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Stoney Creek

Watershed Work Plan

Wayne County

North Carolina



Local
Sponsors



Geology



Design



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Economics



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ADDENDUM

Stoney Creek Watershed

Wayne County, North Carolina

This addendum is prepared to present information consistent with the intent of the Principles and Standards for Planning Water and Related Land Resources which became effective October 30, 1973. The information presented is: 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

The project costs, benefits, and benefit-cost ratio are based on a 5 7/8 percent interest rate, current normalized prices, and the 1974 price base. Annual project costs, annual benefits, and benefit-cost ratio are as follows:

- 1. Project costs \$ 94,550
- 2. Project benefits \$135,715
- 3. Benefit-cost ratio 1.4 to 1.0
- 4. Benefit-cost ratio without
secondary benefits 1.3 to 1.0

PART II

Selected Plan

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Stoney Creek Watershed
Wayne County, North Carolina

Measures of Effects^{1/}

Components

Measures of Effects^{1/}

Beneficial Effects:

Adverse Effects:

A. The value to users of increased outputs of goods and services

A. The value of resources required for a plan

- 1. Flood prevention \$ 78,535
- 2. Recreation 33,065
- 3. Utilization of unemployed and underemployed resources 10,285

- 1. Three multiple-purpose structures for flood prevention and recreation with approximately 2.1 miles of stream clearing and loose debris removal.

Total beneficial effects \$121,885

- a. Project installation \$75,635
- b. Project administration 6,915
- c. Operation and maintenance 12,000

Total adverse effects

\$94,550

Net beneficial effects

\$27,335

^{1/} Average annual benefits and costs @ 5 7/8 percent interest

Selected Plan
REGIONAL DEVELOPMENT ACCOUNT

Stoney Creek Watershed
Wayne County, North Carolina

<u>Components</u>	<u>Measures of effects^{1/}</u>	<u>Region^{2/} Rest of Nation</u>
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<u>Components</u>	<u>Measures of effects^{1/}</u>	<u>Region^{2/} Rest of Nation</u>
A. Income:		
A. Income:		
Beneficial effects:		
1. The value of increased output of goods and services to users residing in the region.		
a. Flood prevention	\$ 78,535	-
b. Recreation	33,065	-
c. Utilization of unemployed and underemployed resources	10,285	-
2. The value of output to uses residing in the region from external economies.		
a. Induced by and stemming from effects	11,630	-
Total beneficial effects	\$133,515	-
Total adverse effects	\$ 48,340	\$ 46,210
Net beneficial effects	\$ 85,175	\$-46,210

^{1/} Average annual
^{2/} The region consists of Wayne County, North Carolina

Components	Measures of Effects		Components	Measures of Effects	
	Region	Rest of Nation		Region	Rest of Nation
B. Employment:			B. Employment:		
Beneficial effects:			Adverse effects:		
1. Increase in the number and types of jobs.	--	--	1. Decrease in number and types of jobs.	0	0
a. Employment for project construction	Create 24.4 man-years of semi-skilled employment during the installation period (6 years).	--	Total adverse effects	0	0
b. Employment for project operation and maintenance	One permanent semi-skilled job.	--	Net beneficial effects	One permanent semi-skilled job.	
Total beneficial effects	One permanent semi-skilled job.	--			24.4 man-years of semi-skilled employment over the installation period (6 years).
C. Population Distribution:					
Beneficial effects:	Create one permanent semi-skilled job, and 24.4 man-years of semi-skilled employment over the installation period (6 years).	--			
Adverse effects:	--	--			
D. Regional Economic Base and Stability					
Beneficial effects:	Provide residents of the watershed area with 22,340 visitor-days of recreation on 3 lakes totaling 219 surface acres. Create one permanent semi-skilled job and 24.4 man-years of employment to local unemployed labor over the project installation period (6 years). Reduce flood hazard on 549 acres of flood plain. Reduce flood hazard to 14 homes, 5 apartment units, 3 commercial establishments, a city park and 3 buildings at a college in Goldsboro.	--			
Adverse effects:	--	--			

Selected Plan
ENVIRONMENTAL QUALITY ACCOUNT

Stoney Creek Watershed
Wayne County, North Carolina

Components

Beneficial and adverse effects:

A. Areas of natural beauty.

Measures of Effects

1. Project output will make available regional funds and resources that can be used to enhance the physical appearance of 110 farms in the watershed. Reduction of flooding on the 549 acres of flood plain below structures will enhance the usefulness and aesthetic appeal of the area.
2. Create 219 surface acres of water.
3. Clear and inundate 219 acres of forestland.
4. Convert approximately 3 miles of streams to impounded water in the permanent pools of structures.
5. Clear 79 acres of forestland for the three structures, spillways, and access areas.
1. Reduce erosion by adequate treatment of 848 acres of cropland, 100 acres of grassland, and 106 acres of other land.
2. Reduce sediment yield at mouth of Stoney Creek by 20,800 tons annually.
3. Reduce turbidity of stream water and improve fishery resources.
4. Reduce sediment deposition in channels, thereby reducing flooding and swamping.
5. Reduce runoff rates and increase infiltration on land adequately treated.
6. Temporarily increase sedimentation during construction.
1. Enhance wildlife habitat and food supply by development of 100 acres of upland habitat.
2. Create 219 surface acres of lake fish habitat.
3. Clear 219 acres of forestland for permanent pools, with loss of wildlife habitat.

Selected Plan
ENVIRONMENTAL QUALITY ACCOUNT

Stoney Creek Watershed
Wayne County, North Carolina
(continued)

Components

Measures of Effects

- C. Biological resources and selected ecosystems (continued).
4. Clear 79 acres of forestland for structures, spillways, and access areas, with loss of wildlife habitat.
 5. Cause a temporary detrimental effect on stream fishing resources when channel clearing and debris removal is done.
- D. Irreversible or irretrievable commitments.
1. Convert 219 acres of forestland to permanent water.
 2. Convert 78 acres of forestland and 5 acres of cropland to dams and spillways.
 3. Permanently commit 4 acres of cropland and 2 acres of forestland to use as access areas to the lakes..
 4. Prevent construction of building in the flood pool areas, 319 acres.
 5. Permanently commit the labor and materials used in construction to water resource development.

Selected Plan
SOCIAL WELL-BEING ACCOUNT

Stoney Creek Watershed
Wayne County, North Carolina

Components

Beneficial and adverse effects:

A. Real income distribution

Measures of Effects

1. Create one permanent semi-skilled job and 24.4 man-years of semi-skilled employment over the installation period (6 years).
2. Create estimated regional income benefit distribution of \$131,355 annual benefits by income class as follows:

<u>Family Income Class</u> (dollars)	<u>Percentage of Adjusted Gross Income in Class</u>	<u>Percentage Benefits in Class</u>
Less than 3,000	191/	25
3,000 - 10,000	56	50
More than 10,000	25	25

3. Local cost to be borne by region total \$51,440 annually with distribution by income class estimated as follows:

<u>Family Income Class</u> (dollars)	<u>Percentage of Adjusted Gross Income in Class</u>	<u>Percentage Contribution in class</u>
Less than 3,000	191/	3
3,000 - 10,000	56	52
More than 10,000	25	45

B. Life, health, and safety

1. Reduce risks of damaging floods in the city of Goldsboro, thereby reducing the health and safety risks of flooding.

2. Reduce interruptions in transportation activities, business operations, and normal community life.

C. Recreational opportunities

1. Provide water-based recreation which is easily accessible to the people of Goldsboro and Wayne County.

1/ From 1970 census data.

Date: December 1974

PART III
ABBREVIATED ENVIRONMENTAL QUALITY PLAN

Stoney Creek Watershed
Wayne County, North Carolina

Environmental Quality Problems

Stoney Creek Watershed, located in Wayne County, North Carolina, is in an accelerated transition stage from a rural agricultural environment to an urbanized and industrialized one. In fact, part of the watershed area is already within the city limits of Goldsboro and the areas along all the main routes within the watershed are building up.

The main environmental quality problem of the watershed is that of flooding. Most of the watershed's agriculture, located in the headwater areas, escapes major flood damage. Homes and businesses in the lower urban reaches, however, often suffer serious damages from high water. Flooding also interferes with transportation by blocking roads or damaging streets and bridges. It washes tree limbs and other debris into the channels, further decreasing their ability to convey floodwaters as well as their aesthetic value.

Erosion and sediment associated with agricultural activity as well as urbanization (home building, street construction, etc.) are another threat to the environmental quality of the area. Erosion on open cropland decreases its productivity as well as its appearance. Erosion from construction sites has been and will continue to be a very serious problem where control measures are neglected. Sediment, the product of erosion, further aggravates the flooding problems cited above by filling in the channels and reducing their available area for water flow. In addition, sediment has been shown to be a major carrier into watercourses of dangerous farm chemicals (e.g. pesticides, herbicides, etc.) and such plant nutrients as phosphorus and nitrogen which can lead to eutrophication problems further downstream. Not only do these chemicals deteriorate the water's value for human use, but they can also seriously affect fish and other aquatic resources.

The lack of sufficient water-based recreational facilities is a factor adversely affecting the quality of life for the human inhabitants of the watershed. Population growth, rising standards of living, and increased leisure time are creating increased demand for recreation of this type in the watershed and surrounding area. Water-based recreation within the area is now limited to individual landowner fishing in private ponds and bank fishing in pools in the lower reaches of Stoney Creek. Although accessibility to this portion of the creek is good, the fishery resource is generally rated as poor. Only one lake of 1,000 surface acres or

more is located within 50 miles of the watershed. The North Carolina Division of Parks and Recreation has estimated unmet recreation needs in Wayne County as: 160 acres of Class I sites, 2,324 acres of Class II sites, and 24,927 acres of Class III sites. Class I sites are intensively developed for group sports and are usually within or near major urban populations. Class II sites are general outdoor recreation areas, generally more remote than Class I areas, featuring activities such as camping, nature walks, and outdoor sports. Class III sites are natural environment areas which support weekend and vacation activities dependent on a natural setting such as nature study, sightseeing, hunting, and fishing.

The 160 acres of unmet needs for Class I sites are composed of 21 acres of neighborhood emphasis areas, 7 acres of community emphasis areas, and 132 acres of city parks. Most of the unmet needs are in Goldsboro.

A basic problem relating to the environmental quality for the watershed's fish and wildlife resources is the continuing urban and suburban encroachment. Many acres of wildlife habitat have already been cleared in the urbanization process. Further habitat loss and associated decreases in wildlife population will be brought about unless measures are taken to preserve certain areas as wildlife habitat.

Still another problem associated with the transition to an urban and industrial setting is the deterioration of the area's aesthetic values. Unsightly "junk piles" have begun to form. Sites for shopping centers or plants have been cleared and graded with no regard for preserving "natural areas." Debris and trash have collected in streams. Powerlines, utility lines, roads, etc., were laid out and constructed completely neglecting the way they fit into the natural landscape. These are examples of some of the ways that aesthetic values of those areas of the watershed that have already built up have deteriorated. Uncontrolled, undirected growth in other areas of the watershed will further deteriorate aesthetic values unless preventive steps are taken.

Needs for Solving Environmental Quality Problems

Component needs for solving the watershed's environmental quality problems are as follows:

1. Human Resources
 - a. Provide public accessible water-based and other outdoor recreational facilities.
 - b. Reduce flooding damages to existing homes and businesses as well as preventing increases of these damages in the future.
 - c. Improve aesthetic value of the present "built up" areas and take steps to prevent deterioration of aesthetic value of other areas as they urbanize.
 - d. Protect and develop any archaeological or historic resources within the watershed for present and future generations.

2. Plant and Animal Resources

- a. Provide additional fish habitat within the watershed.
- b. Preserve Type 1 and 7 wetlands in the lower part of the watershed.
- c. Create areas of new wildlife habitat.
- d. Take measures to insure that wildlife habitat will be maintained in the future.
- e. Improve water quality in watershed streams in order to improve fish habitat.

3. Water, Land, and Air Resources

- a. Improve quality of water through reduction of sediment and associated pollutants.
- b. Insure that sewage discharges are in compliance with all North Carolina state laws.
- c. Reduce air pollution and sediment production associated with dirt roads.
- d. Insure that all discharges from industry (both present and future) are in compliance with North Carolina air quality standards.

4. Aesthetic Values and Natural Areas

- a. Improve aesthetic value of Stoney Creek Watershed through urban reaches.
- b. Insure that future development in the watershed fits in with the "natural setting" to the maximum extent possible.
- c. Preserve "natural areas" for enjoyment of watershed residents.

Components of Environmental Quality Plan

The first element of the plan will be the initiation of an accelerated land treatment program over the watershed. Conservation measures to be applied under this program will be land treatment conservation practices of the selected plan. Conservation cropping systems, crop residue use, contour farming, and field border planting are just some of the practices

that will be used. The land treatment program will be carried out through existing conservation plans or new plans to be developed by individual landowners with technical assistance provided by the Soil Conservation Service. An information program to inform urban residents on the proper use of fertilizers and other chemicals on lawns and gardens will be initiated as a supplement to the land treatment program. Proper application to avoid pollution of runoff waters will be stressed.

The North Carolina Division of Forest Resources, cooperating with the United States Forest Service, will provide accelerated technical assistance to aid landowners and operators in identifying and solving problems generated by urban development in the forestland areas. The regular cooperative forestry programs will be continued. Assistance will be provided for installing forestland measures and for adequate fire protection.

A second part of the environmental quality plan will be the construction of the three multiple-purpose structures described in the selected plan. These structures will provide floodwater storage as well as supplying watershed residents with recreational opportunities. Public access areas, parking lots, sanitary facilities, and boat ramps will be provided at all three reservoirs. In addition, nature trails will be developed around the pools. These nature trails will include plantings of various flowers, shrubs, and trees. Wildlife foods (both duck food and upland wildlife food) will also be planted around the pools. All of the land connected with the reservoirs will be set aside as wildlife sanctuaries and no hunting, except on a controlled basis as determined by the North Carolina Wildlife Resources Commission, will be allowed. A fish management program will also be followed. All three structures will have installed cold-water releases, minimum flow orifices, and "duck windows." The cold-water releases and minimum flow orifices will prevent damages to downstream reaches and the duck windows will provide water level management.

Sediment control on non-agricultural sources will be accomplished in several ways. First, the town of Goldsboro and Wayne County will accelerate the process of developing specific sediment control guidelines as provided for under the recent North Carolina Sedimentation Law. These specific requirements will be applied to all on-going as well as future construction projects. This would include applying an accelerated erosion control program on the construction of new roads through the watershed. Sediment basins, grading, and cutting only as needed, and seeding as soon as possible are examples of the type measures that will be used. In addition, approximately 10 sediment traps will be constructed on major laterals to Stoney Creek below the planned structures. The traps will be located just before the junctions of the lateral and Stoney Creek. They will be constructed so that most of the coarse material will be dropped out of incoming drainage waters before they enter Stoney Creek. Cleanout of the traps will be as needed.

Clearing and snagging work for flood prevention will be done on Reach IIA and Reach III of Stoney Creek just as in the selected plan. A hydrologic analysis has shown that this work will be very beneficial in reducing flood damage through this section. The work will be done so as to minimize damages to the environment.

Debris in other reaches of Stoney Creek will be removed as necessary to improve the aesthetic value of the stream. Much trash such as old tires, discarded furniture, etc., has been thrown into the creek in the past, especially through the urban reaches. The channel bottom or banks will not be disturbed in these reaches other than as necessary to remove debris.

A floodway will be developed and maintained along the entire length of the creek below the planned structures (see project map). Development of the floodway will consist of removing all trash and vegetation in the flood plain that interferes with flow.

There is already a zoning ordinance in effect which prevents further development of the flood plain in reaches below structures. Therefore, the floodway area will be used for parks, wildlife areas, and "natural areas," and will be designated as a wildlife sanctuary. Operation and maintenance of the environmental quality plan would include removing trash and other debris from the floodway as necessary. In addition, all buildings that are still located within the 100-year flood plain of the creek after the environmental quality plan is installed will be flood-proofed. This will be done by constructing a levee or wall around the building sufficient to keep out water from all storms up to the 100-year frequency event. A maintenance travelway will be included with the floodway to allow machinery to mow weeds and other undesirable, unattractive vegetation on and along the channel banks.

As a further step in improving aesthetic values, unsightly junk yards and other eyesores within the watershed will be removed or a fence will be constructed to shield them from view of roads. Also, all existing overhead powerlines, telephone lines, etc., will be relocated underground wherever possible. Where this cannot be done, poles will be painted a natural pastel color or replaced with poles which better fit into the natural setting. This will be done for the area already developed as well as areas developed in the future.

In order to cut down on dust and associated air pollution and on sediment loads and water pollution in streams, approximately five miles of dirt roads will be paved. Paving of the roads will be done by the North Carolina Department of Transportation and Highway Safety and will meet their minimum standards. Also, any areas of critical eroding road banks on dirt roads to be paved or existing hard surface roads will be stabilized. New roads to be constructed in the future will be laid out to best fit in with the landscape and to avoid destruction of especially scenic areas or areas of valuable wildlife habitat.

As a further step in maintaining acceptable air quality levels, all industrial discharges will be checked to determine if they meet the requirements of the North Carolina air quality standards. This will also be done for all new industries constructed in the future. All industries will be required to meet minimum standards.

Before any construction is started on structural measures, an investigation of the affected area will be made to determine if there are any archaeological or historic resources present or if any rare and endangered plant and animal species exist within the area. If any such resources are found, measures will be taken to preserve them. Modification of some of the structural measures may be required.

The total cost of the environmental quality plan is estimated to be \$3,952,800. Following are estimated costs of individual components of the plan:

Accelerated land treatment program-----	\$ 141,200
Multiple-purpose structures-----	1,256,250
Recreational facilities-----	32,550
Clearing and snagging work-----	26,800
Cleanout of other channel reaches-----	16,500
Wildlife plantings around structures-----	7,500
Developing sediment control guidelines-----	--
Accelerated erosion control on new road construction-	50,000
Sediment basins on laterals-----	4,000
Floodway development-----	175,000
Improvement of aesthetic values within the urban reaches-----	2,000,000
Floodproofing buildings-----	25,000
Paving five miles of road-----	200,000
Information program on urban use of fertilizer, pesticides, etc.-----	--
Preservation of Types 1 and 7 wetlands-----	10,000
Search for archaeological and historic resources-----	2,500
Search for rare and endangered species-----	5,000

Environmental Effects

1. Human Resources
 - a. Reduce damages to home and businesses from flooding and prevent interruptions to traffic and other activities.
 - b. Provide water-based recreational opportunities for watershed residents.

- c. Maintain "green areas" and open space along the floodway and around structures for enjoyment of urban residents.
 - d. Improve aesthetic appearance of urbanized portion of the watershed.
 - e. Insure that future urban growth and expansion will be kept in better harmony with the natural landscape.
2. Plant and Animal Resources
- a. Maintain areas along the floodway and around the structures where wildlife will be protected.
 - b. Preserve wetland wildlife habitat in the lower end of the watershed.
 - c. Improve wildlife habitat through wildlife plantings and certain land treatment practices which benefit wildlife.
 - d. Establish 219 acres of fish habitat in the three multiple-purpose structures.
 - e. Benefit fishery in Stoney Creek and Neuse River through reduction in sediment and associated pollutants, low flow augmentation and floodway development.
 - f. Protect any rare and endangered species existing within the watershed.
3. Water, Land, and Air Resources
- a. Improve and maintain productivity of agricultural land through the land treatment program.
 - b. Improve quality of stream waters through reduction of sediment and associated pollutants.
 - c. Improve aesthetic value of Stoney Creek.
 - d. Improve aesthetic appearance of urban land and farmland within the watershed, insure that aesthetic values will be protected in future development.
 - e. Insure industrial discharges are kept in accordance with North Carolina air quality standards.
4. Irreversible and Irretrievable Commitments
- a. Require the conversion of approximately 220 acres of cropland, pastureland, and forestland to permanent water.
 - b. Restrict use of 188 acres in the 100-year flood plain below the proposed structures.

WATERSHED WORK PLAN

STONEY CREEK WATERSHED
Wayne County, North Carolina

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

Prepared by:

Wayne Soil and Water Conservation District

Wayne County Board of Commissioners

Goldsboro Board of Aldermen

With assistance by:

United States Department of Agriculture
Soil Conservation Service

United States Department of Agriculture
Forest Service

January 1975

ERRATA SHEET

The following paragraph replaces the fourth full paragraph on Page 40 of the Watershed Work Plan:

"The estimated cost of the forestry land treatment program is \$28,020. Of this, \$12,250 will be provided under the authority of Public Law 566 for accelerated technical assistance and \$15,770 will be contributed by other sources. The North Carolina Division of Forest Resources will provide \$2500 for accelerated technical assistance, in addition to \$250 under the going Cooperative Forest Management Program. The going Cooperative Forest Fire Control Program will provide a capital outlay of \$1020 to improve and accelerate the fire control activities. The landowners and developers will provide for installation of forest land treatment measures estimated at \$12,250."

WATERSHED WORK PLAN AGREEMENT

between the

Wayne County Board of Commissioners
Local Organization

Goldsboro City Board of Aldermen
Local Organization

Wayne Soil and Water Conservation District
Local Organization

(hereinafter referred to as the Sponsoring Local Organization)

State of North 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 Organization for assistance in preparing a plan for works of improvement for the Stoney Creek Watershed, State of North Carolina, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd 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 Organization and the Service a mutually satisfactory plan for works of improvement for the Stoney Creek Watershed, State of North 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 consideration, the Sponsoring Local Organization 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 six 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 in the watershed work plan:

1. The Wayne County Board of Commissioners, one of the Sponsoring Local Organization, will acquire without cost to the federal government such land rights as will be needed in connection with the works of improvement. (Estimated cost \$557,300)
2. The Wayne County Board of Commissioners 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 Wayne County Board of Commissioners and the Service as follows:

	<u>Sponsoring Local Organization</u> (percent)	<u>Service</u> (percent)	<u>Estimated Relocation Payment Costs</u> (dollars)
Relocation Payments	46.2	53.8	2,500

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

<u>Works of Improvement</u>	<u>Wayne County Board of Commissioners</u> (percent)	<u>Service</u> (percent)	<u>Estimated Construction Cost</u> (dollars)
Multiple-purpose Structure No. 2 Recreational Facilities	3.75 100.0	96.25 0	209,000 8,500
Multiple-purpose Structure No. 3 Recreational Facilities	3.5 100.0	96.5 0	206,000 8,500
Multiple-purpose Structure No. 39 Recreational Facilities	3.45 100.0	96.55 0	197,000 8,500
Stream Channel Modification	0	100.0	20,000

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

<u>Works of Improvement</u>	<u>Wayne County Board of Commissioners</u> (percent)	<u>Service</u> (percent)	<u>Estimated Engineering Cost</u> (dollars)
Multiple-purpose Structure No. 2	0	100.0	20,900
Recreational Facilities	100.0	0	850
Multiple-purpose Structure No. 3	0	100.0	20,600
Recreational Facilities	100.0	0	850
Multiple-purpose Structure No. 39	0	100.0	19,700
Recreational Facilities	100.0	0	850
Stream Channel Modification	0	100.0	2,000

6. The Wayne County Board of Commissioners and the Service will each bear the cost of project administration which it incurs, estimated to be \$8,120 and \$109,160, respectively.
7. The Wayne Soil and Water Conservation District will obtain agreements from owners of not less than 50 percent of the land above each reservoir and floodwater retarding structure that they will carry out conservation plans on their land.
8. The Wayne Soil and Water Conservation District will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.
9. The Wayne 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.
10. The Wayne County Board of Commissioners 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.
11. The cost shown in this agreement represents preliminary estimates. In finally determining the cost to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

12. This agreement is not a fund obligating document. Financial and other assistance to be furnished by the Service and Sponsoring Local Organization 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 Organization before either party initiates work involving funds of the other party. Such agreement will set forth in detail the financial and other working arrangement and other conditions that are applicable to the specific works of improvement.

13. 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 Organization has failed to comply with the conditions of this agreement. The Service shall promptly notify the Sponsoring Local Organization in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the Sponsoring Local Organization or recoveries by the Service under projects terminated for cause shall be in accord with the legal rights and liabilities of the parties.
14. 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.
15. 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.
16. This agreement will not become effective until the Service has issued a notification of approval and authorizes assistance.

Wayne County
Board of Commissioners

Local Organization
P. O. Box 227
Goldsboro, N. C. 27530
Address Zip Code

By Paul C. Hansen
Chairman, Wayne County Board
Title of Commissioners
Date February 18, 1975

The signing of this agreement was authorized by a resolution of the governing body of the Wayne County Board of Commissioners

adopted at a meeting held on February 18, 1975

Bryan Byrnes
Secretary, Local Organization
Date February 20, 1975

Local Organization
P. O. Box 227
Goldsboro, N. C. 27530
Address Zip Code

Goldsboro
City Board of Aldermen
Local Organization

Dwain D 27530
Address Zip Code
Goldsboro, N.C.

By Ben C. Spurling
Title Mayor
Date February 18, 1975

The signing of this agreement was authorized by a resolution of the governing body of the City of Goldsboro, North Carolina
Local Organization

adopted at a meeting held on February 17, 1975

Sadie Whitfield
Secretary, Local Organization
Date February 18, 1975

Dwain D, Goldsboro, NC 27530
Address Zip Code

Wayne Soil
and Water Conservation District
Local Organization
Post Office Box 48
Goldsboro, North Carolina 27530
Address Zip Code

By Russell Guley
Title Chairman
Date February 7, 1975

The signing of this agreement was authorized by a resolution of the governing body of the Wayne Soil & Water Conservation District

Local Organization
adopted at a meeting held on February 7, 1975

Ben E. Rollins
Secretary, Local Organization

Post Office Box 48
Goldsboro, North Carolina 27530
Address Zip Code

Date February 7, 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:
James L. Hicks
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WATERSHED WORK PLAN

STONEY CREEK WATERSHED

Wayne County, North Carolina

January 1975

SUMMARY OF PLAN

Stoney Creek Watershed is located in eastern North Carolina, and is entirely within Wayne County. The city of Goldsboro and Seymour Johnson Air Force Base are partially within the watershed. The total drainage area is 17,600 acres or about 27.5 square miles.

Watershed problems include excessive sheet erosion on approximately 1,600 acres, flood damages to agricultural and urban properties on an estimated 840 acres, impaired and inadequate drainage outlets, lack of water-based recreational opportunities, and the need for fish and wild-life habitat protection and development.

The project sponsors are the Wayne Soil and Water Conservation District, the Wayne County Board of Commissioners, and the Goldsboro City Board of Aldermen. Such sponsors have developed a comprehensive program of accelerated land treatment and structural measures to be installed over a six-year period for the solution of watershed problems and satisfaction of resource development needs. As a supporting action to the project, the city of Goldsboro has initiated a flood plain management plan for that segment of the Stoney Creek flood plain between Secondary Roads 1920 and 1571. Zoning ordinances have been amended to preclude further residential and commercial development in this area up to the maximum flood stage expected from a 100-year frequency storm with project.

Land treatment practices and measures to be installed include conservation cropping systems, tile and open ditch drainage, diversions, terraces, and grassed waterways. Approximately 850 acres of cropland, 100 acres of pastureland, and 110 acres of land in other uses will be treated. Structural measures to be installed include three multiple-purpose structures for flood prevention and recreation with associated public access areas, and approximately 2.1 miles of stream clearing and loose debris removal. In the reach to be cleared, Stoney Creek is a perennial stream. The channel was modified in 1932.

Twenty-nine percent of the watershed, or 5,110 acres, is presently forestland. Accelerated technical assistance will be provided to aid landowners and operators in identifying and solving problems generated by urban development on approximately 1,200 acres of forestland within the watershed. The regular cooperative forestry programs will be continued.

Summary

Total estimated cost of the proposed project is \$1,541,579, of which \$141,249 is for land treatment and \$1,400,330 is for structural measures. Land treatment costs will be borne by Public Law 566 funds in the amount of \$45,827 and by other funds in the amount of \$95,422. Structural measure costs are distributed \$783,860 to Public Law 566 funds and \$616,470 to other funds. Annual operation and maintenance cost for structural measures is estimated at \$12,000, of which \$800 is for stream channels, \$3,000 is for multiple-purpose structures, and \$8,200 is for recreational facilities.

Land treatment measures will be installed, operated, and maintained by individual landowners and operators in cooperation with the Wayne Soil and Water Conservation District. Installation, operation, and maintenance of planned structural measures will be the responsibility of the Wayne County Board of Commissioners.

The project, when installed, will reduce floodwater damage by 75 percent, and sediment damage by 77 percent on approximately 550 acres of flood plain land. Runoff from approximately 47 percent of the watershed will be regulated by the three multiple-purpose structures. Water quality in stream flows will be improved once the project is installed through a reduction in sediment transport. Permanent impoundments behind structures will create lake fisheries totaling 219 acres in surface area. An estimated 22,340 visitor-days of annual recreation use will be realized from the lakes and public access areas. Wildlife habitat will be improved through the initiation of wildlife management practices under the proposed land treatment program on an estimated 100 acres.

One mile of poor quality stream fishery on the upper Stoney Creek main stem and two miles of such stream fisheries on tributaries will be inundated in structure permanent pool areas. Approximately 304 acres of woodland will be destroyed by the construction of dams, emergency spillways, and permanent pools of the planned structures. Three hundred and nineteen acres of woodland and pasture in proposed structure flood pool areas will experience periodic inundations. There will be a temporary increase in turbidity of stream flows during project installation due to construction related soil disturbance. One family will be displaced from their dwelling.

The average annual cost of the structural measures, including operation and maintenance is \$94,550. Average annual benefits are estimated at \$133,515. The ratio of average annual benefits to average annual costs is 1.4 to 1.0.

WATER RESOURCES - ENVIRONMENTAL SETTING

Physical Data

Stoney Creek Watershed, an area of 27.5 square miles (17,600 acres), lies entirely within Wayne County in eastern North Carolina. The

watershed is located approximately 25 miles south of Wilson, North Carolina (population 29,347), 25 miles west of Kinston (population 22,309), 50 miles southeast of Raleigh (population 121,577), and 60 miles northeast of Fayetteville (population 53,510). The population of Wayne County was 85,408 in 1970, and, according to projections published by the Environmental Protection Agency, will increase to 120,000 by the year 2020. The watershed is expected to experience a higher rate of population growth than the county as a whole, since it is in the path of urban and suburban growth north and east of Goldsboro. The population of the watershed is estimated to be 75 percent urban and 25 percent rural, with about 13,400 persons residing within the city of Goldsboro (population 26,810). The 1971 population of the watershed was estimated by the North Carolina Office of State Planning to be about 32,000 which includes the approximately 8,200 residents of Seymour Johnson Air Force Base.

Stoney Creek originates about four miles northeast of Goldsboro and flows southward to its confluence with the Neuse River. The east side of the city of Goldsboro and a part of Seymour Johnson Air Force Base are in the watershed. The Neuse River Basin, together with the Tar River Basin, which adjoins it on the northeast, forms an area of about 10,000 square miles, a sub-region of the South Atlantic Gulf Water Resources Region. The region, as described in The Nation's Water Resources, includes parts of Virginia, North Carolina, Georgia, Alabama, Louisiana, and Mississippi, all of South Carolina and Florida, and has an area of 276,000 square miles which varies in terrain from rugged, wooded mountains to coastal plain flatlands. Rainfall, generally well distributed through the year, varies from over 80 inches in the mountains to 44 inches in central Georgia. In general, winters are mild and summers warm and humid. Freezing temperatures occur about 70 times per year in the mountains and about 40 times per year in upper coastal plains.

The climate of the watershed itself is continental, as it is far enough inland to be out of reach of the tempering effects of the ocean. Weather data show that temperatures vary from an average 80.5 degrees Fahrenheit in summer to an average 45.0 degrees in winter, with extremes of 108 degrees to zero degrees Fahrenheit recorded. The growing season is about 225 days, extending from about the end of March to the beginning of November. Average rainfall of about 50 inches is well distributed throughout the year with the heaviest rainfall in spring and summer and the lightest in the fall. Snowfall is too light to cause any runoff.

Geologically, the watershed is underlain by bedded sands and clays with some shell marl found in the area north of Goldsboro. The three geologic formations underlying the watershed are the Black Creek, the Tuscaloosa, and Yorktown. Ground water aquifers in the watershed are mainly located in these three geologic formations. The relatively thin Black Creek and Yorktown formations yield ground water of usually less than 10 gallons per minute for wells of six-inch diameter or less and are sufficient for domestic supply only. Yields from the Tuscaloosa formation are considerably higher, ranging up to 720 gallons per minute from eight-inch diameter wells.

Resources

The major user of water in the watershed is the city of Goldsboro, which secures water from Little River, which is about two miles upstream from the city. This source together with the Neuse River can meet water supply needs for the foreseeable future. Although the present population served by surface water supply is estimated to be 26,000, it is estimated that by 1990 38,000 persons will use these supplies. The water supply for Seymour Johnson Air Force Base comes from deep wells, and about 10,000 persons throughout the watershed secure their water supplies from ground water sources. With greater dependency on municipal systems, it is estimated that only about 3,000 will be using ground water by 1990.

Tobacco is virtually the only crop that is irrigated in the watershed and each producer has his own system, consisting of a pump, supply lines, and sprinklers. The systems are adequate, and efficiency varies from 70 to 90 percent. Water is secured from dug holes and farm ponds on individual farms. Inasmuch as tobacco is grown on sandy, well-drained soils, no problem of application is encountered.

The watershed is in the upper coastal plain, a relatively flat upland surface, incised by tributaries of the Neuse and Tar Rivers. It contains three broad land categories, based on topography, soil and drainage conditions, and usage: the flat upland plain, the valley bottoms, and the sloping valley sides.

The flat upland plain, which includes about 75 percent of the watershed area, slopes from about 130 feet mean sea level on the north end of the watershed to about 100 feet mean sea level on the terrace of the Neuse River near the southern end of the watershed.

In addition, Stoney Creek with its two main forks flows through a simple system of narrow valleys with numerous short prong-like tributaries. The valleys are typically 20 to 40 feet deep, and the creek enters the Neuse River at 68 feet mean sea level. On the upper half of the main stream and on the large tributaries, the valley bottoms are about 200 to 500 feet wide. The lower half of the main stream flows through bottomlands about 500 to 2,000 feet wide.

The sloping valley sides, comprising about 20 percent of the watershed, occur in bands about one-fourth to one-half mile wide along each side of the streams. Generally, the steepest slopes are about 10 to 15 percent, and they average five percent or less. The steepness of a slope is expressed in percent which is the vertical rise in feet per 100 feet in horizontal distance.

The main Stoney Creek is a natural, perennial stream which was modified in 1932. Average base flow is about 1.2 cubic feet per second per square mile, and sediment delivery at the mouth of the creek is estimated to be 32,430 tons per year, producing an average sediment concentration of 1,085 mg/l.

Resources

Present water quality classification of Stoney Creek and all natural streams tributary to it is "C" which means it is considered suitable for fishing and boating use. (Stream water quality classifications are established by the Water Quality Section, North Carolina Department of Natural and Economic Resources.)

According to Wilder and Slack in the Chemical Quality of Water in North Carolina, the water of Stoney Creek is soft, having a concentration of calcium carbonate (CaCO₃) in the range of 11 - 30 mg/l. Unpolluted fresh surface water in North Carolina is soft except for a few streams in the eastern area of the state. Nitrate (NO₃) is present in the range of 1.0 - 1.9 mg/l and chloride (Cl) in the range of 6.0 - 9.9 mg/l. Wilder and Slack note that North Carolina stream water nitrate concentrations greater than about one mg/l are probably caused by pollution from nitrogenous organic matter or fertilizer. They also note that water containing chloride in concentrations up to about 250 mg/l is acceptable for most uses.

Present overall watershed land use consists of 6,548 acres of cropland, 606 acres of pastureland, 5,110 acres of forestland, 734 acres in miscellaneous uses (mainly roads), and 4,602 acres in urban use. Land use within the flood plain includes 10 acres of cropland, 75 acres of pastureland, 113 acres in miscellaneous uses, and 642 acres of forestland, for a total of 840 acres. There are about 200 acres of Type I wetlands (described as seasonally flooded bottomlands in United States Fish and Wildlife Service Circular 39) found along the lower 3.2 miles of Stoney Creek.

Open agricultural land capability classification, based on the detailed soil survey of Wayne County, is as follows:

<u>Land Capability</u>	<u>Soil Series</u>	<u>Acres</u>
I	Norfolk, Wickham (0-2 percent slope)	998
IIe	Norfolk, Goldsboro, Wickham (2-6 percent slope)	2,159
IIw	Goldsboro, Lynchburg	2,050
IIs	Wagram (0-6 percent slope)	203
IIIe	Norfolk (6-10 percent slope)	305
IIIw	Rains	1,048
IIIs	Wagram-C (6-10 percent slope)	107
IVw	Johnston	<u>309</u>
	Total	7,179

Resources

The land capability classification system provides a land grouping based on agricultural use adaptations and treatment needs. Eight classes of land are recognized and are designated as Classes I, II, III, IV, V, VI, VII, and VIII. Classes I, II, III, and IV are suitable for rotations of crops ordinarily used in the locality. Management needs, or risks of damage, or both, are progressively greater on soils in Classes II, III, and IV. Classes V, VI, and VII are not suitable for cropland but may be protected and improved when used for pasture, hay, and forestland if certain conservation practices are applied. Class VIII is suitable for recreational or wildlife purposes only.

Land subclasses indicate the dominant limitation on use of the land. The subclasses are: (e)-erosion limitation; (w)-water limitation, either internal soil drainage or overflow; and (s)-physical or chemical soil limitation, such as sand, stones, shallow profiles, etc., which affects land use.

Formed from coastal plain sediments of sands and clays, upland soils are principally in the Norfolk, Goldsboro, Lynchburg, and Rains series. Soils in the Wickham series are found in the New River terrace, and soils in the Johnston series are dominant in the flood plains. The soils in the Norfolk series are well-drained and have few limitations for intensive use except on the sloping areas. The Goldsboro soils are moderately well-drained and in periods of high rainfall may have a moderate degree of wetness, while Lynchburg soils, being somewhat poorly drained, and the Rains soils, being poorly drained, need artificial drainage for most uses. The Wickham soils are well-drained and have few limitations, but the Johnston soils are very poorly drained and are flooded frequently.

Economic Data

In the watershed, public ownership of land is as follows: United States Government - 1,140 acres at Seymour Johnson Air Force Base; State of North Carolina - 25 acres at a highway maintenance headquarters; Wayne County - 100 acres at Wayne Memorial Hospital; and the city of Goldsboro - 177 acres of parks, in addition to city streets. The remaining land is in private ownership.

There are 110 farms in the watershed, most of which are family-operated, either by owner or tenant. About 80 percent of these farms are commercial, with annual sales of more than \$2,500. Tenancy on commercial farms in Wayne County declined from 52.2 percent in 1964 to 34.5 percent in 1969. The average size of commercial farms increased from 95 to 106 acres with an average value of about \$75,000.

Principal farm enterprises are tobacco, corn, and soybeans, and livestock is gaining in importance and now accounts for about 25 percent of the value of all farm products sold. Average per acre yields are tobacco - 2,160 pounds; corn - 66 bushels; soybeans - 22 bushels; and pasture - five animal-unit months of grazing. The principal crops grown on soils

Resources

with water limitation (capability Classes IIw, IIIw, and IVw) are pasture, soybeans, and some corn. Pasture yields in these areas average about three animal-unit months of grazing; soybeans yield about 20 bushels and corn below 50 bushels per acre.

Varying greatly throughout the watershed, land values in agricultural areas range from \$250 to \$600 per acre for upland and from \$50 to \$200 per acre for flood plain land. Urban land values also vary, ranging from \$100 to \$1,000 per acre, depending on location, improvements, management, and soil capabilities.

A well-developed network of roads provides easy access to markets, for the watershed is served by United States Highways 70, 117, and 13; North Carolina Highway 111; and numerous secondary roads. Also serving the area are the Southern Railway (Atlantic and East Carolina), and the Seaboard Coast Line Railroad.

Work force estimates, prepared by the Employment Security Commission of North Carolina, show that Wayne County had a civilian work force of 35,010 in 1970 with approximately 1,290 persons unemployed. The rate of unemployment declined from 6.1 percent in 1962 to 3.4 percent in 1969; then rose to 3.7 percent in 1970, and to 4.1 percent in 1971.

The following table shows the distribution of the 1970 work force:

Manufacturing (food, textiles, apparel, etc.)	6,590
Non-manufacturing (construction, trade, government, etc.)	17,870
Agricultural	4,080
Non-agricultural (non-farm, self-employed, unpaid family workers, domestics, etc.)	<u>5,180</u>
Total employed	33,720
Unemployed	<u>1,290</u>
Total work force	35,010

Technological advances in farming have released many farm workers into the labor market, and agricultural employment in Wayne County declined from 6,630 in 1962 to 4,080 in 1970. Many of these workers migrated to other areas, with out-migration from Wayne County estimated by the Office of State Planning, North Carolina Department of Administration, at 9.85 percent during the 1960's. Net out-migration for the decade was thus about 9,330 persons.

Goldsboro, the trade center for a large farming area, is an important tobacco market, with sales of more than 11 million pounds in the 1970-71 season. Agriculture is an important basic industry in the watershed area, and workers directly employed in agriculture account for about 12 percent of employment in Wayne County with agricultural product sales amounting to \$29,941,000 in 1969. Agriculture is expected to remain the major economic activity in the upper half of the watershed.

Resources

Urban development in the Goldsboro area is expected to take place to the north and east of the city. Therefore, according to the Stoney Creek Watershed Land Potential Study, most of the watershed south of Secondary Road 1003 will be urbanized.

Fish and Wildlife Resources

Lying in the edge of the pine sub-climax of the deciduous forest region, the watershed has been greatly modified by man, and much of the natural vegetation has been replaced by cultivated and forest edge communities.

Wildlife habitat values within the watershed vary greatly and are influenced to a large extent by the high human population and urban development. This is particularly true of the middle reach from Secondary Road 1920 upstream to Secondary Road 1566. In the upstream reaches, wildlife habitat consists primarily of mixed hardwoods and pines interspersed with agricultural lands, while along the lower reach, approximately 200 acres of seasonally flooded bottom-land hardwoods occur. These areas are flooded primarily during winter and early spring months with the extent and duration of flooding being largely influenced by backwater flooding from the Neuse River.

Populations of upland wildlife species in the watershed are rated moderate, and wetland wildlife populations are low. Hunting pressure on upland game species is also moderate, with squirrel, quail, and rabbit the most sought after game. Hunting demands on wetland wildlife species are low.

Fishery resources in Stoney Creek are classified as poor by Bayless and Smith in the Survey and Classification of the Neuse River and Tributaries, North Carolina. The lower reach, from the junction with Neuse River upstream to Secondary Road 1920, is influenced to some extent by fishery movements from the Neuse River. Redbreast sunfish and redbfin pickerel are the dominant game species but fishing pressure is light. In addition to stream fishing, farm ponds provide warm-water fishing.

Resources

Recreational Resources

As noted in the Stoney Creek Watershed Land Potential Study, nearly all recreational activities within the watershed area are found in the city of Goldsboro. Exceptions are the light stream and pond fishing and the moderate hunting activities in the rural parts of the watershed.

Of the four public parks in the watershed, Quail Park and Stoney Creek Park are located along Stoney Creek, and Fairview Park is adjacent to the Fairview Homes housing project near Stoney Creek. All are within the city of Goldsboro. Berkley Memorial Park is just east of the city in the vicinity of Adamsville. The area of each park and its annual attendance, estimated by the Division of Parks and Recreation of the North Carolina Department of Natural and Economic Resources, are shown in the following table:

<u>Facility</u>	<u>Area</u>	<u>Attendance</u>
Fairview Park	18 acres	38,000
Quail Park	9 acres	---
Berkley Memorial Park	29 acres	188,000
Stoney Creek Park	<u>4 acres</u>	<u>12,000</u>
Total	60 acres	238,000

Providing a variety of recreational opportunities, these parks have facilities such as softball fields, picnic shelters, grassed play areas, playground apparatus, horseshoe pits, a wading pool, and flower beds.

A number of opportunities for recreation on the water exist outside the watershed itself but in the immediate vicinity. Sediment pools of six floodwater retarding structures for the Bear Creek Watershed, for example, are located from two to five miles east of the Stoney Creek area, and these impoundments provide fishing facilities. The Carolina Power and Light Company's Quaker Neck Lake, primarily used for power plant cooling, also provides bank fishing and picnicking and is located about six miles west of the watershed. In addition, there are three commercially operated fishing lakes open to the public listed in the sites inventory of the Division of Parks and Recreation. One of the lakes is located ten miles to the south, another ten miles northeast, and the third is five miles west of the watershed. These lakes have a combined surface area of about 60 acres, and total annual attendance is estimated at 7,000.

Still another recreational area is the Little River, with its Goldsboro access area owned and operated by the North Carolina Wildlife Resources Commission. West of Goldsboro and about five miles from the watershed,

Resources

this facility hosts about 500 visitors a year, according to the Division of Parks and Recreation. Swimming is the chief use of the 11-acre lake at the Cliffs of the Neuse State Park, about 10 miles south of the watershed. Fishing and boating use here is estimated at 5,000 persons per year.

The Soil Conservation Service, in cooperation with other agencies, has compiled An Appraisal of Potentials for Outdoor Recreational Development in Wayne County, North Carolina. The results are summarized as follows:

Vacation Cabins, Cottages, and Homesites have a high potential.

Camping Grounds - Vacation site camping grounds, pack trip camping, and transient camping grounds all have a medium potential for future development.

Picnic and Field Sports Areas have a high potential.

Fishing Waters have a high potential.

Golf Courses - Standard and Par-3 golfing have a medium potential, while driving ranges and miniature golfing have a high potential.

Hunting Areas have a high potential.

Scenic and Historic Areas have a medium potential.

Riding Stables have a medium potential.

Shooting Preserves have a medium potential.

Vacation Farms have a medium potential.

Water Sports Areas have a medium potential.

Archaeological and Historic Values and Unique Scenic Areas

Contact with the North Carolina Department of Cultural Resources, Division of Archives and History, and the Research Laboratories of Anthropology at the University of North Carolina in Chapel Hill, did not reveal any places of historical or archaeological value located within the watershed area. The National Register of Historic Places lists the Charles B. Aycock Home, a state historic site, located approximately five miles north of the watershed. An Appraisal of Potentials for Outdoor Recreational Opportunity in Wayne County, North Carolina, lists a Tuscarora Indian site, destroyed in 1712, located four miles northeast of the watershed. Several late 18th century to mid 19th century homes within Goldsboro are also listed.

Soil, Water, and Plant Management Status

Land use trends in the watershed primarily reflect the conversion of cropland and forestland to urban and suburban uses. Urban, suburban, and road uses now occupy 5,306 acres and are expected to occupy about 6,630 acres within the next 10 years.

Forty-five percent of the watershed farms, involving 66 percent (8,133 acres) of the agricultural land in the watershed, are covered by cooperative agreements with the local soil and water conservation district. Complete conservation plans have been developed on 33 percent of the watershed farms. Such plans cover 51 percent (6,265 acres) of the existing agricultural land in the watershed. Approximately 26 percent of the planned land treatment measures have been installed, with 70 percent of the watershed area adequately treated. A detailed soil survey of Wayne County was published in June, 1974.

Through the various federal-state cooperative forestry programs, the Division of Forest Resources is providing forestry management assistance, forest fire prevention and suppression, distribution of planting stock, and forest pest control assistance to private landowners in the watershed.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land Treatment

Sheet erosion, mostly caused by straight-row farming without proper conservation methods, is a severe problem on 1,600 acres of cropland in soil capability classes IIe and IIIe. However, the problem is difficult to resolve because this well-drained land is adapted for tobacco and other high-income producing crops.

Since application of land treatment measures must be voluntarily paid for by the owner, problems are encountered. For example, adequate land treatment measures may not yield a profit in the short run, and, therefore, may not be attractive to the landowner. The practice of renting cropland also creates a problem since the renter frequently does not have an interest in applying conservation measures. Further, in areas where farmland is being converted to urban uses, there may be no incentive for the landowner to adequately treat land which might soon go out of agricultural production. In addition, the use of large farm machinery in small fields makes contour farming and other conservation practices costly because more turning time and area are needed. It also is often difficult to secure equipment necessary for installing conservation measures such as grassed waterways and land smoothing. Lack of personnel for adequate conservation planning and follow-up also presents a problem.

As the urbanization of once predominantly rural land continues, problems such as increased peak runoff rates from areas converted from farm and

Resource Problems

pastureland to shopping centers, schools, streets, and buildings also multiply. The increases in volume and peak rate of runoff cause the water to become a misplaced resource. Of all land use changes affecting the hydrology of an area, urbanization is by far the most forceful.

Another such problem arises when building sites are denuded for construction, causing a very large sediment movement in a stream channel immediately downhill from the construction site. During storm flow, the sediment movement is great, and as urbanization continues, construction activities increase the potential of sediment loads.

There are also water management problems in the use of about 2,970 acres of cropland and 410 acres of pastureland in land capability classes IIw, IIIw, and IVw. Excess rainfall has to be removed, and wet soils need drainage for efficient agricultural use. Urbanization, commercial development, and roads add to the problem by making drainage more difficult.

Erosion Damages

Accelerated sheet erosion on about 1,600 acres of well-drained cropland adjacent to the flood plain and drainageways is one of the major conservation problems in the watershed. Soil loss from this land is estimated to be in the range of 25 to 30 tons per acre per year, while the average annual rate for the total watershed area is 6.1 tons per acre and is the primary source of sediment. Further erosion will reduce the capability of this land for agricultural production and could result in its less intensive use as pastureland or forestland.

Average erosion rates by land use are shown in the following table:

TABLE NO. I

Present Average Annual Gross Erosion
(Before Project Land Treatment Applied)

Land Use	Acres	Erosion Rate Tons/Acre/Year	Tons
Cropland	6,548	12.3	80,540
Adequately Treated	1,684	3.4	5,726
Partially Treated	4,864	15.3	74,814
Pastureland	606	1.2	727
Forestland	5,110	0.8	4,088
Miscellaneous (includes road banks)	734	2.6	1,908
Urban Areas	4,602	4.5	20,847
Established	4,372	0.9	3,935
Under Construction	230	73.5	16,912
Total	17,600	6.1	108,110^{1/}

^{1/} Approximately 32,430 tons are delivered to the mouth of the watershed.

Sediment Damages

An estimated 32,430 tons of the 108,110 tons of annual erosion are delivered as sediment into the Neuse River from the watershed each year, resulting in an average sediment concentration of 1,085 mg/l. Much of this sediment is ultimately deposited in the Neuse River estuary, causing the impairment of navigation, recreation, water supply, and fish propagation functions. Sediment damages to the river and estuary are estimated at \$19,200 annually.

The filling of channels with sediment and the natural channel leveeing resulting from overbank flooding have created swampy conditions in the flood plain along Stoney Creek and the main tributaries. In the agricultural reaches (I, IA, II, IIA, and V), swamping prevents the use of land for crop cultivation. Twenty-six acres in Reach I, 15 acres in Reach IA, 47 acres in Reach II, 14 acres in Reach IIA, and 18 acres in Reach V are swamped, with annual damages estimated at \$5,730.

Floodwater Damages

Floodwater damages were evaluated on 549 acres of the 840 acres of flood plain land subject to flooding by the 100-year frequency storm. About 47 percent of this land floods annually and about one-third floods twice annually. Most of the floods occur during seasons when crops and pasture are susceptible to the greatest damages. The storm of October, 1964, rated between the five-year and ten-year frequency, caused estimated damages of \$92,750, for example.

There are two areas along the stream course where development has encroached upon the flood plain. In the vicinity of Wayne Memorial Hospital, a house and lot and several lots downstream of United States Highway 70 By-pass receive damages from floodwaters. Some development also has occurred in the area from Royal Avenue downstream to Elm Street. There now are 14 houses, five apartment units, three commercial or business establishments, a park and associated facilities, and three college buildings within the 100-year flood plain, and these receive floodwater damages. Heating systems, furniture and other house furnishings, floors and foundations of buildings, and automobiles are examples of damaged property. In addition, business and college activities are disrupted during floods, and cleaning up costs are incurred. Non-agricultural damages result from flooding of properties now valued at over \$1,069,000.

The flooding problem and swamping have limited land use in the agricultural reaches and to a greater degree in the developed reaches. Swamping is defined as any impairment of drainage of bottom lands or colluvial soils by sediment deposits. It may be caused by the filling of stream channels with the products of accelerated erosion, thus raising the water table on the bottom lands, or by formation of natural levees from recent sediment deposits which prevent proper surface drainage. Swamping

Resource Problems

and the risk of crop losses from flooding have caused most farmers to move row crops from the flood plain to the uplands. Associated with this land use shift have been accelerated sediment damages due to the increase in use of type "e" land for row crops.

Flooding directly affects the health and lives of people in the watershed and especially of those in the flood problem area. For example, greatly increased mosquito populations and stream pollution result from every major storm. Organic matter and trash also are deposited by floodwater on public grounds and lawns, creating a health hazard, reducing aesthetic values, and causing environmental degradation.

TABLE NO. II

Acres Flooded by Various Storms for Present Conditions

Reach	ACRES FLOODED		
	Present Conditions		
	Storm		
	<u>100</u>	<u>10</u>	<u>1</u>
I	63	48	41
IA	38	22	0
II	156	99	42
IIA	45	33	28
III	183	162	100
IV	13	13	9
V	<u>51</u>	<u>45</u>	<u>38</u>
Total	549	422	258

Furthermore, land values in the flood plain are somewhat depressed because of the flood hazard and are inversely related to frequency of flooding; but, as agricultural lands are converted to non-agricultural uses, land values are expected to gradually increase despite the existing flood hazard.

Floodwater damages to crops and pasture are estimated to be \$745 annually. Other agricultural damages are about \$1,845 with non-agricultural damages about \$69,180. Average annual floodwater damages thus amount to approximately \$71,770.

Drainage

About 2,970 acres of cropland require some form of drainage for optimum production. Most of this area is in the headwaters where the land is flat and a drainage system has never completely developed.

Resource Problems

Farmers have installed tile field drains and open ditches on about 700 acres of the wet cropland. However, not all of the systems are complete or efficient, and additional drainage measures are needed. The drainage is now sufficient so that most water-tolerant crops can be produced with reasonable success. Yet tobacco is an exception, and the best drained land must be used for this crop. The need to rotate tobacco and other crops creates the demand for improved drainage of cropland, but high cost of such measures has prevented their installation on all wet cropland.

Municipal and Industrial Water

The major user of water in the watershed is the city of Goldsboro. Water for this municipality is secured from Little River about two miles upstream from the city. The supply is adequate for the foreseeable future. Water supplies for the outlying urban areas and the Seymour Johnson Air Force Base come from deep wells. To date there has been no ground water drawdown detected. Present population served by surface water supply is estimated to be 26,000. Ground water supplies are used by about 10,000. By 1990 it is estimated that 38,000 will use surface water supplies and 3,000 will be using ground water.

Recreation

Population growth, rising standards of living, and increased leisure time are creating increased demand for outdoor water-based recreation in the watershed and surrounding area. Most of the population of Wayne County lives within ten miles of the watershed.

The North Carolina Division of Parks and Recreation has estimated unmet recreation needs in Wayne County as: 160 acres of Class I sites, 2,324 acres of Class II sites, and 24,927 acres of Class III sites. Class I sites are intensively developed for group sports and are usually within or near major urban populations. Class II sites are general outdoor recreation areas, generally more remote than Class I areas, featuring activities such as camping, nature walks, and outdoor sports. Class III sites are natural environment areas which support weekend and vacation activities dependent on a natural setting such as nature study, sight-seeing, hunting, and fishing.

The 160 acres of unmet needs for Class I sites are composed of 21 acres of neighborhood emphasis areas, seven acres of community emphasis areas, and 132 acres of city parks. Most of the unmet needs are in Goldsboro.

Water-based recreation within the watershed, aside from fishing in farm ponds, is limited to bank fishing in pools mainly in the lower part of Stoney Creek where accessibility is good. There is only one lake of 1,000 acres or more within 50 miles of the watershed and only 280 surface-acres of lake water within Wayne County available for public use.

Resource Problems

Fish and Wildlife

A basic problem relating to fish and wildlife resources within this watershed arises from continuing urban and suburban development, and it is estimated that approximately 1,300 acres will be converted to urban uses within the next ten years. However, the city of Goldsboro is a bird sanctuary and the less densely populated residential areas within the city provide refuge for upland game species, such as squirrel, as well as for song birds. In the reach downstream from Secondary Road 1556, urbanization of existing wildlife habitat is occurring at a rapid pace. Sedimentation from both agricultural land and construction sites has restricted the aquatic life in the watershed streams.

Other problems associated with forestland plant and animal management are fire control and forest pest control.

Water Quality

The major water quality problem in Stoney Creek is sediment, for as noted by Bayless and Smith, the water of Stoney Creek is frequently turbid. This turbidity, especially toward the lower end of the watershed, restricts the recreational value of the water. The present stream classification is "C," designating suitability for fishing and boating use. The stream classification was upgraded from "D" to "C" by the North Carolina Environmental Commission on August 22, 1974.

Economic and Social

Economic and social problems in the watershed center around low family income and lack of employment opportunities. Technological advances in farming have released many farm workers into the labor market. Wayne County's agricultural employment declined from 6,630 in 1962 to 4,080 in 1970. Many of these workers migrated to other areas.

Out-migration from Wayne County was estimated by the Office of State Planning, North Carolina Department of Administration, at 9.85 percent during the 1960's. This would place the net out-migration for the decade at about 9,330 persons. Young non-whites, as a group, had the highest percentage of out-migration. Although the urban and suburban parts of the watershed have increased in population, the agricultural area has declined.

About 25 percent of the farms in Wayne County had sales of less than \$5,000, according to the 1969 Census of Agriculture. (This does not include part-time and part-retirement farms.) The average net income of all farms in the county was \$3,900 in 1969, and the average net income of commercial farms was \$5,000, according to census data.

Resource Problems

The need for vocational training and retraining is evidenced by the number of persons who have left agricultural employment over the past decade, and by the increase in nonagricultural employment from 15,590 in 1962 to 24,460 in 1970.

Although significant gains have been made, per capita income in the watershed area lags behind that of the state and nation. The per capita income of the county was \$3,066 in 1970; while those of the state and nation were \$3,208 and \$3,910, respectively. In 1969, 22.2 percent of the families in Wayne County had incomes of less than the poverty level defined in the 1970 Census of Population. Nevertheless, it is likely that average incomes in the watershed area are above those of the county because of the large urban and suburban population in the Stoney Creek vicinity.

Mean family income in the state, according to the 1970 census, was \$8,872, while that of Wayne County was \$7,387. Half of all families then had incomes of less than \$6,354, the median family income, compared to the state median family income of \$7,774. Thus, there is a need to increase income and employment opportunities in the watershed area.

About 12 percent of the commercial farms in the watershed used 150 days or more of hired labor per year, while 15 percent of the commercial farms used no hired labor, according to the 1969 Census of Agriculture.

Promotion of rural community development in this watershed is not a pressing need, since it is largely urban and suburban. The rural areas are within a few miles of Goldsboro.

PROJECTS OF OTHER AGENCIES

There are no known existing or soon-to-be constructed works of improvement for water resource development which will affect or be affected by works of improvement included in this plan.

Stoney Creek Watershed is in the Neuse River Basin which is under study and development by the United States Army, Corps of Engineers. No specific development has been proposed within Stoney Creek Watershed.

PROJECT FORMULATION

Community leaders early in 1960 expressed an interest in flood prevention in the Stoney Creek Watershed. Several incidents of flooding in recent years have caused damage to agricultural and urban areas. Prior to submitting an application for assistance, the Soil Conservation Service was requested to make an inspection of the watershed. Upon completion of the inspection, numerous educational meetings were held. In September 1964, a formal application for planning assistance was prepared.

Formulation

The North Carolina Soil and Water Conservation Commission approved the application in January 1965, after reviewing the field examination report. This report contained comments from concerned federal and state agencies. Public educational meetings were held in 1966. A preliminary investigation conducted in 1967, verified earlier findings that a feasible project could be developed. These findings were presented to the sponsors at a public meeting. Upon acceptance of the preliminary investigation report, planning authority was requested by the sponsors. Authorization was received in November 1968.

The educational meetings and other public meetings provided ample opportunity for all interested persons and agencies to participate in project formulation.

Objectives

The local sponsors desire to establish a complete soil and water conservation program on the watershed. Some specific objectives were:

1. Increase adequate treatment for erosion control, sediment reduction, and land protection from 70 percent of the watershed to 76 percent of the watershed.
2. Attain sufficient flood reduction and protective measures to continue current land uses within the watershed.
3. Improve the recreational opportunities for the people of the watershed area.

The sponsors considered the impacts, both favorable and adverse, in developing the plan for meeting stated and other objectives. The overall project objective is the conservation, development, and productive use of the watershed's soil, water, and related resource in such a way that the residents of the watershed can enjoy:

QUALITY IN THE NATURAL RESOURCE BASE FOR SUSTAINED USE.

QUALITY IN THE ENVIRONMENT TO PROVIDE ATTRACTIVE, CONVENIENT, AND SATISFYING PLACES TO LIVE, WORK, AND PLAY.

QUALITY IN THE STANDARD OF LIVING BASED ON COMMUNITY IMPROVEMENT AND ADEQUATE INCOME.

The sponsors selected and/or modified measures which will help to achieve these objectives and also to minimize adverse impacts wherever possible and still accomplish the project objectives.

Environmental Considerations

The waters in Stoney Creek Watershed, which for years had been classified as "D," are currently of sufficient quality and have been upgraded to a "C" classification. This classification, which is for a quality suitable for all uses except bathing and drinking, is compatible with the proposed recreational uses of boating, fishing, and hunting.

The present conditions of the stream are such that the proposed project will not induce flooding in the downstream reaches. Rather, the planned structural works of improvement will provide a reduction in flooding in these reaches.

Installation of structural works of improvement will inundate 219 acres, which are now mainly woodland. This area will be lost to wildlife habitat; however, fish habitat will be increased by 219 acres. Another 80 acres of woodland and five acres of cropland will be required for the three dams and spillways and access areas. This will have grass cover. Upland game habitat will be improved by the installation of wildlife food and cover areas under the accelerated land treatment program. Waterfowl will use the lakes as feeding and resting areas.

One family will be displaced by installation of the structural works of improvement.

Alternatives

Land Treatment Only

The alternative of land treatment only would involve application of those practices and measures previously described under the heading of Works of Improvement to be Installed. Environmental impacts would be the same as those discussed in the Effects of Works of Improvement.

This alternative would avoid all adverse environmental effects of the planned project. However, favorable environmental effects of flood damage reduction and additional recreational opportunities would be foregone by not including the multiple-purpose structures and channel clearing. See Table IV. The cost of this alternative is estimated to be \$141,000.

Land Treatment with Channel Clearing

Channel clearing and debris removal in Reaches IIA and III would increase channel velocity by 20 percent and would increase channel capacity from 540 cubic feet per second to 650 cubic feet per second. A 100-year frequency storm would produce a peak flow of about 3,300 cubic feet per second, but channel clearing and debris removal would reduce the peak

Formulation

stage of this storm by approximately 0.2 foot. With structural works limited to channel clearing, all buildings subject to flooding from this storm would continue to flood. However, damages from smaller storms would be reduced. The estimated average annual cost of channel clearing is \$1,770 (\$30,000 installation cost), and average annual flood damage reduction benefits are \$14,120.

Except for the detrimental effect that channel clearing and debris removal would have on the stream fishery resource, adverse effects of the total planned project would be avoided. Floodwater and sediment damages of about \$93,000 annually would continue (See Table III). No additional recreational opportunities would be afforded by this alternative.

Land Treatment and Three Structures

Accelerated land treatment and three multiple-purpose structures would reduce floodwater damages by approximately \$40,000, sediment damages by about \$21,400, and indirect damages by \$8,000 annually. Floodwater damages of approximately \$37,900 annually would continue (see Table III). The average annual cost of the three structures would be approximately \$87,000 and the average annual benefits about \$110,000.

Acres flooded under each alternative by the 100-year, 10-year, and one-year storms are compared in Table IV.

Except for temporary detrimental effects of stream clearing, all other adverse effects of the planned project would also result from this alternative.

Land Treatment, Three Structures, and Channel Enlargement

Also evaluated was an alternative composed of land treatment, three multiple-purpose structures, and channel enlargement from United States Highway 70 downstream to Station 553+00, just below Secondary Road 1920, a distance of 18,840 feet. The channel would be designed to keep the 25-year storm within banks, although some low-lying areas along the creek would continue to flood (see Table VI).

This alternative would reduce average annual flood damages from \$107,300 to \$9,200 (see Table III). Flooding from the 100-year storm would be removed from all dwellings and businesses now subject to damages from this event. Acres flooded by the 100-year storm within the built-up area would be reduced by 78 percent, and damages from the six-month storm would be eliminated. Average annual benefits would total about \$150,000, but would be less than the average annual cost of \$165,000.

All adverse effects of the planned project would still occur with this alternative. In addition, sediment produced by channel enlargement would increase stream water turbidity during construction.

Purchase of Land and Improvements

Purchase of land and improvements would require relocation of business establishments, several families, farm operations, and a Bible college with estimated cost of purchase \$1,500,000. The alternative would not reduce sediment and gross erosion damages, but adverse effects of the planned project would be avoided.

No Project

Continuation of the present land treatment program would reduce erosion and sediment from adequately treated land. Flood damages would continue at the rate of approximately \$107,300 annually. During the next 10 to 20 years as the area south of Secondary Road 1003 is converted to urban uses, sediment production due to construction activities would add to the problems of channel aggradation, swamping, and flooding. Runoff from the urbanized area also would be increased. Even with runoff reduced on adequately treated farmland, the area flooded by a given storm would increase.

This alternative would, of course, avoid all the adverse effects of the planned project. The present stream fishery would be preserved. In addition, the bottom land and upland wildlife habitat would remain in their present state except for urban encroachment.

If the planned project is not installed, net annual benefits of about \$38,965 would be foregone.

TABLE III
Estimated Flood Damages and Benefits by Alternatives

<u>Alternatives</u>	<u>Damages</u>	<u>Benefits</u>
No Project	\$107,300	\$ 0
Land Treatment	\$ 95,540	\$11,760
Land Treatment and Channel Clearing	\$ 93,180	\$14,120
Land Treatment and Three Structures	\$ 37,900	\$69,400
Land Treatment, Three Structures, and Channel Enlargement	\$ 9,200	\$98,100

TABLE IV
Acres Flooded - by Storms and Alternatives

<u>Alternatives</u>	<u>Storms</u>		
	<u>100-Year</u>	<u>10-Year</u>	<u>1-Year</u>
	-----acres-----		
No Project	549	422	258
Land Treatment	Not evaluated in detail		
Land Treatment and Channel Clearing	Not evaluated in detail		
Land Treatment and Three Structures	424	336	213
Land Treatment, Three Structures, and Channel Enlargement	292	180	76

Formulation

Flood Proofing, Flood Plain Zoning, Flood Plain Insurance, and Land Treatment

This alternative would consist of (a) constructing dikes, walls, or other barriers around existing buildings and other property within the 100-year flood plain where practical and possible; (b) providing flood plain insurance to compensate for flood damages to buildings or other properties not practical to flood proof or for flood damages from storms greater than the 100-year frequency event; (c) the adoption of flood plain zoning to prevent future developments subject to flood damage within the 100-year flood plain; and (d) installation of conservation land treatment over the watershed.

Flood proofing of 14 houses, five apartment units, three business establishments, and three college buildings would be required. Several roads and bridges would also have to be raised to prevent overtopping by floodwaters. Extensive borrow areas would be required to supply the needed fill material for dikes and road modifications.

Flood plain insurance could be provided under the National Flood Insurance Program for compensation of damages to cars, lawns, fences, or other properties not practical to flood proof. This program is intended as a means by which flood insurance, never made generally available by the private insurance industry, can be offered through federal subsidy to owners of existing flood-prone structures. Participation on the voluntary program requires the adoption of land use and control measures by a community prior to the insurance being made available. The measures adopted must meet the standards set by the Federal Insurance Administration, United States Department of Housing and Urban Development. These requirements will be met through the adoption of zoning ordinances by the city of Goldsboro on 549 acres (100-year flood plain) adjacent to Stoney Creek. Such zoning would exclude any new buildings or other development subject to flood damage within this area.

The land treatment program involved with this alternative would be the same program associated with the selected plan (see Land Treatment section of WORKS OF IMPROVEMENT TO BE INSTALLED). Landowners would install conservation measures on their land with assistance from Wayne Soil and Water Conservation District and the North Carolina Division of Forest Resources.

Practically all floodwater damages through the urban reaches of the watershed would be eliminated or compensated with adoption of this alternative. Flood damage reduction benefits to commercial and residential properties would amount to a gross value of \$69,180 annually. In addition, indirect damages such as interruptions of traffic, business, etc., would be reduced or eliminated. Additional flood damages that might occur to future developments in the flood plain would be eliminated. Adoption of this alternative would eliminate the need

Formulation

for clearing about 300 acres of forestland associated with the three structures in the selected plan. Relocation of a family associated with construction of one of the structures would also be avoided. Any adverse effects associated with the proposed channel work would not be sustained. Although sediment loads in the streams would probably be increased during construction of the dikes, the severity of these increases and associated effects would be less than those associated with construction of the dams.

Selection of this alternative would mean that floodwater damages to crop and pasture land and other agricultural (\$2,590 average annual) and swamping damages (\$5,730 average annual) would continue. A total gross average annual agricultural benefit of \$5,375 afforded by the selected plan would be foregone. Also lost would be the sediment reduction benefits provided by the proposed structures (\$9,300 average annual gross value). Gross recreation benefits of \$33,065 resulting from the water-based recreational opportunities provided by the structures would be eliminated in an area that badly needs such resources (see Recreation section of WATER AND RELATED LAND RESOURCE PROBLEMS). Installation of the proposed plan is expected to reduce the 100-year flood plain along Stoney Creek by about 100 acres. Enhancement of this land will thus occur as its development for commercial, residential, or business use is already taking place or expected. This benefit (estimated at \$5,715 gross average annual) would likewise be lost with exclusion of the structures and channel work. A portion of the secondary and redevelopment benefits (see Table 6) would be lost although no practical estimate of the loss was made. Total benefits that can definitely be considered as foregone with this alternative amount to a gross value of about \$58,000.

The average annual cost of flood proofing existing buildings in the 100-year flood plain would amount to \$58,600 annually. No accurate estimate of the cost of flood plain insurance is available. The cost to individual property owners would depend on the potential for damage to the property, the degree of flood proofing, etc. In any event, the annual insurance premium would be a significant part of the anticipated flood damages expressed on an average annual basis. A cost estimate for developing flood plain zoning ordinances was not made.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

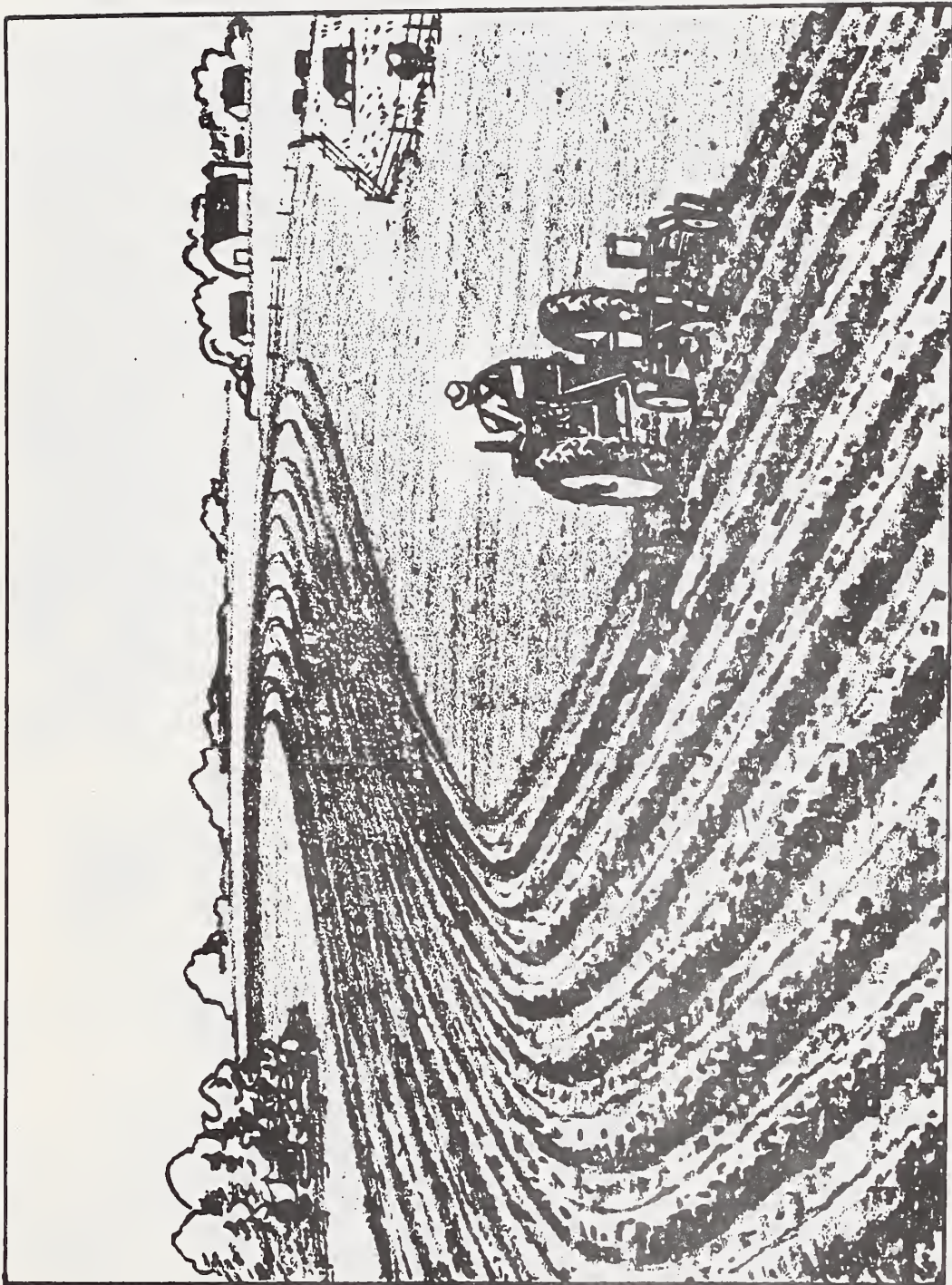
Approximately 850 acres of cropland, 100 acres of pastureland, and 110 acres of land in other uses (including 100 acres of wildlife land) will be adequately treated during the project installation period. An additional 950 acres of cropland and pastureland will receive partial treatment.

Improvements

Soil and water conservation plans will be prepared on 43 more farms, making a total of 108 conservation plans in the project area. Land developed within the capabilities of the soil, with the essential protective conservation practices applied, is considered to be adequately treated.

Cropland treatment practices to be applied include approximately 1,790 acres of conservation cropping systems, 380 acres of cover crops, 1,890 acres of crop residue use, 440 acres of contour farming, 80 acres of minimum tillage (no till), and 14,000 feet of field border planting. Pastureland treatment will consist of approximately 60 acres of new seeding and 40 acres of reseeding. Treatment of land in other uses will consist of 100 acres of wildlife upland habitat development, three acres of critical area planting, and three acres of recreational area improvement. These measures and their purposes are defined as follows:

1. Conservation Cropping System: This system involves growing crops in combination with needed cultural and management measures. Cropping systems include rotations containing grasses and legumes as well as rotations achieving desired benefits without using such crops. This measure will improve or maintain good physical condition of the soil; protect the soil during periods when erosion usually occurs; help control weeds, insects, and diseases; and provide an economic return for farmers.
2. Cover Crop: A crop of close-growing grasses, legumes, or small grain used primarily for seasonal protection and soil improvement, it usually is grown for one year or less except where there is permanent cover as in orchards. The purposes of a cover crop are erosion control during periods when major crops do not furnish adequate cover, addition of organic material to the soil, and improve infiltration, aeration, and tilth.
3. Crop Residue Use: By using plant residues to protect cultivated fields during critical erosion periods, this measure conserves moisture, increases infiltration, reduces soil loss, and improves soil tilth.
4. Contour Farming: Contour farming involves farming sloping cultivated land so that plowing, preparing land, planting, and cultivating are done on the contour. (This includes following established grades of terraces, diversions, or contour strips.) See Figure 1. Erosion is thus reduced and water better controlled.
5. Minimum Tillage: This measure means limiting the number of cultural operations to those that are properly timed and essential to produce a crop and prevent soil damage. These limits retard deterioration of soil structure, reduce soil compaction and formation of tillage pans to improve soil aeration, permeability, and tilth.



Contour Farming

Figure 1

Improvements

6. Field Border: With this method a border or strip of perennial vegetation is established at the edge of a field by planting or by conversion from trees to herbaceous vegetation or shrubs. Purposes of a field border are to control erosion, protect edges of fields that are used as "turn rows" or travel lanes for farm machinery, reduce competition from adjacent woodland, provide wildlife food and cover, and improve the landscape.
7. Pasture and Hayland Planting: Such planting means establishing and reestablishing long-term stands or adapted species of perennial, biennial, or reseeding forage plants. (Includes pasture and hayland renovation but does not include grassed waterway or outlet on cropland.) The purpose of this measure is to reduce erosion, to produce high quality forage, and to adjust land use.
8. Wildlife Upland Habitat Management: Designed for retaining, creating, or managing wildlife habitat other than wetland, this measure attempts to keep, make, or improve habitat for desired kinds of wildlife. See Figure 2.
9. Critical Area Planting: Planting vegetation such as trees, shrubs, vines, grasses, or legumes on critical areas is involved. (Does not include tree planting mainly for wood products.) The purpose of critical area planting is to stabilize the soil, reduce damage from sediment and runoff to downstream areas, improve wildlife habitat, and enhance natural beauty.
10. Recreation Area Improvement: Establishing grasses, legumes, vines, shrubs, trees, or other plants or selectively reducing stand density and trimming woody plants is undertaken in order to improve an area's recreational potential.

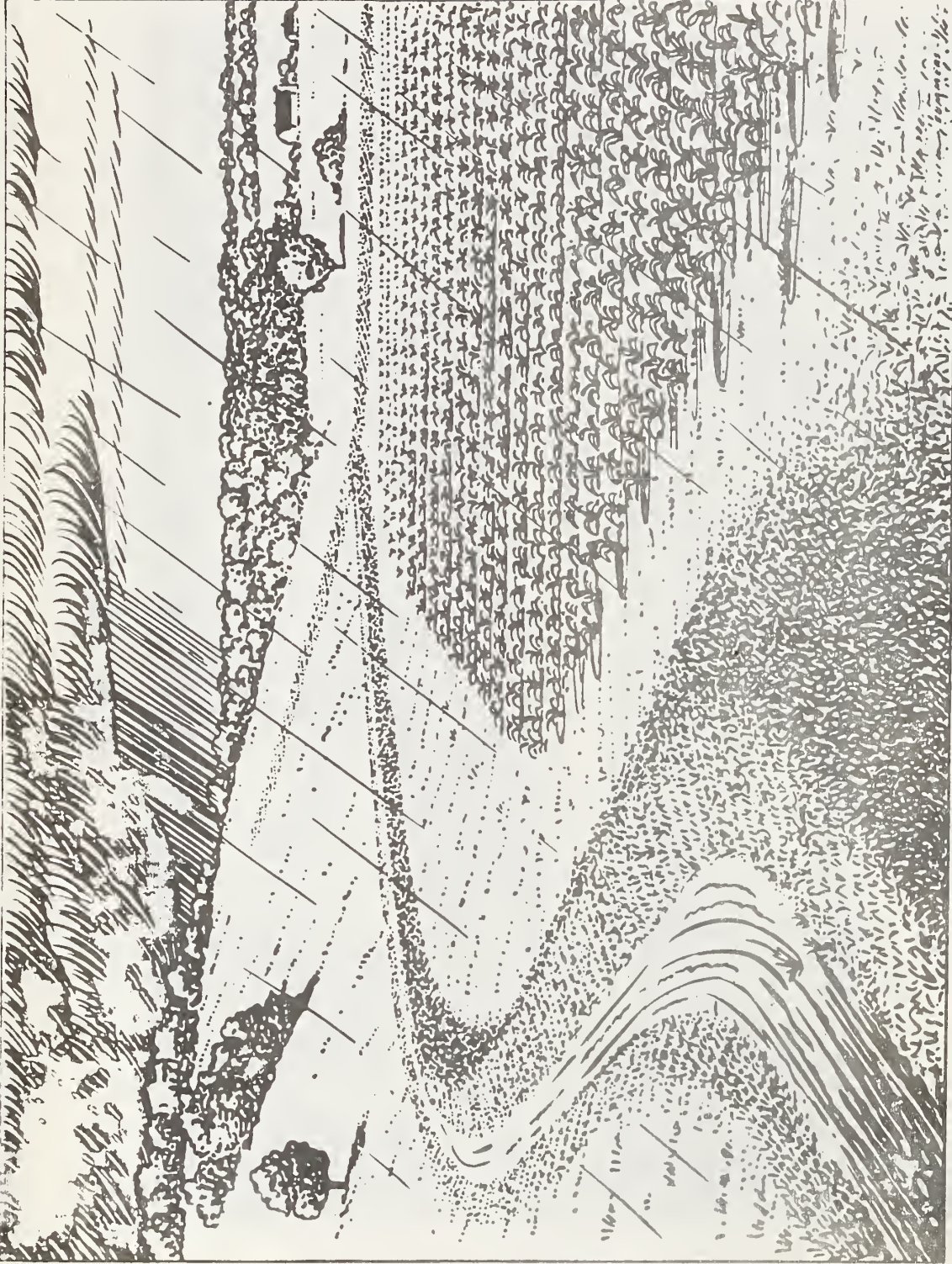
In addition to the cropland treatment measures, mechanical measures to be installed on cropland areas include 10,000 feet of diversions; 175 acres of land smoothing; 19,800 feet of terraces; 12,000 feet of open drains; and 118,000 feet of tile drains. These are defined as follows:

1. Diversion: A channel with a supporting ridge on the lower side constructed across the slope. The purpose of this practice is to divert water from areas where it is in excess to sites where it can be disposed of safely. See Figure 3.
2. Land Smoothing: Land irregularities are removed with special equipment. Land smoothing improves surface drainage, provides for more effective use of precipitation, obtains uniform planting depths, provides for more uniform cultivation, improves equipment operation and efficiency, improves terrace alignment, and facilitates contour cultivation.



Wildlife Management

Figure 2



Diversion

Figure 3



Terraces

Figure 4

Improvements

3. Terrace: An earth embankment or a ridge and channel are constructed across the slope with suitable spacing and an acceptable grade. Terraces control erosion and reduce pollution. See Figure 4.
4. Subsurface Drain: A conduit, such as tile, pipe, or tubing, is installed beneath the ground surface to collect and/or convey drainage water. A drain may improve agricultural production by lowering the water table intercepting and preventing water movement into a wet area, relieving artesian pressures, removing surface runoff, facilitating leaching of saline and alkali soils, serving as an outlet for other drains, and providing ground water regulations and control for sub-irrigated areas.

As a part of the forestry program over the watershed, the going cooperative forestland insect and disease control programs will be continued at present levels. The going Cooperative Forest Fire Control Program will be accelerated due to the greater fire hazard generated by increasing urbanization.

Accelerated forestry technical assistance will be provided to local authorities, developers, landowners, and planning groups to insure the proper treatment of the forestland during changes from rural to urban land use. This accelerated technical assistance will include the preparation of forestland conservation reports in which needed treatment measures will be recommended. Some of the recommended measures will be the inclusion of forest buffer strips, infiltration zones, tree planting on areas to be left undeveloped and planned for forest cover, stand improvement on areas left in permanent forest cover, and the development of outdoor classrooms and recreational facilities.

Land treatment measures will be installed by landowners at their expense. Technical assistance for installation of land treatment on cropland, pastureland, and land in other uses will be provided by the Soil Conservation Service.

The North Carolina Division of Forest Resources in cooperation with the United States Forest Service will provide technical assistance to landowners and operators on forestland areas.

Structural Measures

Planned is a combination of three dams containing multiple-purpose storage and 2.1 miles of channel clearing and debris removal. The multiple-purpose dams are designed to reduce the peak flow from storm runoff in the downstream reaches, and to impound water for public recreational use. See Figure 5. The channel work is planned to increase stream velocities and thereby reduce flood stages in the urban portion of the flood plain.

Improvements

The three structures planned with an effective life of 100 years will be earthfill and will control runoff from 8,295 acres or about 46 percent of the watershed. Structure No. 2 will have a drainage area of 3.53 square miles and will be approximately 25 feet in height, with a 65-acre permanent pool and a flood pool covering 142 acres at emergency spillway level.

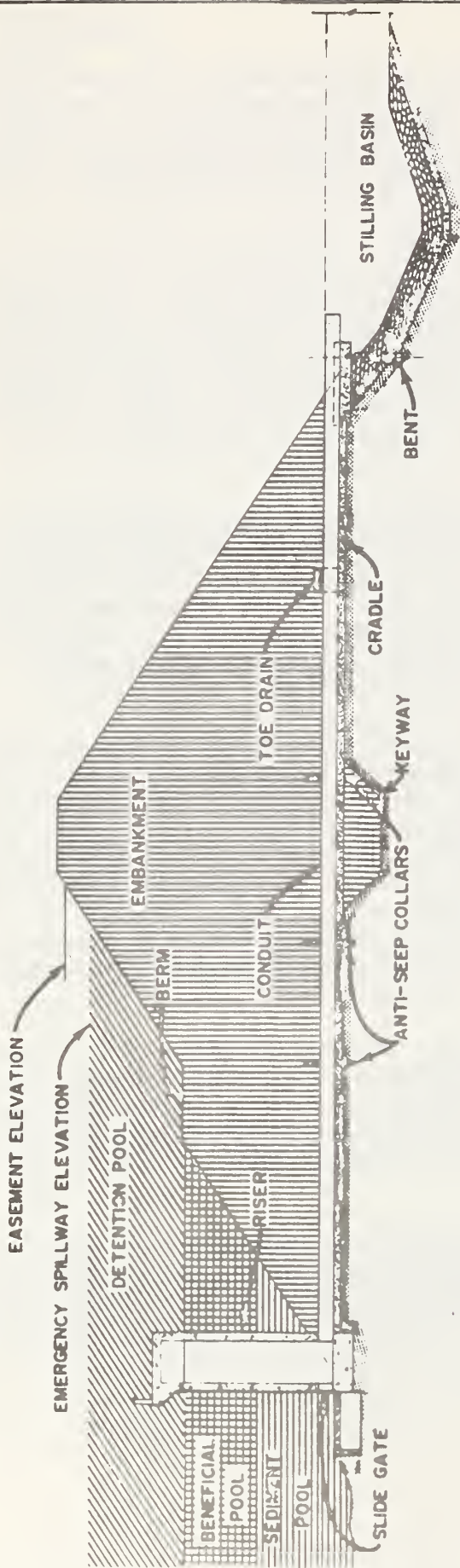
Structure No. 3 with a drainage area of 3.76 square miles, will be about 28 feet high, and will have a permanent pool of 52 acres. Its flood pool will cover 140 acres at emergency spillway level. Structure No. 39 will have a drainage area of 5.67 square miles and will be approximately 25 feet high. The permanent pool will be 102 acres in size, and the flood pool will cover 256 acres at emergency spillway level. Approximately 25 additional acres per site will be required for spillways and dam sites.

Embankment foundations for all three structures (including principal spillways) are yielding. There is a two to four foot layer of soft, mucky silt overlaying mixed alluvial material in the flood plain areas while the abutments consist of clayey sand. A core trench and shallow relief wells will be adequate to control seepage under the embankment. Adequate fill material is available near each site. This material consists of sandy clay grading into gravelly clay.

Principal spillways of the structures will consist of 30-inch diameter reinforced concrete conduits with concrete risers and excavated stilling basins as energy dissipators for the discharged water. See Figures 5 and 6. A 24-inch slide headgate will be installed at flood plain level to facilitate construction and reservoir management. An ungated orifice will be installed two feet below the crest of the riser in each of the structures. Each orifice will be sized so that it will release 0.1 cubic foot per second per square mile of drainage area with two feet of head. These orifices will assure a release from the structures equal to the 10-year, seven-day low flow.

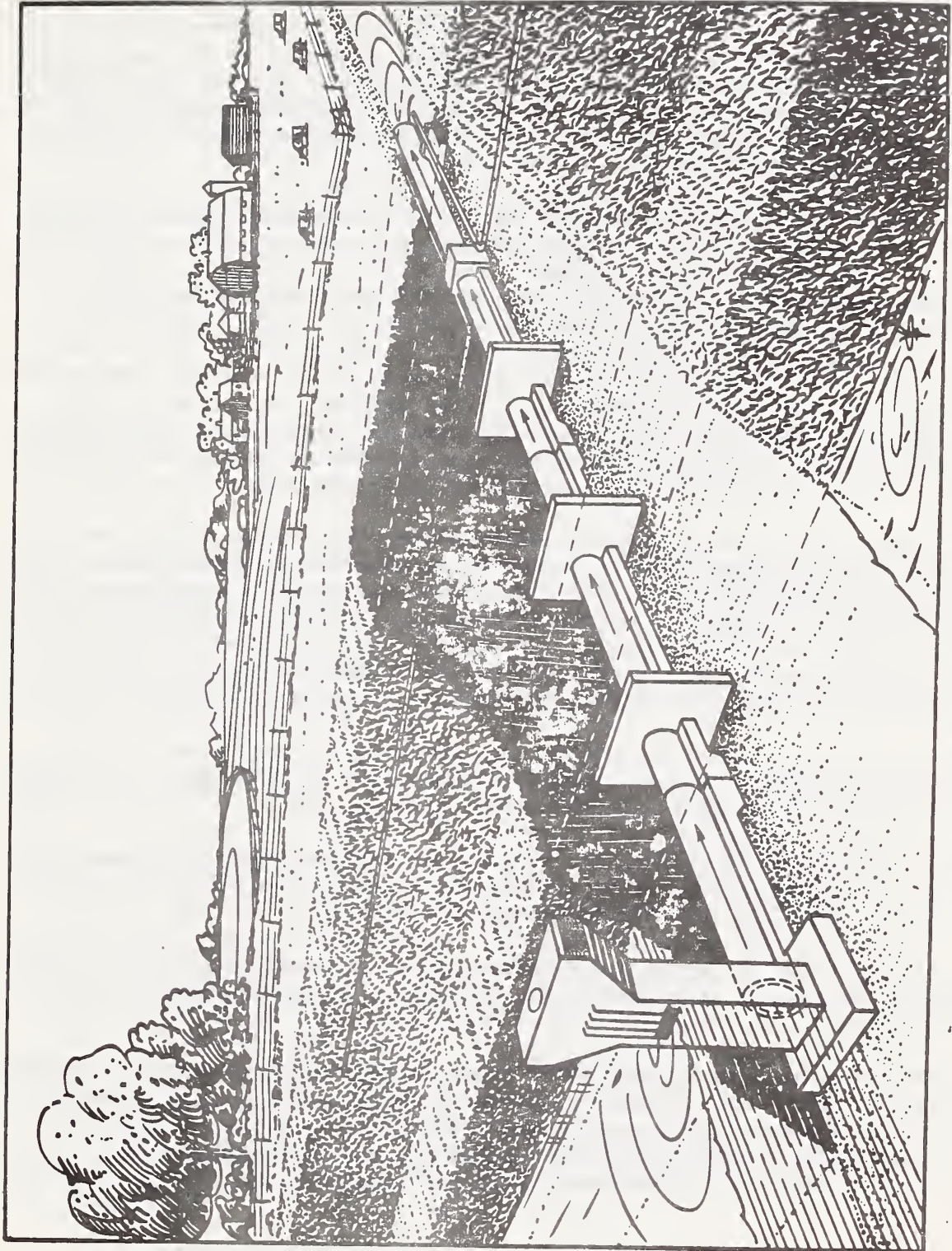
A contract has been let with the North Carolina Department of Cultural Resources, Division of Archives and History, for a field survey to determine if there are any archaeological sites in the areas affected by structural measures. The field work has been completed and indicates that no archaeological sites would be adversely affected by the proposed project.

Emergency spillways of the structures will be constructed in earth and vegetated. Storage provided between the crest of the principal spillway and the emergency spillway will provide for a frequency of flow through the emergency spillway of once per 100 years on the average. Mineral



SECTION OF A TYPICAL
MULTIPLE-PURPOSE STRUCTURE

Figure 5



Reinforced concrete pipe with flat top inlet.

Formerly Milwaukee Chart No. 55-14
U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE
USDAS-SCS-PHOTO WORKS. 1933. 1609

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Figure 6

Improvements

material to be removed from the emergency spillway areas is suitable for fill material and will be used in the structure embankment. Additional fill material for structures will be secured from the permanent pool areas as needed.

Permanent pool areas of structures will be clear-cut of all vegetation to within one foot of ground level. All vegetation within the embankment, emergency spillway, and borrow areas will be removed by clear cutting and grubbing where needed. Vegetative material will be burned where possible, or buried.

As construction progresses, all exposed structure embankment, spillway, borrow, and other area disturbed during construction will be vegetated with adapted grasses and legumes. The prime contract will provide for vegetation, debris basins, diversions, and other similar measures to prevent sediment damage during construction.

Each structure site will have a public access road, vehicle parking lot, boat launching ramp, a water supply, and sanitary facilities. See Figures 7, 8, and 9. Sanitary facilities will consist of flush toilets and septic tank with disposal field and will be installed according to North Carolina Division of Health Services regulations.

Structure No. 2 has two houses with basement elevations below the crest of the emergency spillway. One of these houses will be relocated. A dike will be constructed around the other house and storage sheds to prevent water damages. A dike will also be constructed around a cemetery which would otherwise be affected by the flood pool of this structure. Two roads (Secondary Roads 1523 and 1571) will be raised and a powerline modified during the construction process.

In connection with Structure No. 3 a house and several sheds located below the crest of the emergency spillway will be diked out. Two roads (Secondary Roads 1003 and 1571) will be raised also.

Construction of Structure No. 39 will necessitate modifying a gas line, relocating a telephone line, diking out a cemetery and a house, and raising two roads (Secondary Roads 1547 and 1523).

All modifications to existing improvements associated with a particular structure will be completed prior to initiating construction on that structure.

Structure No. 2 will require 160 acres of land rights for the impoundment area, 25 acres for the dam and emergency spillways, and two acres for the parking area and access to the lake, for a total of 187 acres. Structure No. 3 will require 156 acres for the impoundment area, 28 acres for the dam and emergency spillway, and two acres for parking area

Improvements

and access to the lake, for a total of 186 acres. Structure No. 39 will require 296 acres for the impoundment area, 30 acres for the dam and emergency spillways, and two acres for parking and access to the lake, for a total of 328 acres. Thus, total land rights required for the multiple-purpose structures will involve 701 acres.

Channel clearing and debris removal is proposed for the area from the Atlantic and East Carolina Railroad to 0.6 mile below Elm Street. This work will be done on previously modified channels with perennial flow and will consist of removing channel debris, log jams, and adjacent trees which lean over the channel 30 degrees from the vertical. Material in channels consists of sandy alluvial soils. This work will be done using small, light construction equipment.

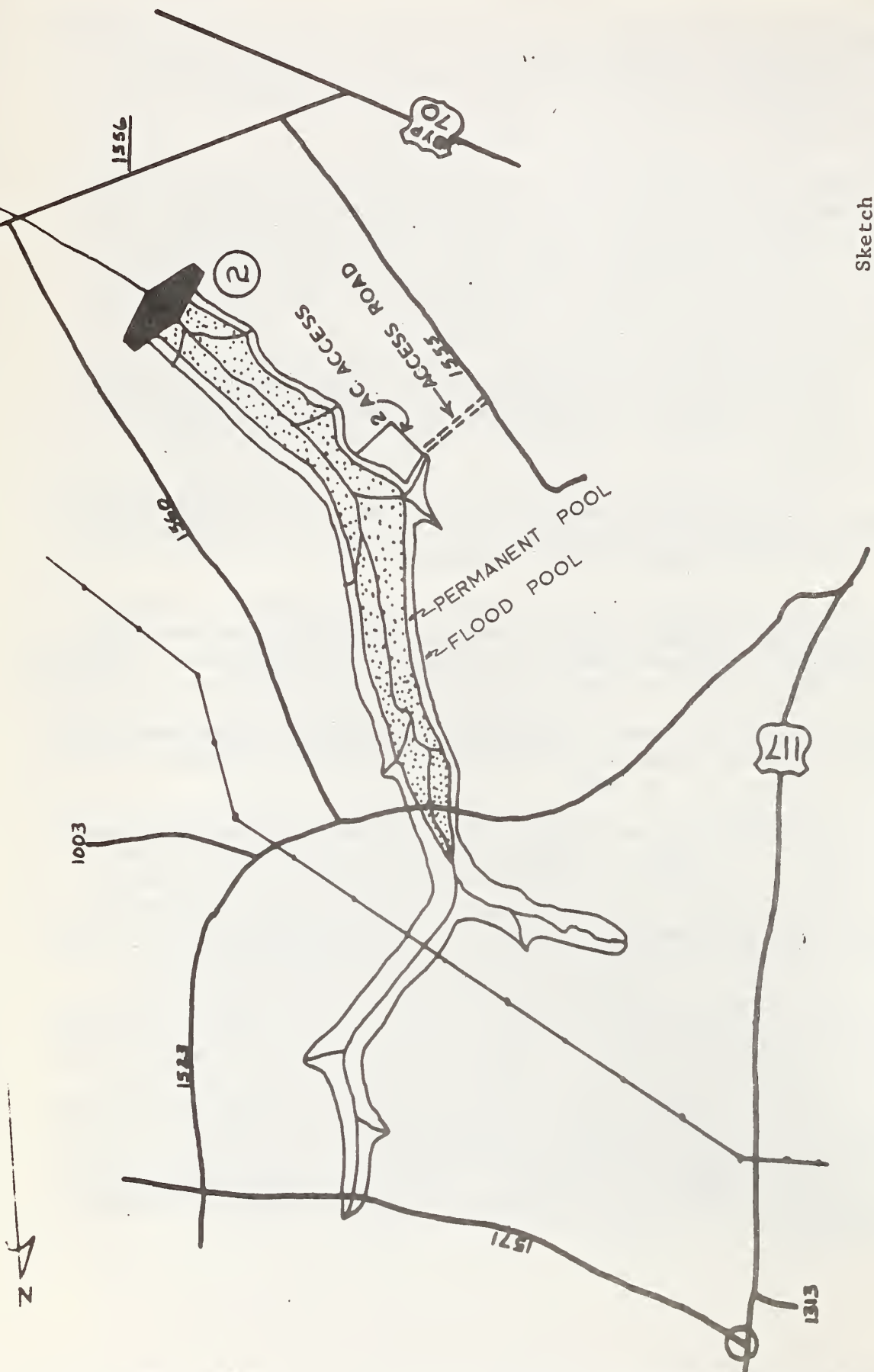
The selection of clearing and snagging as the channel design was based on the maximum increase in channel capacity possible (two-year frequency storm) within the restraint of stable channel design using tractive force analysis.

Channel work will require 13 acres of land rights, and this land will be used only as access for construction activities and as a disposal area for woody material removed from the channel.

All land rights required for each structural measure will be secured prior to letting of construction contracts. In addition to land rights for construction, permanent land rights for ingress and egress to structure sites and channels will be secured to allow proper operation and maintenance.

To minimize vector problems in the design, operation, and maintenance of watershed structural measures, guidelines from the North Carolina Division of Health Services will be used.

During construction, the environment will be protected from soil erosion and water and air pollution. Contractors will be required to adhere to strict guidelines set forth in each construction contract to minimize soil erosion and water and air pollution. Excavation and construction operations will be scheduled and controlled to prevent exposure of unnecessary amounts of unprotected soil to erosion forces, thus restricting the translocation of sediment. Erosion control measures will be uniquely specified at each work site and will include, as applicable, use of temporary vegetation or mulches, diversions, mechanical retardation of runoff, and traps. Motors of construction equipment will be required to have mufflers to reduce noise. Harmful dust and other pollutants inherent to the construction process will be held to a practical minimum by requiring haul roads, excavation areas, and other work sites to be sprinkled as necessary. Contract specifications will require that fuel, lubricants, and chemicals be adequately labeled and stored safely in protected areas, and disposal at work sites will be by approved methods and procedures.



Sketch
Not To Scale

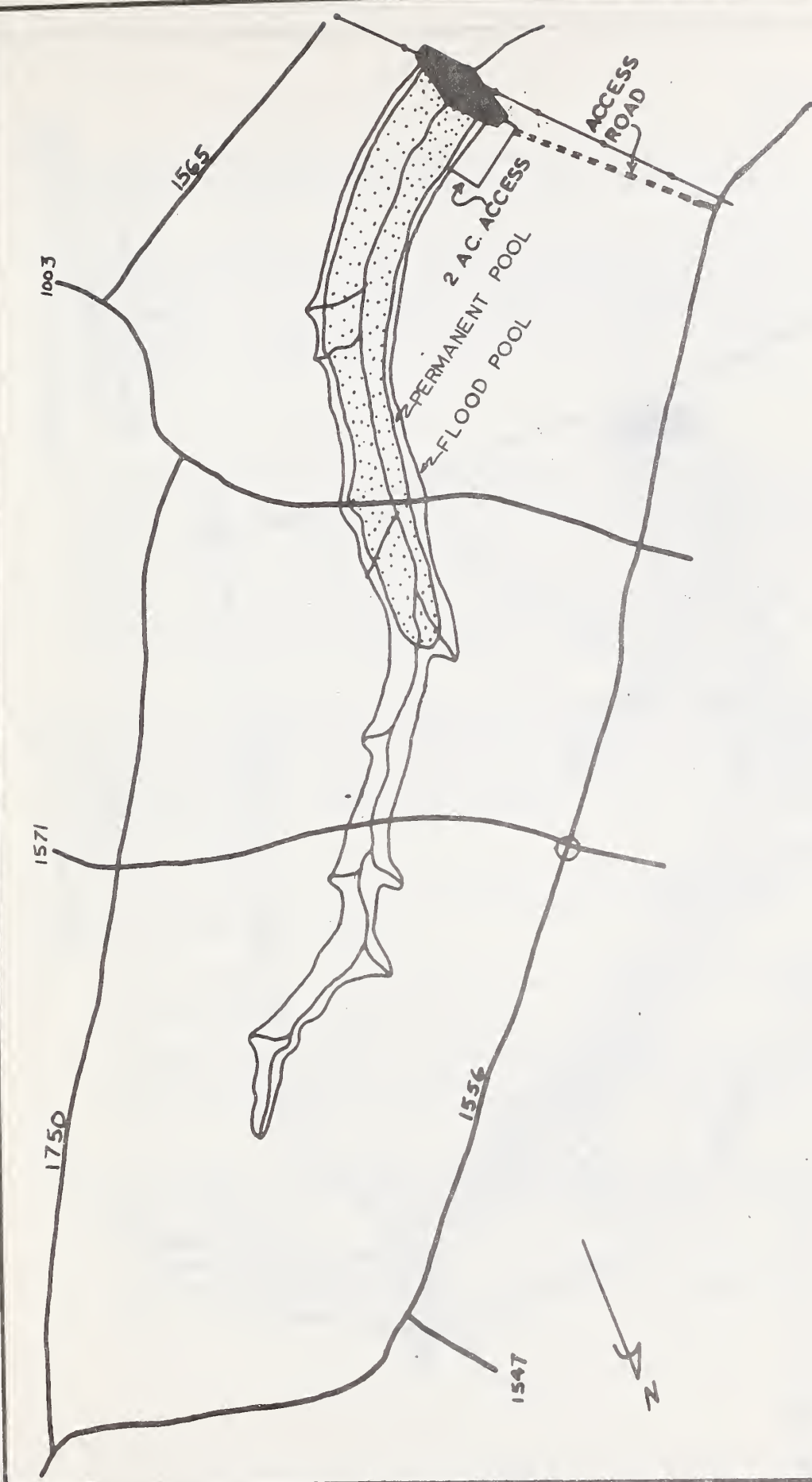
STONEY CREEK WATERSHED
WAYNE COUNTY, N. C.

RECREATION STRUCTURE NO. 2

LEGEND

① STRUCTURE NUMBER

Figure 7
36



Sketch

Not To Scale

STONEY CREEK WATERSHED

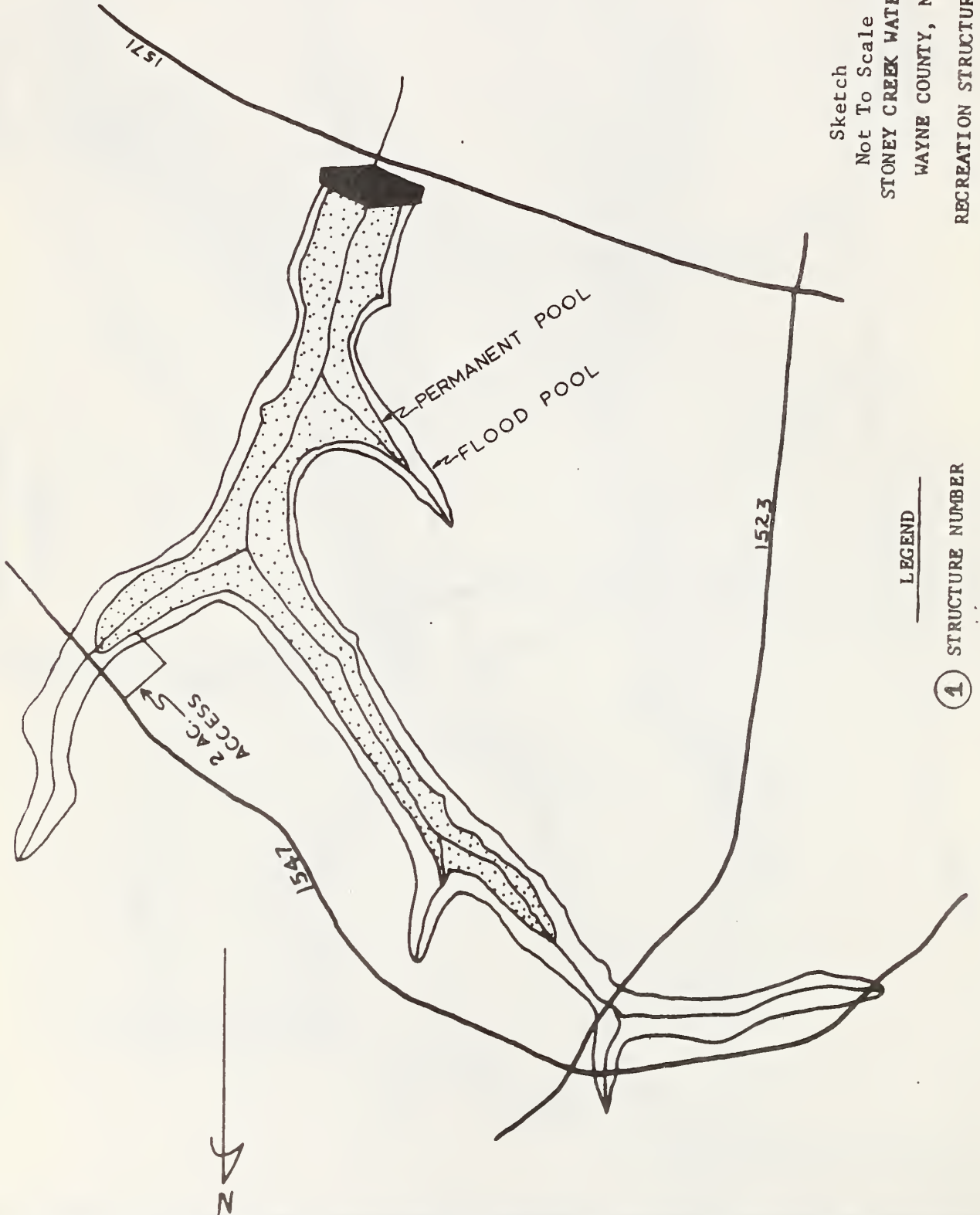
WAYNE COUNTY, N. C.

LEGEND

① STRUCTURE NUMBER

RECREATION STRUCTURE NO. ③

Figure 8
37



Sketch
 Not To Scale
 STONEY CREEK WATERSHED
 WAYNE COUNTY, N. C.
 RECREATION STRUCTURE NO. 39

LEGEND
 ① STRUCTURE NUMBER

Figure 9

Improvements

Stringent requirements for safety and health in conformance with the Construction Safety Act will be included in each construction contract.

During construction, necessary sanitary facilities, including garbage disposal facilities will be located to prohibit such facilities from being sources of pollution to the live streams, wells, or springs. Conformance to all environmental control requirements will be monitored constantly by a construction inspector who will be on-site during all periods of construction operation.

Non-Structural Project Measures

Flood plain management to reduce floodwater damages and to increase recreational use of flood plain land is a concern of local project sponsors. The zoning ordinance of the city of Goldsboro was amended in August, 1971, to exclude future residential and commercial development from that portion of Stoney Creek flood plain unprotected by structural measures. The area zoned extends from Secondary Road 1920 (Slocumb Street) upstream to Secondary Road 1571. The flood pool areas of Structures Nos. 2 and 3 are included in the zoned area.

The city of Goldsboro will publish a map and make public announcements in the local newspapers of the remaining area subject to flooding by the 100-year frequency storm. Publication of this information will be made annually within 10 days of the anniversary of the zoning ordinance established for the Stoney Creek Watershed area.

Land Use Changes

The installation of the proposed structural measures will require the following land use changes:

1. Two hundred and nineteen acres of forestland will be cleared and permanently covered by water.
2. Seventy-eight acres of forestland and five acres of cropland will be permanently committed to dams and emergency spillways. After construction, this land will have a grass cover.
3. Four acres of cropland and two acres of forestland will be used for access to the lakes. About one acre of the forestland will be cleared. Gravel parking areas will cover about one acre of land.
4. A house will be removed from the flood pool area of Structure No. 2.

EXPLANATION OF INSTALLATION COSTS

Land Treatment Measures

The estimated cost of land treatment measures to be applied during the project installation period is \$141,249 (see Table 1). Of this total, \$45,827 will be paid by Public Law 566 funds and \$95,422 will be provided from other funds. The Public Law 566 funds are for accelerated technical assistance. Other funds represent the estimated costs of installing the land treatment measures and maintaining the going soil and water conservation program.

The cost of technical assistance for the installation of land treatment measures was based on an analysis of actual Service expenditures and soil and water conservation district accomplishments for the past several years.

The costs of the forestry phase of the private land program were developed by the United States Forest Service and the North Carolina Division of Forest Resources.

The estimated cost of the forestry land treatment program is \$28,020. Of this, \$12,250 will be provided under authority of Public Law 566 for accelerated technical assistance and \$15,770 will be contributed by other sources. The North Carolina Division of Forest Resources will provide \$2,500 for accelerated technical assistance. The going Cooperative Forest Fire Control Program will provide a capital outlay of \$1,020 to improve and accelerate the fire control activities, and the going Cooperative Forest Management Program will provide services valued at \$12,250 during the installation period.

Structural Measures

Joint costs for the three multiple-purpose structures were allocated by the use of facilities method. Each of the three structures will have public access facilities, estimated to cost \$10,850 per structure, for a total of \$32,550. This is a specific cost to the water resource improvement purpose (recreation).

Channel modification cost of \$26,800 is a specific cost to the flood prevention purpose. Joint costs allocated to flood prevention amount to \$1,136,555. Joint costs allocated to water resource improvement amount to \$87,145. The total allocated to flood prevention is \$1,163,355; and a total of \$119,695 is allocated to water resource improvement (see Table 2A).

Costs

The construction costs of structural measures include all materials, labor, and equipment needed for construction. These costs, estimated to be \$657,500, are based on estimated quantities and the unit costs are based on the costs of previous watershed projects. Included in the construction cost is a contingency allowance of 12 percent to cover unforeseen items that may be encountered during construction.

Public Law 566 funds will pay a total of \$610,155 construction costs (see Table 2). This total is made up of the following amounts:

1. Clearing and snagging - \$20,000.
2. Multiple-purpose Structure No. 2, flood prevention - \$193,324; and water resource improvement - \$7,838.
3. Multiple-purpose Structure No. 3, flood prevention - \$191,580; and water resource improvement - \$7,210.
4. Multiple-purpose Structure No. 39, flood prevention - \$183,406; and water resource improvement - \$6,797.

Other funds (Wayne County Board of Commissioners) will pay a total of \$47,345 construction costs (see Table 2). The total is made up of the following amounts:

1. Multiple-purpose Structure No. 2, water resource improvement - \$7,838; recreational facilities - \$8,500.
2. Multiple-purpose Structure No. 3, water resource improvement - \$7,210; recreational facilities - \$8,500.
3. Multiple-purpose Structure No. 39, water resource improvement - \$6,797; recreational facilities - \$8,500.

Engineering services include the direct cost of engineers, geologists, and technicians for surveys, investigations, design, and preparation of plans and specifications for all structural measures.

Public Law 566 funds will pay \$63,200, which includes engineering services costs associated with the three multiple-purpose structures (\$61,200) and channel clearing and snagging (\$2,000).

Costs

The Wayne County Board of Commissioners will pay the engineering services costs associated with the recreational facilities at each of the multiple-purpose structures. The total amount is \$2,550; \$850 per structure.

Land rights costs include all land values and expenditures made in acquiring easements and rights-of-way and all cost associated with altering roads, utility lines, and other fixed improvements affected by the structural measures. These costs are estimated to be \$557,300, all of which will be paid by the Wayne County Board of Commissioners. This total is composed of the following amounts:

1. Structure No. 2

Relocate one house	\$ 20,000
Dike out houses and storage sheds	\$ 3,000
Dike out cemetery	\$ 20,000
Modify powerline (115KV)	\$ 2,000
Modify Secondary Roads 1523 and 1571	\$ 56,000

2. Structure No. 3.

Dike out one house and several sheds	\$ 5,000
Modify Secondary Roads 1003 and 1571	\$105,000

3. Structure No. 39

Modify gas line	\$ 5,000
Relocate telephone line	\$ 7,000
Dike out cemetery	\$ 1,000
Dike out houses	\$ 5,000
Modify Secondary Roads 1547 and 1523	\$ 66,000

4. Channel improvements

Modify Slocumb and Elm Streets	\$ 12,000
--------------------------------	-----------

5. Land easements for sediment pools, detention pools, dams, spillways, and borrow areas

\$250,300

Relocation costs of \$2,500 will be shared according to the ratio of Public Law 566 funds to other funds, excluding the relocation costs from the calculation (see Table 1).. Public Law 566 funds will pay \$1,345 and the Wayne County Board of Commissioners \$1,155. The \$2,500 is made up of \$500 moving and related costs, and \$2,000 replacement housing cost.

Project administration includes the cost of contract administration, government representatives, construction surveys, and necessary inspection during construction of structural measures. This cost also includes \$500 for relocation assistance advisory services to be paid by other funds.

Costs

Each party will bear the cost of project administration which it incurs. Public Law 566 funds will pay \$109,160 and other funds \$8,120.

Estimated Public Law 566 and other obligations for each fiscal year during the installation are as follows:

<u>Year</u>	<u>Land Treatment</u>		<u>Structural Measures</u>	
	<u>Public Law 566</u>	<u>Other .</u>	<u>Public Law 566</u>	<u>Other</u>
First	\$ 7,650	\$ 9,200	\$ 19,700	\$233,500
Second	7,650	11,700	22,250	161,350
Third	7,650	16,700	234,000	102,905
Fourth	7,650	18,700	238,200	102,000
Fifth	7,650	22,000	239,000	16,705
Sixth	7,577	17,122	30,720	---
Totals	\$45,827	\$95,422	\$783,860	\$616,470

EFFECTS OF WORKS OF IMPROVEMENT

Conservation Land Treatment

Land treatment will reduce the present average annual watershed gross erosion rate of 6.1 tons per acre to 4.2 tons per acre. Land treatment without the planned floodwater retarding structures would also reduce the present average annual sediment yield at the mouth of the watershed from 32,430 tons to 22,300 tons (see Table V). Land treatment measures will provide flood damage reduction benefits of approximately \$2,340 annually.

TABLE NO. V
Future Average Annual Gross Erosion
(After Project Land Treatment Applied)

<u>Land Use</u>	<u>Acres</u>	<u>Erosion Rate</u> <u>:Tons/Acre/Year :</u>	<u>Tons</u>
Cropland	6,548	7.2	47,453
Adequately Treated			
Before Project	1,684	3.4	5,726
Adequately Treated			
During Project	848	2.9	2,459
Adequately Treated			
After Project	532	3.2	8,185
Partially Treated			
After Project	4,016	7.7	31,083
Pastureland	606	0.9	545
Forestland	5,110	0.7	3,577
Miscellaneous (includes			
road banks)	734	2.6	1,908
Urban Areas	4,602	4.5	20,847
Established	4,372	0.9	3,935
Under Construction	230	73.5	16,912
Total	17,600	4.2	74,330 ^{1/}

^{1/} Approximately 22,300 tons will be delivered to the mouth of the watershed.

Effects

The reduction of sediment deposition in the channels will help relieve the aggrading situation (past and present) which is the main cause of the swamping problems throughout the flood plain areas. Swamping problems and risk of crop losses from flooding in the agricultural reaches have caused most farmers to move row crops from the flood plain to the uplands, further aggravating erosion and sedimentation problems.

The quality of stream water in the watershed will be improved by a reduction in turbidity. The average sediment concentration in water leaving the watershed would be reduced from an estimated 1,085 mg/l to 745 mg/l by land treatment or to 390 mg/l by land treatment and structural measures combined.

By reducing erosion and producing more vigorous growth, conservation land treatment will contribute to the aesthetic appeal of agricultural land and also aid long-term agricultural productivity.

Since land treatment measures reduce runoff rates and increase infiltration volumes, ground water resources in the watershed will not be harmed and, most likely, will benefit due to the increased infiltration rates.

Structural Measures

Installation of the three multiple-purpose structures will provide a further reduction in the amount of sediment delivered to the mouth of the watershed of 10,670 tons per year. This, together with the 10,130-ton reduction from land treatment, will result in 11,630 tons of sediment being delivered annually under future conditions with project, a 64 percent reduction.

The planned project will reduce the area damaged by the 100-year frequency flood from 549 to 404 acres. In the urban part of the watershed (Reach IIA and Reach III), the area flooded by this storm will be reduced from 228 acres to 189 acres, and the depth of flooding will be reduced an average of 1.5 feet. Damages from a recurrence of the October, 1964, flood would be reduced from \$92,750 to \$26,500, a reduction of about 70 percent; while the area flooded would be reduced by approximately 25 percent. Table VI illustrates the reduction in area flooded in each evaluation reach by the 100-year, 10-year, and annual storms.

TABLE NO. VI
 Acres Flooded by Various Storms for
 Present Conditions and Future Conditions with Project

Evaluation	ACRES FLOODED					
	Present Conditions			Future Conditions		
	Reach	Storm		Reach	Storm	
	100	10	1	100	10	1
I	63	48	41	50	45	33
IA	38	22	0	20	10	0
II	156	99	42	95	57	31
IIA	45	33	28	33	30	21
III	183	162	100	155	122	50
IV	13	13	9	12	10	0
V	51	45	38	39	36	7
Total	549	422	258	404	310	142

There are 14 homes, five apartment units, three commercial or business establishments, a park, and associated facilities, and three college buildings that would benefit from reduced flooding. However, after the project is installed, floodwater from the 100-year frequency storm still will reach to or above the flood level of six residences, a college building, a scout hut, a park shelter, and above the greens of a putt-putt golf course.

Nineteen families who live in the area flooded by the 100-year frequency storm will benefit from reduction in flood hazards. The community and surrounding area also will benefit from reduced interruptions to transportation, business activity, and normal community life. In addition, floodwater damages to crops and pasture will be reduced by 70 percent, and damages to fences and farm buildings will be reduced 50 percent. About 75 acres of pastureland and 10 acres of cropland also will be protected and become available for production. The reduction to non-agricultural damages will amount to approximately 75 percent.

Furthermore, installation of structural measures will allow about 100 acres of land along the fringes of the flood plain to be developed for business, industrial, and residential uses. The first area where this is expected lies along Reach III where development is already occurring, and the other is at the upper end of Reach IV in the vicinity of the county hospital. As a result of the project, about 100 acres will be developed, probably for urban use. Increased sediment during construction will result.

A wet forestland area of 219 acres will be converted permanently to water for the three floodwater retarding structures. This water, suitable for fish, will provide a warm-water fishery for an average of 61 fishermen per day or 22,340 visitors annually. The two miles of channel work will consist of clearing and debris removal, but this type of work does not destroy the canopy nor reduce the depth of flow in the channel. The

Effects

clearing and debris removal will improve the hydraulic efficiency of the channel, and floodwaters will be removed more efficiently. The Service expects some minor reduction in fishery resource in this reach due to the planned channel work and subsequent maintenance. However, this is currently a low quality resource.

Upland game areas available for hunting will not be affected by the project except during the period when parts of the 319 acres of flood pool will be inundated, also the additional 100 acres of wildlife habitat created by the land treatment program will be available.

Because of ponding water behind the floodwater retarding structures, ground water levels will increase in shallow wells or dug holes located immediately adjacent to the pools of the retarding structures, the effect will occur only in the immediate vicinity of the pools and will not have major effects on the environment or the ecosystem within the watershed.

Neither will base flow volumes in perennial streams be affected by the three floodwater retarding structures. The structures will be initially filled with water during the wet season so as not to affect normal stream flow, and designed to store the 100-year, 10-day runoff. An ungated orifice will be installed two feet below the top of the riser in each of the structures, and the orifices will be sized so that they will release 0.1 cubic foot per second per square mile of drainage area with two feet of head. The orifices will assure a release from the structures equal to the 10-year, seven-day low flow.

Another expected change is that temperatures of stream water immediately below the outlets of the structures will be increased slightly during the summer months and decreased slightly during the winter months.

Installation of the project will require the clearing of 298 acres of forest which will be lost as timber producing area. Of the total acres to be cleared, 219 are in the permanent pool areas of the structures, 78 acres are in the dams and spillways, and one acre in an access area.

In addition, alterations to eight bridges, 4,500 feet of public roads, and public utilities (pipelines, telephone lines, and powerlines) will cause some traffic disruption and inconvenience to the local residents. However, the one family to be relocated will not have to move out of the neighborhood, but will be relocated in qualified housing as required by the Uniform Relocation Assistance and Real Property Acquisition Act of 1970 - Public Law 91-646.

Further construction of the project will provide 24.4 man-years of employment for local labor, and the presence of the lakes will stimulate local bait and tackle business. The three recreation areas to be constructed

will require maintenance, thus creating one new job for the life of the project. Due to the appeal of the waterfront land, land values around the structures will also increase, although there will be a flooding easement on the land around the permanent pools. However, the sponsors will control development around the lakes to insure sanitation requirements are met.

The multiple-purpose structures will be located north of United States Highway 70 where the population is sparse, so noise during construction will not be a problem. In any case, channel work will be accomplished with light equipment, and noise levels will be below problem magnitude.

An average of about 20 visitors per day is expected at each recreation lake, and this low number should keep traffic problems to a minimum. A full-time employee assigned to maintain access areas to the lakes will control pollution problems.

Fish and Wildlife

Installation of the three proposed impoundments also will have major impacts on the biological productivity of the approximately one mile of the main channel and two miles on the laterals that will be inundated. Dominant species of fish in these reaches will be changed from stream types to warm-water impoundment types. The overall productivity of these reaches will be increased as a result of the creation of 219 acres of surface water. These wet, forestland areas will be permanently lost as terrestrial species habitat, as well as a source of timber. Waterfowl populations can be expected to increase in this improved habitat. Since the aquatic productivity of these reaches is presently very low, however, any losses of species here would not significantly affect total productivity of the watershed. Upstream from the proposed reservoirs aquatic productivity is expected to be unaffected. The impact on productivity of terrestrial species in the 319 acres of flood pool will depend on the extent, duration, and time of flooding. The primary detrimental effect would be increased hazards affecting reproduction of small game species such as quail and rabbit.

With the planned impoundments biological productivity downstream from the structures is expected to improve. For example, turbidity reductions will increase fish propagation areas and reduce the destruction of food chain organisms. (Heimstra has shown that silt turbidity alone will reduce the activity of largemouth bass and sunfish, making these fish less able to find food and more susceptible to predation.)

Non-Structural Measures

Zoning of Stoney Creek will prevent flood plain land use not compatible with flooding. Buildings thus will be excluded, but more recreational uses of the flood plain may reasonably be expected. Zoning of Stoney Creek is the first step toward qualifying those who have already built in the flood plain for flood insurance.

Effects

Although no firm plans have been made for more extensive recreational use of the flood plain, the Goldsboro Department of Planning recognizes the potential for pedestrian greenways along Stoney Creek and recommends this use of the land.

With the planned project installed, there will be approximately \$83,300 annual flood damage reduction benefits, but approximately \$24,000 of annual benefits will be foregone, because there will be 404 acres, 310 acres, and 142 acres that will continue to be flooded by the 100-year, 10-year, and one-year storms respectively.

Archaeological, Historic, and Scientific

No places of historic or archaeological value are anticipated to be affected by the project installation.

Economic and Social

Construction funds from the project installation will inject \$122,000, in the form of wages, into the local economy. This one-time capital outlay will create 24.4 man-years of new employment, paying \$5,000 per job. These increases in employment will have the secondary impact of creating eight man-years of new employment. Local labor employed to operate and maintain the project will create an average of a man-year of employment over the effective life of the project.

The reservoirs are located in the rural part of the watershed and land adjacent to the lakes will increase in value. This will provide income producing potential at the lakes which will expand the economic base of this rural area.

About 100 acres of land along the fringes of the flood plain are expected to be put to urban uses after installation of the proposed project. This change allows urban development on land previously unsuitable for this purpose and will relieve somewhat the demand for outlying farmland to be used for urban development. From the long-range growth perspective, according to the Stoney Creek Watershed Land Potential Study, the trend of urbanization is likely to shift land use from a dominance of agriculture to approximately an even distribution between urban and agricultural uses. This will result in scattered houses throughout the rural areas, but many of the occupants will not depend on agriculture for their livelihood. These people will be commuters to urban areas or to industrial sites where they will earn their living.

The water resource improvement planned in this project will enhance the development of rural areas and improve the quality of life by providing convenient water-based recreation.

Other

The installation of the structural measures proposed will cause the following land use changes:

1. Two hundred and nineteen acres of woodland will be cleared and permanently covered by water.
2. Seventy-eight acres of woodland and five acres of cropland will be permanently committed to dams and spillways. After construction, this land will have a grass cover.
3. Four acres of cropland and two acres of woodland will be used for access to the lakes. About one acre of the woodland will be cleared. Gravel parking areas will occupy about one acre of land.
4. A house will be removed from the flood pool area of Structure No. 2.

There is expected to be no other land use change in the flood pool areas, a total of 319 acres. This land will be periodically flooded. All of it is now in woods, except for about 10 acres of cropland, a two-acre pond on the fringe of a flood pool, and one house which will be relocated.

PROJECT BENEFITS

The estimated average annual monetary damage attributed to floodwater, sediment, and indirect damages within the watershed will be reduced from \$107,335 to \$24,055 (see Table 5) by the proposed project. Total annual flood damage reduction benefits are \$83,280, which includes floodwater - \$53,915; sediment - \$21,350; and indirect - \$8,015. Land treatment measures account for \$11,760, and structural measures for \$71,520 of the flood damage reduction benefits (see Table 6). More intensive land use benefits are estimated to average \$1,300 annually.

Changed land use (urban) benefits are estimated to be \$5,715. These benefits accrue from increased land for urban use caused by the reduction of damage from the 100-year, 24-hour frequency storm.

Recreation benefits are estimated to be \$33,065 annually. These benefits are based on a value of \$1.50 per visitor-day and 22,340 visitor-days. Appropriate associated cost for installation, operation, and maintenance of access and sanitary facilities are included in project costs.

Redevelopment benefits were calculated and used in project justification since Wayne County is in the Coastal Plains Redevelopment Area as provided under Public Works and Economic Development Act of 1965. The benefits accrue from added employment during project construction, operation, and maintenance. Average annual redevelopment benefits are estimated to be \$10,285.

Benefits

Local secondary benefits from increased business activity induced by and stemming from the installation of the project measures amount to \$11,630 annually. Secondary benefits from a national point of view were not considered in the economic evaluation of the project.

COMPARISON OF BENEFITS AND COSTS

The average annual cost of structural measures, including operation and maintenance and relocation payments, is estimated to be \$94,550. Average annual benefits are estimated to be \$133,515. The ratio of average annual benefits to average annual cost, with local secondary benefits of \$11,630 included, is 1.4 to 1.0 (see Table 6). The benefit-cost ratio without local secondary benefits is 1.3 to 1.0.

PROJECT INSTALLATION

The installation period of the project is six years.

Land treatment measures will be installed throughout the project installation period with not less than 25 percent of all crop and grass land adequately treated prior to the beginning of installation of structural works of improvement. The remaining planned land treatment will be installed at a rate which will permit its completion within the project installation period.

The Wayne Soil and Water Conservation District will be responsible for the installation of land treatment measures in accordance with conservation plans developed for land users.

Landowners having forestland will be encouraged to apply and maintain the best forestry measures on their land.

The Division of Forest Resources, in cooperation with the United States Forest Service, will provide technical assistance in the planning and application of forestry land treatment measures under the going Cooperative Forest Management Program. They will provide additional technical assistance for accelerating the installation of the measures recommended in the plan. A forester, trained in watershed management, will be assigned to the watershed to assist and guide the landowners in the installation of the planned measures.

The Department of the Air Force has expressed unqualified support of the Stoney Creek Watershed project, and has installed land treatment measures on federal land within the watershed in accordance with good conservation practices. This program will be continued at Seymour Johnson Air Force Base in the future.

Structural works of improvement are scheduled for installation during the third, fourth, and fifth project years. All construction work will be let in two contracts.

Installation

Structural works of improvement are planned for installation in two construction units. The first construction unit to be installed during the third and fourth years and the second construction unit to be installed during the fourth and fifth years with some overlap between the completion of the first unit and the start of the second unit. These construction units are as follows:

First construction unit - Multiple-purpose Structure Nos. 2 and 39
Second construction unit - Multiple-purpose Structure No. 3 and
stream channel work

Water rights are not involved under existing North Carolina laws. All land, easements, and rights-of-way necessary for each contract will be secured prior to the issuance of invitation to bid for construction.

Structural works of improvement will be installed by the Wayne County Board of Commissioners. All items of construction except pipes, culverts, and bridges installed on public road rights-of-way, will be performed under contracts let, administered, and financed by the Wayne County Board of Commissioners.

The Board of Commissioners will develop and maintain a financial management system that will provide for disclosure of the financial results of each Public Law 566 undertaking in which the Soil Conservation Service has a financial interest in accordance with Soil Conservation Service reporting requirements.

The Soil Conservation Service will be responsible for the design and installation of structural works of improvement included in the plan. The Service has complied with the requirement of Public Law 86-523 that the Secretary of the Interior be notified of intent to construct planned multiple-purpose structures. The Service will advise the Secretary of the Interior through the Director, Southeast Region, National Park Service and the State Historic Preservation Office if it finds evidence, is presented with evidence, or finds during construction historical or archaeological materials. To further insure protection of possible resources of this type, the Research Laboratories of Anthropology at the University of North Carolina in Chapel Hill have been furnished a project map indicating location and extent of project measures. If historic or archaeological values are discovered during construction work will be halted until an evaluation is made.

In connection with the expected relocation at Structure No. 2, the Wayne County Board of Commissioners will provide:

1. Written notice of displacement, by personal delivery or first class mail.
2. Assistance in filing applications for relocation assistance.
3. Review of and action on the application.

Installation

4. Review and processing of any grievance in connection with the displacement.
5. Relocation payments.

The Soil Conservation Service will assist the Board in fulfilling their responsibilities. The Board will also provide relocation assistance advisory services as may be needed. These services will include assistance in locating replacement housing which is decent, safe, and sanitary. Notice to vacate will be given at least 90 days before the person displaced is required to move.

The sponsoring local organizations will negotiate with the North Carolina Department of Transportation and Highway Safety for changes to be made to culverts and bridges on public roads. Pipes and culverts for ingress and egress on public road rights-of-way will be installed by the North Carolina Department of Transportation and Highway Safety. Criteria for installation will equal the requirements of the Soil Conservation Service and the North Carolina Department of Transportation and Highway Safety.

The Wayne County Board of Commissioners has the authority to participate in watershed projects, including the power of eminent domain and assessment.

FINANCING PROJECT INSTALLATION

Federal assistance for carrying out the works of improvement on non-federal land, as described in this plan, will be provided under authority of the Watershed Protection and Flood Prevention Act, Public Law 566 (83rd Congress, 68 Stat. 666), as amended. This assistance is contingent on the appropriation of funds for this purpose.

The sponsoring local organizations have the authority to participate in watershed protection and flood prevention projects. The Wayne County Board of Commissioners has the power of assessment and eminent domain. Funds raised by the Wayne County Board of Commissioners will be used to pay the local share of the cost of structural works of improvement. The sponsoring local organizations have been notified of the provisions of GSA Federal Management Circular 74-7, concerning program income.

Land Treatment Measures

Land treatment measures will be installed by landowners or operators utilizing any cost sharing available from other programs.

Technical assistance provided to the soil and water conservation district will be continued at the present rate. Accelerated technical assistance to plan and apply land treatment measures will be provided by the Soil Conservation Service from Public Law 566 funds.

Installation

Technical assistance for the installation of forestry land treatment measures will be provided from Public Law 566 funds and state funds on a predetermined cost sharing basis.

Forestry land treatment measures will be installed by landowners and operators.

Structural Measures

The Wayne County Board of Commissioners has legal authority to install, operate, and maintain works of improvement; to levy taxes and assessments to finance project measures; acquire the necessary land rights; and borrow money, issue, negotiate, and sell bonds. When necessary, they will initiate condemnation proceedings.

Project installation will necessitate modification to existing culverts and bridges on public roads. The cost of this modification and of such replacements and additional culverts and bridges, as required, will be borne by the sponsoring local organizations and the North Carolina Department of Transportation and Highway Safety. The sharing of cost will be negotiated by the sponsoring local organizations.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land Treatment Measures

Land treatment measures will be operated and maintained by landowners or operators under provisions of their individual soil and water conservation district plans. Maintenance will be a part of regular farm operations.

The forestry land treatment measures will be maintained by the landowners or operators under agreement with the Wayne Soil and Water Conservation District. The North Carolina Division of Forest Resources, in cooperation with the United States Forest Service, will furnish the technical assistance necessary for operating and maintaining the forestry land treatment measures under the going Cooperative Forest Management Program. They will continue to furnish fire protection under the going Cooperative Forest Fire Control Program.

The district supervisors will make a periodic review of the land treatment measures installed to see that they are adequately maintained. A record of their review and action taken will be kept in the district files. The supervisors will use all means available to keep land treatment measures functioning satisfactorily.

Structural Measures

Structural measures to be operated and maintained are three multiple-purpose structures with access and sanitary facilities at each site, and approximately 10,840 feet of stream channel modification.

Installation

The structural works of improvement will be maintained so that they will function as designed. Water in the reservoirs will be sampled periodically to insure that water quality is compatible with the designed recreational uses.

Maintenance of the multiple-purpose structures and channel will include but not be limited to the following:

1. Removal of debris from the principal and emergency spillways.
2. Refilling, smoothing, and vegetating of rilling on embankment, spillways, and drainageways.
3. Maintaining good vegetative cover.
4. Keeping the channel free of logs and debris.
5. Replacement of exposed metal used in dam construction as required.

Operation and maintenance of the public access facilities at each structure will include:

1. Maintenance of access roads.
2. Maintenance of equipment (water pumps and wells).
3. Maintenance and clearing of sanitary facilities.

These facilities will require employment of a permanent part-time employee.

The annual operation and maintenance cost of \$12,000 is made up of the following items:

Three structures @ \$1,000	\$ 3,000
Channel	800
Recreation facilities:	
Road maintenance and equipment maintenance	1,500
Supplies and electricity	1,500
Maintenance employee	<u>5,200</u>
Total	\$12,000

The Wayne County Board of Commissioners will be responsible for the operation and maintenance of all the structural measures. They may perform these functions with county staff employees or enter into agreements for other entities to carry out these activities.

The Service and the sponsors will make a joint inspection annually, or after unusually severe storms, for three years following installation of works of improvement. Inspection after the third year will be made annually by the sponsors and a report will be prepared by them with a copy to the Service representative.

A specific agreement for the operation and maintenance of structural works of improvement will be executed prior to signing of a project agreement. This agreement will cover such items as source of funds, methods of providing maintenance, annual maintenance inspection, and the responsibility of providing these funds and services. An operation and maintenance plan will be prepared for each structural measure.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Stoney Creek Watershed
Wayne County, North Carolina

Installation Cost Item	Unit	Number	Estimated		Cost	(Dollars)		TOTAL
			Non-Federal	Federal		Other	Funds	
			FS2/	FS2/		Non-Federal Land	Federal Land	
LAND TREATMENT								
Land Areas ^{3/}	Acres	848			60,324		60,324	60,324
Cropland	to be	100			9,700		9,700	9,700
Pastureland	Treated	1,200				12,250		12,250
Forestland		106			2,700		2,700	2,700
Other Land								
Individual Practices								
Cooperative Forest Fire Control Program		5,110	33,577	12,250	6,928		1,020	1,020
Technical Assistance							2,500	9,428
TOTAL LAND TREATMENT			33,577	12,250	45,827	15,770	95,422	141,249
STRUCTURAL MEASURES								
Construction								
Multiple-purpose Structures	No.	3	590,155		21,845		21,845	612,000
Recreation Facilities					25,500		25,500	25,500
Channel Modification ^{4/}	Miles	2.1	20,000					20,000
Subtotal-Construction			610,155		47,345		47,345	657,500
Engineering Services			63,200		2,550		2,550	65,750
Relocation Payments			1,345		1,155		1,155	2,500
Project Administration								
Construction Inspection			63,600					63,600
Other			45,560		7,870		7,870	53,430
Relocation Assistance-Advisory Services					250		250	250
Subtotal-Administration			109,160		8,120		8,120	117,280
Other Costs								
Land Rights					557,300		557,300	557,300
TOTAL STRUCTURAL MEASURES			783,860		783,860	616,470	616,470	1,400,330
TOTAL PROJECT			817,437	12,250	829,687	15,770	711,892	1,541,579

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/ Type of channel before project: (M) - manmade ditch or previously modified channel.

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

Stoney Creek Watershed
 Wayne County, North Carolina

Measures	:	:	:	Total
	:	:	Applied :	Cost
	:	Unit :	To Date :	(Dollars)1/
LAND TREATMENT				
Conservation Cropping System	Acre	1,784		4,460
Cover and Green Manure	Acre	374		1,870
Grass and Legumes in Rotation	Acre	98		1,470
Crop Residue Use	Acre	786		2,358
Contour Farming	Acre	160		480
Field Boarder Planting	Feet	5,300		265
Critical Area Planting	Acre	2		160
Grassed Waterways	Acre	1		180
Minimum Tillage	Acre	8		40
Diversions	Feet	600		30
Land Smoothing	Acre	98		2,450
Terracing	Feet	6,665		267
Drainage Mains and Laterals	Feet	52,723		10,545
Spoil Bank Spreading	Feet	52,723		6,327
Ditch Bank Seeding	Feet	2,500		125
Tile Drains	Feet	31,697		14,264
Pasture and Hayland Management	Acre	239		13,145
Pasture and Hayland Planting	Acre	606		45,450
Timber Marked	Acre	250		150
Tree Planting	Acre	50		1,000
TOTAL		XXXX	XXXXXX	105,036

1/ Price Base: 1974

Date: December 1974

TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Stoney Creek Watershed
Wayne County, North Carolina

(Dollars)1/

Item	Installation Cost ---- P. L. 566 Funds :				Installation Cost ---- Other Funds :				Total Installation Cost
	:Construction:Engineering:Payments	:P.L. 566:Construction:Engineering:Payments	:Land:Rights	:Relocation:Payments	:Construction:Engineering:Payments	:Land:Rights	:Relocation:Payments	:Other:Payments	
Multiple-purpose Structure No. 2 Recreational Facilities	201,162	20,900	1,345	223,407	7,838	850	1,155	162,993	386,400
					8,500	1,500		10,850	10,850
Multiple-purpose Structure No. 3 Recreational Facilities	198,790	20,600		219,390	7,210	850		171,210	390,600
					8,500			10,850	10,850
Multiple-purpose Structure No. 39 Recreational Facilities	190,203	19,700		209,903	6,797	850		236,797	446,700
					8,500	1,500		10,850	10,850
Subtotal	590,155	61,200	1,345	652,700	47,345	2,550	1,155	603,550	1,256,250
Chanel Modification Main 359+10 - 467+50 (M)5/	20,000	2,000		22,000				4,8006/	26,800
Project Administration				109,160				8,120	117,280
GRAND TOTAL	610,155	63,200	1,345	783,860	47,345	2,550	1,155	616,470	1,400,330

1/ Price Base: 1974

2/ Includes \$20,000 to relocate one house; \$3,000 to dike out houses and sheds; \$20,000 to dike out cemetery; \$2,000 to modify powerlines; and \$55,000 to modify SR 1523 and SR 1571 above the structures.

3/ Includes \$4,900 to dike one house and several sheds; and \$105,000 to modify SR 1003 and SR 1571 above the structures.

4/ Includes \$4,900 to modify gasoline; \$7,000 to relocate telephone lines; \$1,000 to dike out cemetery; \$5,000 to dike out houses; and \$65,000 to modify SR 1547 and SR 1523 above the structures.

5/ Type of channel before project: (M) - manmade ditch or previously modified channel.

6/ Includes \$2,000 to modify SR 1920 and Elm Street.

Date: December 1974

TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Stoney Creek Watershed
Wayne County, North Carolina

(Dollars) 1/

Item	COST		ALLOCATION :		COST		SHARING	
	PURPOSE :	RECREATION :	FLOOD :	PREVENTION :	P. L. :	RECREATION :	OTHER :	TOTAL :
	28,981	386,400	213,900	223,407	9,507	143,519	19,474	162,993
	10,850	10,850	10,850	10,850	10,850	10,850	10,850	10,850
	27,342	390,600	210,738	219,390	8,652	152,520	18,690	171,210
	10,850	10,850	10,850	10,850	10,850	10,850	10,850	10,850
	30,822	446,700	201,748	209,903	8,155	214,130	22,667	236,797
	10,850	10,850	10,850	10,850	10,850	10,850	10,850	10,850
Subtotal	1,136,555	1,256,250	626,386	652,700	26,314	510,169	93,381	603,550
Channel Modification	26,800	26,800	22,000	22,000	22,000	4,800	4,800	4,800
Grand Total	1,163,355	1,283,050	648,386	674,700	26,314	514,969	93,381	608,350

TABLE 2B - RECREATIONAL FACILITIES
ESTIMATED CONSTRUCTION COSTS

Stoney Creek Watershed
Wayne County, North Carolina

(Dollars)1/

Item	: Number:	: Estimated : : Unit : : Cost :	: Total : Construction : Cost
Structure No. 2:			
Parking Lot (2 acres)	1	2,000	2,000
Boat Launching Ramp, Asphalt, Single	1	1,000	1,000
Well, Complete with Pump	1	1,500	1,500
Flush Toilet, 2 Unit, Divided with Lavatory	1	3,500	3,500
Electric System	1	500	500
Structure No. 3:			
Parking Lot (2 acres)	1	2,000	2,000
Boat Launching Ramp, Asphalt, Single	1	1,000	1,000
Well Complete with Pump	1	1,500	1,500
Flush Toilet, 2 Unit, Divided with Lavatory	1	3,500	3,500
Electric System	1	500	500
Structure No. 39:			
Parking Lot (2 acres)	1	2,000	2,000
Boat Launching Ramp, Asphalt, Single	1	1,000	1,000
Well, Complete with Pump	1	1,500	1,500
Flush Toilet, 2 Unit, Divided with Lavatory	1	3,500	3,500
Electric System	1	500	500
GRAND TOTAL			25,500

1/ Price Base: 1974

Date: December 1974

TABLE 3 - STRUCTURAL DATA
STRUCTURES WITH PLANNED STORAGE CAPACITY

STONEY CREEK WATERSHED
Wayne County, North Carolina

Item	Unit	Structure Number			Total
		2	3	39	
Class of Structure		c	c	c	
Drainage Area	Sq. Mi.	3.53	3.76	5.67	12.96
Curve No. (1-day) (AMC II)		71	68	68	-----
Tc	Hrs.	6.25	6.17	5.96	-----
Elevation Top of Dam	Ft.	113.0	113.2	118.7	-----
Elevation Crest Emergency Spillway	Ft.	108.7	108.7	113.6	-----
Elevation Crest High Stage Inlet	Ft.	99.7	99.0	104.3	-----
Maximum Height of Dam	Ft.	25	28	25	-----
Volume of Fill	Cu. Yds.	55,800	46,500	26,000	128,300
Total Capacity	Ac. Ft.	1,208	1,157	2,042	4,407
Sediment Submerged 100 years	Ac. Ft.	190	162	280	632
Sediment Aerated	Ac. Ft.	34	29	54	117
Recreation	Ac. Ft.	90	81	140	311
Retarding	Ac. Ft.	894	885	1,508	3,347
Surface Area					
Sediment Pool	Acres	53	40	86	179
Recreation Pool	Acres	65	52	102	219
Retarding Pool	Acres	142	140	256	538
Principal Spillway					
Rainfall Volume (areal) (1 day)	In.	8.70	8.70	8.70	-----
Rainfall Volume (areal) (10 day)	In.	14.90	14.90	14.90	-----
Runoff Volume (10 day)	In.	7.86	7.27	7.27	-----
Capacity of High Stage (Max.)	cfs.	96	100	91	-----
Frequency Operation-Emer. Spillway	% chance	1	1	1	-----
Size of Conduit	Dim. In.	30	30	30	-----
Emergency Spillway					
Rainfall Volume (ESH) (areal)	In.	12.26	12.22	12.20	-----
Runoff Volume (ESH)	In.	8.45	8.40	8.38	-----
Type		Veg	Veg	Veg	-----
Bottom Width	Ft.	300	300	300	-----
Velocity of Flow (V _e)	Ft./Sec.	5.3	5.4	5.4	-----
Slope of Exit Channel	Ft./Ft.	.035	.034	.033	-----
Maximum Water Surface Elevation	Ft.	110.2	110.2	115.3	-----
Freeboard					
Rainfall Volume (FH) (areal)	In.	29.95	29.86	29.80	-----
Runoff Volume (FH)	In.	25.40	25.50	25.00	-----
Maximum Water Surface Elevation	Ft.	113.0	113.2	118.7	-----
Capacity Equivalents					
Sediment Volume	In.	1.28	.96	1.10	-----
Retarding Volume	In.	4.75	4.12	5.18	-----

Date: December 1974

TABLE 3A - STRUCTURAL DATA
CHANNELS

Stoney Creek Watershed
Wayne County, North Carolina

Channel (No. or Name)	Sta	Sta	Sq. Mi.	Design	(ft/ft)	Sq. Ft.	Ft.	Aged	Built	1/	2/	3/	Type	Before Project
	Station Numbering	Drainage:Capacity	Hydraulic	Wetted	"n" Value	Velocities	of	Type	of	Flow				
	For Reach	Area	cfs	Gradient	Area	Perimeter	As	As	Work	Channel	Condi-			
	Sta	Sta	Sq. Mi.	Design	(ft/ft)	Sq. Ft.	Ft.	Aged	Built	1/	2/	3/		
Reach III	359+10	445+00	9.04	590	.00038	204	65	.050	.050	2.90	2.90	IV	M(1932)	PR
Reach IIA	445+00	467+50	9.77	600	.00021	249	70	.050	.050	2.41	2.41	IV	M(1932)	PR

Main

- 1/ IV - Clearing and removal of loose debris within channel section
- 2/ M(1932) - Manmade ditch or previously modified channel; approximate date of original major construction in parenthesis
- 3/ PR - Perennial - flows at all times except during extreme drought

Date: December 1974

TABLE 4 - ANNUAL COST

Stoney Creek Watershed
Wayne County, North Carolina

(Dollars)1/

Evaluation Unit	: Amortization of Installation Cost ^{2/}	: Operation and Maintenance Cost	: Total
All Structural Measures	75,635	12,000	87,635
Project Administration	6,915	xxxxxxx	6,915
TOTAL	82,550	12,000	94,550

1/ Price Base: 1974

2/ Amortized at 5 7/8 percent interest rate for 100 years.

Date: December 1974

TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Stoney Creek Watershed
Wayne County, North Carolina

(Dollars)^{1/}

Item	: Estimated Average Annual Damage :		Damage Reduction Benefit
	: Without Project	: With Project	
Floodwater			
Crop and Pasture	745	240	505
Other Agricultural	1,845	905	940
Non-agricultural			
Residential and			
Commercial	69,180	16,710	52,470
Subtotal	71,770	17,855	53,915
Sediment			
Swamping	5,730	3,100	2,630
Stream, River, and			
Estuary ^{2/}	19,200	480	18,720
Subtotal	24,930	3,580	21,350
Indirect	10,635	2,620	8,015
TOTAL	107,335	24,055	83,280

^{1/} Price Base: Adjusted Normalized and 1974

^{2/} The benefits of sediment reduction from land treatment are included in these figures.

Date: December 1974

TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Stoney Creek Watershed
Wayne County, North Carolina

(Dollars)

Evaluation Unit	AVERAGE		ANNUAL		BENEFITS/		Average:	
	: More	: Changed Land:	:	:	:	:	: Annual	: Benefit
	: Damage	: Intensive:	:	:	:	:	: Cost	: Cost
	: Reduction:	Land Use :	Urban	: Secondary:	Redevelopment:	Recreation:	Total	: 2/
								: Ratio
All Structural Measures	71,520	1,300	5,715	11,630	10,285	33,065	133,515	87,635 1.5:1.0
Project Administration	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXXX	XXXXXXX	6,915 XXXXXX
GRAND TOTAL	71,5203/	1,300	5,715	11,630	10,285	33,065	133,515	94,550 1.4:1.0

1/ Price Base: 1974 prices for all values but agricultural products which are adjusted normalized.
 2/ From Table 4.
 3/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$11,760 annually.

Date: December 1974

TABLE 7 - CONSTRUCTION UNITS

Stoney Creek Watershed
Wayne County, North Carolina

(Dollars)^{1/}

Measures in Construction Unit	:	Benefit	:	Annual Cost
Construction Unit #1 Multiple-purpose Structures No. 2 and No. 39		89,455		62,310
Construction Unit #2 Multiple-purpose Structure No. 3 and Channel Clearing and Snagging ^{2/}		44,060		32,240

^{1/} Price Base: 1974

^{2/} Benefits shown for Construction Unit #2
are dependent upon prior Construction Unit #1

Date: December 1974

INVESTIGATIONS AND ANALYSES

Land Use and Treatment

Present land use was determined from soil surveys, soil, and water conservation district reports, and field studies. Estimates of future land use and treatment measures were made by the district conservationist on his knowledge of the land, people, and present trends in the watershed area. Needed land use adjustments based on land capabilities were considered in arriving at the land treatment measures planned for the watershed.

The importance of land treatment has been stressed in every meeting with the sponsoring local organizations. Every effort has been made to make them aware of the importance that land treatment measures will have in the project. The sponsoring local organizations anticipate that the acreage of surplus crops will not be increased as a result of the project.

Geology

A preliminary investigation was made on each of the three planned structures. Investigations included studies of lithology, stratigraphy, channel banks, abutment, foundations, ground water, and potential borrow areas. Adequate quantities of good fill material are available at each site and no major geologic problems are anticipated. A complete detailed geologic investigation of each site will be necessary for construction design.

Channel stability investigations consisted of hand augered holes along the reach (sta. 359+10 through sta. 467+50) where clearing and snagging is planned. All logs indicate similar soil profiles consisting of about three feet of SP-SM (Unified Soil Classification System) overlying SP material down to at least 5.5 feet. A representative sample was collected and, after sieving, classified as SP with only about 1.5 percent of the sample passing the No. 200 sieve. The D75 grain size of the SP material falls in the range of .1 to .3 mm. This range of grain size was checked, along with channel hydraulic conditions, by tractive force procedures and was found to be well within the allowable tractive forces as outlined in Technical Release No. 25, Planning and Designing of Open Channels.

Erosion and Sedimentation

Field investigations to determine the soil-cover complex were made in collaboration with the planning party hydrologist and the work unit conservationist. Data developed was used to make sediment source studies and to compute the soil-cover complex values. Procedures used for developing the complex data are contained in Section 4, National Engineering Handbook, Part I - Watershed Planning, Chapters 7, 8, and 9.

Investigations

Data collected during the field investigations was mapped on areal photographs. The information included the nature and extent of the sediment and erosion problems such as deposition on upland areas, flood plains, and stream channels. Sheet, gully, and streambank erosion were also delineated along with critical sediment-source areas.

Musgrave's^{1/} equation was used to compute soil loss from sheet erosion. Average percent of slope and soils information was obtained from soil surveys within the watershed. Length of slope was obtained by direct measurement on photographs under a stereoscope.

Sediment damages are limited to those damages which limit future productivity of flood plain land for future food and fiber needs. Channel fill is progressing very slowly; however, swamping has progressed to about the maximum extent possible. Most drainage ditches are located in the flat areas where no erosion is taking place.

Hydraulics and Hydrology

Stage discharge relationships without project and with clearing and snagging were determined according to E&WP Technical Guide No. 41. Roughness coefficients used in the hydraulics program were estimated in accordance with procedures outlined in Supplement B, Section 5, of the National Engineering Handbook. Stage-area inundated relationships were computed with the use of the electronic computer in conjunction with the hydraulic program.

Flood routing for future without project and future with project conditions was performed with the use of the computer in accordance with methods outlined in the Washington Technical Release No. 20. It was found that the future without project peaks were too high as compared to peaks obtained from the Log Pearson Type III Frequency; therefore, the unit hydrograph factor of 256 rather than 484 was used in the analysis. This change in the unit hydrograph factor was made with the concurrence of the Fort Worth E&WP Unit Hydrologist. Eight frequency storm series of 24-hour duration were used in the evaluation. They were the following: 100-year; 25-year; 10-year; five-year; two-year; one-year; six-months; and two-months.

The clearing and snagging reaches were checked by the tractive force method and are in accord with TR-25.

Engineering

Aerial photographs, on a scale of 3.168 inches per mile, were secured. These were used to develop a semi-controlled aerial mosaic and base map showing streams, roads, railroads, cities, towns, and other desirable information.

^{1/} Musgrave, G. W., The Quantitative Evaluation of Factors in Water Erosion, Journal of Soil and Water Conservation.

Investigations

All United States Geological Survey bench marks used and temporary bench marks established by the Soil Conservation Service are recorded on a copy of the base map. Those set by the Soil Conservation Service are identified by three-inch by five-inch aluminum plates.

Topographic maps of Goldsboro and the adjacent one-mile area, except Seymour Johnson Air Force Base, were compiled in June 1965 by photogrammetric methods by Piedmont Aerial Surveys, Inc., Greensboro, North Carolina. The scale is one inch equals 100 feet with a two-foot contour interval.

Topographic maps of Seymour Johnson Air Force Base portion of the watershed were furnished by the base engineers. These maps were of the scale of one inch equals 50 feet with one-foot contours. They were compiled for the Tactical Air Command, Department of the Air Force, by L. E. Wooten and Company, Raleigh, North Carolina, and dated January 1, 1965.

Valley cross sections were surveyed at intervals along Stoney Creek and were used in hydraulic and engineering computations. The flood plain was delineated by the use of photographs and stereoscope using the valley sections as a check.

Structural sites were located by photo interpretation and field examinations. Topographic maps furnished by the city of Goldsboro were used to compile stage-storage and stage-area curves for site Nos. 2 and 3. A topographic map of site No. 39 was made by field surveys using a telescopic alidade.

All structure sites in this watershed are classified as "C" hazard. Soil Conservation Service Engineering Memorandum 27 criteria were used for floodwater storage capacities and safety. Minimum size conduits (30-inch diameter) were used in all structures.

Field surveys were made only for hydraulic and hydrologic computations except for a topographic map of site No. 39. All field surveys were made using mean sea level datum for vertical control.

Soil Conservation Service Engineering Memorandum 27 and Watershed Protection Handbook criteria were used to design structural measures. Structures were proportioned for 100-year sediment, one percent probability 10-day storm detention; and the second 50-year submerged sediment volume was added for beneficial storage.

Engineering Memorandum NC-24 was used as a basis for cost estimates. Cost estimates for road and bridge modifications were obtained from the North Carolina Department of Transportation and Highway Safety. Land rights costs were estimated by the sponsors.

Forestry

The North Carolina Division of Forest Resources and the United States Forest Service jointly conducted a systematic field survey which showed ground cover, forest and hydrologic conditions, and treatment needs. This survey, supporting data, and information from other agencies determined the amount of remedial measures.

Biology

A biology field review was conducted by representatives of the North Carolina Wildlife Resources Commission, United States Fish and Wildlife Service, and the Soil Conservation Service. This was a team effort to determine the present fish and wildlife resources, possibilities for improvement, and expected damages from project measures.

Numerous field studies have been made in or near this watershed and were considered in addition to observations made in several field trips carried out as a part of work plan development studies. Regular meetings were held to discuss and reach agreement on the various aspects of biology findings. These efforts provided a consolidated report of findings which was used in planning and is a part of the basic watershed data.

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 were obtained from local agricultural workers, city and county officials, local property owners, experiment stations, United States Department of Agriculture publications, and other secondary sources.

Adjusted normalized prices were derived from data published by the Interdepartmental Staff Committee, Water Resources Council, on April 20, 1966. All agricultural damages were based on adjusted normalized prices. Current prices were considered appropriate for evaluating non-agricultural damageable values and for estimating operation, maintenance, and replacement cost. Prices used for installation cost were 1974. Costs of all structural measures were amortized over a 100-year period, using an interest rate of 5 7/8 percent.

Planning staff and field personnel, local real estate agents, agricultural workers, and property owners were interviewed to determine present land use and land use trends. Information supplied by local people and secondary data were used as a basis for estimated present and projected yields.

Residential and commercial damages were based on stage damage relationships without and with the project. Engineering surveys were made to determine elevations of properties subject to floodwater damage at the

Investigations

ground and first floor. Present value estimates were made by a local real estate agent. These values served the basis for determining damage by depth of flooding in accordance with E&WP Technical Guide No. 21. Damages by depths of flooding were summarized and projected in accordance with Chapter 15 of the Economics Guide.

Swamping damages were estimated in accordance with Chapter 5 of the Economics Guide and Fort Worth Economics Memorandum 1. A computer program for land damage appraisal was used for calculating monetary damage and damage reduction benefits.

Sediment damages to downstream reaches, rivers, and the estuary were estimated based on the United States Army, Corps of Engineers, Wilmington District, average dredging cost (\$0.75/cu. yd.). When sediments leave the watershed they cause damage to downstream areas by filling channels, raising the water table, increasing flooding, and carrying absorbed pollutants. Therefore, any sediment trapped behind the structures is beneficial to downstream reaches. The average annual sediment reduction due solely to structures is 12,390 cubic yards.

Indirect damages were estimated in accordance with Chapter 3 of the Economics Guide. They were computed at 10 percent of crop and pasture damages, 10 percent of other agricultural, and 15 percent of damages to residential and commercial properties.

More intensive land use benefits were based on 87 acres of crop and pasture land without project and 57 acres with the project. These benefits result from increased net income due entirely to increased production resulting from reduction on the flood hazard.

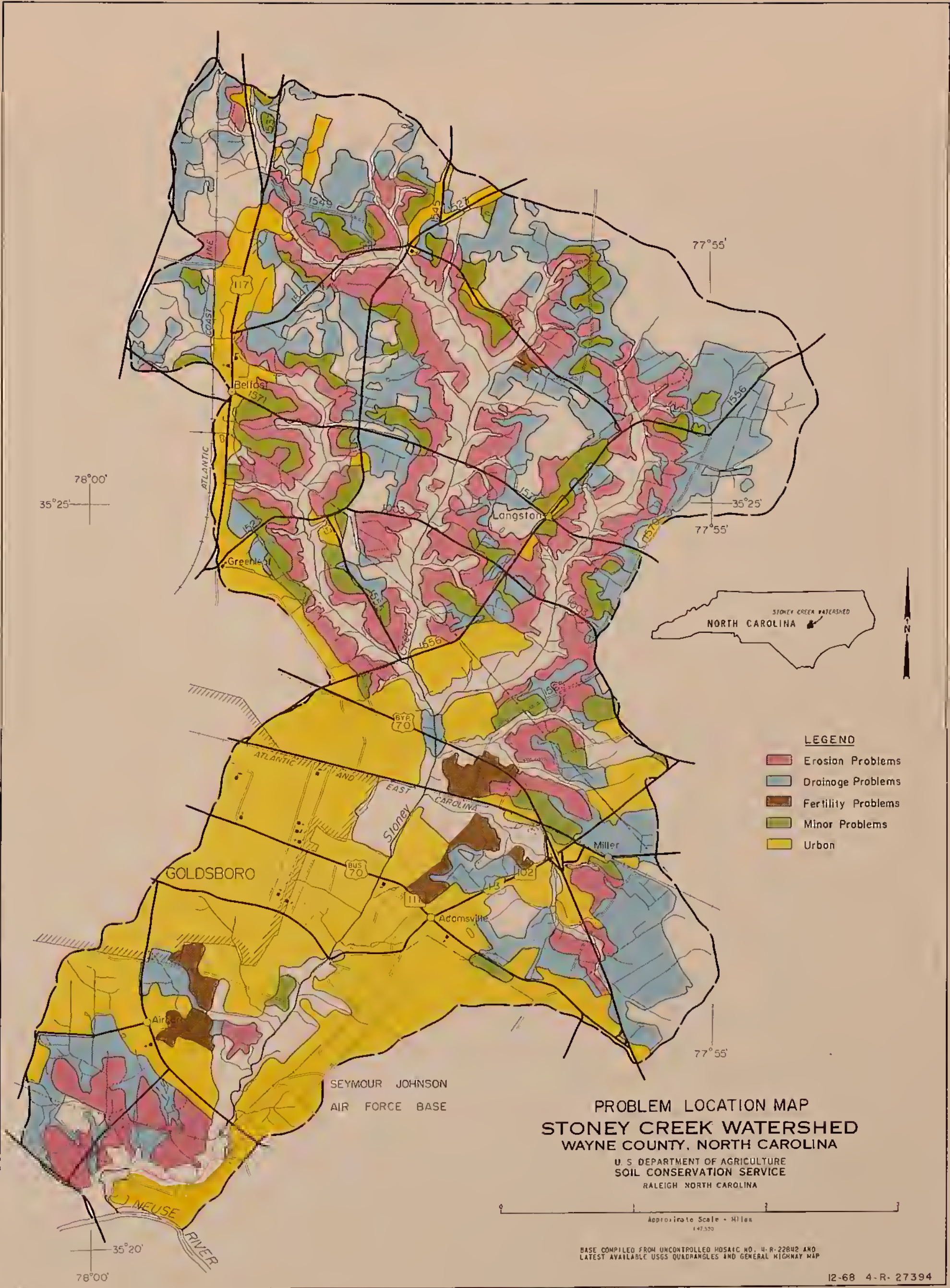
Benefits from changed land use (urban) were estimated on the basis of increased land values due to flood reductions caused by the project. It is estimated that basic land values would increase by \$1,500 per acre for 70 acres, amounting to \$105,000. This was amortized using 5 7/8 percent for 100 years to arrive at the average annual gross benefits. The annual agriculture income lost was deducted to arrive at the net annual benefit from this source.

Recreation benefits were estimated in accordance with paragraph 108.08 of the Watershed Protection Handbook and Chapter 9 of the Economics Guide. Since recreation is included as a planned project objective and meets the requirements of a water resource improvement, benefits were estimated to have a value of \$1.50 per visitor-day. There will be approximately 22,340 visitor-days per year. The average annual installation operation, maintenance, and replacement costs are included in the plan as a project cost. Average annual benefits from recreation are estimated to be \$33,065. The recreation structures are located within easy driving distance of several populated areas. These benefits will accrue to the public as public access is provided at each structure.

Redevelopment benefits were estimated in accordance with the Economics Guide and paragraph 102.02212 of the Watershed Protection Handbook. Wage payments for local labor during construction were estimated to be equivalent to 20 percent of the construction costs. This value was amortized at 5 7/8 percent for 100 years to arrive at annual redevelopment benefits from this source. Fifty percent of the annual operation and maintenance cost 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 life of the project.

Local secondary benefits were estimated in accordance with paragraph 102.02213 of the Watershed Protection Handbook and Chapter 11 of the Economics Guide. The value of local secondary benefits stemming from the project was estimated to be 10 percent of direct primary project benefits. Indirect benefits were excluded when computing secondary benefits. The value of local secondary benefits induced by the project was estimated to be 10 percent of the increased cost that primary producers will incur in connection with increased cost of sustained production.





78°00'
35°25'

77°55'

35°25'

77°55'



LEGEND

- Erosion Problems
- Drainage Problems
- Fertility Problems
- Minor Problems
- Urban

GOLDSBORO

SEYMOUR JOHNSON
AIR FORCE BASE

**PROBLEM LOCATION MAP
STONEY CREEK WATERSHED
WAYNE COUNTY, NORTH CAROLINA**

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
RALEIGH NORTH CAROLINA



BASE COMPILED FROM UNCONTROLLED MOSAIC NO. 4-R-22842 AND
LATEST AVAILABLE USGS QUADRANGLES AND GENERAL HIGHWAY MAP

35°20'
78°00'

77°55'



URBAN FLOOD PLAIN
CITY OF GOLDSBORO
STONEY CREEK WATERSHED
WAYNE COUNTY, NORTH CAROLINA
 U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
 RALEIGH, NORTH CAROLINA

0 1/4 1/2 1 MILE
 SCALE

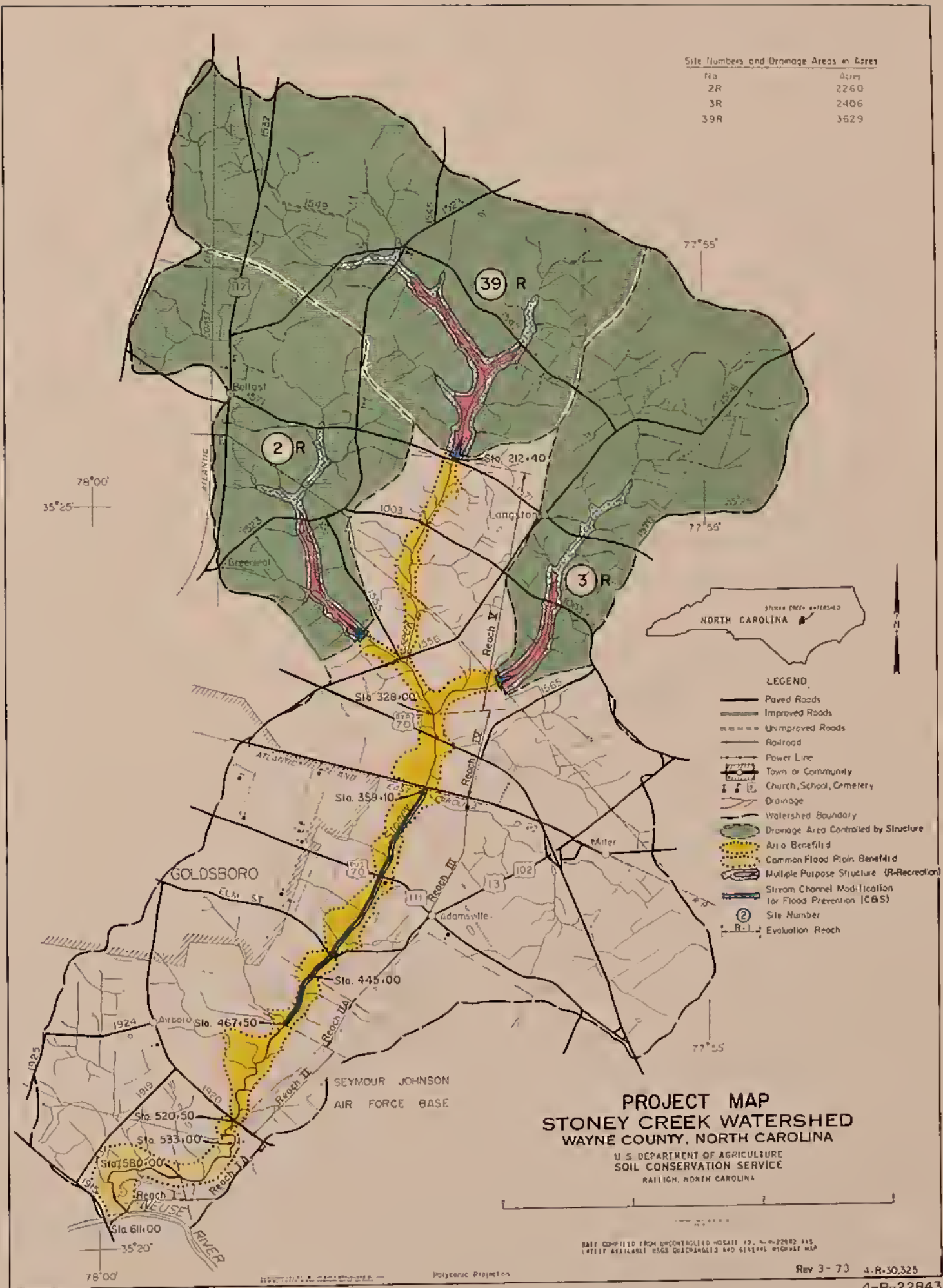
Rev. 1-73 4-R-27,427





Site Numbers and Drainage Areas in Acres

No.	Acres
2R	2260
3R	2406
39R	3629



PROJECT MAP
STONEY CREEK WATERSHED
 WAYNE COUNTY, NORTH CAROLINA

U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 RAILIGH, NORTH CAROLINA

BASE COMPILLED FROM UNCONTROLLED MOSAIC NO. 4-422002 AND
 LATEST AVAILABLE 1:50,000 QUADRANGLES AND GENERAL TOPOGRAHY MAP

Rev 3-73 4-R-30,325

4-R-22843

