management:

Richwood presently is using 400,000 gallons of water per day. The towns of Fenwick, Holcomb and surrounding areas are not served by community water systems. It is anticipated that these communities may tie in with the Richwood system. Increasing per capita consumption along with anticipated expansion of the area served is expected to double present use. Richwood now utilizes the normal flow in the North Fork of Cherry River as a source of supply, which is supplemented during low-flow periods from Summit Lake, a small recreation impoundment. The capacity of this impoundment would not provide sufficient supplemental water for a critical drought period.

Tradition, setting, accessibility, and scenic beauty along the North Fork have contributed to its history and potential as one of the finest

trout streams in West Virginia. Acid mine drainage, largely from a number of inactive mines in the Bear Run drainage, the anticipated opening of new mines in the Rabbit Run drainage, along with drought periods of increasing frequency, threaten to completely eliminate the 17-mile fishery. Only the lower six miles of the stream is being stocked. The acid condition of the water limits the life expectancy of stocked trout to five days.

This stream is located mainly within the Monongahela National Forest. In order to restore and enhance the fishery, the Forest Service and the West Virginia Department of Natural Resources have indicated needs to augment low flows, improve the physical and chemical quality of the water, and improve mining techniques to insure control of acid mine drainage.

Very little opportunity for outdoor water-related recreation, other than stream fishing, exists within the watershed. Summit Lake, a 43-acre impoundment, built by the West Virginia Department of Natural Resources on National Forest land and operated by the Forest Service, USIA, as a fishing, camping, and boating lake, is within the watershed. Summersville Reservoir, built by the Corps of Engineers, is located about 20 miles west of Richwood. The southern terminus of the Appalachian Scenic Highway will be located about 4 miles east of the watershed boundary. A Forest Service Visitor Information Center will be in operation by the summer of 1967. Preliminary estimates indicate a first-season visitation of 25,000 people. Eagle Lake, a potential recreation development by the Forest Service, will be located on Hills Creek just outside the Cherry River Watershed. That area has a scenic trail system. Cranberry Glades, a unique natural scenic area characterized by Canadian muskeg-type vegetation, is some four miles from the eastern boundary of the watershed. Several recreational developments and areas in the

Monongahela National Forest, including the Woodbine Recreational Area, are located in the adjoining Cranberry River Watershed. Some of the visitors to these areas will probably overflow into the Cherry River area.

There is a heavy sediment load in the lower reaches of Laurel Creek that adversely affects water quality, fishing, and the natural beauty of the stream. Reduction of this sediment load is a watershed need.

It is believed that project-type action could serve as a stimulus to economic growth and activity in the area, enhance local employment, and stimulate business activity.

POTENTIAL FOR MEETING NEEDS

are approximately 80 farms, averaging 100 acres each, in the watershed. Part-time farming and rural residency represent the principal farming activity. About 50 percent of these farmers are cooperators of the local soil conservation district.

The hydrologic cover conditions on the open land at present are as follows: 45 percent poor, 40 percent fair, 15 percent good.

The forest land has a high to medium potential to improve hydrologically. This potential can be realized with proper protection and management. That portion under National Forest administration is improving under protection and management.

The hydrologic soil grouping is: 43 percent B, 54 percent C, and 3 percent D.

The area receives an average annual rainfall of 52 inches. Based on the Fenwick gage, the average annual runoff is about 36 inches.

Watershed problems and needs could best be solved by a system of storage impoundments.

The South Fork of Cherry River offers the best potential for a large multiple-purpose impoundment. This stream would produce the highest quality water supply for Richwood. It would effectively control a large area above the principal flood damage reaches. No conflict with existing improvements would be involved.

West Virginia Highway 39 and the potentially valuable trout fishery preclude a structure on the main stem of the North Fork of Cherry River. Bear Run, a small tributary in the headwaters, offers the best potential for water storage on the North Fork. It has been indicated that the acid mine

drainage could be treated in an impoundment by broadcasting limestone dust. This treatment would raise the fertility of the now rather sterile, acid stream. Effective control on other side tributaries would not be economically feasible because of the small drainages, and steep gradients.

In general, the number of potentially feasible sites are limited by: (1) Small drainage areas and steep gradients of the tributaries, (2) Poor spillway conditions, and (3) Cultural improvements on the floodplain. Many locations would require long, high fills.

The potential storage sites are located on four geologic groups of rocks, usually occurring in groups of two or more at each potential site location. The groups, in ascending order, are the Hinton, Princeton, and Bluestone Groups of the Mauch Chunk Series, and the New River Group of the Pottsville Series.

The Pocahontas Group of rocks, normally found between the Bluestone and the New River Groups of rocks, is either absent or occurs only as remnants in the Nicholas County portion of the watershed. This means that the entire group of Pocahontas Coal seams is either missing or occurs only in insignificant quantities in this area.

Borrow materials are somewhat limited and overhaul will be required at all sites. The total volume of rock excavation will be above average at all sites.

The ignorable coal seams, all of Pennsylvanian Age, generally lie at the higher elevations well above drainage. Any subsequent surface or sub-surface mining would be of no consequence to the potential dam sites from a stability standpoint. However, future mining of these seams above potential sites could be a factor from a sediment-production standpoint.

Water-related recreation opportunities, other than those provided by existing facilities at Lake Summit, would be limited to the improved trout fishery on the North Fork of Cherry and incidental recreation use of the permanent pools at the potential sites.

Coal dust and refuse piles from mining and coal washing operations, coupled with inaccessibility of the potential site on the headwaters of Laurel Creek, limit that area's suitability for water-related recreation.

On the basis of data provided by the Bureau of Outdoor Recreation with respect to incidental recreation use of potential impoundments, it is estimated that by 1980, 11,200 visitors annually would make use of simple facilities at the sites. The BOR estimates are preliminary, intended as planning information only, and are subject to later revision.

## LOCAL INTEREST IN PROJECT DEVELOPMENT

Approximately 72 percent of the Cherry River Watershed lies in the Greenbrier Valley Soil Conservation District, with the remainder in the Elk Soil Conservation District. However, the main damage reaches are located in the Elk Soil Conservation District. Both districts have co-sponsored PL-566 projects, and local organizations have adequate legal authorities for project action.

Local people have shown interest in project action for a number of years. Interest at present is high, and local interest in water-related recreation appears extremely high. Interest in water supply is also apparent. The Elk Soil Conservation District and Town of Richwood could be expected to enthusiastically support project action. It is anticipated that an application for planning assistance under Public Law 566 will be submitted to the State Soil Conservation Committee in the near future.

Some work has been carried out in the watershed under other authorities. A local Protection Project by the Corps of Engineers is discussed on page 4. Summit Lake is discussed on page 8.

The Forest Service, USDA, and the West Virginia Department of Natural Resources have evidenced interest in development of water and related land resources in the Monongahela National Forest (see section on "Effects and Economic Feasibility of Potential Development").



## WAYS OF IMPROVEMENT FOR POTENTIAL DEVELOPMENT

### Land Treatment Measures:

The success of any watershed development will depend on the proper use and treatment of all land within the watershed. Landowners should be encouraged to make full use of technical services available through the local soil conservation districts and other sources.

In achieving proper treatment of all lands, the following - by no means a complete list of all applicable practices - should be emphasized:

1. Maintenance of adequate cover on all open land through the use of contour farming, contour strip cropping, conservation cropping systems, minimum tillage, and pasture and hayland management.
2. Partial or complete revegetation, as may be needed, on several hundred acres of land disturbed by strip mining.
3. Tree planting to establish an adequate protective cover on several hundred acres of steep and eroded pastures, on some abandoned agricultural land, and on some areas with inadequately stocked stands.
4. Proper location and maintenance of logging roads, skid trails, and mining roads for erosion control.
5. Hydrologic stand improvement practices on a large part of the forest land to establish and develop desirable species and to maintain favorable stocking and stand conditions.

Fire has not been a serious problem in the forest land, but continued protection is basic and essential to derive the maximum benefits from all watershed protective measures.

### Structural Works of Improvement:

A number of potential floodwater retarding sites were examined in the watershed. During the detailed study phase, only four, Sites Nos. 7, 9, 15, and 16, were found to be feasible. These sites could control about 48,030 acres, or 46 percent of the watershed, and could provide storage requirements to meet watershed problems and needs. This amount of control could meet objectives because of the improved channel conditions through the major damage reaches.

Sites Nos. 7 and 16, located on Little Laurel and Laurel Creeks, respectively, were considered for flood prevention only. These sites would have limited potential for multiple-purpose development, should additional needs become apparent during more detailed investigations.

Site No. 7 is situated on the Bluestone and New River Groups of rocks. Site No. 16 is situated on the Bluestone Group of rocks. Borrow materials will be scarce, overhaul will be required, and rock excavation in the emergency spillway is anticipated at both sites. The abutments at Site No. 16 contain beds of broken and fractured sandstone which could cause excessive leakage; however, a larger than average drain system should suffice. The Sewell seam of coal is exposed in the road cut in the left abutment of Site No. 7. This would put the Fire Creek seam at or below drainage in this area. These two coal seams have no apparent commercial value in this immediate vicinity due to the thinning of the seams; therefore, it appears that they would not be of any consequence with respect to the safety of a structure. Some leakage is anticipated in the massive, broken sandstone occurring in the abutments.

Site No. 9, located on the South Fork of Cherry, is the key flood prevention site and could include municipal water storage. It is on the Hinton and Princeton Groups of rocks. Borrow materials would be available but require an overhaul. The total volume of rock excavation in the emergency spillway would be high. The Princeton sandstone occurs high up in the abutments and should not be a factor from an excessive leakage standpoint.

Site No. 15, located on Bear Run in the headwaters of the North Fork of Cherry, could provide storage for low-flow augmentation on the North Fork along with floodwater storage. It is estimated that the storage provided, with proper control, could provide a minimum of 10 cubic feet per second of flow during a drought period equal to the drought of record. This is based on a 10 percent chance of shortage. Transmission and evaporation losses were considered.

Site No. 15 is located on the Princeton and Bluestone Groups of rocks. Borrow material is not readily available at this location. Overhaul would be required for a large percentage of the borrow. It would be necessary to locate and mine weathered shales occurring in benches and weathered points at the higher elevations. The total volume of rock excavation would be higher than average. Excessive leakage is anticipated in the lower abutments, since the Princeton sandstone lies at or near the valley floor level. This sandstone is normally badly broken and fractured where encountered at or near the surface. It is very resistant and usually forms large slump blocks which would have to be removed from the embankment area. Larger than average drains would be required, due to the nature of the rock and the excessive heads created by the impoundment. It may be more desirable to grout or install a clay blanket in the lower abutments. This cost would be very small, probably less than one (1) percent of the total cost.

Restoration and enhancement of the trout fishery on the North Fork of Cherry could be achieved by sustaining minimum acceptable flows, reducing acidity, and providing cold water releases at the Bear Run site.

For more specific information see Tables 2 and 3 and Figure 1.

Recreation Developments:

Facilities for incidental recreation could be included at Sites Nos. 7 and 9. At Site No. 7, facilities could be for picnicking, boating, swimming, and fishing. At Site No. 9, facilities could be for picnicking, boating, and fishing.

TABLE 2

STRUCTURE DATA

Cherry River Watershed, Kanawha River Basin

Site Number	Drainage Area (Sq. Mi.)	Estimated Height of Dam (Ft.)	Estimated Volume of Fill (Cu. Yd.)	Principal Spillway Type	Release Rate (C. S. M.)	Emergency Spillway Type	% Chance of Use	Area Emergencly Spillway Crest (Ac.)	Max. Surface Emergencly Spillway Crest (Ac.)
7	16.87	84	572,000	R/C Conduit	25	Vegetated	1.0	110	110
9	38.35	128	1,320,000	R/C Conduit, <sup>1/2</sup>	24	Vegetated	1.0	230	230
15	3.62	90	650,000	R/C Conduit	24	Vegetated	1.0	50	50
16	16.20	98	700,000	R/C Conduit	27	Vegetated	1.0	80	80
TOTAL	75.04		3,242,000					470	470

<sup>1/2</sup> Twin Conduits.

TABLE 3

RESERVOIR STORAGE CAPACITY

Cherry River Watershed, Kanawha River Basin

Site Number	Drainage Area (Sq. Mi.)	S T O R A G E			C A P A C I T Y			P L A N N E D			Additional Storage Capacity Available (Ac. Ft.)
		Sediment (Ac. Ft.:In.)	Detention (Ac. Ft.:In.)	Sub-Total Flood Prevention (Ac. Ft.:In.)	Low Flow Augmentation (Ac. Ft.:In.)	Water Supply (Ac. Ft.:In.)	Total (Ac. Ft.:In.)	Additional Storage Capacity Available (Ac. Ft.)			
7	16.87	350 : .39	2,620 : 2.9	2,970 : 3.3	0 : 0.0	0 : 0.0	2,970 : 3.3	0 : 0.0	2,970 : 3.3	*	
9	38.35	760 : .37	5,830 : 2.9	6,590 : 3.3	0 : 0.0	0 : 0.0	6,590 : 3.3	630 : 0.3	7,220 : 3.6	*	
15	3.62	100 : .53	550 : 2.9	650 : 3.4	1,270 : 6.6		1,270 : 6.6	0 : 0.0	1,920 : 10.0	4,200	
16	<u>16.20</u>	<u>370 : .43</u>	<u>2,460 : 2.9</u>	<u>2,830 : 3.3</u>	<u>0 : 0.0</u>		<u>2,830 : 3.3</u>	<u>0 : 0.0</u>	<u>2,830 : 3.3</u>	*	
TOTAL	75.04	1,580	11,460	13,040	1,270		13,040	630	14,940		

\* Watershed yield is the only limitation

Date: February 1967

## NATURE AND ESTIMATES OF COSTS OF IMPROVEMENTS

The preliminary design for all potential structures was based on stage-storage and stage-area curves obtained from "rapid" transit-stadia field survey data. Earth fill computations and emergency spillway layouts were based on field surveyed sections along the centerlines of the potential dams.

The preliminary designs are in accordance with West Virginia State Criteria for Class "c" structures. The flood-storage capacity was based on the runoff associated with the 100-year frequency storm and an antecedent soil moisture condition midway between conditions II and III. Emergency spillway design and freeboard hydrographs were routed by the UD Method of Reservoir Flood Routing.

The estimated cost of each potential structure was based on a curve of unit cost of compacted earth fill as reflected in current contracts. This curve includes the cost of associated construction items.

An additional cost allowance was made for the following items:

1. Overhaul of borrow materials at all sites.
2. Rock excavation at all sites.
3. Reforestation of borrow areas at all sites.
4. Clearing at Sites Nos. 9, 15, and 16.
5. Rock rip-rap at Sites Nos. 9 and 15.
6. Twin-conduit principal spillway at Site No. 9.

A 12 percent contingency cost was added to the estimated cost to obtain the construction cost for each structure.

The cost for installation services was estimated in accordance with West Virginia Memorandum WS-WV-3 (6/29/62).

Easement costs were estimated from field observation and referenced to a common datum during the site surveys. No major roads or utilities would be involved; however, some portions of secondary roads would have to be re-located at Sites Nos. 7, 9, and 15. Road relocations costs were estimated at \$51,000. A number of homes would be involved at Site No. 7.

Operation and maintenance costs should be nominal. An annual cost of \$800 was tentatively estimated for treatment of the acid mine drainage at Site No. 15. See Tables 4 and 5 for specific cost estimates. Table 6 shows cost allocation by the Use-of-Facilities Method.

Costs of recreation facilities were estimated in accordance with UD-9 (Advisory May 12, 1966).



TABLE 4

ESTIMATED STRUCTURAL COST -- POTENTIAL DEVELOPMENT

## Cherry River Watershed, Kanawha River Basin

Item	Unit	Amount	Estimated Total Cost (Dollars) <sup>1/</sup>
<b>STRUCTURAL MEASURES</b>			
Construction			
Floodwater Retarding Structure	No.	2	1,515,500
Floodwater Retarding and Stream Flow Augmentation Structure	No.	1	824,100
Floodwater Retarding and Water Supply Structure	No.	1	1,649,000
Sub-Total Construction	-	-	(3,988,600)
Installation Services	-	-	618,200
Land, Easements, and R/W	-	-	156,000
Administration of Contracts	-	-	800
<b>TOTAL STRUCTURAL MEASURES</b>	No.	4	4,763,600

<sup>1/</sup> Price Base: 1966

Date: February 1967

Structural Measures	Construction	Furnishings : Services	Installation : Low, medium, and R/W	Administration : of Contracts	Total
No. 7	743,600	115,300	111,500	200	970,600
No. 9	1,649,000	255,600	30,800	200	1,935,600
No. 15	824,100	127,700	9,500	200	961,500
No. 16	<u>771,900</u>	<u>119,600</u>	<u>4,200</u>	<u>200</u>	<u>895,900</u>
TOTAL	3,988,600	618,200	156,000	800	4,763,600

1/ Price Base: 1966

Date: February 1967

TABLE 6

COST ALLOCATION

Cherry River Watershed, Kanawha River Basin

(Dollars)<sup>1/</sup>

Structural Measures	Flood Prevention	Low Flow Augmentation	Water Supply	Total
No. 7	970,600	0	0	970,600
No. 9	1,733,200	0	202,400	1,935,600
No. 15	323,600	637,900	0	961,500
No. 16	<u>895,900</u>	<u>0</u>	<u>0</u>	<u>895,900</u>
TOTAL	3,923,300	637,900	202,400	4,763,600

<sup>1/</sup> Price Base: 1966

Date: February 1967

## EFFECTS AND ECONOMIC FEASIBILITY OF POTENTIAL DEVELOPMENT

If a flood of equal magnitude to the one of record (July 1954) should occur, damages could be reduced 95 percent with potential development; and complete protection would be provided from all floods equal to or less than the 100-year frequency event. The reach of highest potential damage, in and below Richwood, would have a reduction of 100 percent from a flood equal to the one of record. Estimated average annual flood damage reduction benefits would be \$20,400. Flood damage and benefits were based on the assumption that the Corps of Engineers Local Protection Project would be maintained at present condition.

Incidental recreation benefits, less associated development cost, could be \$37,500 annually. These benefits were estimated to be \$20,200 at Site No. 7; and \$17,300 at Site No. 9. These were based on a total of 46,400 visitor days. Due to the amount of water and available land, the potential project at two of the four sites would exceed the annual visitations as estimated by the Bureau of Outdoor Recreation for the year 1980.

Benefits to the trout fishery on the North Fork of Cherry River, due to low-flow augmentation from Site No. 15, were estimated by the Forest Service, USDA. A comparison of use was made between the Cranberry River, the best fishery in the area, and the North Fork of Cherry River, the poorest fishery in the area, but having the potential of Cranberry River. From this comparison, it was estimated that potentially 17,200 additional fishermen could use the North Fork. At a value of \$2.00 per fisherman day, the estimated direct average annual benefits from the improved fishery could be \$34,400.

Water supply benefits of \$6,800 annually were assumed to be equal to the cost of the cheapest alternative.

Local secondary and redevelopment benefits, estimated as outlined in SCS Appalachia Memorandum-2 and the SCS Economics Guide, would amount to \$41,500 annually. It was further estimated that the increased value of the improved fishery could add a secondary benefit of \$4.00 per fisherman to the local economy. These secondary benefits would amount to \$68,800 annually.

With potential development, the benefit to cost ratio would be 1.3 to 1. The benefit to cost ratio not counting secondary and redevelopment benefits would be 0.6 to 1.0. See Table 7 for annual cost and Table 8 for comparison of benefits and costs.

The development of additional water storage facilities would increase recreational use of the surrounding forest land. This could have an impact on the management and protection of the area.

(NOTE: A summary of the National Forest Statement of Interest in regard to potential development will be included at this point in the final draft of the Watershed Investigation Report.)

The West Virginia Department of Natural Resources has indicated possible interest in storage on Bear Run for enhancement of the trout fishery on the North Fork of Cherry. Interest is not firm at this time pending results of further study of the water quality by the Department. Water quality being satisfactory, the Department would take a favorable view of augmentation and fisheries enhancement of the North Fork of Cherry River by the construction of Dam No. 15, because this could also lessen the need of drawdown of the recreation water in Summit Lake. Summit Lake would then provide better recreation opportunity and the Department would be better able to manage a trout

fishery with the increased quantity of water from the Bear Run site. Should local sponsors bring the project to the planning stage, interest of the Department should be explored further.

TABLE 7

ANNUAL COST

Cherry River Watershed, Kanawha River Basin

(Dollars)<sup>1/</sup>

Structural Measures	Amortization of Installation Cost <sup>2/</sup>	Operation and Maintenance Cost	Total
No. 7	31,800	200	32,000
No. 9	63,400	200	63,600
No. 15	31,500	1,000	32,500
No. 16	<u>29,300</u>	<u>200</u>	<u>29,500</u>
TOTAL	156,000	1,600	157,600

<sup>1/</sup> Price Base: 1966 - O&M adjusted normalized.

<sup>2/</sup> Interest Rate and Period: 3 1/8 percent, 100 years.

Date: February 1967

TABLE 8

COMPARISON OF BENEFITS AND COSTS

Cherry River Watershed, Kanawha River Basin

(Dollars)<sup>1/</sup>

Evaluation: Unit	A N N U A L			B E N E F I T S		Average Annual Cost	Benefit Cost Ratio	
	Flood Prevention	Low Flow Augmentation	Water Supply	Local Secondary and Redevelopment <sup>2/</sup>	Total			
Strs. Nos. 7, 9, 15, 16.	20,400	37,500	34,400	6,800	110,300	209,500	157,600	1.3 to 1.0

29

<sup>1/</sup> Price Base: 1966 for cost; adjusted normalized for benefit.

<sup>2/</sup> Includes \$68,800 benefits resulting from improved North Fork fishery as estimated by U. S. Forest Service.



### ALTERNATE OR ADDITIONAL POSSIBILITIES

1. It might prove more feasible for the city of Richwood to utilize the supplemental flows in North Fork resulting from storage in Site No. 15 on Bear Run as a source of water supply instead of Site No. 9 on the South Fork.
2. Site No. 9, along with the surrounding land, could support a planned recreation development. This is located on a large tract of land owned by a lumber company and access may be a problem. Also, additional cost would be incurred for improving the road to this site, if planned recreation were included.
3. Preliminary watershed yield determinations indicate that sufficient storage could be provided at Site No. 15 to furnish up to 40 cfs for low-flow augmentation on the North Fork, should more detailed studies reveal the need.
4. If the mines above Site No. 15 could be effectively sealed, the impoundment might possibly be developed into a trout fishery.
5. If low-flow augmentation and acid neutralization were not objectives on the North Fork, Site No. 15 would not be needed.
6. More detailed investigations might reveal that Site No. 16 could be eliminated and still maintain an acceptable level of protection.

## KANAWHA RIVER BASIN

### CHERRY RIVER WATERSHED INVESTIGATION REPORT

Greenbrier, Nicholas, Pocahontas, and Webster Counties, West Virginia

February 1967

#### ADDENDUM

A four-structure project with potential development for flood prevention, low-flow augmentation, and water supply without local secondary and redevelopment benefits would have a benefit-to-cost ratio of 0.6 to 1.0. This development would have a 70-acre lake at Site No. 9 for water supply, and a 39-acre lake at Site No. 15 for low-flow augmentation to improve the trout fishery on North Fork of Cherry River. Total installation costs would be about \$4,763,600, of which PL-566 cost would be \$3,807,200 and other costs \$956,400. Other costs are further broken down as follows: construction, \$692,300; installation services, \$107,300; land and buildings, \$105,000; road relocation, \$51,000; and administration of contracts, \$800. In addition, local operation and maintenance costs would amount to about \$1,600 annually.

Sites Nos. 7, 9, and 16 were evaluated for single-purpose flood prevention. Only direct and indirect benefits, along with \$37,500 average annual incidental recreation benefits, were counted. The resulting ratio of benefit-to-cost was 0.4 to 1.0. When local secondary and redevelopment benefits were included, the resulting ratio of benefit to cost was 0.7 to 1.0. The total project installation cost would be about \$3,618,300, of which PL-566 cost would be \$3,483,500, and other costs about \$134,800. The items of other costs would be land and buildings, \$99,700; road relocation, \$34,500; and \$600 for administration of contracts.

The attached table outlines the PL-566 cost versus other costs of potential development as described in the body of the Watershed Investigation Report.

ADDENDUM TABLE

COST ALLOCATION AND COST SHARING SUMMARY -- POTENTIAL DEVELOPMENT

Cherry River Watershed, Kanawha River Basin

(Dollars)<sup>1/</sup>

Item	Flood Prevention	Low Flow Augmentation	Water Supply	Total
<u>COST ALLOCATION</u>				
Single-Purpose Strs. Nos. 7 and 16	1,866,500	0	0	1,866,50
Multiple-Purpose Str. No. 9	1,733,200	0	202,400	1,935,60
Str. No. 15	<u>323,600</u>	<u>637,900</u>	<u>0</u>	<u>961,50</u>
TOTAL	3,923,300	637,900	202,400	4,763,60

<u>COST SHARING</u>				
PL-566	3,807,200	0	0	3,897,20
Other	<u>116,100</u>	<u>637,900</u>	<u>202,400</u>	<u>956,40</u>
TOTAL	3,923,300	637,900	202,400	4,763,60

128,500  
1,200  
1,200

<sup>1/</sup> Price Base: 1966

Date: February 1967



LOCATION MAP

80° 35' 00"

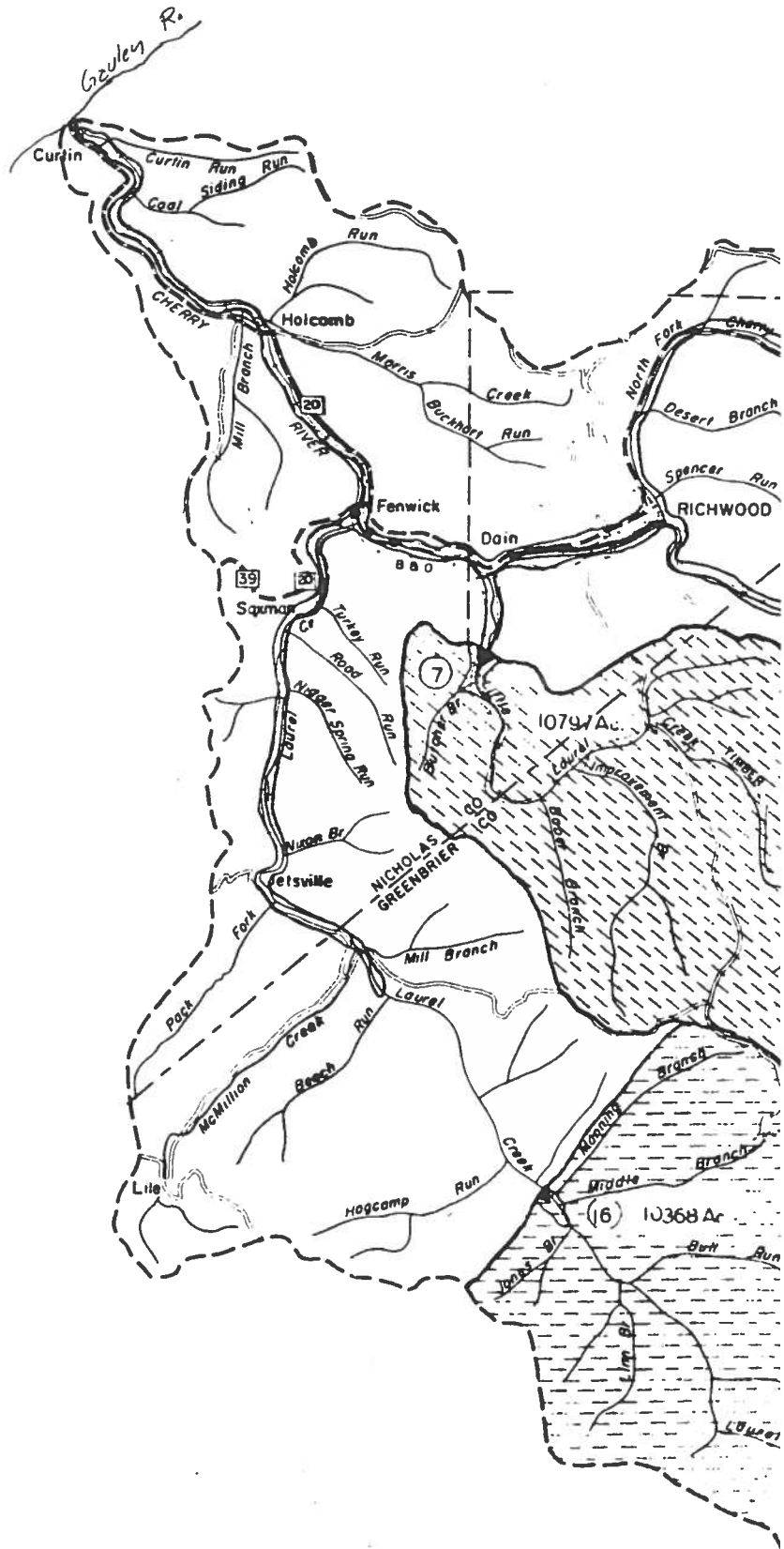
80° 3'

38° 15' 00"

N

38° 10' 00"

38° 05' 00"



80° 40' 00"

80° 35' 00"

80° 30'

80° 30' 00"

80° 25' 00"

80° 20' 00"

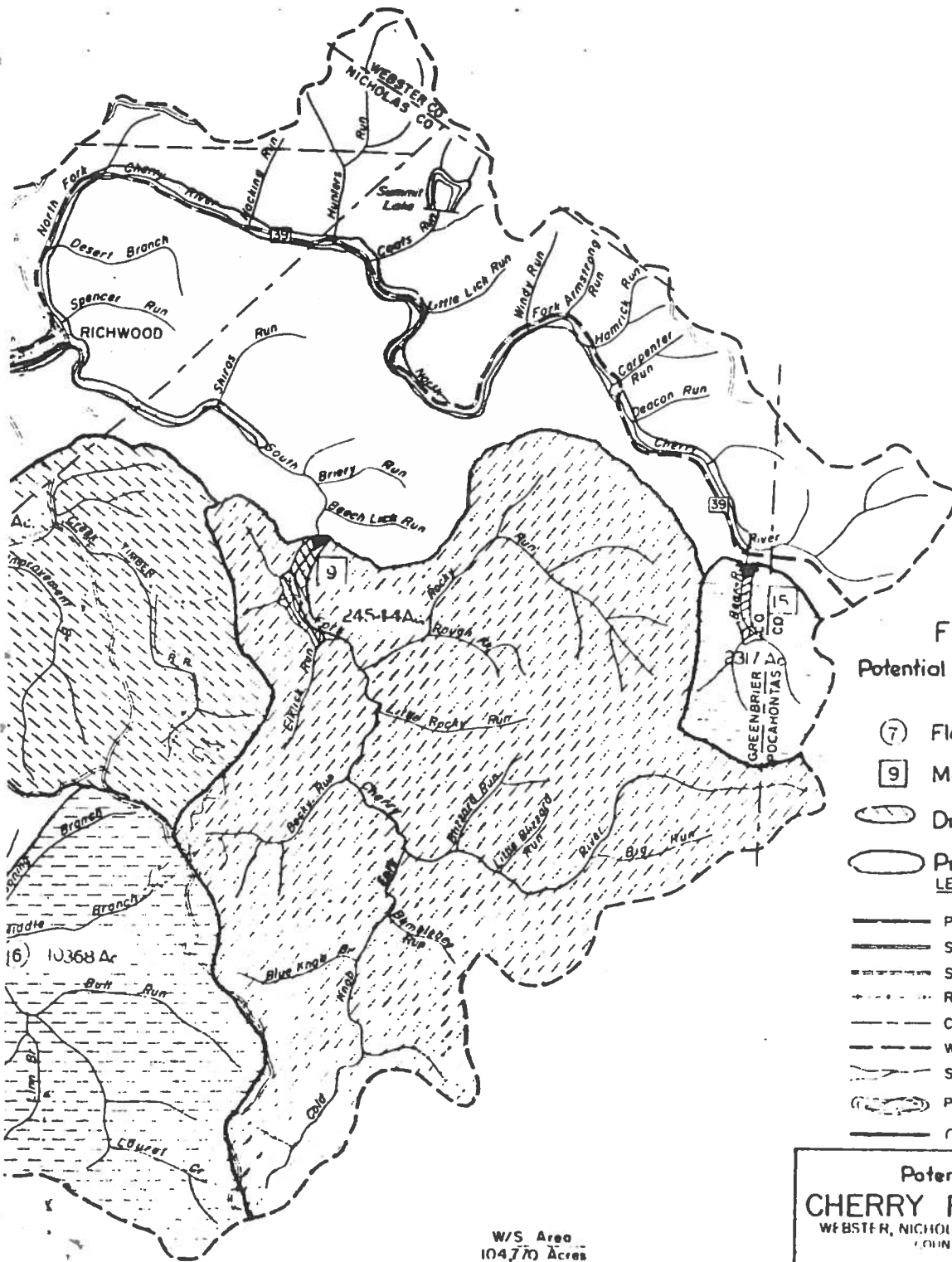


FIGURE No. 1.  
Potential Project Measures

- ⑦ Floodwater Retarding Str.
  - ⑨ Multiple-Purpose Str.
  - Drainage Area Controlled
  - Problem Area
- LEGEND

- Primary Road
- Secondary Road - Paved
- Secondary Road - Dirt
- Railroad
- County Line
- Watershed Boundary
- Streams
- Pond or Lake
- Corps of Engineers Project

W/S Area  
104,770 Acres

Potential Development Map  
**CHERRY RIVER WATERSHED**  
WEBSTER, NICHOLAS, POCAHONTAS & GREENBRIER  
COUNTIES, WEST VIRGINIA  
U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Date		Approved by	
Designed		Title	
Drawn		Title	
Traced		Checked	Issuing No.
Checked		No.	

80° 15' 00"

80° 25' 00"