

WATERSHED WORK PLAN AGREEMENT

between the

Thomas Jefferson Soil Conservation District
Albemarle County Board of Supervisors

(hereinafter referred to as the Sponsoring Local Organizations)

State of Virginia

and the

Soil Conservation Service
United States Department of Agriculture
(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organizations for assistance in preparing a plan for works of improvement for the Beaver Creek watershed, Albemarle County, State of Virginia, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress; 68 Stat. 666), as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organizations and the Service a mutually satisfactory plan for works of improvement for the Beaver Creek watershed, Albemarle County, State of Virginia, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organizations and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan will be installed, within three (3) years, and operated and maintained substantially in accordance with the terms, conditions, and stipulations provided for therein.

It is mutually agreed that in installing and operating and maintaining the works of improvement described in the watershed work plan:

1. The Sponsoring Local Organizations will acquire without cost to the Federal Government such land, easements, or rights-of-way as will be needed in connection with the works of improvement. (Estimated cost \$20,575.00)
2. The Sponsoring Local Organizations will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State law as may be needed in the installation and operation of the works of improvement.
3. The percentages of construction costs of the works of improvement to be paid by the Sponsoring Local Organizations and by the Service are as follows:

<u>Works of Improvement</u>	<u>% Sponsoring Local Organizations Will Pay</u>	<u>% Service Will Pay</u>	<u>Estimated Construction Cost</u>
Multiple Purpose Structure	41.3%	58.7%	\$112,020

4. The Service will bear the cost of all installation services applicable to works of improvement for flood prevention. (Estimated cost \$20,618)

The Sponsoring Local Organizations will bear the cost of all installation services applicable to works of improvement for non-agricultural water management. (Estimated cost \$14,506)
5. The Sponsoring Local Organizations will bear the cost of administering contracts. (Estimated cost \$1,400)
6. The Sponsoring Local Organizations will obtain agreements from owners of not less than 50 percent of the land above the works of improvement as planned and that they will carry out conservation farm plans on their land.
7. The Sponsoring Local Organizations will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.

8. The Sponsoring Local Organizations will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.
9. The Sponsoring Local Organizations will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.
10. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.
11. This agreement does not constitute a financial document to serve as a basis for the obligation of federal funds, and financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the appropriation of funds for this purpose. Where there is a federal contribution to the construction cost of works of improvement, a separate agreement in connection with each construction contract will be entered into between the Service, the Sponsoring Local Organizations and the Contracting Local Organization prior to the issuance of the invitation to bid. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.
12. The watershed work plan may be amended or revised, and this agreement may be modified or terminated, only by mutual agreement of the parties hereto.
13. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

THOMAS JEFFERSON SOIL CONSERVATION DISTRICT
Local Organization

By 15/ D. B. Wayland

Title Chairman

Date Apr. 22, 1960

The signing of this agreement was authorized by a resolution of the governing Body of the Thomas Jefferson Soil Conservation District
Local Organization
adopted at a meeting held on March 25, 1960

15/ T. C. Andrews
Secretary, Local Organization

Date April 22, 1960

ALBEMARLE COUNTY BOARD OF SUPERVISORS
Local Organization

By 19 John W. Williams

Title Chairman

Date Apr. 21, 1960

The signing of this agreement was authorized by a resolution of the Albemarle County Board of Supervisors
Local Organization
adopted at a meeting held on March 19, 1960

15/ June T. Moon
Clerk, Local Organization

Date April 21, 1960

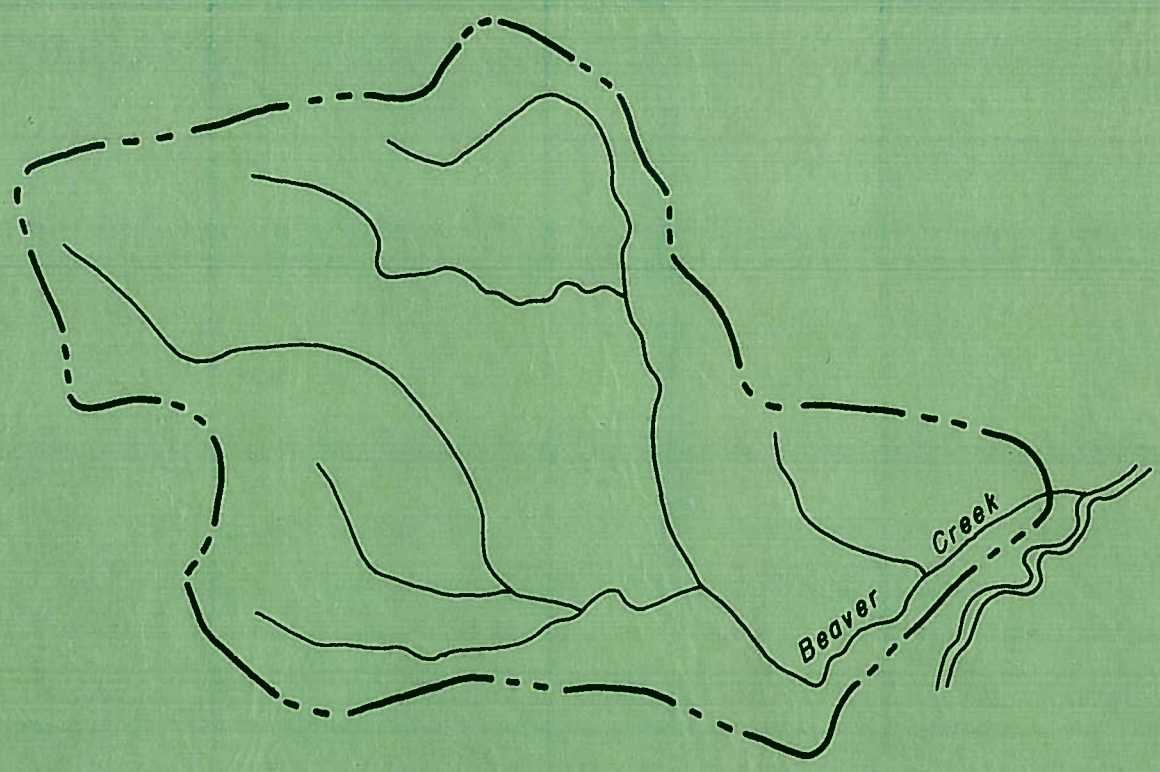
SOIL CONSERVATION SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

By 15/ Shadwin Young
Administrator

Date 6-2-60

Approved by Congress 8-31-60

WORK PLAN BEAVER CREEK WATERSHED



ALBEMARLE COUNTY
VIRGINIA

WATERSHED WORK PLAN

BEAVER CREEK WATERSHED

Albemarle County, Virginia

Prepared Under the Authority of the Watershed
Protection and Flood Prevention Act (Public
Law 566, 83d Congress, 68 Stat. 666) as amended.

Prepared by: Thomas Jefferson Soil Conservation District
Albemarle County Board of Supervisors

With assistance by:

U. S. Department of Agriculture, Soil Conservation Service

U. S. Department of Agriculture, Forest Service
in cooperation with the Virginia Division of Forestry

March 1960

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SECTION 1 - THE WATERSHED WORK PLAN

BEAVER CREEK WATERSHED

ALBEMARLE COUNTY, VIRGINIA

March 1960

SUMMARY OF PLAN

The work plan for watershed protection and flood prevention for the Beaver Creek watershed, Albemarle County, Virginia, was prepared by the Thomas Jefferson Soil Conservation District and the Albemarle County Board of Supervisors, the sponsoring organizations. Technical assistance was provided by the Soil Conservation Service and Forest Service of the U. S. Department of Agriculture. Other State and Federal agencies consulted were the Agricultural Conservation Program Service, Virginia Division of Forestry of the Department of Conservation and Economic Development, Virginia Department of Highways, Virginia Agricultural Extension Service, Fish and Wildlife Service, the Virginia Commission of Game and Inland Fisheries.

The watershed covers an area of 7,010 acres, located in Albemarle County, Virginia. Approximately 22 percent of the watershed is in cropland, 37 percent in grassland, 36 percent in woodland, and 5 percent miscellaneous. No federal lands are involved. The plan provides for an acceleration of the land treatment program for watershed protection and one multiple purpose dam for flood prevention and county water storage.

It is anticipated that the plan will be completed in three years at a total cost of \$214,827, with Public Law 566 funds bearing \$91,513 of the cost and others \$123,314. The land treatment for watershed protection amounts to \$45,708 of which other funds will bear \$40,569 and Public Law 566 \$5,139 of the cost of technical assistance.

The total installation cost of the multiple purpose dam is estimated to be \$169,119. Public Law 566 funds will bear \$86,374 of this cost. The remainder, \$82,745, will be borne by other funds. \$96,470 of the total installation cost is allocated to flood prevention. Of this amount, \$86,374 will be borne by Public Law 566 funds and \$10,096 by other funds. The latter includes costs for land, easements and rights-of-way, and administering contracts. Other funds will bear the entire cost of \$67,874 allocated to county water storage. An additional \$4,775 will be borne by other funds for non-project purpose of providing additional width of the dam for a public roadway.

The sponsoring local organizations will assume the responsibility for preparing, letting and administering contracts, providing necessary land, easements, rights-of-way and for periodic inspections.

The annual operation and maintenance of the multiple purpose structure is estimated to be \$400 with the Albemarle County Board of Supervisors bearing the cost.

Land treatment measures for watershed protection will be installed and maintained by the landowners and operators under agreement with the Thomas Jefferson Soil Conservation District.

The average annual benefits from the multiple purpose dam will be \$7,211 and the average annual cost will be \$6,194. This gives a benefit-cost ratio of 1.2 to 1.0. Benefit for the flood prevention purpose will be \$4,653 and the cost will be \$3,636; this gives a benefit cost ratio of 1.3 to 1.0. The benefits for county water storage are \$72,551.

DESCRIPTION OF THE WATERSHED

Physical Data

Location

The Beaver Creek watershed has a drainage area of 7,010 acres. It is located ten miles west of Charlottesville in the White Hall Magisterial District of Albemarle County. The town of Crozet is located on the southern boundary of the watershed. Beaver Creek flows in a southeasterly direction into Mechum River about six miles above the junction of Mechum and Moorman River, a part of the James River Basin.

Climate

The climate is moderate. Temperatures seldom go above 100° in summer or below 0° in winter although extreme temperatures beyond this range have been recorded. The mean annual rainfall is 42 inches, usually well distributed throughout the year.

Soils

The soils in this watershed are derived from acidic rock formations mainly granites and gneiss. The main soils found in the watershed, Cecil, Hayesville, Braddock, Dyke, and Thurmont, are all well drained and have a moderate to high rate of productivity. A minor amount of Tusquitee is present and most of the bottomland is mapped as Mixed Alluvium. About 20 percent of the area above the dam is classified as stony land. Most of the floodplain soils above the site of the proposed dam are not as productive as the ones below the site. This is evident from the soil structure, drainage and present use and cover.

Topography and Geology

Beaver Creek watershed has a varied topography from steeply mountainous to rolling piedmont. Beaver Creek flows in a southeasterly direction

until it passes through the gap where the dam is to be located and then it turns abruptly and flows to the northeast. The highest point in the watershed is located on Bucks Elbow Mountain at an elevation of about 2,900 feet and the lowest point is at the junction of Beaver Creek and Mechums River at an elevation of about 460 feet. The watershed is located in two physiographic provinces. The eastern part is in the Piedmont Province and the western part is in the Blue Ridge Province. The watershed is underlain by pre-Cambrian basement complex of gneisses and granitoid rocks known as the Lovingston granite. The eastern border adjoins a belt of pre-Cambrian sediments known as the Lynchburg formation.

Land Use and Cover

The cover on the watershed is classified as 36 percent good, 34 percent fair and 30 percent poor. The present land use is 2,519 acres of woodland, 2,615 acres of grassland, 1,518 acres of cropland and 358 acres of miscellaneous. The land is all privately owned.

It is estimated that 55 percent of the forest acreage supports hardwood stands, 14 percent softwood stands, and 31 percent mixed stands. Principal hardwood types include northern and southern red, black, white, scarlet, and chestnut oak, yellow poplar, hickory, black gum, red maple, white ash, black cherry, black walnut and aspen. Softwood stands consist mainly of Virginia, shortleaf, pitch and white pine.

The stands are in reasonably productive condition and with management are expected to improve hydrologically.

Economic Data

There are approximately 84 farms and 135 families in the watershed. Crozet, the only town in the watershed, has a population of some 700, with two large industries and several smaller businesses that are vitally in need of water. Several thousand dollars have been spent in attempts to get adequate water supplies from deep wells. These attempts to obtain water have not been successful.

Transportation facilities are adequate, being provided by the main line of the Chesapeake and Ohio Railroad and by U. S. Route 250.

Agriculture in the watershed is devoted mainly to the production of peaches, apples, beef cattle, grain, hay and dairy products. There are ready markets for these products in and around Charlottesville, Virginia.

The development of the forest resources offers a real economic opportunity for forest landowners.

Past use of the forest land is responsible for the present stand-size condition. Approximately one-half of the stands are immature but have a high potential for the production of future timber crops. Saw timber stands containing more than 1,500 board feet per acre occupy about 59

percent of the woodland area. Pole timber stands ranging upward from 200 cubic feet per acre in trees 5 to 11 inches DBH occupy about 27 percent, seedling and sapling stands, about 10 percent and 4 percent unstocked.

Given protection, care and management, the forest stands may be expected to contribute substantially to the future over-all economy of the watershed.

WATERSHED PROBLEMS

Floodwater Damage

There are 126 acres of bottomland in the Beaver Creek watershed that are subject to flooding. The major flood damage in the watershed is the flooding of cropland, pasture land, farm roads, bridges, fences and other minor fixed improvements on the floodplain. Frequent flooding prevents the proper management of the highly productive soils of the floodplain.

The flood of September 18, 1944, caused approximately \$6,000 damage. A similar flood of August 15, 1949, caused approximately \$6,200 damage. In addition to these larger floods, the creek overflows its banks on an average of twice a year causing varying damages depending on depths of flooding and seasons. The historical series of flood events do not show any seasonable trends.

Sediment and Erosion Damages

The land above the dam is rather steep with 50 percent of the land sloping greater than 15 percent. This hilly land has contributed large amounts of sediment from sheet erosion, minor amounts of sediment have been contributed by gully erosion. A large percentage of woodland has been heavily cut over and grazed by livestock. These slopes need reforestation with more desirable species of forest trees.

The floodplain below the dam shows evidence of considerable erosion and sediment damage. The bottom land survey shows that 90 acres have been damaged by overwash in amounts varying from 10 to 30 percent; 17.5 acres have been damaged by scour in amounts varying from 30 to 40 percent; and 11.6 acres have been damaged in amounts varying from 60 to 90 percent.

Problems Relating to Non-Agricultural Water Management

Albemarle County is rather thickly populated in the vicinity of Beaver Creek watershed. The present county water supplies are inadequate for present needs during drought periods. The county desires a water supply to supplement present supplies and to provide water for both residential and industrial growth.

- LEGEND**
- WATERSHED BOUNDARY
 - ROADS
 - ~~~~~ STREAMS & FLOODPLAINS
 - ~~~~~ STREAMBANK EROSION
 - XXXXX SEDIMENTATION
 - SCOUR

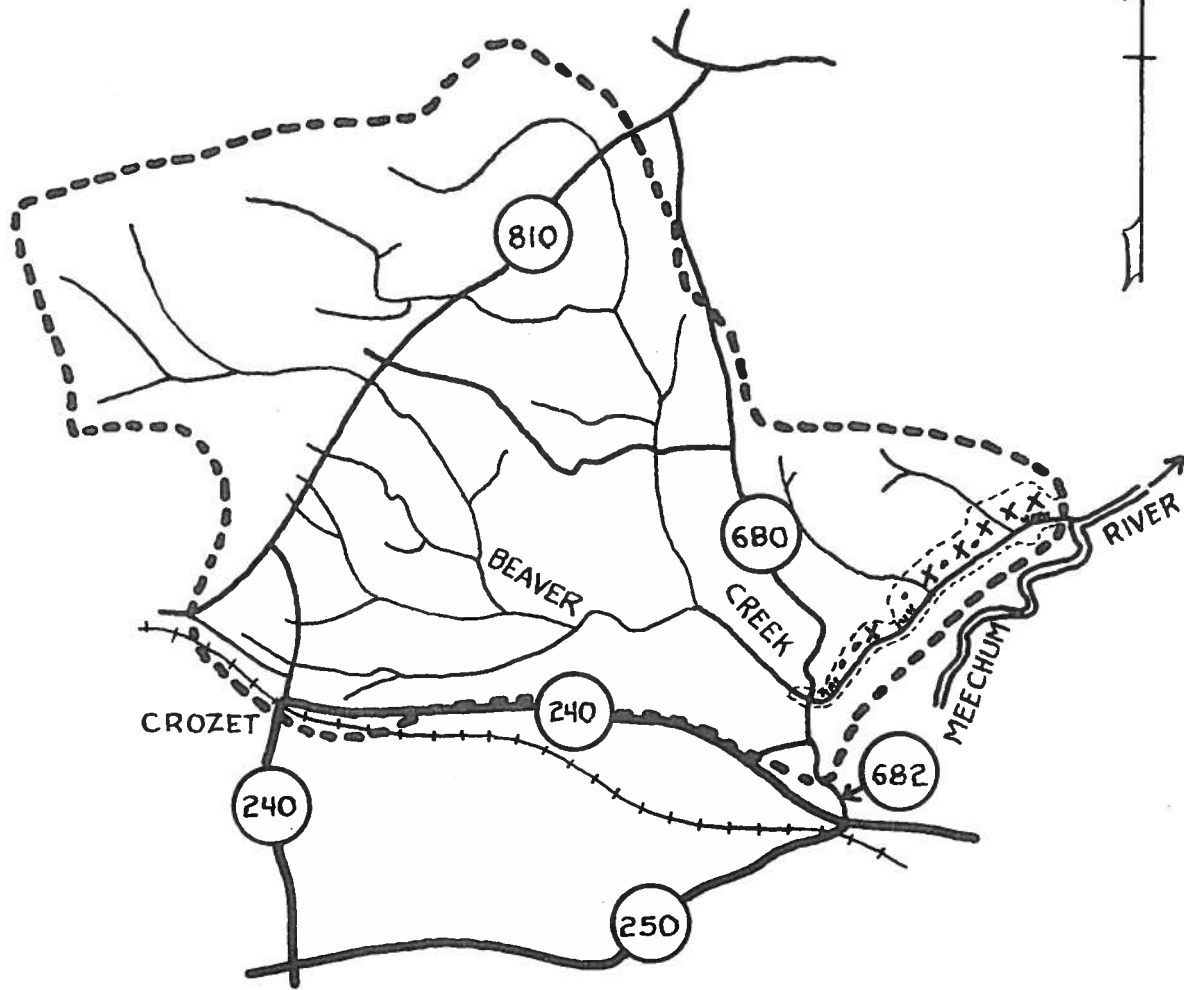


FIGURE 1
PROBLEM LOCATION
 1960

U.S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 BEAVER CREEK WATERSHED
 LOCATED IN
 ALBEMARLE COUNTY, VIRGINIA
 SCALE: 1" = 5280'

EXISTING OR PROPOSED WORKS OF IMPROVEMENT

There are no existing or proposed works of improvement under other authorities in the watershed:

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures for Watershed Protection

The complete success of this project depends upon an acceleration of the establishment of soil and water conservation practices during the installation period of the project. Conservation farm plans have been prepared for over 60 percent of the watershed area and land treatment measures are being rapidly installed. This concerted effort will be continued with the objective of early installation of conservation land treatment measures.

The measures included in the plan will improve hydrologic cover conditions and decrease runoff, erosion and sediment production.

The installation of contour stripcropping on the cultivated uplands will reduce sheet erosion. This will assist in preventing sediment from filling stream channels and reduce deposition on the floodplains.

The construction of waterways will control surface runoff from cultivated areas and reduce or prevent the formation of gullies which contribute to the sediment yield.

The establishment of perennial grasses and legumes, pasture improvement, pasture planting and wildlife areas will provide good hydrologic cover, increase infiltration and retard runoff and erosion.

The combination of farming on the contour and good vegetative cover improves the rate of infiltration, the water holding capacity of the soil and retards surface runoff.

The forestry remedial program included in this plan has been developed by the local people from a survey of land treatment needs prepared by the Virginia Division of Forestry and the U. S. Forest Service following a field survey of the watershed and from land capability recommendations by the Soil Conservation Service.

The establishment of woodland practices is progressing well but technical assistance is needed to meet the objectives of this work plan. The forestry measures included will increase infiltration thus reducing runoff, erosion and sedimentation.

The installation of the tree planting measure will increase and improve cover on lands now in the process of eroding and will reduce both sheet and gully erosion, thereby reducing sediment in streams and soil deposition on the floodplains.

Hydrologic cultural operations will improve hydrologic conditions of the forest land by increased development of litter and humus and by maintaining adequate vegetative cover.

Woodland grazing control will reduce soil compaction on a large portion of the woodland allowing an increase in infiltration thus reducing runoff and erosion.

Skid trail and logging road erosion control will correct the problem created by a large number of abandoned logging roads that now act as wet weather channels. This measure will reduce runoff and sedimentation.

Other technical assistance is needed in stimulation of landowner interest, development of timber sale agreements and general woodland schedules so as to prevent damage to watershed values.

Structural Measures




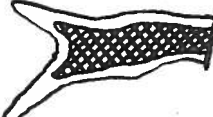
The multiple purpose structure will consist of an earth dam that will impound a sediment pool of 202 acre feet and county water supply pool of 1,600 acre feet and will provide floodwater storage of 1,746 acre feet. In addition, Virginia Highway No. 680 will be relocated upstream from its present location which will permit use of the dam as a roadway, thereby eliminating the present bridge and several curves in the road.

The county will withdraw their water supply from the stream below the dam. Two 10 inch valves will be provided in the riser to release flow when drawing on storage. Rock riprap will be provided on the upstream face of the dam to cover entire range of draw down for the county water supply. The top width of the dam will be 32 feet including 13 feet added in order to provide a roadway. The Virginia Department of Highways will surface the roadway on top of the dam and provide approaches. Because of the favorable terrain at the site, the highway will cross the emergency spillway upstream from the control section and be graded to the top of the dam on a permissible grade.

The detailed site investigation may determine the need for additional information. This information may only be available through core drilling. The cost estimates have been set up to take care of this possibility.

This dam will cost \$169,119 which includes \$4,775 local cost for widening the dam to permit use as a roadway. This dam will control 86 percent of the watershed.

The amount of runoff controlled below the crest of the emergency spillway will be 3.9 inches. With the addition of the emergency spillway storage, the runoff controlled to the top of the dam will be 15.7 inches.

- LEGEND**
-  WATERSHED BOUNDARY
 -  ROADS
 -  STREAMS & FLOODPLAINS
 -  FLOODWATER RETARDATION AND MUNICIPAL WATER SUPPLY STORAGE STRUCTURE

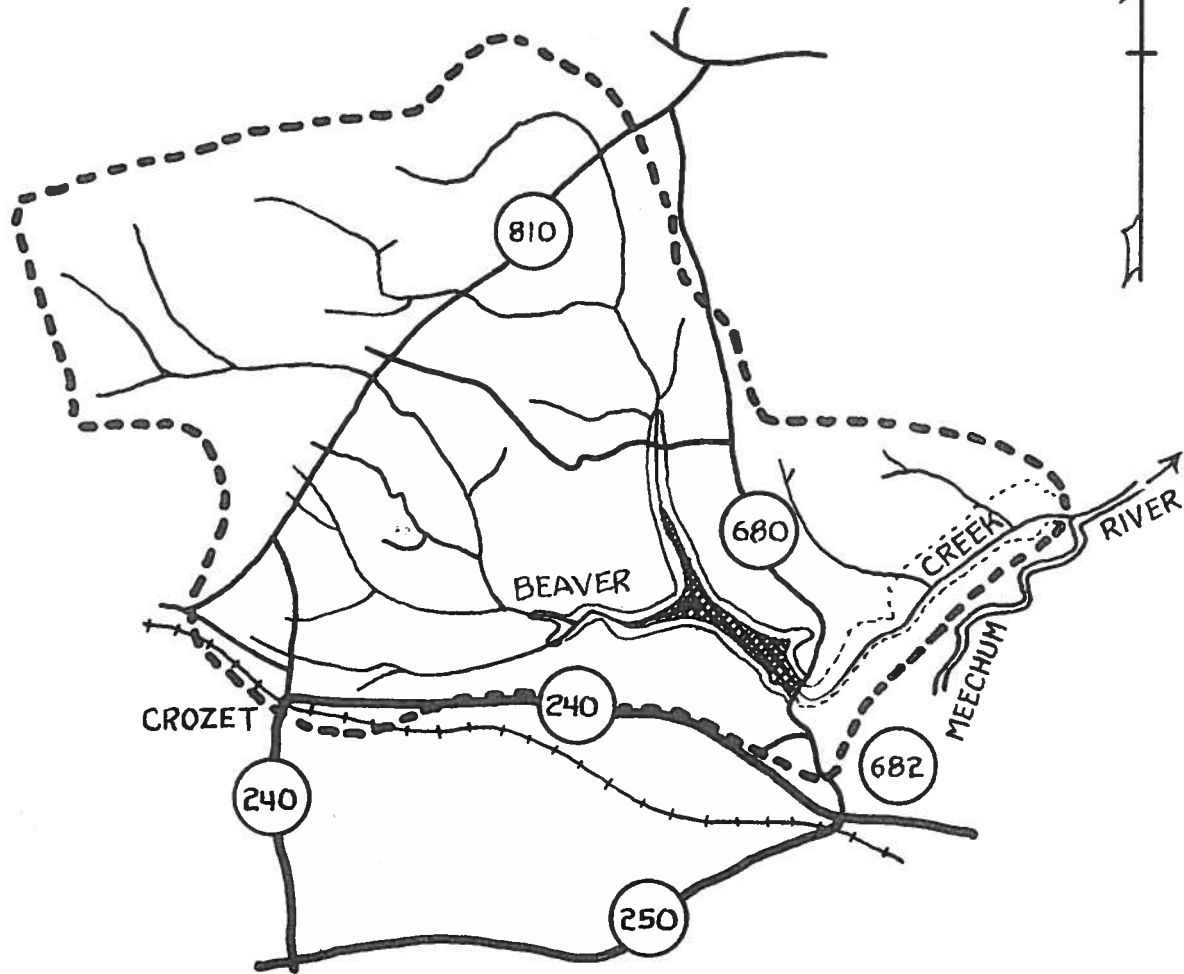
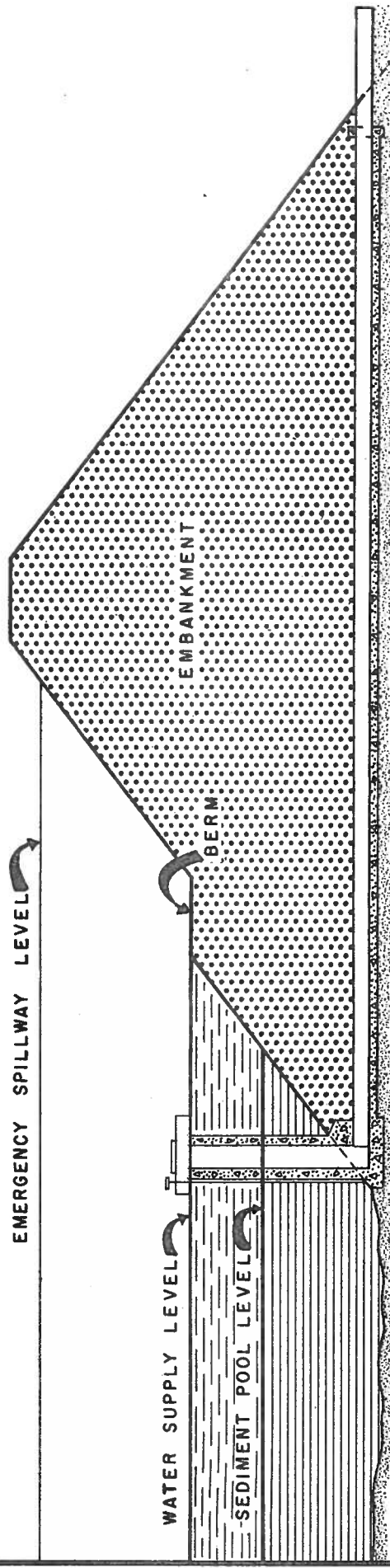


FIGURE 2
PLANNED STRUCTURAL MEASURES
1960

U.S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 BEAVER CREEK WATERSHED
 LOCATED IN
 ALBEMARLE COUNTY, VIRGINIA
 SCALE: 1" = 5280'



SECTION OF A TYPICAL FLOODWATER RETARDING AND WATER SUPPLY STRUCTURE

FIGURE 3-A

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST
Beaver Creek Watershed, Virginia

Total Project

Installation Cost Item	: Unit:	: No. to be Applied:	: Estimated Cost (Dollars) <u>1/</u> :	: Non-Fed. Land	: Other	: TOTAL
<u>LAND TREATMENT FOR</u>						
Watershed Protection						
Soil Conservation Service						
Contour Stripcropping	: Ac.:	60 ::	:	700	:	700
Pasture Improvement	: Ac.:	400 ::	:	12,000	:	12,000
Pasture Planting	: Ac.:	100 ::	:	4,000	:	4,000
Perennial Gr. & Legumes	: Ac.:	125 ::	:	7,000	:	7,000
Waterway Development	: Ac.:	5 ::	:	400	:	400
Wildlife Area Improvement	: Ac.:	10 ::	:	800	:	800
Technical Assistance	:	::	1,750	:	1,750	3,500
SCS Subtotal	:	::	1,750	:	26,650	28,400
<hr/>						
Forest Service						
Tree Planting	: Ac.:	80 ::	:	2,480	:	2,480
Hydrologic Cultural Operations						
Hydrologic Stand Improvement	: Ac.:	1,330 ::	:	4,500	:	4,500
Woodland Grazing Control	: Ac.:	700 ::	:	2,050	:	2,050
Skid Trail and Logging						
Road Erosion Control	: Mi.:	5 ::	:	1,500	:	1,500
Technical Assistance	:	::	3,389	:	3,389	6,778
FS Subtotal	:	::	3,389	:	13,919	17,308
<hr/>						
Subtotal-Watershed Protection:	:	::	5,139	:	40,569	45,708
<hr/>						
TOTAL LAND TREATMENT	:	::	5,139	:	40,569	45,708

1/ 1959 Prices

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST (Cont'd)
Beaver Creek Watershed, Virginia

Total Project

Installation Cost Item	: No. to be Applied:	: Estimated Cost (Dollars) 1/:	: Non-Fed. Land	: Other	: TOTAL
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STRUCTURAL MEASURES

Soil Conservation Service					
Multiple Purpose Structure:	No.:	1	:: 65,756	: 46,264	: 112,020
SCS Subtotal	:	:	:: 65,756	: 46,264	: 112,020
Subtotal-Construction	:	:	:: 65,756	: 46,264	: 112,020

Installation Services

Soil Conservation Service					
Engineering Services	:	:	:: 15,881	: 11,172	: 27,053
Other	:	:	:: 4,737	: 3,334	: 8,071
SCS Subtotal	:	:	:: 20,618	: 14,506	: 35,124
Subtotal-Install. Services	:	:	:: 20,618	: 14,506	: 35,124

Other Costs

Land, Easements & R/W	:	:	::	: 20,575 ^{2/}	: 20,575
Admin. of Contracts	:	:	::	: 1,400	: 1,400
Subtotal - Other	:	:	::	: 21,975	: 21,975

TOTAL STRUCTURAL MEASURES	:	:	:: 86,374	: 82,745	: 169,119
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TOTAL PROJECT	:	:	:: 91,513	: 123,314	: 214,827
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SUMMARY

Subtotal SCS	:	:	:: 88,124	: 109,395	: 197,519
Subtotal FS	:	:	:: 3,389	: 13,919	: 17,308
TOTAL PROJECT	:	:	:: 91,513	: 123,314	: 214,827

1/ 1959 Prices

2/ This includes \$4,775 for modification to provide roadway on top of dam.

Date: March, 1960

BENEFITS FROM WORKS OF IMPROVEMENT

All flood prevention benefits claimed in this watershed are from the reduction of damage to crops and pastures and minor fixed improvements on the floodplain. \$746 of the crop and pasture benefits are from restoration of former productivity and are considered as a present damage.

In the 30 year period used for evaluation there were 63 storms with out-of-bank flows ranging from .1 to 2.4 feet stage. After the project is installed, there will be only 8 out-of-bank floods in a similar period. A recurrence of the maximum flood in the evaluation period would reduce flood stage to one foot, and cause approximately \$1,500 damages.

A recurrence of a flood similar to the August 15, 1949 flood with the project installed would cause approximately \$1,500 damages. This would be the most damaging flood in a historical series of floods similar to the period evaluated. The total floodwater benefits are \$3,172, including restoration to former productivity. Of these benefits \$413 are from the installation of the land treatment program and \$2,759 from the structural measures.

The reduced flooding would practically eliminate future land damages from overwash and scour. Streambank erosion damage will be reduced from the present rate of 0.43 acres per year to 0.08 acres per year, or a reduction of 81 percent.

The benefits from the non-agricultural water management (county water supply) are \$72,551.

In addition to the monetary benefits evaluated in this plan, there are other more or less intangible benefits that do not lend themselves to evaluation. These are vitally important to the well being of the people in the watershed and the surrounding area.

The installation of land treatment and structural measures will generally provide a more uniform flow in Beaver Creek. It will also have a beneficial effect on the local ground water level.

Installation of the project will eliminate flooding of a private farm road, serving several families.

The sediment and county water pool of the dam will furnish fish and wild-life habitat and recreational facilities for the area. In addition it is anticipated that the sponsors will purchase adjacent land to develop as a picnic area. These benefits have not been monetarily evaluated.

The county water storage will assure a supplemental water supply during drought periods for residents of the area and provide storage for industrial expansion.

The economic stability of the area will be improved through better land use of the farm land with better yields of adapted crops. When farm income increases the benefits are reflected throughout the whole community.

The productive floodplain below the dam site can be relied upon for production of corn without loss by flooding relieving the cultivation of at least an equal amount of upland. Even though the dam will flood an equal amount of floodplain, the area inundated is unproductive, about one-third is idle and the remainder in poor pasture affording a very small amount of grazing.

COMPARISON OF BENEFITS AND COSTS

Structural Measures

The average annual benefits are estimated to be \$7,211 and the average annual costs \$6,194, resulting in a benefit-cost ratio of 1.2 to 1.0.

ACCOMPLISHING THE PLAN

The Thomas Jefferson Soil Conservation District and the Albemarle County Board of Supervisors as legal sponsors, will be responsible for the successful application of this plan. The District will negotiate all contracts with the assistance of the Virginia Soil Conservation Committee. The sponsors will obtain all easements and rights-of-ways. The county has the power of eminent domain and will execute this power if necessary. The responsibilities of the sponsors will be implemented by cooperative agreements and memoranda of understanding with other agencies, organizations, and individuals. Funds have been budgeted by the county to cover the sponsors' responsibilities in the installation of the structural measure.

The Thomas Jefferson Soil Conservation District with the assistance of Soil Conservation Service technicians will assist cooperating landowners and operators in the preparation and application of farm conservation plans. More than 50 percent of all farm land above the multiple purpose structure is already under cooperative agreement with the Thomas Jefferson Soil Conservation District.

The Virginia Division of Forestry of the Department of Conservation and Economic Development, in cooperation with the U. S. Forest Service, will provide technical assistance in the application of woodland phases of the plan.

The Virginia Commission of Game and Inland Fisheries will furnish assistance and planting materials as available for the development and improvement of land cover for wildlife food and cover. The Commission will also furnish guidance in wildlife management.

The Agricultural Conservation Program Service will include particular provisions for cost-sharing for eligible practices needed within the watershed.

The Virginia Agricultural Extension Service will assist in the informational and educational activities needed to complete the project (according to schedule).

The Albemarle County Board of Supervisors as co-sponsor will assume the cost of non-agricultural water management (county water storage) including construction costs and installation services.

The Albemarle County Board of Supervisors will provide for construction of a roadway across the dam through an acceptable agreement with the Virginia Department of Highways.

The installation of the land treatment measures will be distributed over the three years of the plan. Federal assistance for carrying out the works of improvement on non-federal land as described in this work plan will be provided under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666) as amended.

The total Public Law 566 and other funds scheduled for the three years of the plan are as follows:

MEASURE	P.L. 566 FUNDS \$	OTHER FUNDS \$
First year		
Land Treatment Measures	1,713	13,523
Structural Measures	<u>86,374</u>	<u>82,745</u>
Subtotal	<u>88,087</u>	<u>96,268</u>
Second Year		
Land Treatment Measures	1,713	13,523
Third Year		
Land Treatment Measures	1,713	13,523
TOTAL	91,513	123,314

PROVISIONS FOR OPERATION AND MAINTENANCE

The Albemarle County Board of Supervisors will assume the responsibility for operation and maintenance of the multiple purpose dam, at an estimated annual cost of \$400.00.

The structural measure will be inspected annually and after each major storm by representatives of the county, the district and the Soil Conservation Service to see that they are properly maintained. All maintenance agreements will be properly executed before bids are let for construction.

All land treatment measures for watershed protection will be maintained by the local landowners under cooperative soil and water conservation agreements with the Thomas Jefferson Soil Conservation District.

COST-SHARING

Land Treatment for Watershed Protection

The installation costs of these measures will be the responsibility of the local landowners. Advantage will be taken of cost-sharing under other available programs insofar as funds are available. \$5,139 will be available from Public Law 566 for additional technical assistance to accelerate installation of the land treatment measures included in the work plan.

Structural Measures

The total installation cost of the structural measure will be \$169,119 with Public Law 566 bearing \$86,374 or 51 percent and others bearing \$82,745 or 49 percent of the cost.

The cost of non-agricultural water management (county water supply) will be \$67,874 with Albemarle County bearing all the cost.

The sponsors will bear the cost of all easements \$20,575; this includes a non-project purpose cost of \$4,775 for increasing the width of the dam for secondary highway No. 680. The sponsors also will bear the cost of administering contracts, \$1,400. The installation services will cost \$35,124 with Public Law 566 bearing \$20,618 or 58.7 percent and others \$14,506 or 41.3 percent.

Cost Allocation

The Separable Cost-Remaining Benefits Method of cost allocation was used in allocating the installation costs of the multiple purpose dam. Details of this allocation are shown in Section 2 of the work plan under "Economic Analysis."

Allocations were based on total installation costs and are as shown below:

Structure #1	F. P.	Non-Agric.	Total
Dollars	\$96,471	\$67,873	\$164,344
Percent	58.7	41.3	100

This allocation does not include the costs of the additional width for the road.

CONFORMANCE OF PLAN TO FEDERAL LAWS AND REGULATIONS

This plan as proposed would have no adverse effect on any future development of the river basin.

SECTION 2 - INVESTIGATIONS, ANALYSES AND SUPPORTING TABLES

INVESTIGATIONS AND ANALYSESGeneral

The first objective of the investigation was to determine the type of program needed and desired in the watershed. It was immediately apparent that even though there was good progress being made on the land treatment program, it should be accelerated. It appeared early in the analyses that one multi-purpose, floodwater retarding water-supply, structure would contribute most toward the solution of the problems involved.

Land Treatment for Watershed Protection

Additional land treatment measures for watershed protection were planned in accordance with the capabilities of the land, to reduce runoff erosion and sedimentation.

Structural Measures

As a supplement to land treatment it was found that one floodwater retarding structure, with the addition of county water storage, would give the most desirable project.

Hydraulic and Hydrologic Analyses

The base map was prepared from a U. S. Department of Interior Geological Survey Map, Edition of 1931, Reprinted 1944, and the floodplain map was prepared from a stereoscopic study of aerial photographs. Engineering surveys were made of channel and valley cross sections selected to adequately represent the stream hydraulics and floodplain area. Preliminary locations for cross sections were made by stereoscopic examination of aerial photographs of the floodplain. The final locations were selected on the ground, giving due consideration to the needs of the economist and geologist. The composite acre damageable values are homogeneous within each evaluation reach.

An evaluation series of storms was used to compute flood flows and associated damages for the climatic period of 1927 through 1950. This series was used again in evaluating the future effects of the proposed project. It was assumed to be equally representative of the future climatic period. Storm rainfall data such as, volume, duration, and antecedent condition for the evaluation series, were obtained from "Climatological Data."

Soil, cover, and land use information was obtained from the local Soil Conservation Service personnel and Forest Service personnel. These data were used to compute indexes for the watershed. Rainfall-runoff relationships were based on this study. The procedure used is described in chapters 3.8, 3.9 and 3.10 of Supplement A of National Engineering Handbook, Section 4.

Four storms of magnitudes spanning the amounts produced by the storm series were routed to the damage reaches by use of the Wilson method described in chapter 3.17 of Supplement A of National Engineering Handbook, Section 4. This information was used to set up a relationship between peak discharge and weighted runoff. From this, discharges were determined for all storms in the series.

Stage-discharge curves at all cross sections were computed by use of Manning's formula.

Stage-area inundated curves were developed from field survey data for each portion of the valley represented by a cross section. Determinations were made of the area by depth increments that would have been inundated by each storm in the evaluation series under conditions that would exist due to:

- a. The present conditions of the watershed remaining static.
- b. The installation of land treatment measures for watershed protection.
- c. The installation of land treatment measures and the multiple purpose structure.

The crest of the emergency spillway was determined by routing a 100 year (I-F) Yarnell storm with antecedent moisture condition III through the principal spillway. 1.25 times the 6 hour point rainfall with antecedent moisture condition II taken from Figure 3.21-1, Supplement A, National Engineering Handbook, Section 4, was used for the emergency spillway design. 1.75 times the 6 hour point rainfall with antecedent moisture condition II was routed for the freeboard. 2.7 feet was added to the elevation of the water obtained by the emergency spillway design storm for wave action. This caused the dam to be one foot higher than the elevation obtained from the freeboard routing.

Water surface profiles were computed on Mechum River starting at the stream gage 3.3 miles north of the town of Ivy to a point a short distance above the confluence of Beaver Creek and Mechum River. A storm estimated to be between 5 and 10 year frequency of occurrence would have 9000 cfs discharge and a stage of 20 feet at the Mechum River stream gage. A water surface profile run up stream from the gage for this storm gave a stage of 2.8 feet out of bank at the lower end of Beaver Creek. This inundated approximately five acres. This area was not considered in the evaluation of the watershed.

Engineering Analysis

Structural works of improvement for flood prevention proposed in this plan were based on the findings of the economic, hydrologic and geologic

studies of existing conditions. It was determined that the measure proposed in this plan will give the desired degree of flood protection and reduction in sediment and erosion damage.

The preliminary design for the proposed structural measure is in accord with the latest Soil Conservation Service design criteria. The design is based on adequate field survey and a study of specific site condition.

Sediment storage volume to be provided is based on the expected accumulation during a 50-year period. 3.9 inches of runoff, produced by a 100-year frequency storm with III antecedent moisture condition, was routed through the structure to determine the elevation of the emergency spillway crest.

The storms listed above under "Hydraulic and Hydrologic Analyses" were routed for the design of the dam. These storms are in excess of the minimum amounts required in SCS Engineering Memorandum No. 27.

The base flow for the spring months was deducted from the principal spillway capacity when the emptying time of the reservoir was computed.

Sedimentation Investigations

A field examination of the floodplain was conducted to determine the type and extent of sediment and related damages. Erosion rates were calculated by the use of the Musgrave formula and field investigations. All highways and railroad banks were examined and it was determined that the amount of sediment being contributed from these sources was insignificant so no land treatment for flood prevention measures is included in the work plan.

SEDIMENT SOURCES BY PERCENT

Type of Damage	Sheet Erosion	Gully Erosion	Streambank Erosion	Floodplain Scour	Roadside Erosion	Total
Total W/S	90	3	4	2	1	100
Overwash	80	2	13	5	0	100

All procedures and formulas used are similar to those in the Work Plan Party Guide for the Northeast, Chapter IV, Geologic Investigations.

Geologic Investigations

Geologic investigations consisted of a study of the available literature ^{1/} and aerial photographs of the region and a thorough examination of the conditions in the field. A preliminary examination of the dam

^{1/} Geologic Map of Virginia, State Cons. and Dev. Comm., V.G.S., 1928; and, Bulletin of the Geo. Soc. of America, Vol. 69, PP 569-574, 1958.

site was conducted and depths of overburden was determined where possible with a hand auger and other hand tools.

The structure site is located on the edge of the Piedmont and Blue Ridge Physiographic Provinces. The bedrock consists of granite gneisses and associated rocks. The depths to rock under the foundation appears to be 10 feet or less. The rock surfaces may be uneven due to differential weathering which is characteristic of granitic type rocks. Depth to ground water in most cases is approximately equivalent to the stream level. The material to be excavated from the emergency spillway will range from SM to ML (Unified Soil Classification System) with silty sands dominating. Substantial amounts of weathered bedrock will probably be found, which will decrease the amount of rock to be excavated. The floodplain alluvium consists of very fine silty sand with minor amounts of fine gravel. A certain amount of seepage should be expected near the surface of the hard bedrock. No geologic conditions were found which would adversely affect the construction costs. The dam will be 59 feet high and 500 feet long. Abutment slopes range from 40 to 60 percent. The left abutment is the only possible spillway location; medium to low rock excavation will probably be necessary. This site is a water supply structure; therefore it may be necessary to core drill the foundation to better determine subsurface rock conditions. There are possibly deeply weathered zones in the bedrock which can only be checked by core drilling.

Economic Investigations

Agricultural damage estimates were based upon schedules obtained in the field covering 100 percent of the floodplain area of Beaver Creek. These schedules covered land use, present crop distribution, average yields, and historical data on flooding and flood damages.

Information obtained from these schedules was analyzed and used with other data to develop damage rates for crops by seasons and depth of flooding. The applicable rates of damage were applied to the floods of the historical series, and an adjustment was made to take into account the effect of recurrent flooding where several floods occurred within one crop year.

The floodplain land use was mapped in the field. Estimates for the normal yields of crops were based on information obtained from the schedules supplemented by information obtained from work unit personnel and other agricultural workers in the area. Because of the small floodplain and uniform use, a composite crop distribution was used for each reach.

In the calculation of crop and pasture damage, all expenses saved, such as the cost of harvesting, were deducted from the gross value of the damage. Damage estimates to other agricultural property, such as fences, were obtained from analysis of schedules and correlated with sizes of floods.

Benefits due to restoration of former productivity were calculated by summarizing land use conversions, acreages, yields and net incomes for present and future conditions. These are summarized as follows:

Crop	Present			:	Future		
	Acre	Yield	Net Income		Acre	Yield	Net Income
			\$				\$
Corn	53	80 bu.	3,889	:	73	80 bu.	5,357
Hay and Pasture	73	2½ T. & 8 AUM	2,047	:	53	2½ T. & 8 AUM	1,486

All associated costs and added flood damages were deducted. Restoration benefits were discounted for five years for lag in accrual.

The monetary appraisal of the physical damage from the floodplain scour, streambank erosion and the overbank deposition of sediment was based on the value of the production lost, taking into account both the lag for recovery of productivity and costs of farm operations.

The value of easements was based on the appraised value of the lands involved. This gave a more realistic value rather than using productivity of the lands lost by inundation. Much of this land is now idle or very poor pasture with a low net income.

Indirect damage to agricultural enterprises in this watershed involves extra farming expense, such as additional travel time and costs for extra feed, and additional travel time for school bus, transportation, and mail delivery. Upon analysis, it appeared that these damages are about ten percent of the direct damage.

Costs of producing crops, pasture, and livestock, were obtained locally and from experiment station data. All installation costs were based on current (1959) prices. All costs of production and benefits were based on long-term projected prices, as projected by ARS, September 1957.

Methods of economic evaluation conform to those set up in the Economic Guide.

The County Board of Supervisors of Albemarle County appraised the costs allocated to the county water supply and determined in conjunction with the local engineer that the benefits to be derived were compatible with the costs. Albemarle County is in an area of industrial growth and residential development. This water supply is one of several reservoirs that is anticipated in the county to encourage this growth and development.

Costs for the multiple purpose structure were allocated between purposes using the separable costs-remaining benefits method. The actual allocation is shown in the following tables:

Allocation of Costs between Purposes 1/

	<u>Flood Prevention</u>	<u>Non-Agri. Water Mgmt.</u>	<u>Total</u>
Step A			
1. Benefits	137,302	72,551	209,853
2. Alternate Costs	87,413 <u>2/</u>	61,809 <u>2/</u>	149,222
3. Lesser of 1 or 2	87,413	61,809	149,222
4. Separable Costs	85,335	59,731	145,066
5. Remaining Benefits	2,078	2,078	4,156
6. Alloc. Joint Costs	1,039	1,039	2,078
7. Total Alloc. Costs	86,374	60,770	147,144
Percent	58.7	41.3	100.0

	<u>Flood Prevention</u>		<u>Non-Agri. Water Mgmt.</u>	<u>Total</u>	<u>Total</u>
	<u>P.L. 566</u>	<u>Other</u>	<u>Other</u>	<u>Other</u>	<u>Funds</u>
Step B					
Eng. Estimate	58,711	58,711	41,307	41,307	100,018
Contingencies	7,045	7,045	4,957	4,957	12,002
Eng. Services	15,881	15,881	11,172	11,172	27,053
Other	4,737	4,737	3,334	3,334	8,071
Subtotal	86,374	86,374	60,770	60,770	147,144
Land, Easements & R.O.W.	9,275	9,275	6,525	15,800	15,800
Adm. of Contract	822	822	578	1,400	1,400
Subtotal	10,097	10,097	7,103	17,200	17,200
Grand Total	86,374	10,097	96,471	67,873	77,970
Percent from Step A		58.7	41.3		

Alternatives Considered

During the preliminary investigation it was obvious that the planning and installation of land treatment measures should be accelerated. Even though much of the area had already been treated there were some areas that were still contributing an undue amount of runoff and sediment. The objective of the local people was also to protect as much of the good floodplain land in the lower end of the watershed as possible. This could be accomplished with one structure immediately above the principal damage area or in two structures further up stream. These two structures would increase costs considerably and would not materially increase benefits. Therefore, the lower structure was included in the plan. This was also a suitable site for including the county water storage.

1/ 1959 Prices

2/ Administering of contracts and land, easement and right-of-way costs were not included because comparable analysis showed essentially the same allocation.

TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION
Beaver Creek Watershed, Virginia

(Dollars) 1/

Structure Site No. or Name	Federal Installation Cost					Non-Federal Installation Cost				
	Construction	Eng.	Est.	Other	Total	Construction	Eng.	Est.	Other	Total
Multiple Purpose Structure #1	7045	15881	4737	86374	41307	4957	14506	1400	20575 ^{2/}	82745:169119
GRAND TOTAL	7045	15881	4737	86374	41307	4957	14506	1400	20575	82745:169119

1/ 1959 Prices

2/ Includes \$4,775 for modification of structure to provide roadway on top of dam.

Date: March, 1960

TABLE 3 - STRUCTURE DATA
FLOODWATER RETARDING STRUCTURE AND WATER SUPPLY RESERVOIR

Beaver Creek Watershed, Virginia

ITEM	UNIT	DAM 1
Drainage Area	sq. mi.	9.45
Storage Capacity		
Sediment	ac. ft.	202
Floodwater	ac. ft.	1746
Water Supply	ac. ft.	1600*
Total	ac. ft.	3548
Between high and low stages	ac. ft.	0
Surface Area		
Sediment pool	acres	31
Floodwater pool	acres	160
Water supply pool	acres	104
Volume of Fill	cu. yds.	132,300**
Elevation Top of Dam	ft.	559.4
Maximum Height of Dam	ft.	59.4
Emergency Spillway		
Crest elevation	ft.	552.1
Bottom width	ft.	200
Type	-	Veg.
Percent chance of use	-	1
Ave. curve No.-Cond. LL	-	70
Emergency Spillway Hydrograph		
Storm rainfall (6-hr.)	in.	14.4
Storm runoff	in.	10.3
Velocity of flow (v_c)	ft./sec.	9.3
Discharge rate	c.f.s.	5,350
Max. w.s. elev.	ft.	556.7
Freeboard Hydrograph		
Storm rainfall (6-hr.)	in.	20.0
Storm runoff	in.	15.7
Velocity of flow (v_c)	ft./sec.	10.8
Discharge rate	c.f.s.	8,700
Max. w.s. elev.	ft.	558.4
Principal Spillway		
Capacity	c.f.s.	100***
Capacity Equivalent		
Sediment volume	in.	0.40
Detention volume	in.	3.47
Spillway storage	in.	2.60
Class of Structure		b

* County Water Supply.

** Includes 10,027 cu. yds. for widening top of dam for use as a public road.

*** Capacity when pipe starts flowing full.

Date: March, 1960

TABLE 4 - SUMMARY OF PHYSICAL DATA

Beaver Creek Watershed, Virginia

Item	Unit	Quantity With- out Project	Quantity With Project
Watershed area	:Sq. mile	: 10.95	: xxxxx
Watershed area	:Ac.	: 7,010	: xxxxx
Area privately owned	:Ac.	: 7,010	: xxxxx
Area of cropland	:Ac.	: 1,518	: 1,281
Area of grassland	:Ac.	: 2,615	: 2,775
Area of woodland	:Ac.	: 2,519	: 2,610
Area of miscellaneous	:Ac.	: 358	: 344
Overflow area subject to damage <u>2/</u>	:Ac.	: 126 ^{1/}	: 33
Area damaged annually <u>2/</u> by Sediment	:Ac.	: 15.60	: 1.24
Floodplain scour	:Ac.	: 6.30	: 1.82
Streambank erosion	:Ac.	: .43	: .08
Annual rate of erosion	:	:	:
Sheet	:Tons/yr.	: 38,000	: 32,300
Gully	:Tons/yr.	: 1,400	: 200
Streambank	:Tons/yr.	: 3,800	: 1,320
Scour	:Tons/yr.	: 765	: 120
Average annual rainfall	:	: 42	: xxxxx

1/ Total floodplain area based on the largest storm evaluated in the 30 year period of the historical series of floods.

2/ Area below multiple purpose structure.

Date: March, 1960

TABLE 5 - SUMMARY OF PLAN DATA

Beaver Creek Watershed, Virginia

Item	Unit	Quantity
Years to complete project	Year	3
Total installation cost		
Public Law 566 funds	Dollar	91,513
Other	Dollar	123,314
Annual Operation and Maintenance Cost		
Non-Federal	Dollar	400
Average annual monetary benefits ^{1/}	Dollar	7,399
Agricultural	Percent	54
Non-Agricultural	Percent	46
Structural Measures		
Floodwater Retarding Structures	Each	1
Area inundated by structures		
Floodplain		
Sediment Pool	Acre	26
Detention Pool	Acre	45
Water Supply Pool	Acre	55
Upland		
Sediment Pool	Acre	5
Detention Pool	Acre	11
Water Supply Pool	Acre	18
Watershed area above structures	Acre	6,050
Reduction of floodwater damage	Dollar	3,172
by Land Treatment Measures -		
Watershed Protection	Percent	13
by Structural Measures	Percent	87
Reduction of Sediment Damages	Dollar	1,025
by Land Treatment Measures		
Watershed Protection	Percent	18
by Structural Measures	Percent	82
Reduction of Erosion Damage	Dollar	808
by Land Treatment Measures		
Watershed Protection	Percent	1
by Structural Measures	Percent	99

^{1/} From Structural Measures.

Date: March, 1960

TABLE 6 - ANNUAL COSTS

Beaver Creek Watershed, Virginia

(Dollars) 1/

Measures	: Amortization of	: Operation and	:
	: Installation	: Maintenance	: Total
	: Cost <u>2/</u>	: <u>Costs</u>	:
	:	: Non-Federal	:
Multiple Purpose Structure #1	: 5,794	: 400	: 6,194
TOTAL	: 5,794	: 400	: 6,194

1/ 1959 prices for installation; long term for Operation and Maintenance.

2/ 2½ percent interest rate for 50 years.

Date: March, 1960

TABLE 7 - MONETARY BENEFITS FROM STRUCTURAL MEASURES AND
LAND TREATMENT MEASURES FOR FLOOD PREVENTION

Beaver Creek Watershed, Virginia

(Dollars) 1/

Item	:Est. Average Annual Damage :			Average Annual Monetary Benefits
	: With- : out : Pro- : ject	: After : All Land : Treat- : ment	: With : Pro- : ject	
Floodwater Damage	:	:	:	:
Crop and Pasture	: 2,596	: 2,315	: 163	: 2,152
Other Agricultural	: 842	: 710	: 103	: 607
Subtotal	: 3,438	: 3,025	: 266	: 2,759
Sediment Damage	:	:	:	:
Over Bank Deposition	: 1,113	: 931	: 88	: 843
Subtotal	: 1,113	: 931	: 88	: 843
Erosion Damage	:	:	:	:
Floodplain Scour	: 448	: 439	: 130	: 309
Streambank erosion	: 429	: 399	: 80	: 319
Subtotal	: 877	: 838	: 210	: 628
Indirect Damages	: 543	: 479	: 56	: 423
Total, All Damages	: 5,971	: 5,273	: 620	: 4,653
Total Flood Prevention Benefits	:	:	:	: 4,653
County Water Supply	:	:	:	: 2,558
Total Non-agricultural Water Management Benefits	:	:	:	: 2,558
Total Primary Benefits	:	:	:	: 7,211
Total Monetary Benefits	:	:	:	: 7,211

1/ Based on Agricultural Price and Cost Projections, September, 1957.

Date: March, 1960

TABLE 8 - BENEFIT COST ANALYSIS

Beaver Creek Watershed, Virginia

(Dollars) 1/

Measures	AVERAGE ANNUAL BENEFITS				Ave. Annual Cost	Benefit Cost Ratio
	Flood Prevention	Non-Agricultural	In-culture	Water Mgt.		
Multiple Purpose Structure #1	2,759	843	628	423	2,558	7,211 : 6,194 : 1.2 to 1.0*
GRAND TOTAL	2,759	843	628	423	2,558	7,211 : 6,194 : 1.2 to 1.0

1/ Benefits based on Agricultural Price and Cost Projections, September 1957 and costs based on 1959 prices.

* The B - C Ratio for Flood Prevention is 1.3 to 1.0.

The B - C Ratio for County Water Storage is 1.0 to 1.0.

Date: March, 1960

TABLE 9 - ALLOCATION OF INSTALLATION COSTS OF STRUCTURAL MEASURES

Beaver Creek Watershed, Virginia

(Dollars) 1/

Item	Purpose		
	Flood	Non-Agricultural	Total
	Prevention	Water Management	
STEP A			
For Flood Prevention and County Water Storage	: 96,471	: 67,873	:164,344
Total	: 96,471	: 67,873	:164,344
STEP B			
P. L. 566	: 86,374	: -	: 86,374
Other	: 10,097	: 67,873	: 77,970
Total	: 96,471	: 67,873	:164,344

1/ 1959 prices.

Date: March, 1960

FINAL TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Jones

Sheet 1 of 2

ew-of

Beaver Creek Watershed, Virginia (2006)

Installation Cost Item	Unit	Number Applied	Est. Cost(Dollars)1/		TOTAL
			P.L. 566	Non-Federal Land Other	
<u>Land Treatment Measures</u>					
Soil Conservation Service					
Grassed Waterways	Acre	9		900	900
Pasture and Hayland Renovation	Acre	2,105		113,670	113,670
Pasture & Hayland Planting	Acre	1,303		78,180	78,180
Stripcropping, Contour	Acre	58		580	580
Wildlife Habitat Develop.	Acre	20		1,500	1,500
Subsoiling	Acre	73		292	292
Cons. Cropping System	Acre	702		2,808	2,808
Contour Farming	Acre	1,286		5,144	5,144
Cover and Green Manure Crops	Acre	464		4,640	4,640
Crop Residue Use	Acre	504		2,016	2,016
Cutback Border	Feet	3,570		1,250	1,250
Ditchbank Seeding	Feet	1,472		147	147
Tile Drain	Feet	5,941		2,673	2,673
Diversion	Feet	400		160	160
Farm Ponds	No.	7		1,750	1,750
Field Border Planting	Feet	237		36	36
Hedgerow Planting	Feet	683		102	102
Grasses & Legumes in Rotation	Acre	254		2,540	2,540
Irrigation Reservoirs	No.	1		750	750
Irrigation Systems	No.	1		6,000	6,000
Land Clearing	Acre	12		600	600
Drainage, Main or Lateral	Feet	3,000		900	900
Spoilbank Spreading	Feet	3,360		168	168
Spring Development	No.	4		600	600
Drainage, Field Ditch	Feet	820		246	246
Terrace, Gradient	Feet	820		328	328
Critical Area Planting	Acre	29		7,250	7,250
Technical Assistance			2,024	1,471	3,495
SCS Subtotal			2,024	236,701	238,725
Forest Service					
Skid & Log Road Eros. Cont.	Mi.	1		300	300
Tree Planting	Acre	18.5		574	574
Woodland Grazing Control	Acre	163		478	478
Woodland Improvement	Acre	145		160	160
Woodland Harvest Cutting	Acre	147		220	220
Hydrologic Stand Improvement	Acre	8		27	27
Woodland Management	Acre	1,657		1,823	1,823
Technical Assistance			3,478	3,478	6,956
FS Subtotal			3,478	7,060	10,538
TOTAL LAND TREATMENT			5,502	243,761	249,263

FINAL TABLE I - ESTIMATED PROJECT INSTALLATION COST

Sheet 2 of 2

Beaver Creek Watershed, Virginia (2006)

Installation Cost Item	Unit	Number Applied	Est. Cost (Dollars) ^{1/}		TOTAL
			Non-Federal Land P.L. 566	Other	
<u>Structural Measures</u>					
Soil Conservation Service					
Multiple Purpose Structure No.		1	84,642	59,553	144,195
Specific cost for water supply				9,919	9,919
SCS Subtotal			84,642	69,472	154,114
Subtotal Construction			84,642	69,472	154,114
<u>Installation Services</u>					
Soil Conservation Service					
Engineering Services			34,422	24,220	58,642
Other			10,283	7,234	17,517
SCS Subtotal			44,705	31,454	76,159
Subtotal Installation Services			44,705	31,454	76,159
<u>Other Costs</u>					
Easements and R/W				15,800	15,800
Administration of Contracts				1,400	1,400
Subtotal Other Costs				17,200	17,200
TOTAL STRUCTURAL MEASURES			129,347	118,126	247,473
TOTAL PROJECT			134,849	361,887	496,736
<u>Summary</u>					
Subtotal SCS			131,371	354,827	486,198
Subtotal FS			3,478	7,060	10,538
TOTAL PROJECT			134,849	361,887	496,736

^{1/} Price Base: Current

FINAL

January 1966

File

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

P. O. Box 10026
Richmond, Virginia 23240

Beaver -
22-16

CFH
rule
4

July 9, 1963

To: Sponsors of Beaver Creek Watershed
and Concerned Agencies

Attached are the Supplemental Watershed Work Plan Agreement (Supplement No. 1) and Supplemental Work Plan for Beaver Creek Watershed. The purpose of Supplement No. 1 is to modify the watershed work plan to justify increased construction costs resulting from design changes in the dam.



Tom F. McGourin
State Conservationist

Attachments

CMJones:etw

See attached Distribution List

D. A. WILLIAMS - 1 Manually signed copy and 1 typed copy @ w/EWPU Memo. of concurrence
EWPU - 5 typed copies

J. K. Abernathy - 1 Manually signed copy - 1 typed copy

Office of General Counsel (to be transmitted by W. E. Armstrong) - 1 typed copy

E. Walker Turner, Va. Dept. Hwy.

U. S. Forest Service - 2 typed copies

Va. Forest Service & 1 typed copy

District Engineers, Va. Hwy. Dept.

Army Engineers - Norfolk - 2 typed copies

Fish & Wildlife - Atlanta - 2 typed copies

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John A. Smart - A. G. - 6 typed copies

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Robert O. Anderson - WUC - 6 typed copies

N. Wilson, R. C. Barnes, A. D. Williamson, L. S. Button, Jr., J. H. SHEPPE, J. Trimmer

T. Mack, - 1 typed copy each

SPONSORS: G. B. Wayland, Chm. Thos. J. SCD, Crozet - 1 typed copy
Hughes C. Swain, Secy. Thos. J. SCD, Lovington, Va. - 1 Manually signed copy,
John W. Williams, Chm. Albemarle Co. Board of Supervisors - Charlottesville, Va. - 1 typed copy
June T. Moon, Clerk, Albemarle Co. Board of Supervisors - Charlottesville, Va. - 1 Manually signed copy

Distribution list sent to J. A. Smart & R. O. Anderson

ETWingfield

**SUPPLEMENTAL WATERSHED WORK PLAN AGREEMENT
(Supplement No. 1)**

between the

**Thomas Jefferson Soil Conservation District
Albemarle County Board of Supervisors**

State of Virginia

(hereinafter referred to as the Sponsoring Local Organizations)

and the

**Soil Conservation Service
United States Department of Agriculture
(hereinafter referred to as the Service)**

Whereas, the Watershed Work Plan Agreement for Beaver Creek Watershed, State of Virginia, executed by the sponsoring local organizations named therein and the Service, became effective the 2nd day of June 1960; and

Whereas, Supplement No. 1 which modifies the watershed work plan for said watershed has been developed through the cooperative efforts of the sponsoring local organizations and the Service, which supplement is annexed to and made a part of the agreement;

Whereas, it has been found necessary to modify the watershed work plan to justify increased construction costs resulting from design changes in dam;

Now, therefore, the sponsoring local organizations and the Service hereby agree upon the following modifications of the terms, conditions, and stipulations of said watershed work plan agreement:

1. Item 1, page 2, of the agreement is changed to read,

"The Sponsoring Local Organization will acquire without cost to the Federal Government such land, easements, or rights-of-way as will be needed in connection with the works of improvement. (Estimated cost \$15,800)"

2. Item 3, page 2, of the agreement is changed to read,

"The percentages of construction costs of the works of improvement to be paid by the Sponsoring Local Organizations and by the Service are as follows:

<u>Works of Improvement</u>	<u>% Sponsoring Local Organizations Will Pay</u>	<u>% Service Will Pay</u>	<u>Estimated Construction Cost</u>
Multiple Purpose Structure	41.3%	58.7%	147,802 ^{1/}

1/ Does not include \$6,939 specific costs.

3. Item 5, page 2, of the agreement is changed to read,

"The Sponsoring Local Organizations will bear the total cost of administering contracts. (Estimated cost \$1,400)

"The Sponsoring Local Organizations will bear the total cost of water supply gates. (Estimated cost \$2,164)

"The Sponsoring Local Organizations will bear the additional cost of modifying the fill to provide a roadway across the top of dam. (Estimated cost \$4,775)"

The Sponsoring Local Organizations and the Service further agree to all other terms, conditions, and stipulations of said Watershed Work Plan Agreement not modified herein.

THOMAS JEFFERSON SOIL CONSERVATION DISTRICT
Local Organization

By G.B. Wayland
Title Chairman
Date June 25 1963

The signing of this agreement was authorized by a resolution of the governing body of the Thomas Jefferson Soil Conservation District, Local Organization, adopted at a meeting held on April 26 1963

Hughes C. Swain
Secretary, Local Organization
Date June 26, 1963
ALBEMARLE COUNTY BOARD OF SUPERVISORS
Local Organization

By John W. Williams
Title CHAIRMAN
Date JUNE 25, 1963

The signing of this agreement was authorized by a resolution of the governing body of the Albemarle County Board of Supervisors, Local Organization, adopted at a meeting held on JUNE 20, 1963

June D. Maer
Clerk, Local Organization
Date JUNE 25, 1963

SOIL CONSERVATION SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

By F.F. Carr
Act. State Conservationist
Date June 28 1963

SUPPLEMENT NO. 1
of the
Watershed Work Plan
BEAVER CREEK WATERSHED
Albemarle County, Virginia

The original work plan for Beaver Creek Watershed was prepared in March 1960 by the Thomas Jefferson Soil Conservation District and the Albemarle County Board of Supervisors, assisted by the Soil Conservation Service and the U. S. Forest Service.

The purpose of this Supplement (No. 1) to the work plan is to change the evaluation period for the project from 50 years to 100 years and add previously unincorporated local secondary benefits. This Supplement was made necessary by an increase in the cost estimate for the dam resulting from the soil laboratory report on the proposed fill material. The soils laboratory analysis of the fill material indicated that the side slope of the dam should be flatter than originally planned to provide greater stability in the fill and insure a greater measure of safety in the dam.

The Beaver Creek Watershed comprises an area of approximately 7,010 acres, located in Albemarle County, Virginia. The watershed work plan includes all of the drainage area of Beaver Creek down to the confluence with the Mechum River. Approximately 22 percent of the watershed is in cropland, 37 percent in grassland, 36 percent in woodland and 5 percent in miscellaneous uses.

The structural measures in this plan are limited to one multiple purpose dam providing 1,746 acre feet of floodwater storage and 1,600 acre feet of water supply storage for Albemarle County.

The costs for the multiple purpose dam were allocated using the Separable Costs-Remaining Benefit Method. On the basis of this cost allocation 58.7 percent of the costs were allocated to flood prevention and 41.3 percent were allocated to non-agricultural water management. Details of the cost allocation and the cost sharing are shown on the attached page.

The estimated construction cost of the dam is \$147,802. The installation services are estimated to be \$35,124. The estimated cost of land, easements and rights-of-way is \$15,800 and the administration of contracts is estimated to cost \$1,400. The installation of water supply gates is estimated to cost \$2,164 and are to be paid for solely by the county. Also the Virginia State Highway Department will furnish \$4,775 to modify the top of the dam to carry a secondary road thereby permitting them to discard an old bridge a short distance down stream from the dam. This brings the total estimated installation cost to \$207,065. Of this total Albemarle County will provide \$84,815 as follows: \$61,042 available as cash prior to awarding the contract for construction; \$14,506 for engineering and other services before and during construction; \$7,103 which

represents the land, easement and rights-of-way and contract administration costs allocated to water supply. The County will also furnish \$2,164 for water supply gates, a specific cost item. In addition, the sponsors will furnish \$10,097 for that portion of land, easements and rights-of-way and administration of contract costs allocated to flood control.

In order to maintain a favorable benefit-cost ratio for the project after the cost estimates were revised upward it was necessary to increase the economic evaluation period of the project from 50 years to 100 years and add 10 percent local secondary benefits not included in the original plan. To extend the evaluation period to 100 years it was necessary to make adjustments for an additional 187 acre feet of sediment storage. Twelve acre feet of this sediment storage was allocated to the flood pool and the remaining 175 acre feet to the water supply pool. It was determined that the 12 acre feet of additional sediment accumulating in the flood pool during the second 50 years of the life of the structure would have no appreciable effect on the structure. However, the water supply benefits were discounted during the second 50 years of structure life to allow for the 175 acre feet of storage lost to sediment accumulation.

Local secondary benefits were not included in the economic evaluation in the original plan. However, local secondary benefits amounting to 10 percent of the direct identifiable benefits were added in this evaluation. These benefits were claimed on the basis of increased farm labor requirements, transportation facilities, processing and handling requirements and economic growth in the surrounding area as a result of the project. Secondary benefits on a national basis were not included.

The estimated average annual benefits from flood prevention and non-agricultural water management are \$7,867. The estimated average annual cost including maintenance is \$6,724. This gives a favorable benefit-cost ratio of 1.2 to 1.0.

COST ALLOCATION AND COST SHARING
 MULTIPLE-PURPOSE STRUCTURE, BEAVER CREEK WATERSHED, VIRGINIA
 Dollars 1/

Cost Allocation of Total Cost

	<u>Flood Prevention</u>	Non-Agri. <u>Water Mgt.</u>	<u>Total</u>
1. Benefits	166,184	91,400	257,584
2. Alternate Costs	108,670	76,839	185,509
3. Lesser of 1 & 2	108,670	76,839	185,509
4. Separable Costs	106,087	74,256	180,343
5. Remaining Benefits	2,583	2,583	5,166
6. Alloc. Joint Costs	1,291	1,292	2,583
7. Total Allocated Costs	107,378	75,548	182,926
Percent	58.7	41.3	100.0

Cost Sharing of Installation Cost

	<u>Flood Prevention</u>			Non-Agri.	<u>Total</u>	<u>Total</u>
	<u>P.L. 566</u>	<u>Other</u>	<u>Total</u>	<u>Water Mgt.</u> <u>Other</u>		
Engineering Est.	77,464	-	77,464	54,502	54,502	131,966
Contingencies	9,296	-	9,296	6,540	6,540	15,836
Eng. Services	15,881	-	15,881	11,172	11,172	27,053
Other	4,737	-	4,737	3,334	3,334	8,071
Subtotal	107,378	-	107,378	75,548	75,548	182,926
Land, Easements & R/W	-	9,275	9,275	6,525	15,800	15,800
Adm. of Contract	-	822	822	578	1,400	1,400
Specific Cost (Gates)	-	-	-	2,164	2,164	2,164
Specific Cost (Road)	-	4,775	4,775	-	4,775	4,775
Subtotal	-	14,872	14,872	9,267	24,139	24,139
Grand Total	107,378	14,872	122,250	84,815	99,687	207,065

1/ Price Base: 1961

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST (Cont'd)
Beaver Creek Watershed, Virginia

Total Project

Installation Cost Item	: No. to be Applied:	: Estimated Cost (Dollars)	: 1/	: Non-Fed. Land	: Other	: TOTAL
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STRUCTURAL MEASURES

Soil Conservation Service

Multiple Purpose Structure:	No: 1	:: 86,760	:	61,042	:	147,802
Specific Cost Items	:	:: -	:	6,939	:	6,939
SCS Subtotal	:	:: 86,760	:	67,981	:	154,741

Subtotal-Construction	:	:: 86,760	:	67,981	:	154,741
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Installation Services

Soil Conservation Service

Engineering Services	:	:: 15,881	:	11,172	:	27,053
Other	:	:: 4,737	:	3,334	:	8,071
SCS Subtotal	:	:: 20,618	:	14,506	:	35,124

Subtotal-Install. Services	:	:: 20,618	:	14,506	:	35,124
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Other Costs

Land, Easements & R/W	:	:: -	:	15,800	:	15,800
Admin. of Contracts	:	:: -	:	1,400	:	1,400

Subtotal - Other	:	:: -	:	17,200	:	17,200
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TOTAL STRUCTURAL MEASURES	:	:: 107,378	:	99,687	:	207,065
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TOTAL PROJECT	:	:: 112,517	:	140,256	:	252,773
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SUMMARY

Subtotal SCS	:	:: 109,128	:	126,337	:	235,465
Subtotal FS	:	:: 3,389	:	13,919	:	17,308

TOTAL PROJECT	:	:: 112,517	:	140,256	:	252,773
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1 / 1961 Prices

Note: Remainder of Table 1 remains unchanged.

Date June 1963

TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION
Beaver Creek Watershed, Virginia

(Dollars) 1/

Structure Site No. or Name	Federal Installation Cost			Non-Federal Installation Cost						
	Construction : Eng. : Est.	Instal. : Contin- : gencies:	Services : Engin- : eering	Total : Fed- : eral	Construction : Instal- : lation	Other : Ease- : ments	Total : Non- : Total			
Multiple Pur- pose Structure # 1	: 9296	: 15881	: 4737	: 107,378	: 54502	: 6540	: 1400	: 15800	: 92748	: 207,065
GRAND TOTAL	: 9296	: 15881	: 4737	: 107,378	: 54502	: 6540	: 1400	: 15800	: 92748	: 207,065

1/ 1961 Prices

2/ Does not include \$6,939 in specific costs for water supply gates and modification of the structure to provide a roadway on top of the dam.

Date : June 1963

TABLE 8 - BENEFIT COST ANALYSIS

Beaver Creek Watershed, Virginia

(Dollars) 1/

Measures	AVERAGE ANNUAL BENEFITS					Benefit Cost Ratio
	Damage Reduction	Non-Agri- cultural Water Mgt.	Local Secondary Benefits	Average Annual Cost	Total Cost	
Multiple Purpose Structure #1	4,653	2,537	677	7,867	6,724	1.2 to 1.0*
GRAND TOTAL	4,653	2,537	677	7,867	6,724	1.2 to 1.0

1/ Benefits based on Agricultural Price and Cost Projections, September 1957 and costs based on 1961 prices.

* The B-C Ratio for Flood Prevention is 1.3 to 1.0.
The B-C Ratio for County Water Storage is 1.0 to 1.0.

Date: June 1963

FINAL TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Jones

Beaver Creek Watershed, Virginia (2006)

Installation Cost Item	Unit	Number Applied	Est. Cost (Dollars) 1/		TOTAL
			Non-Federal P.L. 566	Land Other	
<u>Land Treatment Measures</u>					
Soil Conservation Service					
Grassed Waterways	Acre	9		900	900
Pasture and Hayland Renovation	Acre	2,105	113,670		113,670
Pasture & Hayland Planting	Acre	1,303	78,180		78,180
Stripcropping, Contour	Acre	58	580		580
Wildlife Habitat Develop.	Acre	20	1,500		1,500
Subsoiling	Acre	73	292		292
Cons. Cropping System	Acre	702	2,808		2,808
Contour Farming	Acre	1,286	5,144		5,144
Cover and Green Manure Crops	Acre	464	4,640		4,640
Crop Residue Use	Acre	504	2,016		2,016
Cutback Border	Feet	3,570	1,250		1,250
Ditchbank Seeding	Feet	1,472	147		147
Tile Drain	Feet	5,941	2,673		2,673
Diversion	Feet	400	160		160
Farm Ponds	No.	7	1,750		1,750
Field Border Planting	Feet	237	36		36
Hedgerow Planting	Feet	683	102		102
Grasses & Legumes in Rotation	Acre	254	2,540		2,540
Irrigation Reservoirs	No.	1	750		750
Irrigation Systems	No.	1	6,000		6,000
Land Clearing	Acre	12	600		600
Drainage, Main or Lateral	Feet	3,000	900		900
Spoilbank Spreading	Feet	3,360	168		168
Spring Development	No.	4	600		600
Drainage, Field Ditch	Feet	820	246		246
Terrace, Gradient	Feet	820	328		328
Critical Area Planting	Acre	29	7,250		7,250
Technical Assistance			2,024	1,471	3,495
SCS Subtotal			2,024	236,701	238,725
<u>Forest Service</u>					
Skid & Log Road Eros. Cont.	Mi.	1	300		300
Tree Planting	Acre	18.5	574		574
Woodland Grazing Control	Acre	163	478		478
Woodland Improvement	Acre	145	160		160
Woodland Harvest Cutting	Acre	147	220		220
Hydrologic Stand Improvement	Acre	8	27		27
Woodland Management	Acre	1,657	1,823		1,823
Technical Assistance			3,478	3,478	6,956
FS Subtotal			3,478	7,060	10,538
TOTAL LAND TREATMENT			5,502	243,761	249,263

Beaver Creek Watershed, Virginia (2006)

Installation Cost Item	Unit	Number Applied	Est. Cost (Dollars) ^{1/}		TOTAL
			Non-Federal P.L. 566	Land Other	
<u>Structural Measures</u>					
Soil Conservation Service					
Multiple Purpose Structure No.		1	84,642	59,553	144,195
Specific cost for water supply				9,919	9,919
SCS Subtotal			84,642	69,472	154,114
<hr/>					
Subtotal Construction			84,642	69,472	154,114
<hr/>					
<u>Installation Services</u>					
Soil Conservation Service					
Engineering Services			34,422	24,220	58,642
Other			10,283	7,234	17,517
SCS Subtotal			44,705	31,454	76,159
<hr/>					
Subtotal Installation Services			44,705	31,454	76,159
<hr/>					
<u>Other Costs</u>					
Easements and R/W				15,800	15,800
Administration of Contracts				1,400	1,400
<hr/>					
Subtotal Other Costs				17,200	17,200
<hr/>					
TOTAL STRUCTURAL MEASURES			129,347	118,126	247,473
<hr/>					
TOTAL PROJECT			134,849	361,887	496,736
<hr/>					
<u>Summary</u>					
Subtotal SCS			131,371	354,827	486,198
Subtotal FS			3,478	7,060	10,538
<hr/>					
TOTAL PROJECT			134,849	361,887	496,736
<hr/>					

^{1/} Price Base: Current

FINAL

January 1966