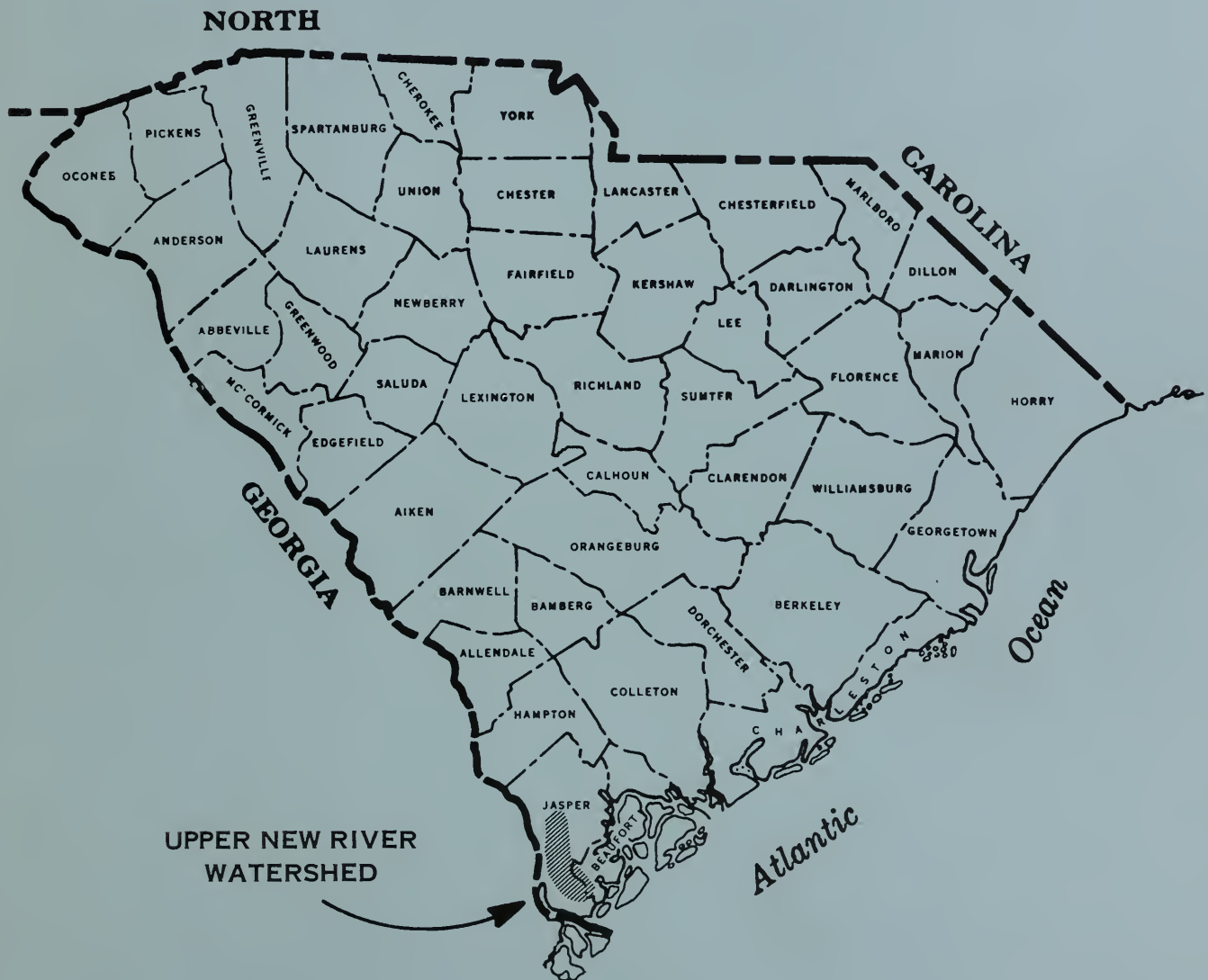


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WATERSHED WORK PLAN UPPER NEW RIVER WATERSHED BEAUFORT AND JASPER COUNTIES SOUTH CAROLINA

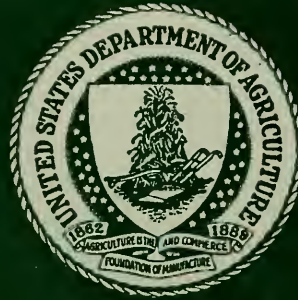


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ADDENDUM

UPPER NEW RIVER WATERSHED, SOUTH CAROLINA

AUGUST 1975

The purpose of this addendum is to add to the Upper New River Watershed Work Plan certain requirements of the Principles and Standards, which are: Part I - Benefit to Cost Comparisons; Part II - Abbreviated Four Account Displays; and Part III - Abbreviated Environmental Quality Plan.

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PART I
BENEFIT TO COST COMPARISONS

Upper New River Watershed, South Carolina

Project costs based on 1974 prices, project benefits based on current normalized prices, and benefit-cost ratio based on 6 1/8 percent interest rate for 40 years are as follows:

1. Annual cost	- \$ 58,700
2. Annual benefits	- \$117,000
3. Benefit-cost ratio	- 2.0 to 1
4. Benefit-cost ratio, excluding local secondary benefits	- 1.8 to 1

August 1975

PART II
Selected Plan
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Upper New River Watershed, South Carolina

<u>Components</u>	<u>Measures of effects</u>	<u>1/</u>
Beneficial effects:		
Value to users of increased outputs of goods and services		
a. flood prevention	\$	48,950
b. drainage		40,150
c. utilization of unemployed and underemployed labor resources		
project construction and O&M		8,900
d. more intensive land use		4,800
Total beneficial effects	\$	102,800
Adverse effects:		
Value of resources required for the project		
28 miles of multiple purpose channel for flood prevention and drainage		
project installation (structural measures)	\$	46,000
project administration		3,050
O&M		8,050
Total adverse effects	\$	57,100
Net beneficial effects		\$ 45,700

1/ Average annual (40 years at 5 7/8 percent interest)

PART II
Selected Plan
ENVIRONMENTAL QUALITY ACCOUNT

Upper New River Watershed, South Carolina

Components

Measures of effects

Beneficial and adverse effects:

A. Areas of natural beauty

1. Make available regional funds and resources that can be used to enhance the physical appearance of 50 farms
2. Remove trees from 290 acres in low-lying wet areas; of this total, 140 acres will revert to trees, and 150 acres will be maintained as open channels and grassed travelways
3. Establish or encourage more desirable species of vegetation

B. Quality considerations of water, land, and air resources

1. Reduce wet conditions in areas associated with fixed improvements, cropland, pastureland, and forest land
2. Increase and maintain soil productivity
3. Improve water quality in Upper New River by providing a dependable flow during dry seasons
4. Temporarily increase noise, dust, and smoke pollution
5. Reduce health hazards through improved septic tank absorption field operation and vector control

6. Improved hydraulic conditions of the channels will cause the flood stages resulting from the one percent chance storm to increase about 0.6 feet immediately below the construction area.
- C. Biological resources and selected ecosystems
1. Improve fishery habitat by providing a dependable source of water to maintain flow in Upper New River during dry periods
 2. Enhance wildlife habitat and food supply, and improve its distribution by providing drainage outlets to low-lying, unproductive wet areas
- D. Irreversible or irretrievable commitments of resources to future uses
1. Use of 334 acres for the installation of the planned measures, of which 290 acres will be cleared
 2. The use of labor, material and energy required to install the project

December 1974

PART II
Selected Plan
REGIONAL DEVELOPMENT ACCOUNT

Upper New River Watershed, South Carolina

<u>Components</u>	<u>Measures of effects 1/</u>	
	<u>State of</u> <u>South Carolina</u>	<u>Rest of</u> <u>Nation</u>
A. Income		
Beneficial effects:		
Value of increased output of goods and services to users residing in the region		
1. flood prevention	\$ 48,950	-
2. drainage	40,150	-
3. more intensive land use	4,800	-
4. utilization of regional unemployed or under- employed labor resources project construction and O&M	8,900	-
5. secondary	14,000	-
Total beneficial effects	\$116,800	-

<u>Components</u>	<u>Measures of effects 1/</u>	
	<u>State of</u> <u>South Carolina</u>	<u>Rest of</u> <u>Nation</u>
Adverse effects:		
Value of resources contributed from within the region to achieve the outputs		
28 miles of multiple purpose channel for flood prevention and drainage project installation (structural measures)	\$ 17,500	\$ 28,500
project administration	250	2,800
O&M	8,050	-
Total adverse effects	\$ 25,800	\$ 31,300
Net beneficial effects	\$ 91,000	-\$ 31,300

1/ Average annual (40 years at 5 7/8 percent interest)

December 1974

<u>Components</u>	<u>Measures of effects 1/</u>	
	<u>State of</u> <u>South Carolina</u>	<u>Rest of</u> <u>Nation</u>
B. Employment		
Beneficial effects:		
Increase in the number and types of jobs		
a. employment in agriculture, service, and trade activities	12 permanent semi-skilled jobs; one permanent skilled job	-
b. employment for project construction	26 semi-skilled jobs for one year; two skilled jobs for one year	-
c. employment for project O&M	one permanent semi-skilled job	-
Total beneficial effects	13 permanent semi-skilled jobs; one permanent skilled job; 26 semi-skilled jobs for one year; two skilled jobs for one year	-

<u>Components</u>	<u>Measures of effects 1/</u>	
	<u>State of</u> <u>South Carolina</u>	<u>Rest of</u> <u>Nation</u>
Adverse effects:		
Decrease in number and types of jobs		
a. loss in agricultural employment of project take area	one permanent semi-skilled agricultural job	-
b. loss in forestry industry employment of project take area	one permanent semi-skilled forestry job	-
Total adverse effects	two permanent semi-skilled jobs	-
Net beneficial effects	11 permanent semi-skilled jobs; one permanent skilled job; 26 semi- skilled jobs for one year; two skilled jobs for one year	-

1/ Average annual (40 years at 5 7/8 percent interest)

December 1974

<u>Components</u>	<u>Measures of effects 1/</u>	
	<u>State of</u>	<u>Rest of</u>
	<u>South Carolina</u>	<u>Nation</u>
C. Population Distribution		
Beneficial effects:	Create 11 permanent semi-skilled jobs; one permanent skilled job; 26 semi-skilled jobs, and two skilled jobs for one year in an area which has experienced a three percent reduction in population in the last three years	-
Adverse effects:	-	-
D. Regional Economic Base and Stability		
Beneficial effects:	Create 11 permanent semi-skilled jobs; one permanent skilled job; 26 semi-skilled jobs, and two skilled jobs for one year in an area where agriculture is the economic mainstay and 37 percent of the families have incomes less than the national poverty level	-
Adverse effects:	-	-

PART II
Selected Plan
SOCIAL WELL-BEING ACCOUNT

Upper New River Watershed, South Carolina

Components

Measures of effects

Beneficial and Adverse Effects

A. Real Income

1. Create 12 permanent low to medium income jobs, and 28 low to medium income jobs for one year for the residents of the area
2. Create regional income benefit distribution of \$116,800 by income class as follows:

<u>Income Class</u> <u>(dollars)</u>	<u>Percentage</u> <u>of Adjusted</u> <u>Gross Income</u> <u>in Class</u>	<u>Percentage</u> <u>Benefits</u> <u>in Class</u>
Less than 3,000	9	29
3,000-10,000	49	40
More than 10,000	42	31

3. Local costs to be borne by region total \$25,800 with distribution by income class as follows:

<u>Income Class</u> <u>(dollars)</u>	<u>Percentage</u> <u>of Adjusted</u> <u>Gross Income</u> <u>in Class</u>	<u>Percentage</u> <u>Contribution</u> <u>in Class</u>
Less than 3,000	9	10
3,000-10,000	49	50
More than 10,000	42	40

<u>Components</u>	<u>Measures of effects</u>
B. Life, Health, and Safety	<ol style="list-style-type: none">1. Provide outlets for internal land drainage2. Remove water from the two year storm in 24 hours3. Provide better access within the area4. Provide outlets for better vector control5. Provide flood protection to roads

December 1974

PART III
ABBREVIATED ENVIRONMENTAL QUALITY PLAN

Upper New River Watershed, South Carolina

The goals of this environmental quality plan for the Upper New River Watershed are to: (1) preserve and enhance areas of natural beauty; (2) maintain and improve the quality of the water, land, and air resources; (3) improve the economic and social conditions of the area; and (4) preserve and enhance the biological resources and ecosystems of the watershed so that man can live in an aesthetically and culturally pleasing environment.

The principal environmental problems in the watershed are flood-water damages, poor drainage, poor water quality in Upper New River, and low income.

The watershed lies in a rural setting of nearly flat Coastal Plain terrain interspersed with cropland, pastureland and forest land. The predominant tree species are water tolerant hardwoods in the low areas and loblolly and longleaf pine on the higher elevations. Most of the pastures in the area are in dallis or coastal bermuda grass. Flood problems and poor drainage make proper management of cropland, pastureland, and forest land impossible.

Within Calfpn Bay, some areas are occupied by brush which have no economic value and minimal wildlife habitat value. Soils in these areas are too wet to manage for forest production efficiently, but have surface water during wet seasons only. Homes and their contents in the Bay suffer mildew damage, and water stands in yards and roads for weeks after rains. Septic tank fields function poorly or not at all for months each year because of the high water table. As a result of the fluctuating conditions, the Calfpn Bay area offers only marginal habitat for game species of wildlife. The streams in this area are either intermittent or ephemeral and have no significant fishery value.

Component needs for solving problems relating to specific environmental conditions are listed below:

1. Areas of natural beauty
 - a. provide adequate outlets for floodwater and drainage
 - b. establish or encourage more desirable species of vegetation

2. Quality of water, land, and air resources
 - a. improve water quality in Upper New River by providing a dependable flow during dry seasons
 - b. maintain and enhance soil productivity
 - c. reduce excess water damages to crops, pastures, forest, and fixed improvements
3. Economic and Social
 - a. improve farm income through increased productivity of crops, pastures and forest land
 - b. improve living conditions by providing outlets for excess water in yards and roads
 - c. improve health conditions through better septic tank field operations and increased vector control
4. Biological resources and ecosystems
 - a. improve fishery habitat by providing a dependable source of water to maintain flow in Upper New River during dry periods
 - b. improve wildlife habitat by providing dependable food supplies and avoiding excessive destruction of habitat

The plan elements for environmental quality consist of land treatment and structural measures. Cropland treatment measures would consist of open and tile drains, conservation cropping systems, stripcropping, crop residue management, land leveling and grading, ponds and irrigation systems.

Pasture and hayland treatment would include pasture and hayland planting and management, ponds, open and tile drains, and brush control.

Conservation practices on forest land would include tree planting, hydrologic stand improvement, and improvement cutting.

Wildlife food and cover plantings would be made in appropriate areas throughout the watershed and existing wildlife habitat would be protected and enhanced.

Landowners would be encouraged by the local soil and water conservation district to apply and maintain land treatment measures with assistance from the Soil Conservation Service, the U.S. Forest Service and other agencies. Financial assistance will be used from

other programs as available.

Floodwater and drainage channels would be constructed in the Calpen Bay area to allow landowners to establish and maintain needed conservation measures. Either wells or pits along the channels would be installed to provide a dependable flow of water in Upper New River during dry periods. The structural measures would be implemented by the Beaufort-Jasper Soil and Water Conservation District and the Jasper County Council. Cost-sharing is available under Public Law 566, as amended.

The estimated installation costs of the elements of the environmental quality plan are as follows:

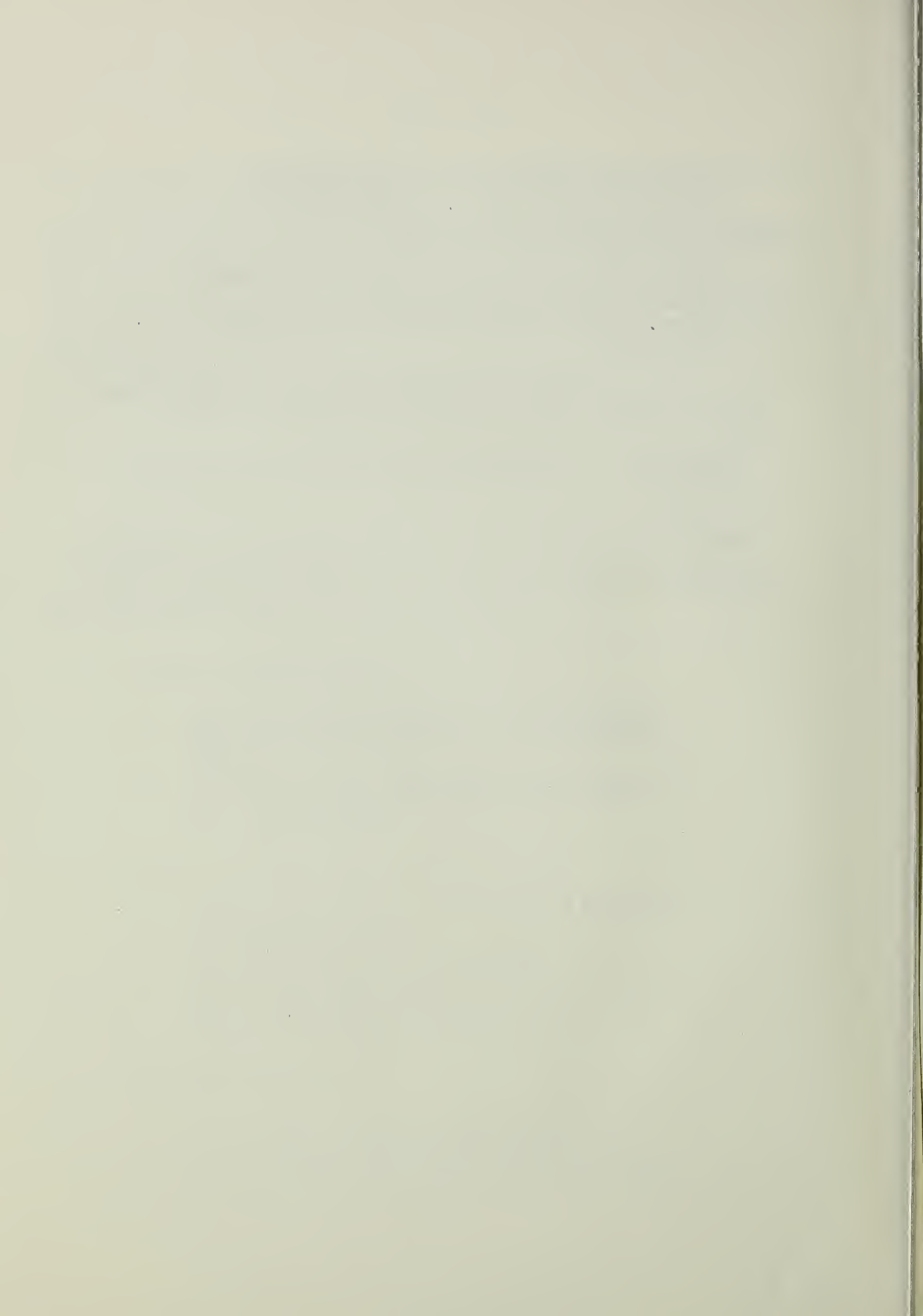
1. Application of land treatment measures - \$ 700,000
2. Installation of multiple purpose channel - \$1,850,000

The total installation cost of the environmental quality plan is estimated to be \$2,550,000.

The environmental effects that would result from installation of the environmental quality plan are as follows:

1. Areas of natural beauty
 - a. appearance of farms will be enhanced through application and maintenance of land treatment measures
 - b. appearance of the forest land will be enhanced as a result of more desirable species and more vigorous growth
2. Quality of water, land, and air resources
 - a. improve water quality by providing a dependable flow during dry periods
 - b. maintain and preserve soil productivity by installing land treatment measures
 - c. reduce excess water damages to crops, pastures, forests and fixed improvements by providing outlets for floodwater and drainage
3. Economic and Social
 - a. improve farm incomes through increased production on cropland, pastureland, and forest land
 - b. improve living conditions by providing outlets for excess water removal from yards and roads

- c. improve health conditions by allowing better vector control and septic tank fields drainage
4. Biological resources and ecosystems
 - a. improve fishery habitat by providing a dependable source of water during dry periods
 - b. improve wildlife habitat by providing dependable food supplies
 5. Irreversible or irretrievable commitments would require 334 acres of land for construction and maintenance of channel work.



WATERSHED WORK PLAN AGREEMENT

between the

Beaufort-Jasper Soil and Water Conservation District
Jasper County Council

(hereinafter referred to as the Sponsoring Local Organizations)
State of South Carolina

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 Upper New River Watershed, State of South Carolina, under the authority of the Watershed Protection and Flood Prevention Act (P.L. 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 Upper New River Watershed, State of South Carolina, 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 can be installed in about five years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the watershed work plan:

1. The Sponsoring Local Organizations will acquire, with other than PL-566 funds, such land rights as will be needed in connection with the works of improvement. (Estimated cost \$133,650.)

2. The Jasper County Council assures that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894), effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Jasper County Council and the Service as follows:

	<u>Jasper County Council</u> (percent)	<u>Service</u> (percent)	<u>Estimated Relocation Payment Costs</u> (dollars)
Relocation Payments	61.2	38.8	0 <u>1/</u>

1/ Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost-shared in accordance with the percentages shown.

3. The Jasper County Council 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.

4. The percentages of construction costs of structural measures to be paid by the Sponsoring Local Organizations and by the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organizations</u> (percent)	<u>Service</u> (percent)	<u>Estimated Construction Cost</u> (dollars)
Multiple Purpose Channel	25	75	533,600

5. The percentages of the engineering costs to be borne by the Sponsoring Local Organizations and the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organizations</u> (percent)	<u>Service</u> (percent)	<u>Estimated Engineering Costs</u> (dollars)
Multiple Purpose Channel	0	100	36,000

6. The Sponsoring Local Organizations and the Service will each bear the costs of Project Administration which it incurs, estimated to be \$3,500 and \$43,000 respectively.
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 Beaufort-Jasper Soil and Water Conservation District will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.
9. The Jasper County Council 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 is not a fund obligating document. Financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the availability of appropriations for this purpose.

A separate agreement will be entered into between the Service and the Sponsoring Local Organizations before either party initiates work involving funds of the other party. 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 except for cause. The Service may terminate financial and other assistance in whole, or in part, at any time whenever it is determined that the Sponsoring Local Organizations have failed to comply with the conditions of this agreement. The Service shall promptly notify the Sponsoring Local Organizations in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the Sponsoring Local Organizations or recoveries by the Service under projects terminated for cause shall be in accord with the legal rights and liabilities of the parties.
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.
14. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964 and the regulations of the Secretary of Agriculture (7 C.F.R. 15.1-15.12), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any activity receiving federal financial assistance.
15. This agreement will not become effective until the Service has issued a notification of approval and authorizes assistance.

BEAUFORT-JASPER SOIL AND
WATER CONSERVATION DISTRICT
P.O. Dr. K
Ridgeland, South Carolina 29936

By J. Seaborn
Title Chairman
Date Sept 23, 1975

The signing of this agreement was authorized by a resolution of the governing body of the Beaufort-Jasper Soil and Water Conservation District adopted at a meeting held on Sept 23, 1975.

M. F. Gray
(Secretary, Beaufort-Jasper
Soil and Water Conservation
District)

P.O. Dr. K. Ridgeland S.C. 29936
Address Zip Code

Date Sept 23, 1975

JASPER COUNTY COUNCIL
Ridgeland,
South Carolina 29936

By W. C. Hamilton, Sr.
Title Chairman
Date Sept 23, 1975

The signing of this agreement was authorized by a resolution of the governing body of the Jasper County Council adopted at a meeting held on Sept 23, 1975.

Mervin C. Mack
(Secretary, Jasper County
Council)

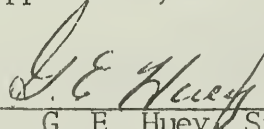
Ridgeland, S.C. 29936
Address Zip Code

Date Sept 23, 1975

Appropriate and careful consideration has been given to the environmental statement prepared for this project and to the environmental aspects thereof.

SOIL CONSERVATION SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

Approved by:



G. E. Huey, State Conservationist

9-29-75

Date

WATERSHED WORK PLAN

UPPER NEW RIVER WATERSHED
Beaufort and Jasper Counties
South Carolina

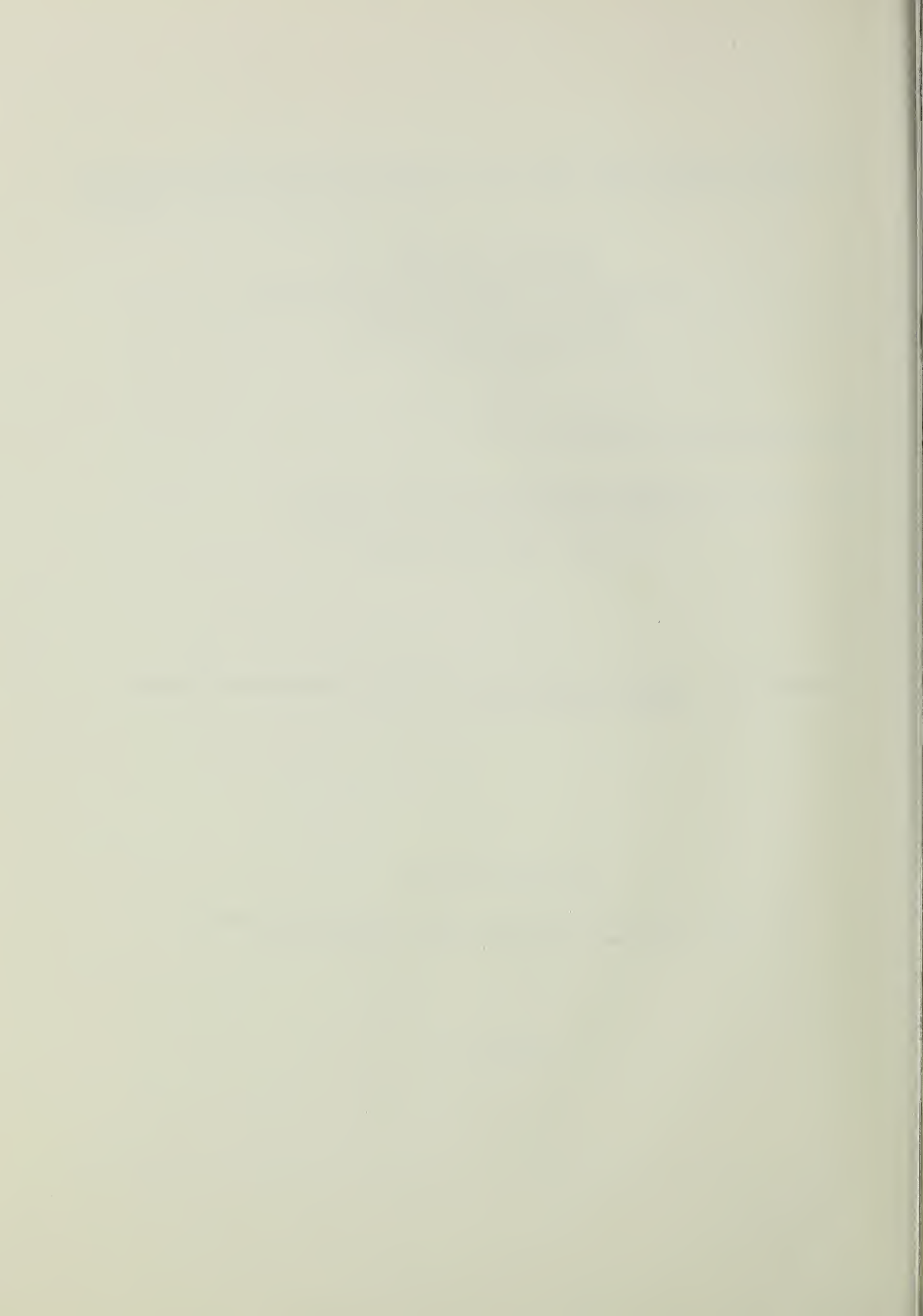
Prepared under the Authority of the
Watershed Protection and Flood Prevention
Act (Public Law 566, 83d Congress,
68 Stat. 666), as amended.

Prepared by: Beaufort-Jasper Soil and Water Conservation District
Jasper County Council

With Assistance by:

U.S. Department of Agriculture, Soil Conservation Service
U.S. Department of Agriculture, Forest Service

AUGUST 1975



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WATERSHED WORK PLAN 1/
UPPER NEW RIVER WATERSHED
Jasper and Beaufort Counties
South Carolina

December 1974

SUMMARY OF PLAN

Upper New River Watershed is about 30 miles long and seven miles wide and covers 134,000 acres. The watershed encompasses all the drainage of New River to South Carolina State Highway 170. Most of the watershed (126,000 acres) is in Jasper County and the remaining 8,000 acres are in Beaufort County.

Sponsors of the project are the Beaufort-Jasper Soil and Water Conservation District and the Jasper County Council.

The major problems in the watershed are flood damages and poor drainage in the Calfpn Bay area. About 80 percent of the area is devoted to forest production, six percent pasture, nine percent cropland, and five percent miscellaneous. The Calfpn Bay area is flat and a lack of proper outlets contribute to a permanent wet condition over most of the area. Because of this wet condition, farmers are unable to properly manage pasture and crops, and woodland site indices are low.

This work plan proposes about 28 miles of channel work to provide outlets adequate for flood prevention and drainage for agricultural uses and woodland production. These outlets will also improve living conditions and reduce health hazards. Of the 28 miles of channel work, 19 miles have ephemeral flow and nine miles are intermittent. Seven miles have been previously modified by man, and for 21 miles there is no or practically no existing channel. The adjacent land use is forest production.

Land treatment proposals include on-farm drainage, wildlife plantings, tree planting and timber stand improvement, and wildlife habitat management. For two 1,000 foot segments at the lower end of Canal 1, the channel will be deepened to expose the underground aquifer and maintain a pool of water. This will help maintain the wetland habitat conditions which now exist and augment the base flow below. Two sediment

1/ All information and data, except as otherwise noted by reference to source, were collected during watershed planning investigations by the Soil Conservation Service and Forest Service, U.S. Department of Agriculture.

traps will be constructed in the channel to reduce sediment movement downstream during and following construction. One of these will be located at the main outlet of channel work and the other just upstream of the areas of exposed aquifer.

Construction of the channels will utilize 344 acres, of which 290 acres will be cleared. However, 140 acres is expected to revert to trees. The impact of this loss is considered slight, since this is less than one percent of similar habitat in the watershed. Most of the Calpen Bay area is used by upland wildlife species and drainage of the area will be beneficial from an overall habitat standpoint.

The planned installation period for the project is five years. The project is estimated to cost \$1,436,420. PL-566 funds will pay \$577,300 of this cost and other funds will provide \$879,120.

The Jasper County Council will operate and maintain the structural measures. Land treatment measures will be maintained by the owners and operators of the land on which they are installed in cooperation with the Beaufort-Jasper Soil and Water Conservation District.

The average annual cost of operation and maintenance is estimated to be \$8,050. The average annual benefits from the project are estimated to be \$116,800, with an average annual cost of \$57,100, giving a benefit-cost ratio of 2.0 to 1.0.

WATERSHED RESOURCES - ENVIRONMENTAL SETTING

Physical Data

The Upper New River Watershed consists of 134,000 acres in the Atlantic Coast Flatwoods resource region of southern South Carolina. This area covers parts of Jasper and Beaufort Counties. There are 126,000 acres of the watershed in Jasper County and 8,000 acres in Beaufort County. The watershed's 30 mile length extends from near Pineland, at the northwest end, to South Carolina State Highway 170, near the community of Prichardville, at the southeast end. Elevations within the watershed range from 100 feet mean sea level near Pineland to five feet in New River channel near Prichardville. The Coosawhatchie River Basin lies northeast of the watershed and the Savannah River passes to the southwest. Ridgeland, with a population of 1,192, is located near the center of the watershed on its eastern boundary. The communities of Tillman, Hardeeville, and Gillisonville are located near the boundaries of the watershed. Savannah, Georgia is 25 miles southwest.

The population of the watershed is about 4,000. All of the families are classed as rural, but 79 percent of these are rural

non-farm^{1/}. Approximately 36 percent of the families of the area have an annual income under the national poverty level.

Upper New River is part of the drainage area of New River which outlets into the Atlantic Ocean about 13 miles south of Prichardville, South Carolina. It is in the South Atlantic-Gulf water resource region and the Combahee River subregion as designated by the U.S. Water Resources Council^{2/}. This region consists of the low, nearly level parts of the Atlantic and Gulf Coastal Plains. The annual precipitation averages 50 inches. The average annual temperature is 65 degrees Fahrenheit. The freeze-free season is approximately 300 days^{3/}. Most soils in the region have sandy or loamy surface layers over grayish loamy subsoils that have higher clay content than the surface layers. Some soils are sandy throughout, and some have sandy or loamy surface layers over clayey subsoils. Generally, soils with the highest clay content have the slowest permeability and internal drainage. Unless ditched or drained, most of the soils have water tables within 15 inches of the soil surface at least two months per year. With proper drainage and management, these soils are well suited for agriculture and woodland production. The present land use by acres of the watershed is as follows: forest land 107,892, cropland 11,653, pastureland 7,182, and miscellaneous 7,273.

^{1/} 1970 Census of Population, Bureau of the Census, U.S. Department of Commerce.

^{2/} Water Resources Regions and Subregions for the National Assessment of Water and Related Land Resources, July 1970, Water Resources Council, Washington, D.C.

^{3/} Atlas of River Basins of the United States, prepared by U.S. Department of Agriculture, Soil Conservation Service, June 1963.

The principal soil series in the watershed and the dominant characteristics of each are as follows^{1/}:

<u>Soil Series</u>	<u>Slope Range</u> (percent)	<u>Permeability</u>	<u>Depth</u>
Goldsboro	0-2	Moderate	Deep
Yemassee	0-2	Moderate	Deep
Lynchburg	0-2	Moderate	Deep
Murad	0-6	Moderate	Deep
Rains	0-2	Moderate	Deep
Paxville	0-2	Moderate	Deep
Ocilla	0-2	Moderate	Deep
Deloss	0-2	Moderate	Deep
Ogeechee	0-2	Moderately slow	Deep
Seabrook	0-2	Rapid	Deep
Osier	0-2	Rapid	Deep

Classification of watershed soils by capability class and sub-class is shown below^{2/}:

<u>Capability Class</u> <u>and Sub-Class</u>	<u>Percent</u>	<u>Number of</u> <u>Acres</u>
IIw	27	36,180
IIIw	68	91,100
Vw	3	4,020
IIs	2	2,700

The land capability classification system is the grouping of soils to show, in a general way, their suitability for most kinds of field crops, pasture, and wildlife plantings. It is a practical classification based on the limitation of the soils, the risk of damage when they are used, and the way they respond to treatment. The letter "s" indicates soil with a low available water capacity, and "w" represents a wetness hazard. Capability Classes II and III, include those soils suitable for annual or periodic cultivation of row crops. Capability Class V, includes those soils considered unsuitable for cultivation of row crops,

^{1/} Soils Survey, Beaufort and Jasper Counties, South Carolina (field work completed, manuscript being developed), U.S. Department of Agriculture, Soil Conservation Service.

^{2/} Ibid

but can be used for pasture and wildlife plantings.

Most of the 4,400 acres of flood plain soils along Upper New River and its tributaries are Class Vw land. The major problem on this land is lack of adequate outlets. Standing water is present throughout most of the year. Land use in the flood plain is forest.

The geologic features of the watershed can be described as a series of overlapping terrace deposits laid down during previous fluctuations of the ocean level. Alternating periods of stable ocean levels and times of recession caused the sediment coming from the upland to be deposited in uneven bands across the watershed. The terrace deposits consist of medium to coarse grained sand with some horizons and lenses of clayey sand and stiff clay. Terraces located within the watershed are^{1/}:

- Recent Terrace - shoreline at present sea level
- Pamlico Terrace - shoreline about 25 feet above present sea level
- Talbot Terrace - shoreline about 42 feet above present sea level
- Penholoway Terrace - shoreline about 70 feet above present sea level
- Wicomico Terrace - shoreline about 100 feet above present sea level

All of the terraces were formed during the Pleistocene Age, except the recent deposits. Soft sandstone and thin-bedded limestone are the sedimentary rocks underlying the terraces. The sandstone and limestone were deposited during the Tertiary Age.

There are no mines or quarries within the watershed boundary. The only commercial quarry operating in the vicinity is a sand excavation operation in western Jasper County^{2/}. Possible commercial deposits of sand occur within the watershed, but no plans for operations are known.

Ground water is the main source of water supply for all of the watershed residents. Wells vary in depth from 30 feet to greater than 400 feet. Varying quantities of water are obtained from the surface sand deposits, and at greater depths from the Hawthorn Formation and the (Santee-Ocala) Limestone.

"Water from the terrace sands is usually of good quality ranging from rather soft to moderately hard and having a bicarbonate content considerably lower than the water from the older deposits. The average yield of 64 wells drilled in terrace sands was found to be 44 gallons per minute, with a maximum yield of 130 gallons per minute and a minimum of 10 gallons per minute. The average hardness was 80 parts

^{1/} Geology of the Coastal Plain of South Carolina, U.S. Geological Survey Bulletin 867, C. Wythe Cook, 1936.

^{2/} South Carolina Mineral Producers Directory, South Carolina State Development Board, Circular 2, 1972.

per million, which is classified as moderately hard"^{1/}. A water pressure exists in the sand deposits of the upper end of the watershed. Water pits and wells extending through a surface clay layer into an underlying sand aquifer allows the ground water level to rise from four to six feet.

The Hawthorn Formation and the (Santee-Ocala) Limestone furnish the "deep" water for the area. "The average yield of 32 wells drilled into the Cooper-Santee (Ocala) unit was 464 gallons per minute, but the yield covered a wide range from a minimum of five gallons per minute to a maximum of 2,000 gallons per minute"^{2/}. Maximum consumption data from sampled watershed wells, their chemical analyses, and state drinking water standards are shown in Appendices A and B.

The watershed is within the southern climatic division of the state. The topography is generally flat with slightly rolling low hills. Elevations range from five feet in the southern end of the watershed to 100 feet in the north. The average annual precipitation is 50 inches, with five percent occurring in spring, 40 percent in summer, 30 percent in fall, and 15 percent in winter. The average annual temperature is 65 degrees Fahrenheit. Average temperature for the winter months is 50 degrees and 80 degrees for the summer months^{3/}. Growing seasons are long enough for a double cropping system. Farm families generally produce both spring and fall crops of fresh vegetables for sale at the local markets. Small grains are produced for cattle grazing during winter and spring seasons. Cattle endure the mild winters without shelter, but require supplementary feed during late winter and early spring.

Upper New River heads in Jasper County near the community of Pineland. It is an intermittent stream draining a system of bays and swamps. Savannah Branch and Gillison Branch are two of the major tributaries in its upper reaches. Downstream tributaries include Calfpn Bay, Great Swamp, Broadwater Creek, Kato Bay, Bagshaw Swamp, Causeway Swamp, Bob Dam Swamp, and Two Bridge Swamp. The name of New River is applied to the drainage area as it approaches the Beaufort-Jasper County line. The bays and swamps above this area dry up occasionally, but the stream becomes perennial at this location.

Field observations concerning stream classifications indicate the ephemeral drains consist of roadside ditches, man-made canals, and drains in cultivated fields. Calfpn Bay, Savannah Branch, and Gillison Branch are frequently dry. Great Swamp is usually dry or low enough

^{1/} Progress Report on Ground Water Investigations in South Carolina, G. E. Siple, Bulletin 15, Research Planning and Development Board, Columbia, South Carolina, 1946.

^{2/} Ibid

^{3/} Climatic Guide for South Carolina, Norton D. Strommen, U.S. Department of Commerce, November 1965.

for the water to become stagnant at least once each year. Approximately 10 miles of drainage canals have been installed by owners in the area west of State Secondary Highway 115. An estimated five miles of these canals are the principal channel for Upper New River. The general stream characteristics for Upper New River are shallow depths, poorly defined banks, swampy areas, and heavily timbered areas on the adjacent banks. At bridge crossings, channels have been excavated presenting a "false" view of general channel character.

Upper New River, as part of New River, is classified by the South Carolina Department of Health and Environmental Control as a Class "SB" stream^{1/}. This classification is assigned to a stream after a public hearing as being the stream quality desired. The actual stream quality may be better or worse than the classification assigned. South Carolina policy is to improve all stream quality. The South Carolina Department of Health and Environmental Control has the authority to enforce water quality standards. A Class "SB" tidal salt water stream has the standard of being suitable for bathing and any other uses, except shellfishing for market purposes. It is also suitable for uses requiring water of lesser quality. (See Appendix C.) Surface waters within the watershed are not used for public consumption.

There are very few farm ponds within the watershed. Some of these are used for catfish farming. There are no lakes of significance within the watershed. The city of Beaufort obtains raw water from the Savannah River. This water is transported by canal and is elevated in its channel above the waters of the swamps as it flows across Upper New River Watershed.

Economic Data

All of the land in the watershed is in private ownership. The size of ownership ranges from a quarter acre house lot to a 50,000 acre plantation. Approximately 20,000 acres are owned by forest industries.

There are approximately 75 holdings which meet the classification of a farm. The average size of a farm is 414 acres. About 38 percent are classified as commercial farms, with an average size of 968 acres. The average value of land and building is \$76,800 per farm. This amounts to \$156,100 per commercial farm. The average value of land ranges from \$50 per acre for swamp land to \$600 per acre for prime farm land.

The major farm enterprises are beef cattle and cash crops. The principal crops grown are corn, soybeans, hay, and vegetables. The average annual yields per acre are as follows: corn - 60 bushels; soybeans - 22 bushels; hay - 2.5 tons; tomatoes - 7,000 pounds; and

^{1/} Stream Classifications for the State of South Carolina, South Carolina Department of Health and Environmental Control, 1972.

watermelons - 325 melons. Catfish farming is a relatively new enterprise in the area. A number of catfish ponds have been built within the watershed in the past four years covering about 75 acres.

Upland forest constitutes 96 percent of the total forest land, or 103,492 acres. Flood plain forest constitutes four percent, or 4,400 acres. Upland forest types are pine - 44 percent; pine-hardwood - 29 percent; and hardwood - 27 percent. The principal natural species of the upland are loblolly pine, longleaf pine, slash pine, pond pine, red cedar, red oak, white oak, yellow poplar, sycamore, black gum, sweet gum, persimmon, ash, hickory, and dogwood. Other associated species are elm, maple, beech, sourwood, black cherry, planted loblolly, longleaf, and slash pine. Principal flood plain species are pond pine, red maple, cypress, yellow poplar, ash willow, sycamore, red gum, cottonwood, black gum, tupelo gum, willow oak, water oak, and bay.

The forest land is 70 percent well stocked with merchantable species. Forty-four percent is sawtimber size averaging 700 board feet per acre of pine and 500 board feet per acre of hardwood. Twenty-two percent is poletimber size averaging 1,000 cubic feet per acre of pine and 150 cubic feet per acre of hardwood. Thirty-three percent is seedling and sapling size and one percent is non-stocked.

The production and sale of pine pulpwood is one of the most important economic enterprises within the region. Competition is keen with major markets being in Charleston, South Carolina and Savannah, Georgia. Ready markets are also available for sawtimber, poles, and veneer logs. Given protection and proper management, the forest stands will contribute considerably to the future economy of the watershed area.

Accessibility of farms to roads and markets is provided by Interstate Highway 95, numerous U.S. and State highways and the Seaboard Coast Line Railroad.

The civilian work force in Jasper County is 3,600. Eighty-five percent of the work force is employed in nonagricultural functions, 11 percent are employed in agriculture, and four percent are unemployed. The median family income is \$5,473 per year. About 60 percent of the farms rely wholly on family labor.

The watershed lies within the Ashley-Combahee-Edisto River Basin study area. Jasper and Beaufort Counties are part of the Lowcountry Resource Conservation and Development Project area, and within the Lowcountry Regional Planning Council.

Fish and Wildlife

The South Carolina Department of Health and Environmental Control maintained a water quality monitoring station at the U.S. Highway 17 crossing of New River from 1963 through 1973. Results of tests showed that water quality in the stream varied widely. Biochemical oxygen demand (BOD) ranged from 0.9 to 16.3 mg/l; color from 70 to 280 units; turbidity from one to 22 mg/l; and pH from 4.6 to 6.9. Water standing

for long periods in the Calfpn Bay area acquires color from organic stains and turbidity from organic detritus. Saprophytic bacteria also play a role in increasing turbidity. These degrees of turbidity, color, BOD, and pH are synergistic in harmful effects on fish.

Streams in the Calfpn Bay are either ephemeral or intermittent and provide no fishery resource, with the possible exception of some fish food organisms. Below this area, however, is a redfin pike fishery which is highly prized by local fishermen. During periods of low flow, thousands of fish die because of water quality deterioration. The South Carolina Wildlife and Marine Resources Department operates a well which is located just above State Secondary Highway 115 for low flow augmentation. The yield from the well is about 600 gallons per minute, which is not sufficient to have an appreciable effect on downstream water quality.

Within the area of proposed channel work, the forest land occupies flat, low-lying, wet areas. On the lower elevations, the dominant tree species are red maple and pond pine with a dense understory of sweet bay, smilax and switch cane. Loblolly pine is the principal species in this area with an understory of gallberry and wax myrtle. The value of this area as habitat for wildlife is very low. The most prevalent observed use is from blackbirds which roost in the area. Fields and field edges provide some habitat for species of open land wildlife common in Jasper County, however, drainage is not adequate for good quail habitat or other species requiring similar habitat. A few wood ducks move into this area during wet periods in search of food. No suitable waterfowl habitat exists within this area.

Endangered wildlife species which may occur in the Calfpn Bay area are the bald eagle, osprey, and alligator. The probability of occurrence of any of these is small because of extremely poor feeding areas and habitat.

The area of the watershed below Calfpn Bay is recognized as very valuable habitat. This area includes 4,400 acres of flood plain hardwood forest and supports a variety of wildlife species including deer, turkey, waterfowl, and alligators.

Recreational Resources

Recreational opportunities in the watershed are limited primarily to hunting and fishing. The Sargeant Jasper Country Club, located south of Ridgeland, has a golf course. Although about 80 percent of the watershed is forested, most of the area is controlled by private clubs or in large ownership and not available to the general public.

Outside the watershed but within Jasper County, the South Carolina Wildlife and Marine Resources Department has cooperative agreements with landowners to provide game management assistance on about 3,500 acres. A permit is required to hunt on these lands.

The U.S. Fish and Wildlife Service administers the Savannah River Wildlife Refuge which is located in the southern portion of Jasper County, just south of the watershed. The refuge encompasses about

11,000 acres and is managed primarily for waterfowl. Recreational activities allowed on the refuge consist primarily of wildlife observation.

The only lake of significant size in the area is Nunna Rock Lake, which is located about two miles north of Ridgeland just east of the watershed. The lake has a surface area of about 80 acres and is open for public fishing on a fee basis.

Other recreation areas within a 50 mile radius of the watershed include Hilton Head Island, Fripp Island, Savannah Beach, Hunting Island State Park, Lake Warren, and Point South, a commercial development. These areas provide a variety of recreational opportunities including camping, picnicking, swimming, fishing, boating, tennis, miniature golf and a driving range.

There are no known pollutants entering the streams in the watershed. Soils in the area have limitations varying from moderate to severe for recreational uses.

Archeological and Historical Values and Unique Scenic Areas

One historic site in the watershed is located five miles south of Ridgeland on U.S. Highway 17. Switzerland was the second settlement of the Swiss Colony which came to South Carolina to found a silk and rice culture. The survivors of the original Purrysburg Colony moved to the higher ground of Switzerland, but the Swiss dream of a silk industry did not materialize.

The South Carolina Department of Archives and History has determined that no properties in the watershed are listed in the National Register of Historic Places or are eligible for nomination.

A field survey of the planned project area was made by the Institute of Archeology and Anthropology, University of South Carolina.

The following paragraph is the summary from their report.

"No archeological sites were located as a result of this survey. Thus, it does not appear, on the basis of presently available information, that construction of additional drainage channels or enlargement of the presently existing channels on this portion of the Upper New River Watershed will damage or endanger the archeological resources of South Carolina. Should construction reveal the presence of archeological material the Institute of Archeology and Anthropology should be notified immediately."

Soil, Water and Plant Management Status

The amount of cropland, pastureland, and forest land has remained about constant over the past 10-15 years, although acres devoted to each use interchange. Corn, hay and pastures have always been major crops, while soybeans and fresh vegetables have replaced cotton within the past 10 years. The absence of cotton gins and small acreage allotments which did not warrant mechanical harvesters led to the demise of cotton in the area.

The Beaufort-Jasper Soil and Water Conservation District, in cooperation with the Soil Conservation Service, presently provides technical assistance to landowners in the two counties involved in the watershed under authority of Public Law 46. Adequate conservation measures have been installed on about 50 percent of the open land in the project as a result of this technical assistance and the willingness of landowners to practice good land use.

There are 50 conservation plans and 60 district cooperators of record. About 80 percent of the watershed is covered by agreements and about 60 percent of the planned practices have been applied. About half of the existing plans need revision to bring them in line with present day farming practices and to account for some changes in ownership. Field surveys have been completed to prepare a soil survey publication for the two counties.

The South Carolina State Commission of Forestry, in cooperation with the U.S. Forest Service, through the various federal-state cooperative forestry programs, is providing forest management assistance, forest fire prevention and suppression assistance, distribution of planting stock, and forest pest control assistance to private landowners in the watershed area.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land Treatment

Practically all of the soils in the watershed are classified as having a wetness hazard. Most areas which have available outlets, have been drained and the soils respond well for agricultural and forest production.

Unfavorable economic conditions on the small farms deter the application of needed conservation measures, since operators are forced to commit their capital resources first to production practices that have a direct bearing on immediate income. This leaves very little capital for investment in land treatment measures that produce long-range benefits rather than immediate returns.

Other land treatment practices such as land grading and leveling cannot be installed until the wetness problem is solved.

Floodwater Damage and Drainage Problems

Problems of flooding and poor drainage are inseparable in this Coastal Plain area. Due to the low range in topography and lack of available outlets, extensive flooding occurs throughout the watershed. Floodwater moves off slowly, causing wet conditions to prevail for extended periods.

The optimum crop planting season in the early spring is broken by short duration, high intensity showers. The absence of needed drainage often leaves the soil too wet for land preparation or planting from rain to rain. If planting of crops is delayed until after the preferred season, root systems and plant growth are not developed sufficiently to take full advantage of the rainfall in the months of July and August.

Flooding combined with poor drainage reduces income to farmers by: (1) delaying spring planting; (2) requiring replanting with its added costs of land preparation, seed, fertilizer and chemicals; (3) damaging growths on mature crops which results in lower yield and poorer quality; (4) limiting grazing time and lowering forage quantity and quality; (5) causing high rate of plant and animal disease; and (6) delaying or preventing harvest.

Long periods of inundation and saturated soil conditions that occur on the nearly level coastal plain soils are also a serious problem to forest landowners. The existing water courses are not adequate to remove excessive surface water and reduce the water table in a period of time suitable for good growth and regeneration of stands, or for ready access for management and protection throughout most of the year.

Very few farms in the watershed have outlets for the needed ditches and tile drains within their boundaries. There is a definite need for group or community type channels to provide flood protection and drainage outlets by crossing farm boundaries, highways, or other obstructions that limit installation on an individual basis.

Soils in the watershed are highly productive when drained and respond well to drainage practices.

The rural residents suffer from flooding of their lawns, driveways, shrubbery and vegetable gardens. The flooding and high water table create health hazards by providing breeding places for mosquitoes and preventing septic tanks from functioning properly.

The average annual damages from floodwater are estimated to be \$19,600 to crop and pasture; \$36,500 to forest land; \$12,300 to roads; and \$1,600 to houses. Also, an estimated \$12,050 of indirect damages occur annually. Except for the indirect damages and damage to houses, losses incurred from lack of drainage outlets equals the floodwater damage.

Erosion and Sediment Damages

Only slight erosion is occurring within the watershed. Soil losses from sheet and rill erosion are below the tolerable limits of two to four tons per acre. The soils are wet and slopes are generally less than two percent. The small amount of sediment available for transport in the drainage system is deposited in the nearest low area, as runoff velocities are low. Sandy soils are dominant over silts and clays, therefore, only negligible amounts of sediment become suspended in the streams. Annual suspended sediment concentrations in Upper New River during runoff periods are 2.6 mg/l. Minor wind erosion occurs during short dry intervals.

Recreation

The South Carolina Outdoor Recreation Plan^{1/} shows a need for a district type state park in this area. The South Carolina Department of Parks, Recreation and Tourism and the Soil Conservation Service are currently studying the feasibility of developing a park in conjunction with a lake near the town of Grays, about six miles north of the watershed. This development is proposed as an RC&D measure within the Lowcountry RC&D Project.

The population of Jasper County, according to the 1970 census, is 10,856. The projected 1985 population is 9,182. Forecasts indicate a tremendous increase in travel through the area. The South Carolina Highway Department predicts that the average daily traffic volume on Interstate Highway 95 at the South Carolina-Georgia State Line in 1975, will be 19,000 vehicles.

Water quality in the watershed varies widely by seasons and rainfall. During periods of low rainfall, the BOD ranges as high as 16.3 mg/l and the water becomes highly acidic. Turbidity ranges from one to 22 mg/l depending on amount and intensity of rainfall. Frequent fish kills occur along Upper New River as a result of inadequate stream flow and poor water quality.

Although Jasper County contains many thousands of acres of excellent game habitat, only a small percent is available to the general public. Most of the area is controlled by hunting clubs which lease hunting rights from industrial holdings and small farms or own the land.

^{1/} SCORP-70, South Carolina Department of Parks, Recreation and Tourism, Columbia, South Carolina, 1970.

Fish and Wildlife

About 80 percent of the watershed is in forest land and no major changes in land use are occurring. Timber harvest operations usually include a salvage cut for pulp, clearing with a bulldozer and replanting. Although tree cover is lost in these areas for 10 years or more, the clear cut areas become established in native plants which produce browse and seeds, and provide fair to good habitat for doves, quail, rabbits, and non-game open land birds for about five years.

Economic and Social

About 77 percent of the family farms in the watershed have annual sales of less than \$5,000. Sixty-two percent of the farms have sales of less than \$2,500.

While unemployment in this area is approximately the same as the state average, employment opportunities are very rare. There are only two manufacturing plants in Jasper County and total employment in these is 650. Another 650 are employed in the wholesale, retail, and service sectors. Various government agencies employ 550. Agricultural employment accounts for 400 jobs. Only two counties in South Carolina have a per capita income lower than that of Jasper County, which is \$1,522. Approximately 36 percent of the families in Jasper County have incomes below the poverty level. Nine hundred ninety-eight families out of 2,676 families in Jasper County receive food stamps.

Additional jobs are needed within this area that will offer residents an opportunity to increase their income level. Jasper and Beaufort Counties are designated Rural Development Areas under the Public Works and Economic Development Act of 1965 (PL 89-136).

PROJECTS OF OTHER AGENCIES

The South Carolina Wildlife and Marine Resources Department operates a well which is located just above State Secondary Highway 115 about 1,000 feet northeast of its intersection with State Secondary Highway 22. Water is pumped from the well into the stream during dry periods in an attempt to reduce fish kills, but the well yields only about 600 gallons per minute and its effects extend for only a very short distance downstream. The Department has tentative plans to install two more wells downstream from the existing well, which will yield about 400 to 600 gallons per minute.

The proposed project will not adversely affect either the existing or planned wells. There are no other known projects of other agencies which will affect or be affected by the proposed project.

PROJECT FORMULATION

An application for federal assistance through Public Law 566, in planning the Upper New River Watershed was submitted by the sponsors on October 30, 1969. The application was properly processed and authorization for planning was given on May 24, 1971.

The sponsors held numerous meetings throughout the planning process to review and explain problems and needs and various alternative solutions. The status of data collection and any reports and information from individuals or groups were considered at all meetings. Reports were received from the U.S. Fish and Wildlife Service, Bureau of Outdoor Recreation, the South Carolina Wildlife and Marine Resources Department, the South Carolina Pollution Control Authority (now part of the South Carolina Department of Health and Environmental Control) and the U.S. Army Corps of Engineers. Monthly status reports were prepared and distributed. Special public meetings were held when the watershed was authorized for planning and when tentative agreement on the project had been reached. Interested federal, state, and local agencies were involved throughout the planning period.

Specific problem areas were investigated at the request of participating publics. Information on description, size and losses was prepared and used in numerous evaluations. Two multiple purpose structures, one on the main stream below Ridgeland and one on Broadwater Creek were analyzed. Flood damage reduction from each was found to be very low. The Lowcountry Resource Conservation and Development Commission is working with the South Carolina Department of Parks, Recreation and Tourism in developing plans for a state park near the town of Grays about six miles north of the watershed. Development of this park will satisfy the recreational needs of the area. Several canals, channels, or diversions were analyzed to divert floodwater to other outlets in adjacent watersheds and provide flood protection with improved drainage outlets to Hardeeville and vicinity. None of these would appreciably affect peak flows and all would involve valuable wetland wildlife habitat areas.

Objectives

1. Install land treatment measures to realize crop, pasture, and forest land drainage benefits
2. Provide drainage outlets where feasible to improve drainage and reduce flooding
3. Reduce flooding and resulting damages around houses, yards, and living areas where feasible

4. Protect and enhance fish and wildlife resources
5. Improve the economic and social environment

Land treatment needs were determined based on present and projected land use. Planning and application goals were developed with the Beaufort-Jasper Soil and Water Conservation District. The present rate of planning and application of land treatment measures will be accelerated. No critically eroding areas were identified in the watershed.

The land treatment needs for forest land were developed from a field survey of the watershed. The goals for accelerated treatment were developed recognizing the installation period and landowner participation. The annual fire loss index for wildfires during the past five years averages 0.58 percent - exceeding the watershed protection goal of 0.20 percent. The planned works of improvement will increase the fire risk slightly because of improved accessibility. The South Carolina State Commission of Forestry is currently intensifying the fire control effort in the watershed under the going Cooperative Forest Fire Control Program. This is deemed adequate for the upcoming installation period.

Land use within the Calfpn Bay area is not expected to change significantly after project installation. Primary changes will consist of planting improved varieties of trees in the areas now virtually unproductive and improved cropland and pasture management on land now in these uses. Installation of the project will also allow landowners to plant and manage additional wildlife food areas.

After considerable investigation of the many specific problem areas in the watershed, it is evident that such work as enlarging the main channel below Ridgeland, constructing diversions outletting into adjacent watersheds, and constructing reservoirs are either not economically feasible, not eligible, or not environmentally sound under present criteria for assistance. Providing drainage and flood reduction to the Calfpn Bay area is a specific objective for the planned project.

Environmental Considerations

Installation of the proposed channel work will cause minor increases in flood peaks below the outlets, however, induced damages will be negligible. The outlet area is a wide swamp and the peak from the one percent chance storm will be contained within the swamp. Construction of the channel will require 334 acres of land, of which 290 acres will be cleared of trees and brush.

To reduce the adverse effect, two segments of 1,000 linear feet each will be excavated deeper and will hold pools of water at all times. This will help maintain a wetland habitat condition. In addition, the extra excavation will expose the underground aquifer and reinforce base flow below the point of work. It is estimated that approximately

one gallon per minute for each linear foot of exposed aquifer will be added to base flow during drought periods. This sustained flow will improve downstream water quality and reduce fish kills now occurring during droughts. Two sediment traps will be excavated in the channel to trap and prevent sediment movement downstream during construction. These will also be maintained after project installation.

No displacement of people, businesses or farm operations are expected as a result of the installation of the project.

Alternatives

In addition to the various designs, methods of construction, and objectives, alternatives to the planned project for the Calpen Bay area include (1) a non-structural measure plan to encourage land use compatible with the present flooding and poor drainage, and (2) no project. Accelerating the installation of land treatment measures is not applicable because these measures are effective only after adequate outlets have been provided or are available.

A non-structural measure plan would include provisions for public purchase of numerous tracts of land. More than 20 households or families would need to be relocated, some for a considerable distance to decent, safe, and sanitary housing. Land use regulations would be necessary which permit only those uses that would be compatible with existing conditions. Residents not relocated would be denied most of their income from present land use. At the present time, there is no agency or program to implement such a plan. Benefits would be the damages that would not be incurred of about \$100,000 annually. The cost would include land purchase, relocation, and loss of present production less future production, and administration, which would exceed \$200,000 annually.

With no project, the crop and pasture damages will continue, water will continue to be ponded around houses, roads, yards, and the forest site index or production potential will remain low. The monetary benefits which would be foregone amount to \$59,700 annually.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

Better land treatment is always considered basic to any watershed planning effort. Reducing the water hazard in this area is the primary effort expended by the sponsoring local organizations and the Soil Conservation Service. Drainage needed will depend on the extent of the problem and the crop to be grown.

Land treatment on 11,600 acres of cropland will consist of conservation cropping systems, ponds, irrigation systems, crop residue management, land grading and leveling, and on-farm drainage systems. A goal to adequately treat 1,200 acres has been established for the

planned project.

The 7,000 acres of pasture and hayland will receive land treatment measures such as pasture and hayland planting and management, ponds, on-farm drainage systems, and brush control. Planned for adequate treatment are 1,200 acres.

Treatment will be applied on about 20,000 acres for wildlife enhancement. Such practices include providing additional food and cover. Drainage measures will provide better access in the wildlife areas.

Commercial fish ponds are a relatively new enterprise in the area. Farmers are expected to install about 50 acres of these ponds in this watershed during the next five years.

Technical assistance will be provided by the Soil Conservation Service through the Beaufort-Jasper Soil and Water Conservation District.

Soil build-up will be accomplished on the forest land through recommended measures and continuing care of the established stands. Forest litter produced under proper forest management and protection is the source of a good humus layer needed to increase infiltration rates and water storage capacity. A forest management program aimed at fulfilling watershed needs and landowner objectives will be followed. The forest lands will be managed for timber, wildlife, and recreation use to the extent that such management is compatible with sound watershed management. Proper forest management will result in tree planting on 1,620 acres, hydrologic stand improvement on 2,620 acres and improvement cutting on 4,800 acres. Improvement cutting will remove undesirable trees while considering wildlife, watershed, and other environmental values in existing hardwood and softwood stands. To provide for proper installation and maintenance of approved measures, individual forest management plans will be prepared for approximately 50 landowners involving 20,000 acres. These plans will be incorporated into the total conservation plan for landowners of the watershed.

In addition to these accelerated treatment measures, the going Cooperative Forest Management and Cooperative Forest Fire Control Programs will continue to provide assistance to private landowners.

Structural Measures

Structural measures to be installed consist of about 28 miles of multiple purpose channel work for flood control and improved drainage on two drainage systems in the Calfpn Bay portion of the watershed. The planned location of the channel work is shown on the Project Map and design data are shown in Table 3.

Canal No. 1 will be about nine miles long and its bottom width will range from seven to 30 feet. The work will begin at State Primary Highway 652 and will end approximately one-half mile below State Secondary Highway 115.

Canal No. 2 will be about seven miles long and its bottom width will vary from four to 16 feet. The work will begin west of State Secondary Highway 58 and will end approximately one-half mile below

Secondary Highway 115.

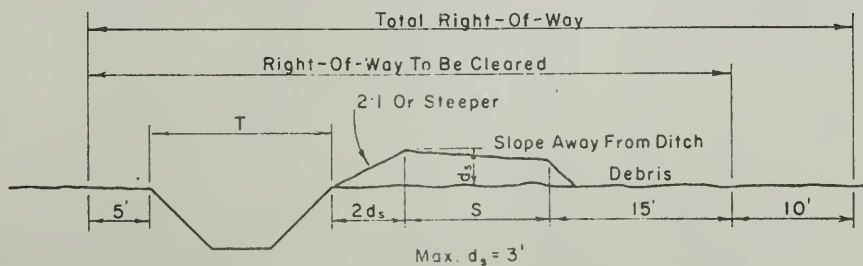
Canal No. 2 will be about seven miles long and its bottom width will vary from four to 16 feet. The work will begin west of State Secondary Highway 58 and will end approximately one-half mile below State Secondary Highway 115.

About nine miles of channel work are planned as laterals to Canal No. 1 and about three miles are planned as laterals to Canal No. 2.

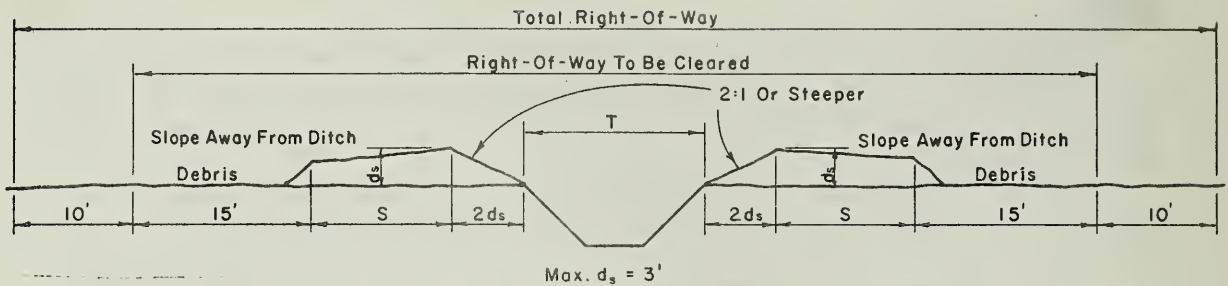
The channels were designed to remove the runoff from the two year - 24 hour storm within one day, following the cessation of rain, for the open land and within five days for the forest land. These removal rates are considered necessary for sustained soybean and pine tree production.

Channel depth will normally be five feet to provide an outlet for tile drainage. Two segments of 1,000 each on Canal No. 1, just upstream of State Secondary Highway 115 will be excavated to a depth of more than five feet, but less than 10 feet to expose the underground aquifer and help preserve a wetland habitat condition below the construction area by providing a dependable stream flow. Two pits will be excavated in the channel to trap sediment. One will be located at the lower end of the channel work and the other just above the water holding pools. Channel side slopes will be 1:1, except where the water holding pools and the sediment pits are constructed. In these areas, side slopes will be 2:1.

Channels with bottom widths of 16 feet or less, will be excavated from one side and have spoil placed only on one side. The bottom width of about five miles of Canal No. 1 exceeds 16 feet and will have spoil placed on both sides. All other proposed channel has a bottom width of 16 feet or less. The spoil will be shaped to form a travelway for maintenance. Side inlet pipe will be placed at locations along the channel where outside surface water concentrates. This will permit the water to enter the channel without causing erosion. Their location will be determined in final design.



TYPICAL CROSS SECTION - SPOIL SHAPED ONE SIDE



TYPICAL CROSS SECTION - SPOIL SHAPED BOTH SIDES

Experience has shown that within two to three years, 1:1 channel slopes constructed in silty and clayey soil material in the Coastal Plains of South Carolina will become vegetated through natural plant succession. To expedite the natural revegetative process and provide temporary protection, bahiagrass with a nurse crop will be planted immediately following channel construction.

The 1:1 channel slopes will be seeded and fertilized within 24 hours following construction, using manual seeders to insure proper placement of the materials on the slopes.

Appropriate vegetation for temporary cover will be planted within 24 hours following excavation on spoil that must be allowed to dry before placing and shaping. At the time bahiagrass is planted on the shaped spoil material, any needed repair seeding on the 1:1 slopes will be done. After the initial seeding work, inspections will be made at least twice yearly and all needed repairs made until the slopes are adequately protected with vegetative cover.

Trees will be planted on the portion of the spoil bank not needed for access roads. The placement, spacing, and species of trees will be designed to produce a tree canopy over the channel as quickly as possible for the purpose of suppressing aquatic and herbaceous growth detrimental to flowage in the channel.

Soils along the planned system are classified as clayey sand, silty and clayey sand, and silty sand. The channel system, based on SCS design requirements and a study of channels excavated in similar soils, is expected to be stable.

Some of the smaller tributaries on which a minimum sized ditch, bottom width of four feet, is planned will have design velocities less than 1.5 feet per second and will require more than average maintenance.

Of the 28 miles of channel work, 19 miles will involve ephemeral streams and nine miles of intermittent streams. There are about seven miles of the planned channels that have been previously modified by man. For a description of the "before project" type of channel and flow conditions by reaches, see Table 3.

The planned channels will cross State Primary Highways 46 and 652, State Secondary Highways 58, and 115, and an unpaved county road. Some of the culverts presently in place are too small or not installed at

the desired elevation. At other locations, new culverts are needed. Approximately eight culvert installations are needed on Canal No. 1 and four on Canal No. 2. No alterations will be required on State Secondary Highway 115 bridges, but some excavation under them will be necessary. The culverts are considered to be land rights and will be installed by the unit of government having the maintenance responsibility for the road.

During construction, the following actions will be taken to control erosion and pollution:

- a. Sanitary facilities will be provided according to the requirements of the South Carolina Department of Health and Environmental Control.
- b. Measures will be provided at equipment and repair areas to prevent contaminants from reaching streams and ground water.
- c. All work areas will be seeded with temporary or permanent vegetation immediately following construction to reduce channel bank and spoil bank erosion.
- d. Debris will normally be burned or buried in open areas and stacked in wooded areas, but will be disposed of in accordance with regulations of the South Carolina Department of Health and Environmental Control.

The project will comply with the Historic and Archeological Data Preservation Act, Public Law 93-291, and the Historic Properties Preservation Program, Public Law 89-665 (Section 106). If artifacts or other items of archeological or historical significance are uncovered during construction, the Institute of Archeology and Anthropology and the National Park Service will be notified.

Easements are required on 334 acres for the installation of the project. No displacement of people, businesses or farm operations are expected as a result of the installation of the project.

EXPLANATION OF INSTALLATION COST

Land Treatment

Land treatment measures to be applied during the project installation period are estimated to cost \$686,670. Of this total, \$78,100 will be paid by PL-566 funds, and \$608,570 will be provided from other funds.

The PL-566 funds include \$32,300 for accelerated technical assistance by the Soil Conservation Service and \$45,800 for accelerated technical assistance by the U.S. Forest Service.

Other funds include \$22,500 for technical assistance provided under the going program of the Soil Conservation Service, \$6,800 provided as the state's share of the accelerated forestry technical assistance, and \$13,200 under the going programs of the U.S. Forest Service and the South Carolina State Commission of Forestry. The remainder of other funds will be borne by individual landowners and operators. These costs include labor, machinery, and materials necessary for the installation of the land treatment measures.

The costs of installing the land treatment measures were developed by the Soil Conservation Service, the South Carolina State Commission of Forestry and the U.S. Forest Service. The technical assistance costs were based on the present costs of the going Soil Conservation Service program and the going Cooperative forest management Program. The costs of installing the land treatment measures were based on present prices paid by landowners and operators in the area. The amount of private forest land treatment measures needed to meet treatment goals was based on a field survey of the watershed adjusted for expected participation during the installation period. The estimates of the amount of all other land treatment measures were developed by the Soil Conservation Service.

Structural Measures

Installation costs include costs of construction, engineering services, project administration, and land rights and are estimated to be \$749,750.

The construction cost of the channel work is the estimated cost of all materials and labor necessary for construction. These costs include clearing rights-of-way, excavating channels and side inlets, spreading and shaping spoil, installing pipe side inlets, purchasing seed and fertilizer and establishing vegetation. A 12 percent contingency allowance was added to cover unforeseen costs that may be encountered during construction. Construction costs were determined by estimating the quantities required for construction and applying unit costs based on previously constructed projects, with current updating, and are estimated to be \$533,600.

Engineering services consist of the costs of design surveys, geological investigations, design and preparation of plans and specifications for construction of channels. These costs are estimated

to be \$36,000.

Project administration costs consist of PL-566 and other administrative costs associated with the installation of the channel improvement including the cost of contract administration, government representatives and necessary inspection during construction. Project administration costs are estimated to be \$46,500.

Land rights costs include all land values and expenditures made in acquiring easements and rights-of-way, and all costs associated with altering roads and culverts, gas and water lines, telephone cables, power lines, or other fixed improvements affected by the structural measures. These total costs are estimated to be \$133,650.

The joint installation cost of multiple purpose channels for flood prevention and drainage was allocated equally to each purpose in accordance with the first method described in Paragraph 103.022 of the Watershed Protection Handbook.

Installation costs will be shared between PL-566 funds and other funds as follows: PL-566 funds will pay all construction costs allocated to flood prevention and 50 percent of the construction costs allocated to drainage. On this basis, 75 percent or \$400,200, of the total construction cost will be borne by PL-566 funds and 25 percent or \$133,400 will be borne by other funds.

The Soil Conservation Service will administer the contract for channel work. The Service and the sponsors will each bear their respective administration costs. These costs are estimated to be \$43,000 for the Soil Conservation Service and \$3,500 for the sponsors. All engineering services, estimated to cost \$36,000, will be furnished by the Soil Conservation Service. All land rights, valued at \$133,650, will be furnished by the sponsors. (See Tables 1, 2, and 2A.) No relocation payments are anticipated, but if any occur they will be shared between the Service and the sponsors, 38.8 percent and 61.2 percent respectively. The cost sharing percentages are based upon the ratio of PL-566 funds and other funds to the total project cost.

Estimated expenditures by years are as follows:

Project Year	PL-566 Funds		Other Funds	
	Structural Measures	Land Treatment	Structural Measures	Land Treatment
First	50,000	10,000	100,000	20,000
Second	275,000	10,000	130,000	38,570
Third	114,200	20,000	38,550	175,000
Fourth	20,000	20,000	1,000	200,000
Fifth	20,000	18,100	1,000	175,000
TOTAL	479,200	78,100	270,550	608,570

Two construction units are planned. Nineteen miles of channel work will be installed during the second year and nine miles the third year. The measures will be installed under a competitive contract. Plans, specifications and the necessary engineering inspection for the installation of structural measures will be furnished by the Soil Conservation Service.

EFFECTS OF WORKS OF IMPROVEMENT

Land Treatment

The planned land treatment measures will provide safe and timely removal of excess water, increase infiltration rates, maintain and improve productivity of the soil, provide additional food and cover for wildlife, and insure the realization of benefits from proposed structural measures. Acceleration of assistance to landowners and operators in planning and applying conservation practices will result in increased income and more effective use of land, labor, equipment, and capital.

The land treatment measures will significantly improve the conditions and productivity of the forest lands. Good water and forest management, along with continued protection from fire, insects, and diseases will combine to increase natural regeneration, satisfactory stocking and tree growth, and improve the accessibility of the forest land for management. Improved forest management and cropping systems will cause a slight reduction in erosion rates within the watershed. Present erosion rates are less than one-half ton per acre.

Structural Measures

The structural works of improvement will allow removal of excess surface water from 10,200 acres of forest land and 1,900 acres of cropland and pastureland. The channel system is designed to remove the two year - 24 hour runoff in one day from cropland and pastureland and in five days from forest land. The planned depth of channel excavation will allow installation of tile drainage systems.

In the lower reach of Canal No. 1, two separate 1,000 foot sections of the channel will be excavated below the required grade. These sections will intersect the ground water table, provide watering areas for wildlife and augment downstream flow during periods of low rainfall. The water provided from these sections will have a higher pH, higher total hardness and less organic stain than the water presently in the stream below the construction area; and thereby improve downstream water quality. Additional pool areas will be created by the sediment traps. These sediment traps will reduce the sediment leaving the project area. It is estimated that 186 tons of sediment are leaving the project area annually at present. During construction, an estimated 310 tons of sediment will reach the traps annually. This will be reduced to 174 tons because of the traps. After construction, an estimated 294 tons of sediment will reach the traps annually. This reduction is the result of increasing channel stability and the land treatment program. Future estimates of sediment leaving the project are 147 tons per year. Average suspended sediment concentrations are expected to be reduced from 2.6 to 2.1 mg/l.

Improved hydraulic conditions of the channels will cause flood stages to increase about 0.6 feet immediately below construction as a result of the runoff from the one percent chance storm. The affected area is in bottom land hardwoods, and the increase in stages will not induce additional damages.

Noise and dust pollution will increase, and the ambient air quality will be lowered as a result of the burning of debris during the construction period.

Reducing the frequency and extent of damage will help stabilize the local agricultural economy. Reduction of the excess water hazard will allow greater freedom in selecting crop rotations and land use adjustments. Better fertilization and management practices will be possible, resulting in greater yields of higher quality products.

The present and expected yields of crops and pastureland are as follows:

<u>Land Use</u>	<u>Yield Without Project</u>	<u>Yield With Project</u>
Corn	60 bu.	90 bu.
Soybeans	22 bu.	35 bu.
Pastureland	5-6 AUM*	7-9 AUM*

* Animal Unit Months.

A net increase of \$4.00 to \$7.00 per acre is expected on the forest land with the planned project. This data was computed by the U.S. Forest Service.

There will be approximately 100 landowners who will benefit from the planned project. About 20 are low to average family farm operations.

The project will give special benefits to average and low income farmers by providing outlets for excess water which are not usually found on their relatively small land holdings. Multiple purpose channels will cross farm boundaries, highways and other obstructions for water removal. General economic conditions in the project area will be improved by making the land more productive on family-size farms.

Annual flood damages to roads, culverts and bridges are presently occurring at some locations within the channel construction area. These damages cause increased repair and maintenance costs and are expected to be reduced approximately 40 percent after project installation. Reduction in road maintenance costs resulting from the multiple purpose channel will permit Jasper County to utilize the money saved to improve the general county road system.

Fire hazard in the forested areas is expected to increase slightly because of increased access resulting from the works of improvement. However, prescribed burning of pine forests for hazard reduction at intervals of three to five years, a standard forest management practice in the area, will reduce the probability, size, and intensity of wild-fires. Prescribed burning is also desirable for improving vector control, forest land grazing and game habitat.

Removal of excess surface waters in the forest, results in a change in the low-growing types of vegetation. Among the native plants that come into open forest lands in the southeast are many seed producers that are attractive to game species. The addition of this food supply to the natural forest cover will provide more food and cover for deer, rabbits, quail and non-game wildlife.

Fish and Wildlife

The greatest effect of installation of the project is expected to be in improved forest land management. The multiple purpose channels will allow landowners to manage the forests for maximum pulp and timber production. Prescribed burning and mechanical methods to remove much of the dense understory will improve habitat for deer, turkey and other wildlife species which favor open-type forest.

In keeping with modern forest management trends, part of the forest land will probably receive even-aged management. This practice involves clear-cutting by compartments, however, if these are 50 acres or less in size, the effect on the forest land wildlife population will not be significant. Tree cover will be lost on these areas for 10 years or more, but fair to good habitat for doves, quail, rabbits, and non-game openland birds will exist for about five years.

Improved drainage of cropland will allow farmers to apply better management practices and diversify crops. Crop diversity will be

favorable to most openland wildlife species.

Exposing the aquifer will create a more dependable source of water for wildlife and benefits to the fishery below the construction area. Test pits dug in the area of the overcuts indicated that there will be a reliable flow into the reaches of New River used by redbfin pike. The aquifer was tested for pumping rates from September through December 1973. These tests show that the aquifer is under a static head of six feet during normal moisture periods and that the head decreases to four feet after a relatively long dry period. Water yield during dry periods was approximately one gallon per minute for each 25 square feet of aquifer exposed. The storage capacity of the aquifer to an elevation six feet below channel depth was calculated to be 87 billion gallons. A constant monitoring of the water level in wells located 100 and 200 feet from the test pits, indicate no change in the water levels during a 24 hour pumping period. Tests for total hardness of the water from the pits ranged from six to 20 mg/l, which is considerably better than the present water quality in Upper New River.

Archeological and Historic

The Institute of Archeology and Anthropology, University of South Carolina, has made a study of the area. The investigations indicate that the project will not encroach on any archeological values. The South Carolina Department of Archives and History has determined that no properties in the watershed are listed in the National Register of Historic Places or are eligible for nomination. The historical site of Switzerland will not be affected by the planned project.

The proposed project will not change the existing responsibility of any federal agency under Executive Order 11593 with respect to archeological and historical resources.

Economic and Social

Employment opportunities in the watershed will be increased slightly, but a greater impact upon the underemployed farmers of the area will be realized. They will be able to utilize more production type practices and have a more diversified farm operation, thus having a greater net income and being more economically stable. The general living conditions of residents in the area will be greatly improved. Water which now stands for several days or even weeks in yards can be removed by the channel system. People will use some of the money from their increased income and decreased floodwater damages to improve the general appearance of their homes and homesites. The children will have a better environment in which to play. By removing the water, septic tanks will function more properly making health and sanitary conditions more tolerable. Breeding places for mosquitoes will be reduced by the works of improvement.

With the improvement of the living conditions of the area, out-migration which has been increasing in the area, will be slowed down

and immigration will be likely.

Other

There will be approximately 334 acres of land committed to the installation of the planned project. Of this acreage, 329 are presently forested and five acres are open land. For construction there will be 290 acres cleared. After construction, vegetation, and tree planting, the future use will be 184 acres of forest land and 150 acres of open land. The immediate wildlife habitat loss of 290 acres will be less than one percent of similar habitat in the watershed.

PROJECT BENEFITS

The floodwater damage benefits and drainage benefits on agricultural lands were considered inseparable, so the benefits were assumed to be 50 percent flood prevention and 50 percent drainage. Both were evaluated using the benefit from its reduction in net income after project installation versus net income without project installation. Benefits to roads and bridges were also considered to be equal from flood reduction and drainage. Flood reduction will provide additional benefits to residential properties and indirect beneficiaries. The proposed channel will provide an outlet for approximately 100 landowners and will directly benefit an estimated 12,100 acres of cropland, pastureland and forest land.

Direct floodwater damage reduction from the proposed project amounts to \$41,750 annually. This includes \$11,100 benefits to crops and pastures; \$23,250 to other agricultural and forest land; and \$7,400 to roads and homesites. The indirect floodwater damage reduction benefits are estimated to be \$7,200 per year. (Table 5.)

Drainage benefits to crops and pasture are estimated to be \$11,100 annually. Benefits to forest land are \$23,250 and benefits to roads are \$5,800 per year. This gives a total of \$40,150 per year benefits to drainage accrued by the proposed project.

The value of local secondary benefits due to the project installation for the watershed and surrounding area amounts to \$14,000 per year. The value of secondary benefits from a national viewpoint was not evaluated, or used in the justification of this project.

Benefits from more intensive use of cropland are estimated to be \$4,800 annually. Landowners will be able to use their lands more intensively with improved drainage outlets and flood protection.

Redevelopment benefits, a by-product of the project, due to expenditures in the local area and from the continued operation and maintenance of the project, are estimated to average \$8,900 per year during the life of the project.

Benefits will be realized as each landowner installs proper land treatment measures, such as open and closed drains, proper fertilization

and liming, and land leveling. These practices are usually not applied until after project installation.

Benefits to wildlife will increase as areas now unsuited for food and cover because of wet conditions, become more productive and suitable for most wildlife species. The proposed project, with an overcutting in the two main channels, is designed to increase the water entering the Great Swamp Channel, thus preventing the stream from drying up during periods of low rainfall and preventing a kill of the fish population.

COMPARISON OF BENEFITS AND COSTS

The average annual cost of structural measures, including project installation, project administration, and operation and maintenance, is estimated to be \$57,100. Benefits derived from the proposed measure are expected to be \$116,800 per year, thus, giving an average annual benefit to average annual cost ratio of 2.0 to 1. The ratio of benefits to costs without local secondary benefits of \$14,000 is 1.8 to 1. A comparison of benefits to costs is shown in Table 6.

PROJECT INSTALLATION

Land Treatment

The landowners and operators will install the planned land treatment measures in cooperation with the Beaufort-Jasper Soil and Water Conservation District. The Soil Conservation Service and the South Carolina State Commission of Forestry will assist in planning and applying land treatment measures in accordance with the authorities and capabilities of each agency. Most of the land treatment measures associated with drainage projects, as in Upper New River Watershed, cannot be justified by landowners until the structural measures are installed. Therefore, most measures will be applied after or concurrently with the construction of the mains and laterals of the proposed project.

Structural Measures

The Sponsoring Local Organizations have requested that the Soil Conservation Service do the contracting for the structural measures of the proposed plan. The Jasper County Council will be responsible for dealing with the Service during construction. The Jasper County Council will be responsible for obtaining all land rights for the structural measures. The Council has sufficient legal authority, including the power of eminent domain, and agrees to use such authority, if necessary, to acquire land rights needed for the proposed

project. The Jasper County Council also has sufficient funds, if needed, to acquire all land rights. Prior to purchase of any land or land rights, the Jasper County Council will be responsible for having the land appraised by a qualified land appraiser.

Engineering services for the proposed structural measures will be performed by the Service.

The planned installation of the structural measures will take place in the first three years of the five year installation period. Canal No. 1, with its laterals, will be constructed during the second year, and Canal No. 2, with its laterals, will be constructed the following year. Both construction units are justified separately, and the installation schedule of the planned measures may be changed if deemed necessary.

FINANCING PROJECT INSTALLATION

Federal assistance for carrying out the planned works of improvement described in the work plan will be provided under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566), as amended. This financial and technical assistance to be furnished by the Soil Conservation Service and the U.S. Forest Service is contingent upon appropriation of funds for this purpose. Organizational expenses that will be incurred by the local sponsoring organizations will be provided for in the annual budgets of the sponsoring organization.

Prior to the Service providing financial assistance for construction, the following conditions must be met: (1) the Jasper County Council will have obtained all needed land rights, (2) the Council must be prepared to discharge their responsibilities, and (3) a specific operations and maintenance agreement must have been executed. The Jasper County Council will provide the necessary non-federal funds for project installation from the County operating budget or by special arrangement.

The cost of installing land treatment measures, which are normally included in conservation plans, will be borne by individual landowners. Technical assistance will be provided by the Soil Conservation Service and the South Carolina State Commission of Forestry, in cooperation with the U.S. Forest Service, with funds from PL-566 and going programs for the installation of these land treatment measures.

The sponsors expect all land rights to be donated by the landowners. Necessary funds required for the purchase of land rights not donated, relocation payments, and relocation assistance advisory services, if needed, will be provided by the Jasper County Council. The sponsors have the legal authority of eminent domain.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land treatment measures will be maintained by the owners and operators of the land on which they are installed, in cooperation with the Beaufort-Jasper Soil and Water Conservation District. The South Carolina State Commission of Forestry, in cooperation with the U.S. Forest Service, will furnish technical assistance to private landowners necessary for forest land treatment measures under the going Cooperative Forest Management Program. They will also continue to furnish fire protection under the going Cooperative Forest Fire Control Program.

Specific maintenance agreements between the Service and the Jasper County Council will be executed prior to issuing bid invitations for construction. The Jasper County Council will operate and maintain the structural measures. The operation and maintenance will be performed as indicated in the South Carolina Watershed Operations and Maintenance Handbook, prepared by the Soil Conservation Service. The work will include fertilizing, maintaining and controlling vegetation, repair of damage, replacement of side inlet pipes, removal of accumulated debris, removal of sediment from sediment traps, and maintaining travelway to assure access.

Funds for this operation and maintenance, estimated to be \$8,050 annually, will be provided by the Jasper County Council.

For three years following installation of the measures, the Service and the Jasper County Council will make joint inspections annually, after unusually severe floods or after the occurrence of any other unusual event that might adversely affect the measures. Inspections after the third year will be made annually by the Council. One copy of their report will be sent to the Service representative and one copy filed by the sponsors and made available for authorized inspection.

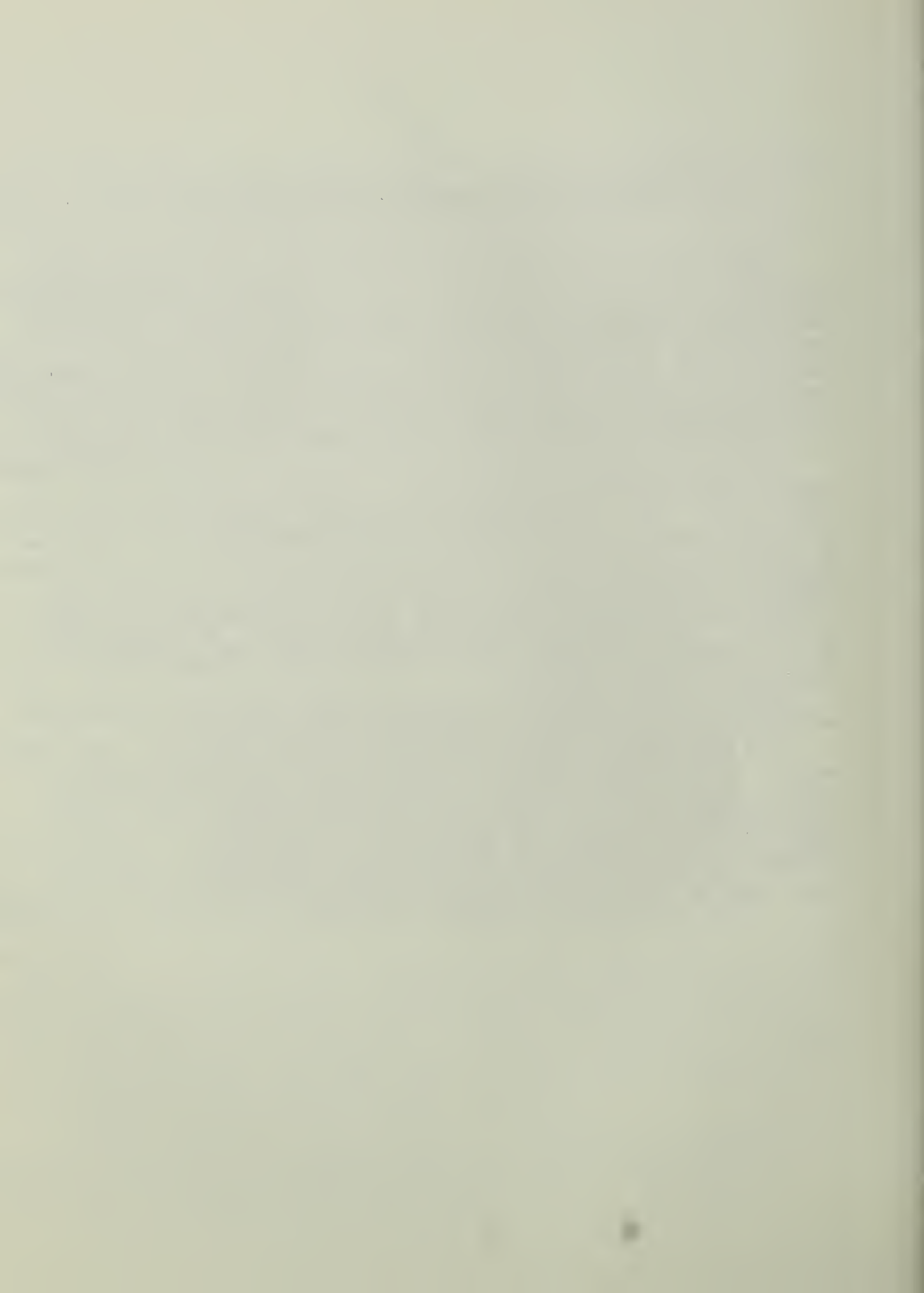


TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Upper New River Watershed, South Carolina

Installation Cost Item	Unit	Estimated Cost (Dollars) 1/						Total
		Non-Federal			Other			
		PL-566 Funds	SCS 2/		FS 2/		Total	
LAND TREATMENT								
Land Areas 3/								
Cropland	Ac.	-	-	216,270	-	-	216,270	216,270
Pastureland	Ac.	-	-	142,000	-	-	142,000	142,000
Forest land	Ac.	-	-	-	207,800	4/	207,800	207,800
Technical Assistance		32,300	45,800	78,100	22,500	20,000	42,500	120,600
TOTAL LAND TREATMENT		32,300	45,800	78,100	380,770	227,800	608,570	686,670
STRUCTURAL MEASURES								
Construction								
Channel Work 6/	Mi.	400,200	-	400,200	133,400	-	133,400	533,600
Engineering Services		36,000	-	36,000	-	-	-	36,000
Project Administration								
Construction Inspection		34,200	-	34,200	500	-	500	34,700
Other		8,800	-	8,800	3,000	-	3,000	11,800
Other Costs								
Land Rights		-	-	-	133,650	-	133,650	133,650
TOTAL STRUCTURAL MEASURES		479,200	-	479,200	270,550	-	270,550	749,750
TOTAL PROJECT		511,500	45,800	557,300	651,320	227,800	879,120	1,436,420

1/ Price base - 1974.
 2/ Federal agency responsible for assisting in installation of works of improvement.
 3/ Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed, and dollar amounts apply to total land areas, not just to adequately treated areas.
 4/ Includes \$21,600 from the going Cooperative Forest Fire Control Program.
 5/ Includes \$13,200 from the going Cooperative Forest Management Program.
 6/ Type of channel before project: seven miles manmade ditch or previously modified channel and 21 miles none or practically no defined channel.



TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT
(at time of Work Plan preparation)

Upper New River Watershed, South Carolina

Measures	Unit	Applied to Date	Total Cost (Dollars) 1/
<u>LAND TREATMENT</u>			
Cooperative Forest Fire Control	Ac.	107,892	165,000
Conservation Cropping Systems	Ac.	6,000	7,500
Commercial Fish Pond	Ac.	75	150,000
Crop Residue Management	Ac.	6,000	6,000
Brush Control	Ac.	1,000	5,000
Drainage Field Ditch	Ft.	360,000	234,000
Drainage Main or Lateral	Ft.	240,000	156,000
Access Road	Ft.	25,000	18,750
Forest Land, Planted	Ac.	10,000	200,000
Forest Land, Release	Ac.	200	3,000
Irrigation System, Sprinkler, Surface & Subsurface	No.	5	40,000
Irrigation Water Management	Ac.	400	4,000
Drainage Land Grading & Irrigation Land Grading	Ac.	100	7,500
Pasture & Hayland Management	Ac.	3,000	60,000
Pasture & Hayland Planting	Ac.	3,000	150,000
Pond	No.	30	45,000
Recreation Area Improvement	Ac.	200	4,000
Stripcropping	Ac.	400	800
Tile Drain	Ft.	15,000	15,000
Wildlife Upland Habitat Management	Ac.	32,000	16,000
Wildlife Wetland Management	Ac.	100	100
TOTAL	XXXX	XXX	1,287,650

1/ Price base - 1974.

December 1974



TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Upper New River Watershed, South Carolina

Item	(Dollars) 1/						Total Installation Cost
	Installation Cost-PL-566 Funds		Installation Cost-Other Funds			Total Other	
	Con- struction	Engi- neering	Con- struction	Land Rights	Total		
		P.L. 566					
Canal No. 1 and Laterals 1, 2, 3, 5, 6, 14, and 15 2/	289,875	24,000	313,875	96,625	98,700	195,325	509,200
Canal No. 2 and Laterals 10, 11, 12, and 13 3/	110,325	12,000	122,325	36,775	34,950	71,725	194,050
Subtotal	400,200	36,000	436,200	133,400	133,650	267,050	703,250
Project Administration			43,000			3,500	46,500
GRAND TOTAL	400,200	36,000	479,200	133,400	133,650	270,550	749,750

1/ Price base - 1974.

2/ Type of channel before project: four miles manmade ditch or previously modified channel and 15 miles none or practically no defined channel.

3/ Type of channel before project: three miles manmade ditch or previously modified channel and six miles none or practically no defined channel.

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TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Upper New River Watershed, South Carolina

(Dollars) 1/

Item	COST ALLOCATION				COST SHARING				
	PURPOSE				OTHER				
	Flood Prevention	Drainage	Total	Flood Prevention	Drainage	Total	Flood Prevention	Drainage	Total
					PL-566				
Canal No. 1 and Laterals	254,600	254,600	509,200	205,250	108,625	313,875	49,350	145,975	195,325
Canal No. 2 and Laterals	97,025	97,025	194,050	79,550	42,775	122,325	17,475	54,250	71,725
GRAND TOTAL	351,625	351,625	703,250	284,800	151,400	436,200	66,825	200,225	267,050

1/ Price base - 1974.

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Channel Designation	Station Numbering for Reach		Drainage Area (sq. mi.)	Capacity (cfs.)		Hydraulic Gradient (ft./ft.)	Channel Dimensions 1/		Depth of Flow (ft.)	"n" Value		Velocities (ft./sec.)		Excavation (cu. yds.)	Type of Work 2/	Type of Channel 3/	Before Project Flow Condition 4/
	Station	Station		Req'd	Design		Width (ft.)	Bottom Grade (ft./ft.)		Aged	As Built	Aged	As Built				
Canal No. 1	961+50	1139+50	5.21	85	83	.00030	7	.00030	5.2	.040	.025	1.3	2.1		I	O	E
	1139+50	1169+50	12.10	188	191	.00030	16	.00030	5.2	.035	.025	1.7	2.4		I	O	E
	1169+50	1186+00	15.10	205	212	.00030	18	.00030	5.2	.035	.025	1.8	2.5		II	M	I
	1186+00	1220+50	19.66	255	255	.00030	22	.00030	5.2	.035	.025	1.8	2.5		II	M	I
	1220+50	1328+00	28.69	286	288	.00032	25	.00030	5.0	.035	.025	1.9	2.6		II	M	I
	1328+00	1350+00	29.13	291	290	.00036	26	.00030	4.9	.035	.025	2.0	2.7		II	M	I
	1350+00	1360+00	29.34	293	298	.00036	23 5/	.00030	4.8	.035	.025	1.9	2.6		II	M	I
	1360+00	1364+00	29.42	294	298	.00036	23 5/	.00030	4.8	.035	.025	1.9	2.6		II	M	I
	1364+00	1374+00	29.63	298	298	.00036	23 5/	.00030	4.8	.035	.025	1.9	2.6		II	M	I
	1374+00	1407+50	29.96	307	315	.00041	30	.00030	4.5	.035	.025	2.0	2.9		I	O	I
	1407+50	1435+00				Transition into existing channel								217,100	I	O	I
Lateral No. 1	981+00	1015+00	0.97	31	86	.00070	4	.00070	5.0	.045	.025	1.6	2.9		I	O	E
	1015+00	1120+00	2.15	55	60	.00030	4	.00030	5.3	.040	.025	1.6	2.0		I	O	E
	1120+00	1241+00	3.79	67	65	.00025	5	.00025	5.4	.040	.025	1.2	1.9	78,500	I	O	E
	1241+00	1306+50	4.15	70	68	.00015	8	.00017	5.3	.040	.025	1.0	1.6		I	O	E
Lateral No. 2	130+00	150+00	0.24	12	71	.00045	4	.00045	5.2	.040	.025	1.5	2.4	5,700	I	O	E
Lateral No. 3	100+00	143+00	0.36	10	33	.00011	4	.00018	5.1	.040	.025	0.7	1.2	8,400	I	O	E
Lateral No. 5	100+00	147+00	0.99	10	44	.00019	4	.00019	5.1	.040	.025	0.9	1.5	9,200	I	O	E
Lateral No. 6	100+00	119+00	0.16	5	61	.00050	4	.00050	5.0	.045	.025	1.4	2.2	2,900	I	O	E
Lateral No. 14	14+50	53+00	0.08	7	61	.00050 6/	4	.00050	5.0	.045	.025	1.4	2.2	9,900	I	O	E
Lateral No. 15	19+50	28+50	0.28	14	61	.00050	4	.00050	5.0	.045	.025	1.4	2.2	1,700	I	O	E
Canal No. 2	1152+00	1298+00	3.46	36	67	.00044	4	.00044	5.1	.040	.025	1.5	2.3		I	O	E
	1298+00	1378+50	5.14	50	67	.00044	4	.00044	5.1	.040	.025	1.5	2.3		II	M	I
	1378+50	1436+50	8.82	90	97	.00044	7	.00044	5.1	.040	.025	1.6	2.5		II	M	I
	1436+50	1456+50	8.88	97	98	.00027	11	.00015	4.8	.040	.025	1.3	2.1		II	M	I
	1456+50	1490+50	11.62	157	118	.00027	16	.00015	4.4	.040	.025	1.5	2.1		I	O	I
	1490+50	1509+50	11.72	160	125	.00046	16	.00015	3.9	.040	.025	1.6	2.6	93,300	I	O	I
	1509+50	1514+00	11.82			Transition into existing channel											
Lateral No. 10	1173+00	1204+00	0.19	3	61	.00050	4	.00050	5.0	.045	.025	1.4	2.2	6,500	I	O	E
Lateral No. 11	90+00	135+00	1.22	12	33	.00015	4	.00015	5.0	.045	.025	0.7	1.2	7,900	I	O	E
Lateral No. 12	100+00	121+00	0.86	9	61	.00050	4	.00050	5.0	.045	.025	1.4	2.2	4,100	I	O	E
Lateral No. 13	100+00	141+00	0.56	6	61	.00050	4	.00050	5.0	.045	.025	1.4	2.2	11,200	I	O	E
														456,400			

1/ Side slopes are 1:1

2/ I - Establishment of new channel including necessary stabilization measures.

II - Enlargement or realignment of existing channel or stream.

3/ M - Manmade ditch or previously modified channel, original construction before 1960.

O - None or practically no defined channel.

4/ I - Intermittent - continuous flow through some seasons of the year, but little or no flow through other seasons.

E - Ephemeral - flows only during periods of surface runoff, but otherwise dry.

5/ Side slopes are 2:1.

6/ Includes a drop structure at Station 38+00 with a drop of five feet.



TABLE 4 - ANNUAL COST

Upper New River Watershed, South Carolina

(Dollars) 1/

Evaluation Unit	Amortization of Installation Cost 2/	Operation and Maintenance Cost	Total
Canal No. 1 and Laterals	33,300	5,600	38,900
Canal No. 2 and Laterals	12,700	2,450	15,150
Project Administration	46,000	8,050 3/	3,050
TOTAL			57,100

1/ Price base: 1974.

2/ Amortized at 5 7/8 percent interest rate for 40 years.

3/ Includes \$550 for replacement of side inlet pipes.

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TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Upper New River Watershed, South Carolina

Item	(Dollars) 1/ Estimated Average Annual Damage		Damage Reduction Benefit
	Without Project	With Project	
Floodwater			
Crop and Pasture	19,600	8,500	11,100
Other Agricultural	36,500	13,250	23,250
Nonagricultural			
Roads	12,300	6,400	5,900
Houses	1,600	100	1,500
Subtotal	70,000	28,250	41,750
Indirect	12,050	4,850	7,200
TOTAL	82,050	33,100	48,950

1/ Price base - current normalized for crop and pasture; current prices for all other.

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TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Upper New River Watershed, South Carolina

(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/ More						Total	Average Annual Cost 2/	Benefit Cost Ratio
	Damage Reduction	Drainage	Intensive Land Use	Secondary	Redevelopment				
Canal No. 1 and Laterals	25,550	21,650	2,000	6,400	6,400	62,000	38,900	1.6 to 1	
Canal No. 2 and Laterals	23,400	18,500	2,800	7,600	2,500	54,800	15,150	3.6 to 1	
Project Administration							3,050		
GRAND TOTAL	48,950	40,150	4,800	14,000	8,900	116,800	57,100	2.0 to 1	

1/ Price base - current normalized for crop and pasture; current prices for all other.

2/ From Table 4.

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INVESTIGATIONS AND ANALYSES

Land Use and Treatment

Present land use was determined from soil and water conservation district reports, surveys, field studies, and interviews with landowners. Estimates of future land use and treatment measures were made on the basis of the people involved, the land within the watershed, and present trends. Needed land use adjustments based on soil capabilities were considered in arriving at the land treatment measures planned for the watershed.

The land treatment program was formulated to meet the physical needs of the land. Land treatment goals were established by the soil and water conservation district. Most of the land treatment measures for cropland and pastureland will not be installed until after the structural measures are installed because of the type of practices needed in the watershed.

The costs of installing the land treatment measures were developed by the Soil Conservation Service, the South Carolina State Commission of Forestry, and the U.S. Forest Service. Technical assistance costs were based on the present costs of the going district programs, the going Cooperative Forest Management Program, and the going Cooperative Forest Fire Control Program. Costs of installing land treatment measures were based on present prices paid by landowners and operators in the locality. The amount of private forest land treatment measures needed to meet treatment goals was based on a field survey of the watershed adjusted for expected participation during the installation period.

Structural Measures

Investigations of flooding and drainage problems indicated a need to study the natural and man-made drainage systems in the watershed. Engineering surveys were necessary to determine the carrying capacity of these systems. The surveys were based on mean sea level datum as established by U.S. National Geodetic Survey and U.S. Geological Survey. Temporary bench marks were established throughout the watershed.

Channel and valley cross sections were made along the drainage system. From these cross sections and other data, the needed channel work was determined.

The planned channel work was designed to remove the runoff from the two year frequency - 24 hour duration storm in 24 hours, following the cessation of rain, for the openland and in five days for the forest land. The needed design capacity of the channels was based on the Cypress Creek formula, $Q = CM^{5/6}$, with a C of 52 for openland and 10 for forest land and with M equal to the drainage area in square miles.

Channels were designed using Manning's formula. The "n" values used for the channel design were based on the recommendations

contained in the National Engineering Handbook, Section 16, Chapter 6. These values were reduced to 0.025 to determine velocities for newly constructed channels.

Horizontal distances for channel design were established from an aerial photographic mosaic of the watershed. Representative samples of materials were collected along the proposed channel system using the Failing CFD-2 power auger and the Damco 1250 core drill. Samples were tested by the Materials Testing Section, EWP Unit, Fort Worth, Texas. Laboratory tests indicate three main soil types: SC with a plasticity index (PI) of 12 and above; SC-SM with a PI of 5-6; and non-plastic SM. The allowable velocity procedure was used to check soil stability under design flow conditions in soils with PI's over seven. For soils with PI's less than seven, the tractive force procedure was used. Water surface profiles were used to check the design of channels in the lower end of the project area. The planned channel meets the criteria of Technical Release No. 25 and is expected to be stable.

Hydraulics and Hydrology

Numerous cross sections were surveyed throughout the watershed to be used in analyzing possible solutions to flooding and drainage problems. Water surface profiles were developed using the IBM 1130 computer water surface profile program.

Flood routings were performed using the TR-20 program for present and future with project conditions to determine downstream effects of the proposed project. This program was also used to analyze effects of possible floodways to divert water into other drainageways on flood peaks.

The analysis of the watershed was made using procedures outlined in the National Engineering Handbook, Section 4, Watershed Planning.

Geology

Erosion rates were computed for the various land uses within the watershed. Soil losses from all sources are based on field examinations and comparisons with similar watersheds. A soil loss of less than one ton per acre per year for all land uses is indicated. An estimate of suspended sediment concentrations for the intermittent stream was calculated using the procedure outlined in Chapter VIIA, Guide to Sedimentation Investigations, SRTSC, Fort Worth, Texas. A yearly average concentration of three mg/l, was computed for Upper New River at State Secondary Highway 115.

A field survey was made to determine the location and extent of sediment and flood plain scour damage. Due to the very flat soil slopes and high rainfall infiltration rates, runoff velocities within the watershed are very low. As a result of these factors, sediment movement and scour are insignificant.

The procedure outlined in Technical Release No. 25, dated December 15, 1964, was used to evaluate stability of the proposed channel. A geologic study of the soil profiles involved was made using a power auger and core drill rig. Representative soil samples were submitted to the laboratory for mechanical analysis, liquid limit, plastic limit, plasticity index, and permeability determinations. Channel stability was evaluated using the Schoklitsch Bedload Transport Equation. Bedload estimates used were based on the erosion rates expected immediately after the construction period. Results indicate Canal No. 2 will be aggrading slightly in the upper and middle reaches, but stable at the outlet. Lateral No. 1 will be slightly degrading in the lower reach, although generally stable elsewhere. Canal No. 1 is expected to aggrade throughout, with the largest sediment accumulation occurring in the middle reaches. All aggradation is expected to be less than one-half inch per year during the least stable channel conditions. The degradation expected in a few reaches will be minor. Existing man-made channels were studied and all appear stable after several years of existence.

During geologic investigations for channel stability analysis, an artesian effect was noted in the ground water table. A study of this condition was made using a series of test wells and pits. Prolonged pump tests were made on two pits near State Secondary Highway 115. The two pits (10 feet deep), averaged 21 square feet of exposed aquifer and produced an average of five gallons per minute. Pumping rates varied from seven gallons per minute in September 1973, to four gallons per minute in November 1973, which was after a period of low rainfall. To determine the relationship between area of aquifer exposure and water yield, a large pit was dug during December 1973. Water yield from the large pit (15 feet deep), exposing approximately 3,100 square feet of aquifer was 150 gallons per minute, or about one gallon per minute for each 21 square feet of aquifer exposed. These results indicate that water yields of the aquifer does not increase proportionately to the area exposed. Possible causes for this would be that the large pit exceeds aquifer permeability, or that the pit was located in a less permeable section of the formation. During the entire period, the pump rates obtained in the pits would not lower the piezometric surface in wells located 100 and 200 feet away. The estimated source of the aquifer considering exposed geologic features and several test wells, has a storage capacity of about 87 billion gallons. This considers only that section of aquifer down to six feet below channel bottom elevation at the outlet of the proposed project area.

Fish and Wildlife

Representatives of the South Carolina Wildlife and Marine Resources Department and the U.S. Fish and Wildlife Service made a joint field survey of the watershed to help in the preparation of the fish and wildlife resource inventory, and an analysis of the effect

of project installation on this resource.

The Soil Conservation Service biologist made an independent survey of the watershed to complete the fish and wildlife resource inventory. The Service biologist also assisted in assessing the effect of the project on fish and wildlife resources.

Economics

Economic investigations and analyses were based on methods approved by the Soil Conservation Service in benefit-cost evaluation of land and water resource projects. Basic data was obtained from landowners, agricultural workers, state highway department personnel, contractors, and USDA publications.

Current normalized prices were used in computations for crop and pasture damages and benefits. Present (1973) prices were used for all other damages and benefits and for estimating installation, operation and maintenance costs. The cost of all structural measures were amortized over a 40 year period, using 5 7/8 percent interest rate.

Land use and estimated yields information used in the economic evaluation was obtained from interviews with operators and landowners. These data were summarized by areas (limited by property lines and drainage patterns) that would be benefited by the proposed channel work. Yields used in the analysis are those that would normally be expected in the future without and with the project.

The benefits from flood prevention and drainage were assumed inseparable, therefore, the benefits were allocated equally between the two.

Benefits to cropland and pasture were derived by analyzing the difference in net income to the benefited area with and without the project. The gross return was reduced by 30 percent for lack of participation. Of this total, 30 percent was discounted for 10 years at seven percent interest rate for delay in accrual, and associated costs were subtracted to give the net average annual benefits.

More intensive land use benefits were calculated on the basis of expected increase in crop and pasture yields. This increase in yield level would result from increased use of fertilizers and better management practices made profitable by reducing the floodwater and drainage hazards.

Indirect damages were estimated to be 10 percent of the direct floodwater damages to cropland and pasture, and 20 percent of other floodwater damages.

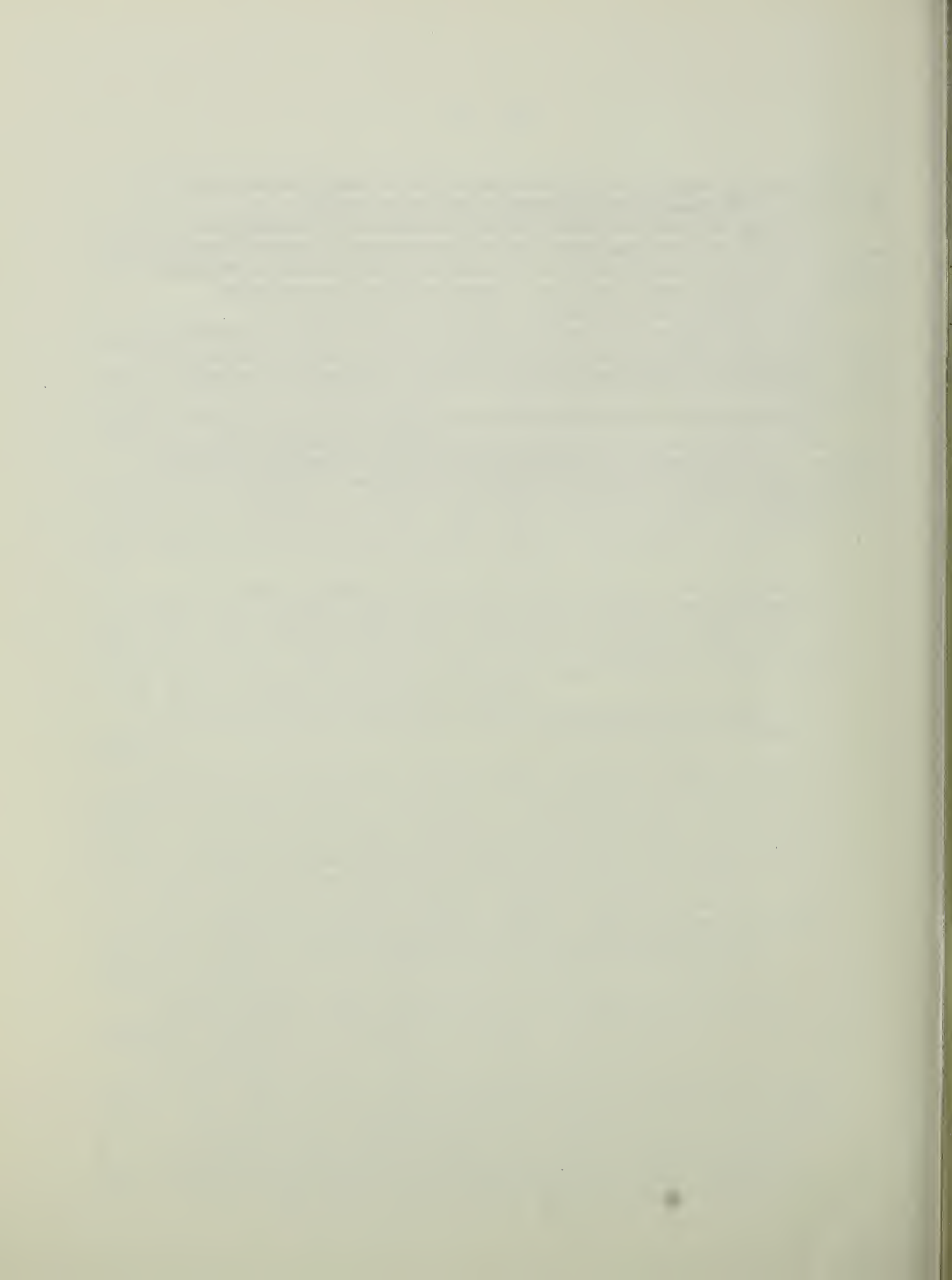
Redevelopment benefits resulting from installation of project measures are based on utilization of unemployed or underemployed local labor. Wage payments to local labor during construction were estimated to be 20 percent of the construction costs. This value was amortized at 5 7/8 percent interest for 40 years to arrive at annual benefits. Fifty percent of the operation and maintenance costs was used as the value of annual wages paid to local labor. This value was treated

as a decreasing annuity for 20 years at 5 7/8 percent interest and converted to an annual equivalent over the project life.

The value of local secondary benefits induced by the project were estimated to be 10 percent of the direct primary project benefits. Indirect benefits were excluded when computing the secondary benefits. Secondary benefits from a national viewpoint were not evaluated.

Cost estimates on maintenance reduction, and savings by increasing the longevity of resurfacing the roads in the benefited area were made. Benefits were assumed to equal the costs saved. These benefits were allocated equally between flood prevention and drainage.

Installation costs of the proposed channel system which serves both flood prevention and drainage was allocated equally to each purpose. This includes all downstream segments that provide outlets for upstream channels serving both purposes, either singly or collectively.



APPENDIX A - WATER WELLS, MAXIMUM CONSUMPTION FROM WELLS AND THEIR CHEMICAL ANALYSES 1/

Upper New River Watershed, South Carolina

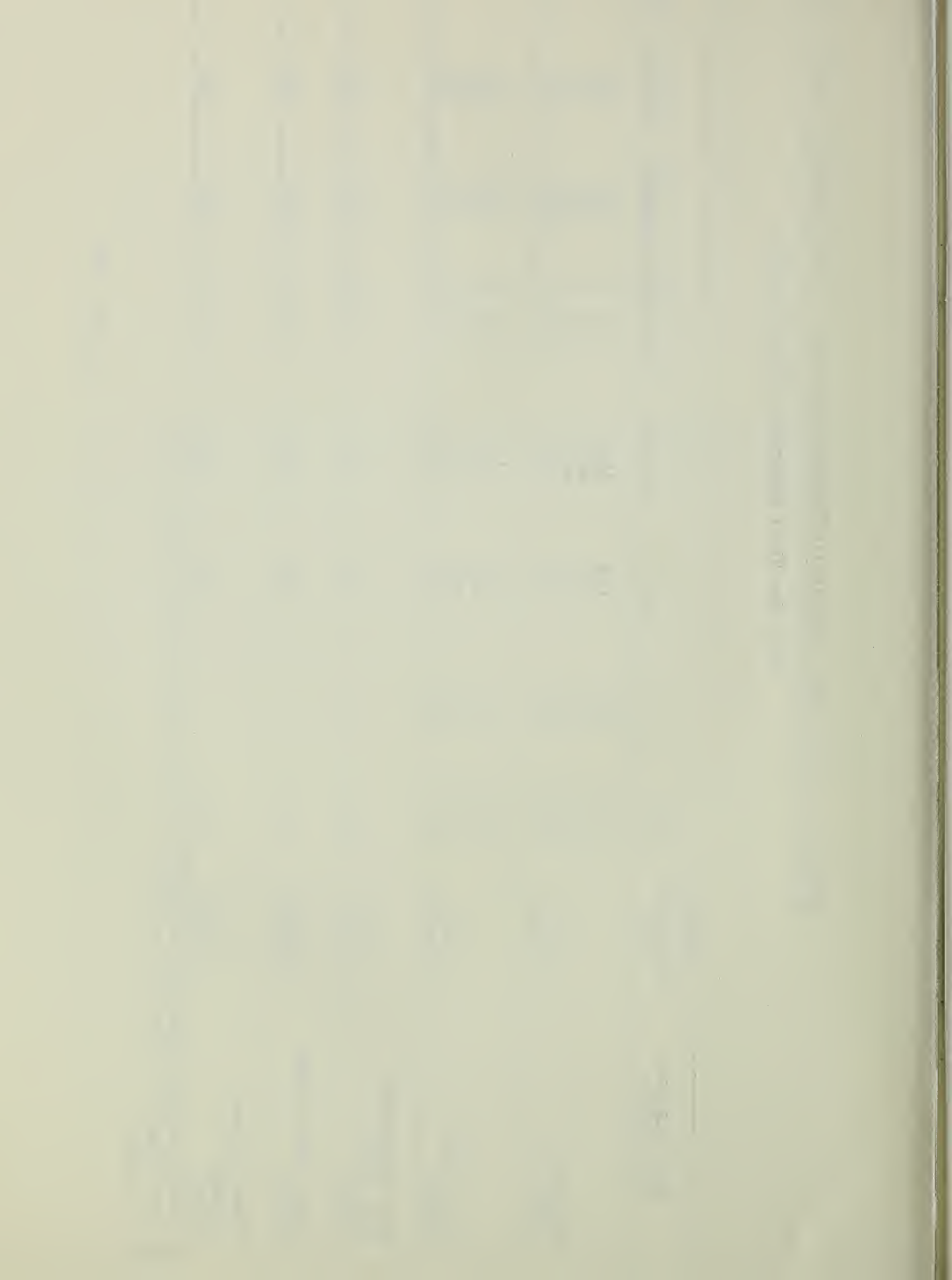
Well Location and Number	Maximum Consumption MGD	Test Date	Solids 2/	Alkinity	Calcium	Magnesium	Hardness	Iron	Chlorides	Acidity	Copper	Zinc
Ridgeland 127001	3.53 (3 wells)	05-72	208	153	28.0	6.1	95	.0	9	8.0	.0	.0
		11-72	188	154	10.0	5.9	49	.0	7	7.9	.0	.1
		06-73	208	146	42.0	6.2	130	.0	7	8.3	.0	.0
		10-73	186	148	34.0	5.9	109	.2	6	7.8	.1	.1
Hardeeville 127002	0.180 (2 wells)	12-71	150	103	11.2	7.7	60	.0	10	7.7	.0	.4
		05-72	152	105	10.7	7.4	57	.0	9	8.1	.0	.0
		11-72	150	108	11.2	7.1	57	.0	7	8.2	.0	.0
		06-73	180	106	11.8	7.6	61	.0	5	8.3	.0	.0
West Hardeeville High School 727100	No rate (1 well)	10-73		105	10.3	7.5	57	.3	8	8.3	.1 3/	.1 3/
Jasper High School 727101	No rate (1 well)	10-73		149	38.0	6.9	123	.2	7	8.0	.1 3/	.1
Thomas Heyward Academy 727103	No rate (1 well)	10-73		146	43.0	6.2	133	.2	9	8.3	.1 3/	.1

1/ South Carolina Department of Health and Environmental Control Report, 1974.

2/ All measured in parts per million.

3/ Less than

December 1974

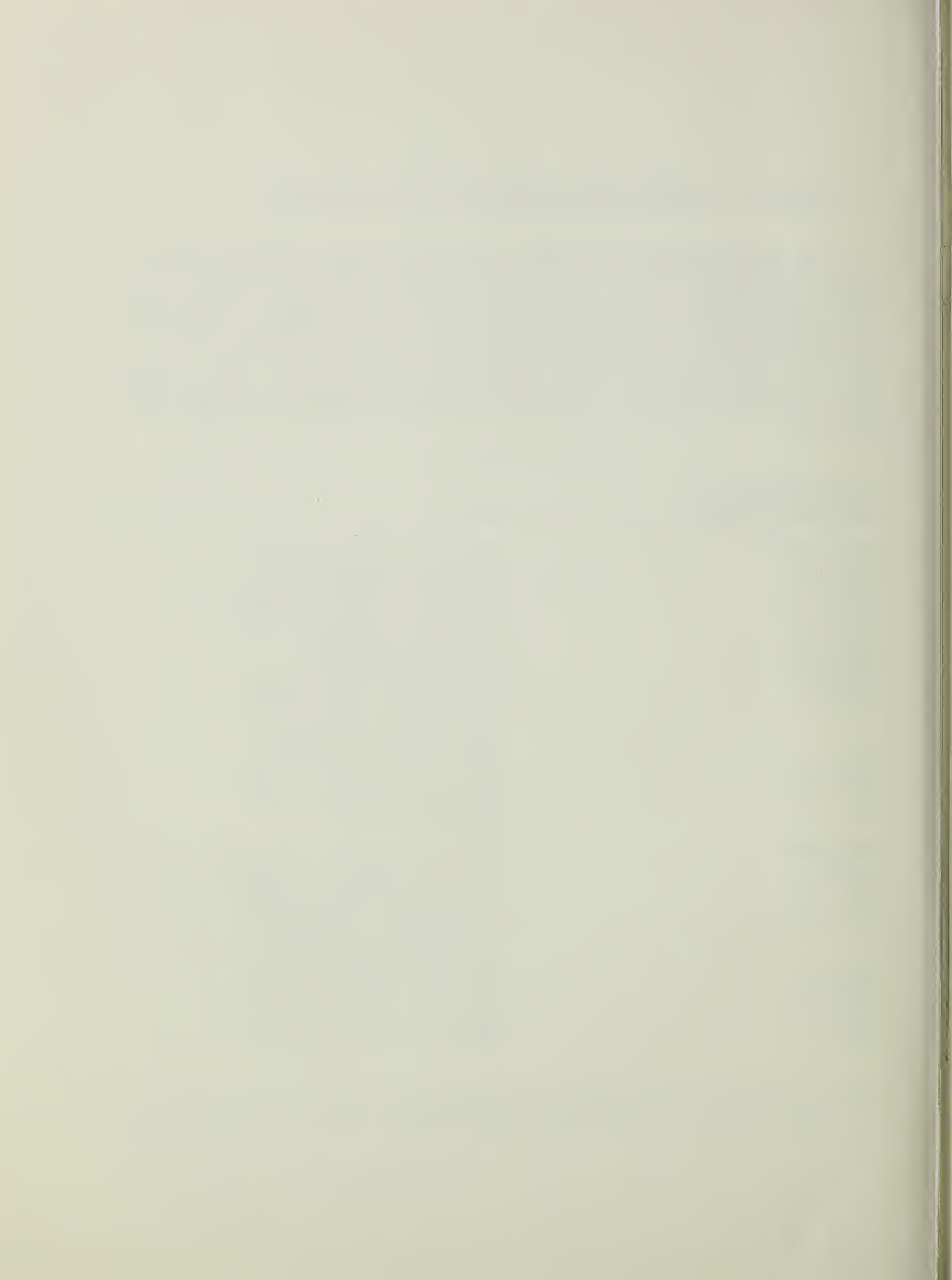


APPENDIX B - SOUTH CAROLINA DRINKING WATER STANDARDS 1/

The South Carolina Department of Health and Environmental Control collects samples of water from the distribution systems of public water supplies in South Carolina, and conducts chemical analyses in accordance with the Law, Rules and Regulations for Waterworks Systems in the State of South Carolina. These analyses are designed to determine if the finished water meets standards for chemical quality as set forth in the 1962 U.S. Public Health Service Drinking Water Standards. These analyses are also used to evaluate treatment processes where such processes are employed.

<u>Characteristic or Chemical Substance</u>	<u>Limit</u>
Total Solids	Should not exceed 500 mg/1
Turbidity	Should not exceed 5 t.u.
Color	Should not exceed 15 units
Alkalinity	Should not exceed 500 mg/1
Calcium	Related to hardness
Magnesium	Related to hardness
Hardness	Should not exceed 100 mg/1
Sodium	No standard. Provided as information for medical doctors when requested
Iron	Should not exceed 0.3 mg/1
Chloride	Should not exceed 250 mg/1
pH	Acceptable range from 6.5 to 8.5
Manganese	Should not exceed 0.05 mg/1
Copper	Should not exceed 1.0 mg/1
Zinc	Should not exceed 5.0 mg/1
Potassium	No standard. Provided as information for medical doctors when requested
Mercury	Should not exceed 0.5 ppb
Chromium	Should not exceed 0.05 mg/1
Cadmium	Should not exceed 0.01 mg/1
Lead	Should not exceed 0.05 mg/1

1/ Law, Rules and Regulations for Waterworks Systems in the State of South Carolina, South Carolina State Board of Health, November 1970.



APPENDIX C - QUALITY STANDARDS FOR CLASS "SB" WATERS 1/

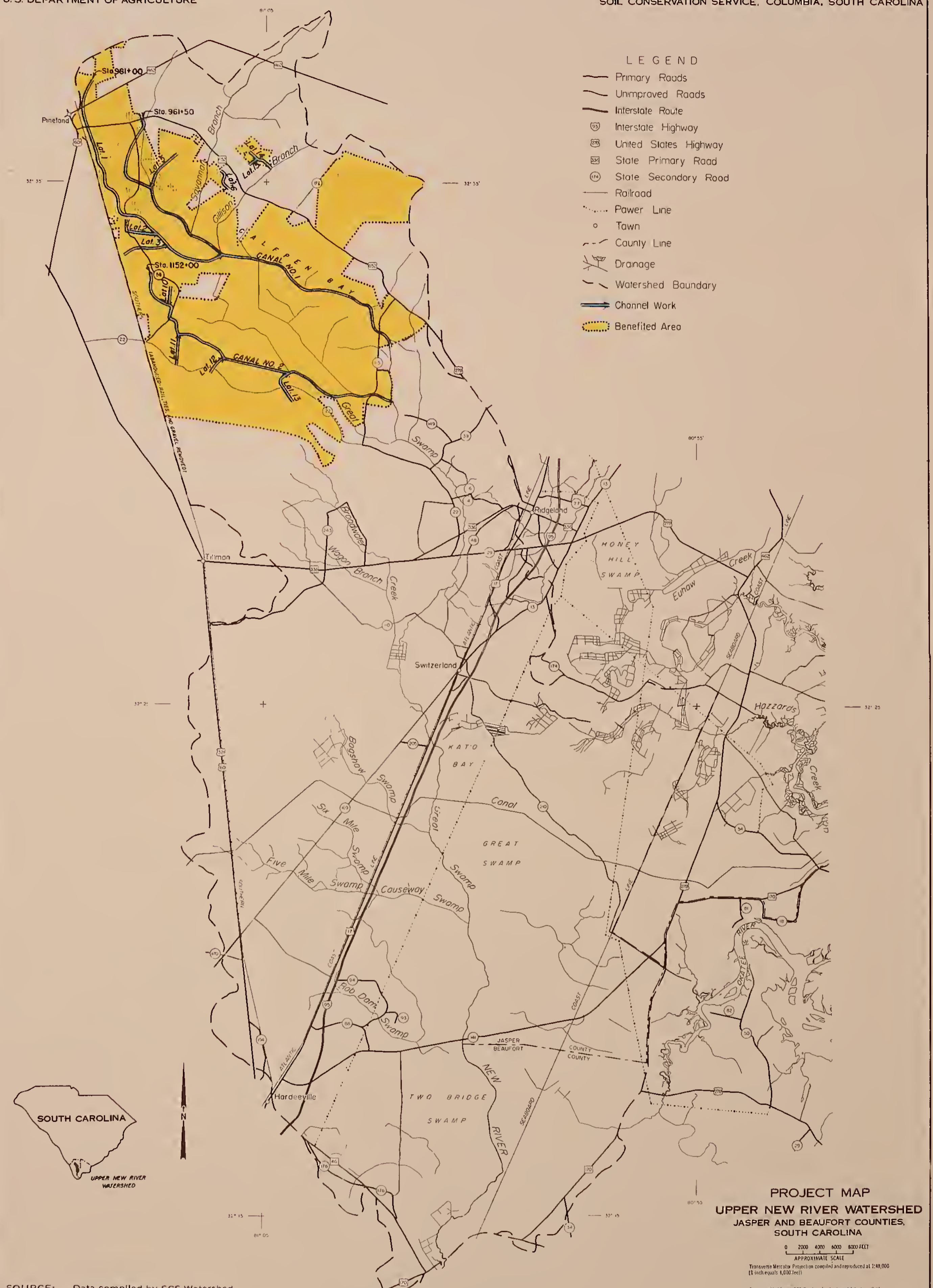
Class "SB" waters are suitable for bathing and any other usages, except shellfishing for market purposes, in accordance with the requirements of the South Carolina Department of Health and Environmental Control. They are also suitable for uses requiring water of lesser quality.

Item	Specifications
1. Garbage, cinders, ashes, oils, sludge or other refuse	None
2. Sewage or waste effluents	None which are not effectively disinfected
3. Dissolved oxygen	Not less than five mg/l
4. Toxic wastes, deleterious substances, colored or wastes	None alone or in combination with other substances or wastes amounts as to be injurious to edible fish or the culture or propagation thereof, or which in any manner shall adversely affect the flavor, color, odor, or sanitary condition thereof; to make the waters unsafe or unsuitable for bathing or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.
5. Fecal coliform	Not to exceed a geometric mean of 200/100 ml; nor shall more than 10 percent of the samples in any 30 day period exceed 400/100 ml.
6. pH	Shall not vary more than one-half of a pH unit above or below that of effluent-free waters in the same geographical area having a similar total salinity, alkalinity and temperature, but not lower than 6.75 or above 8.5

1/ Water Classification Standards System for the State of South Carolina, South Carolina Pollution Control Authority, 1972.

LEGEND

- Primary Roads
- - - Unimproved Roads
- Interstate Route
- Ⓜ Interstate Highway
- Ⓢ United States Highway
- Ⓟ State Primary Road
- Ⓡ State Secondary Road
- Railroad
- Power Line
- Town
- - - County Line
- Drainage
- - - Watershed Boundary
- Channel Work
- ⦿ Benefited Area



PROJECT MAP
UPPER NEW RIVER WATERSHED
JASPER AND BEAUFORT COUNTIES,
SOUTH CAROLINA

0 2000 4000 6000 8000 FEET
 APPROXIMATE SCALE

Transverse Mercator Projection compiled and reproduced at 1:48,000
 (1 inch equals 4,000 feet)

Base compiled from USGS Quadrangle sheets and latest available
 General Highway Maps.

SOURCE: Data compiled by SCS Watershed
 Planning Staff.

NOVEMBER 1974 4-R-31666
 REVISED OCTOBER 1974 4-R-31101

