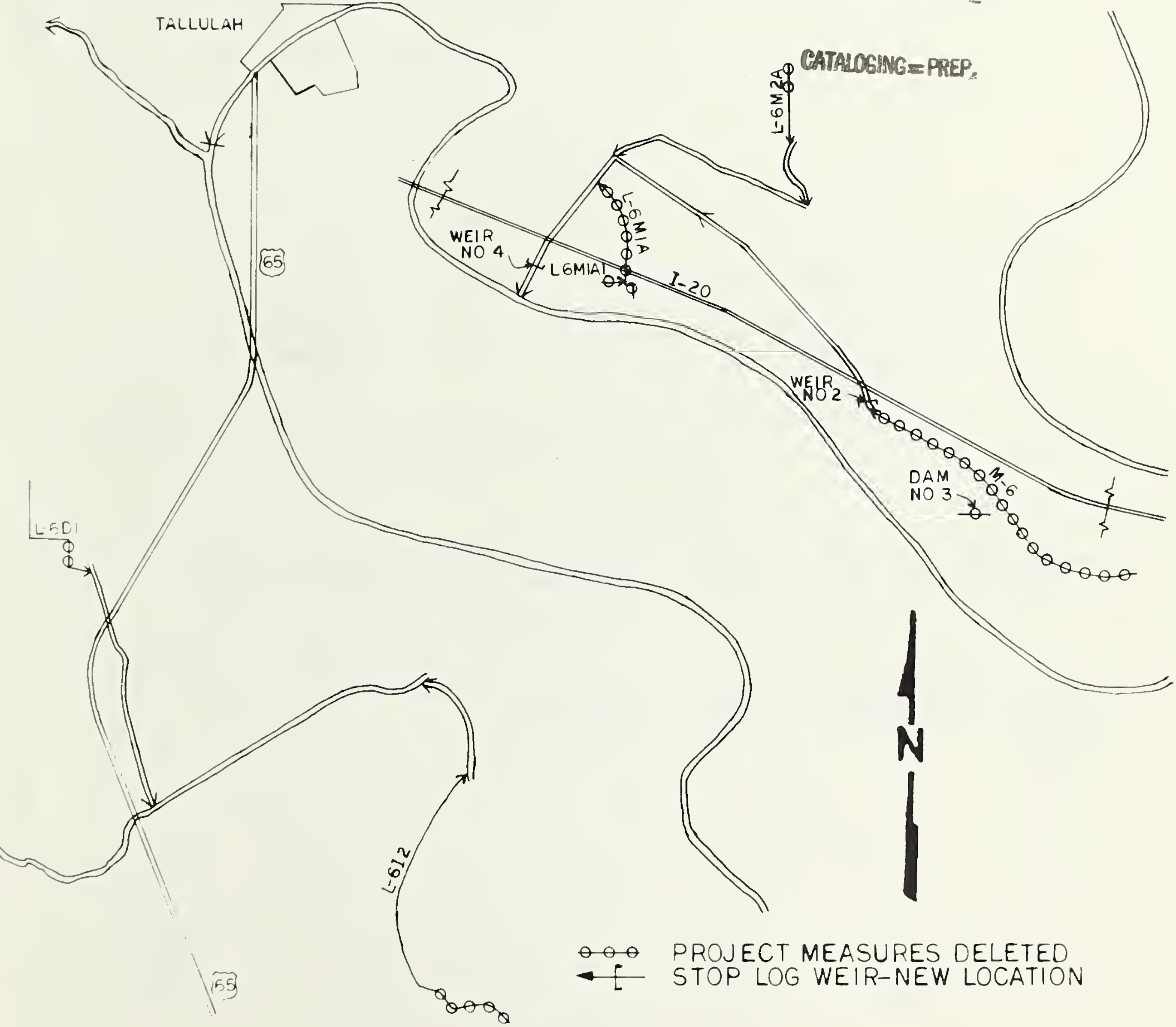
nvironmental
impact
statement

WALNUT-ROUNDAWAY WATERSHED
MADISON AND EAST CARROLL PARISHES
LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ALEXANDRIA, LOUISIANA

ERRATA SHEET I

This map indicates changes in the planned measures displayed on the project map, Appendix C.



ERRATA SHEET II

An abbreviated habitat evaluation and mitigation alternatives (menus) was completed by SCS and USFWS on December 28, 1979. Losses that would result by installation of watershed as planned (1978) amounted to 7,999 habitat units.

The sponsors, SCS and USFWS agreed that these losses will be mitigated. It was also agreed that at no time during installation of the structural measures will the losses exceed the mitigation. The mitigation will be accomplished within the framework of alternative methods which are:

1. Wetland Improvement

    a. Texas Lake Complex

    b. Horseshoe Lake Complex

    c. Alligator Brake

2. Conservation easements to preserve bottomland hardwoods.

3. Vegetative plantings along maintenance-free openland channels.

4. Elimination of project channels that would cause habitat losses if installed.

5. Creation of an 80-acre wetland area.

The following channels, or channel segments, have been eliminated from the plan (1978) from which the habitat units lost (7,999) were calculated, as indicated on Errata Sheet I:

Channel No.	Length (ft.)	R.O.W. (Acres)			
		Openland	WCB	Forest	Wetland
L-6D-1	1,400	-	-	-	2.72
M-6	11,420	-	-	1.85	15.14
L-6M-1A	6,900	0.45	2.25	0.90	4.00
L-6M-1A-1	500	-	0.56	-	-
L-6M-2A	800	-	0.50	0.86	-
L-6 I-2	6,375	2.74	6.03	-	-
TOTAL	27,395	3.19	9.34	3.51	21.86

USDA-SCS-EIS-WS-(ADM)-2-78-(F)-LA

Walnut-Roundaway Watershed
Madison and East Carroll Parishes, Louisiana

FINAL ENVIRONMENTAL IMPACT STATEMENT

Alton Mangum, State Conservationist
Soil Conservation Service

Sponsoring Local Organizations

Madison Soil and Water Conservation District
Post Office Box 311
Tallulah, Louisiana 71282

East Carroll Soil and Water Conservation District
Post Office Box 552
Lake Providence, Louisiana 71254

Madison Parish Police Jury
Courthouse Building
Tallulah, Louisiana 71282

East Carroll Parish Police Jury
Courthouse Building
Lake Providence, Louisiana 71254

November 1978

PREPARED BY
UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
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Alexandria, Louisiana 71301

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USDA FINAL ENVIRONMENTAL IMPACT STATEMENT

Walnut-Roundaway Watershed Project

Madison and East Carroll Parishes

Louisiana

Prepared in Accordance With

Sec. 102 (2)(C) of P.L. 91-100

Summary

I. Final

II. Soil Conservation Service

III. Administrative

IV. Description of Project Purpose and Action. This project is for watershed protection, flood prevention, and agricultural water management in the Walnut-Roundaway Watershed in Madison and East Carroll Parishes, Louisiana. It is to be implemented under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666) as amended. Planned structural measures to be installed consist of approximately 248 miles of channel work for flood prevention and drainage, together with appurtenant measures for channel protection and maintenance access. In addition, 15 structures including five weirs, six dams in existing channels or streams, two grade stabilization and two water control structures to minimize damages to fish and wildlife will be installed. This work will be done to improve water management in a watershed consisting of approximately 68 percent cropland, two percent pastureland, 23 percent forest land, and seven percent of other land such as roads, channels, communities, farmsteads, and urban areas. Because of shifts in land use, the land treatment program has been revised to provide for the adequate treatment of 127,000 acres.

V. Favorable Environmental Impacts and Adverse Environmental Effects.

Favorable

Economic activity in the watershed will increase.

Average annual agricultural damage due to flooding will be reduced by 78 percent. Agricultural damage due to poor drainage will be reduced.

Sheet erosion will be reduced from 724,000 tons per year to 680,000 tons per year. The total acreage with over five tons of soil loss per acre per year will be reduced from 108,000 to 2,640.

Sediment delivered to the watershed outlets and lakes within the watershed will be reduced from 45,700 tons per year in 1970 to 42,900 tons per year. This reduction is about six percent.

Diverting about 10,000 acres of agricultural runoff from Bear Lake into the Tensas River will reduce the amount of sediment and agricultural runoff entering the lake, thereby beneficially effecting the fishery.

The Willow Lake-Eagle Lake-Lake One Complex will benefit from the diversion of about 7,000 acres of agricultural runoff away from it.

Average annual net farm income will increase by $5,300 or about $11.00 per acre.

A total of approximately 157,000 acres of cropland and pastureland will benefit from the combined program of land treatment and structural measures.

The installation of the project will allow for an additonal 84,300 acres of cropland and pastureland to receive adequate treatment.

Approximately 20,700 acres (2,000 open land and 18,700 forest land) of multiple use on cropland, pastureland, and forest land will be used for wildlife habitat.

About 300 farmers, 1,100 farm family members, and the employees of those farmers will benefit from the project. Of these individuals, 107 are minority farmers, 83 of which are cooperators with the soil and water conservation districts.

All new employment attributed to this project is available to both minorities and nonminorities.

Improved farming efficiency resulting from project installation will reduce the average annual fixed cost of production.

Mosquito habitat areas will be reduced as a result of project installation.

There will be an increase in habitat for openland species.

Damages to roads will be reduced.

The quality of upland openland wildlife habitat will increase as a result of better drainage and flood protection.

The clearing operations will result in the removal of unsightly debris from the project channels.

Installation of the project will reduce some of the high risks involved in farming due to flooding and inadequate drainage and made it a more profitable business enterprise.

More efficient use of labor, capital, and management can be expected.

More efficient cropping patterns can be used when the project is installed.

The reduction in the flood and drainage hazards will permit farmers to more effectively use improve management and technology. Protection afforded can result in increased yields of crops that will give higher net returns per acre to the individual farmer.

Average annual benefits from improved drainage will amount to about $774,900; flood prevention benefits will be about $852,400 and more intensive land use benefits will be approximately $172,200. The total of these benefits, $1,799,500, represents an average annual increase in net farm income to farmers in the watershed.

Benefits will include increased income resulting in improved living conditions, better farming equipment, higher education, and better health care.

Adverse

It is estimated that an average of 5,800 tons of sediment per year for four years will be generated by construction.

About 421 acres of forest land, 1,281 acres of wooded channel banks, and 1,755 acres of open land will be disturbed by construction.

An additional 19 acres of forest land, 65 acres of wooded channel banks and 23 acres of openland will be disturbed by maintenance of adequate project channels.

Project channel work will reduce the duration of flooding on about 266 acres of Type 1 Wetlands. This acreage is comprised of about 47 acres to be occupied by project channel rights-of-way and 219 acres outside of rights-of-way limits.

About 1,500 acres of bottom land hardwood clearing, including about 120 acres of Type 1 Wetlands, is projected to be induced by the project. These changes will result in reductions of both game and nongame habitat and monetary loss of forest product.

Monetary losses in forest products will result from disturbance of 421 acres of forest land for rights-of-way needs.

Losses of wildlife values will result from disturbance of 421 acres of forest land and 1,281 acres of wooded channel banks for rights-of-way needs.

Channel work on about 69 miles or 94 acres of channels having water will temporarily increse the turbidity of the water which will indirectly decrease the dissolved oxygen available and increase temperature (due to the removal of overhanging trees).

The pH will temporarily decrease and organic nutrients and available free carbon dioxide will temporarily increase as a result of the organic degradation of debris introduced by the clearing operations on portions of Channels M-1, L-1C, M-6, L-6M, L-7C, L-7C8, and M-16.

The quality of water will be temporarily reduced. The water will be stressful to some fishes, phytoplankton, zooplankton, and benthos, especially those which are filter-feeders. All benthos, especially sessile and sedentary organisms, will be temporarily destroyed and eliminated from the excavated areas. In addition, the removal of snags and other debris will reduce the amount of habitat available to fishes in perennial, intermittent, or ponded channels where clearing operations will be undertaken.

Short-term adverse impacts from the operation of equipment will be noise, dust, exhaust emissions, the displacement of resident wildlife populations along the rights-of-ways, and the removal of existing vegetation.

Land form changes in the watershed will be minimal because there will be only increases in depth and width of selected channels and the addition of new channels.

An additional nine acres of forest Type 7 Wetland, 27 acres of forest Type 6 Wetlands, and four acres of wooded channel banks

Type 6 Wetlands will be affected within the project channel rights-of-way; however, measures will be implemented to mitigate their loss through the creation of 80 acres of wetlands elsewhere in the watershed.

Diverting the full flow of Bull Bayou from Bear Lake will cause an adverse impact on the Tensas River, similar but much less severe to that previously experienced by Bear Lake.

Alligator Brake is an area characterized by Types 5, 6, and 7 Wetlands which provide excellent waterfowl habitat. Channel work upstream will temporarily reduce the water quality due to an increase in turbidity which will impact the primary productivity and, therefore, reduce the value of the area as a fishery and for waterfowl use. However, once the water has stabilized, maintaining the water level in the area will imsure that fish and wildlife values will return to their former state or condition.

The Texas Lake Complex is an attractive waterfowl area. Excavation activities in the complex will temporarily reduce the water quality and productivity of the area. Once the area stabilizes and structures are installed to maintain the water level, the quality of the fishery and the waterfowl habitat will be improved.

Willow Lake, Lake One, Eagle Lake, and Lake Despair are all in areas characterized by Type 5 Wetlands. Excavation activities upstream of these lakes will temporarily reduce the water quality primarily in Willow Lake, Eagle Lake, and Lake Despair. There will be a lesser impact on the water quality in Lake One, which receives water from Willow Lake and Eagle Lake. Temporarily decreased water quality will temporarily decrease the productivity of the area for fish and wildlife.

Temporary excavation upstream from Brushy Bayou, which passes through the City of Tallulah, will temporarily reduce the water quality. However, there will be little change in the fishery of this bayou.

VI. Alternatives Considered

1. Land Treatment Only

2. Original Plan (Channel Work and Land Treatment)

3. Channel Work, Land Treatment, and Restrictive Easements on 18,300 Acres of Bottomland Hardwoods

4. No Project Action

VII. **Written Comments Were Requested on the Draft Environmental Impact Statement from the Following Agencies, Groups, and Individuals.**

Department of the Army
Department of the Interior*
Department of Commerce
Department of Health, Education, and Welfare*
Department of Transportation*
Office of Equal Opportunity
Environmental Protection Agency*
Federal Power Commission
State of Louisiana, Department of Urban and Community Affairs*
State Soil and Water Conservation Committee*
State of Louisiana, Office of Science, Technology, and
    Environmental Policy*
Natural Resources Defense Council
Friends of the Earth
Environmental Defense Fund
National Wildlife Federation
National Audubon Society
Environmental Impact Assessment Project
Division of Public Health
Louisiana Department of Transportation and Development,
    Office of Highway
U.S. Army Corps of Engineers
Bureau of Public Works
Agricultural Stabilization and Conservation Service
State Parks and Recreation Commission
Bureau of Outdoor Recreation
Wildlife Management Institute
Louisiana Wildlife Federation
Sierra Club, Delta Chapter
Louisiana Forestry Association
Regional Environmental Control
Louisiana Department of Transportation and Development,
    Office of Public Works
Louisiana Stream Control Commission
Department of Geography and Anthropology
State of Louisiana, Department of Natural Resources,
    Office of Forestry*
State ASCS Committee
Clifford M. Danby
Daily World
Marine Environmental Researchers
Coastal Resources Law
National Marine Fisheries Service
Louisiana Farm Bureau
Department of Agriculture
Department of Conservation
Louisiana Geological Survey

Joint Legislative Committee on Environmental Quality*
Bureau of Environmental Health, Water, and Air Quality
Office of State Planning*
U.S. Geological Survey
The Izaak Walton League of America
Center for Agricultural Science and Rural Development
Louisiana Cooperative Extension Service
State of Louisiana, Department of Culture, Recreation, and Tourism*
Orleans Audubon Society
Louisiana Department of Wildlife and Fisheries*
Farmers Home Administration
U.S. Fish and Wildlife Service

*Denotes those who responded.

VIII. Draft Statement Transmitted to EPA on February 6, 1978.

USDA SOIL CONSERVATION SERVICE

FINAL ENVIRONMENTAL IMPACT STATEMENT[1/]

for

Walnut-Roundaway Watershed

Madison and East Carroll Parishes, Louisiana

Installation of this project constitutes an administrative action. Federal assistance will be provided under the authority of Public Law 83-566, 83d Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

Madison Parish Police Jury
East Carroll Parish Police Jury
Madison Soil and Water Conservation District
East Carroll Soil and Water Conservation District

PROJECT PURPOSES AND GOALS

The purposes of this project are watershed protection, flood prevention, and agricultural water management. The project goals are to:

1. Provide needed land treatment measures which reduce erosion and increase the efficiency of and insure the maximum benefits from the planned project.

2. Provide a two- to three-year level of flood protection and drainage for cropland and pastureland.

3. Install erosion control structures to reduce erosion and to protect and maintain channels to be worked.

4. Minimize damages to fish and wildlife resources from installation of the structural measures. This will be accomplished by the installation of appurtenant structures such as weirs, dams, grade stabilization structures, and water control structures in existing channels as necessary.

[1/] All information and data, unless otherwise noted, were collected by the Soil Conservation Service, USDA.

PLANNED PROJECT

Foreword

The Walnut-Roundaway Watershed Work Plan was approved for operations by Congress on July 24, 1969. A supplemental Watershed Work Plan Agreement was executed on December 16, 1971 to make provisions for administering the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 91st Congress, 84 Stat. 1894). Since the work plan was approved for operations, the East Carroll-Madison Soil and Water Conservation District was divided to form the East Carroll Soil and Water Conservation District and the Madison Soil and Water Conservation District. The East Carroll Parish Police Jury has also been added as a sponsor. Also, the Watershed Work Plan was restudied to determine changes needed to provide a plan more compatible with the present land use and one that would minimize adverse effects on the environment. Since this watershed was planned, the policy of the Soil Conservation Service has changed, particularly in relation to wetlands. Previously, Types 3, 4, and 5 Wetlands could not be converted to other land use as a purpose of a Public Law 83-566 Project. New policy provides that the Soil Conservation Service will not provide technical and financial assistance to drain or otherwise alter Wetland Types 3 through 20 for the purpose of converting them to other land uses. The restudy of the Walnut-Roundaway Watershed resulted in the elimination of one mile of previously planned project channels in Types 1 and 6 Wetlands and work on an additional three miles of project channel segments in Types 1, 5, 6 and 7 Wetland and 11 miles through bottomland hardwoods were also eliminated. Nineteen miles of project channels that traverse Types 1, 5, 6 and 7 Wetland are of adequate capacity and will not require any work or maintenances for the life of the project. Adequate drainage and flood prevention for existing cropland and pastureland will be provided in keeping with the project objectives. Design features such as low level weirs, earthfill dams, water control structures (pipe drops), and grade stabilization structures are planned to be installed in channels to prevent drainage of Types 5, 6, and 7 Wetlands, reduce the amount of sediment being delivered downstream, and provide for stable channels. The Walnut-Roundaway Watershed Work Plan is being supplemented to reflect all modifications.

Land Treatment

At the time of planning, 80 landusers were to become cooperators with the East Carroll-Madison Soil and Water Conservation District. About 120 conservation farm plans were to be prepared by the cooperators with technical assistance provided by the Soil Conservation Service through the Soil and Water Conservation Districts; and 80 of the plans that were in use would be revised. Soil surveys were to be made on 190,000 acres and the needed conservation measures would be installed to assure than 60,000 acres of cropland and 8,750 acres of pastureland would receive adequate treatment.

Because of shifts in land use the land treatment program has been revised to provide for the adequate treatment of 127,000 acres. The following table presents the land use changes in the watershed. Also, an additional 20 landusers are to become cooperators, 23 additional plans are to be prepared, and 30 old plans revised. Soil surveys on the entire watershed are complete.

Land Use Changes in the Walnut-Roundaway Watershed
(Acres)

Land Use	1968	1976
Cropland	130,000	154,700
Pastureland	5,000	3,600
Forest land	78,900	52,100
Other	13,800	17,300
Total	227,700	227,700

Although the land treatment program is installed voluntarily by the individual landusers, experience in other P.L.-566 projects in Louisiana indicate that these measures do get installed. Of the thirteen watersheds that have been completed, SCS records show that 100 percent of the planned land treatment measures have been installed.

Lands to be Adequately Treated
(Acres)

	Total	Accomplished	Remaining To Be Accomplished
Cropland	103,100	19,700	83,400
Pastureland	2,300	1,400	900
Wildlife	21,600	900	20,700
Total	127,000	22,000	105,000

Since 1974, approximately 22,000 acres have received adequate treatment. The preceding table presents the acres according to land use that were to be adequately treated, what has been accomplished, and the acres of land remaining to receive adequate land treatment. Once adequate outlets are available, the necessary conservation measures will be installed on 83,400 acres of cropland and 900 acres of pastureland for adequate treatment. In addition, 18,600 acres of bottomland hardwoods will be retained, as they exist, by individual landusers as part of their conservation plan for wildlife habitat. Plots or strips 1 to 5 acres in size, totaling 2,000 acres of openland in forested areas, will be planted for wildlife food. The table on page 13 lists and describes the functions of the anticipated land treatment measures that are required to adequately treat the land in the watershed. However, these measures do not preclude the use of other practices that may be needed.

Structural Measures

Planned structural measures consist of approximately 248 miles of channel work for flood prevention and drainage, together with appurtenant measures for channel protection and maintenance access; and five weirs, six dams in existing channels or streams, two grade stabilization structures, and two water control structures to maintain fish and wildlife habitat. Weir No. 2 (Figure 5, Appendix F) will be equipped with removable flashboards (stop logs) for management of water levels in the Texas Lake area. Minimum elevation of the weir will be 73.5 feet mean sea level (msl). The crest or maximum elevation with the stop log(s) in place will be 75.0 feet msl. Current water levels are usually about 75.0 feet msl in this wetland complex during late fall to early spring. The stop log(s) will be installed in the weir between September 15 and October 15 of each year. Water will be held at this elevation (75.0 ft. msl) until about April 1. Between April 1 and June 1, the stop log(s) will be removed and the water level lowered to 73.5 feet msl. During summer periods, water levels may get below this level due to evaporation, low rainfall, etc. However, this occasional additional lowering of the water level would be beneficial to waterfowl because more grasses and forbs will be produced on the exposed area. This schedule of water level control will be repeated each year for the life of the project, which is 50 years.

During low water periods, the area of the Texas Lake wetland complex covered by water will be reduced by about 30 to 40 percent which will allow for growth of natural wildlife food and cover plants, especially those used by waterfowl. Also, during those low water periods, food producing plants beneficial to wildlife could be planted in the area to improve its value to wildlife if the landowners choose. Although such plantings will be encouraged, they will not be required as part of the management.

This schedule of water fluctuation will nearly simulate natural conditions of the area. This will insure a wide variety of food and cover producing plants which are highly productive and available. Therefore, this management plan will provide more benefits to a greater variety of wildlife for a longer period than would be possible without such a plan. Water Control Structure No. 1 (Figure 8, Appendix F) will be equipped with removable flashboards in order to continue managing water levels in Roundaway Bayou between Channels M-6 and L-7CC. Water Control Structure No. 2 (Figure 9, Appendix F) will be modified by enlarging the entrance section and lowering the crest elevation to 71.7 feet mean sea level. The remainder of this structure will not be modified and will continue to function as it now does. New channels or sections of channels will be constructed to more effectively utilize existing land use patterns and drainage systems. The project map (Appendix C) shows the approximate location of the channels to be worked. Minor location adjustments will be made during the operation stage to fit local conditions. They will provide adequate outlets for onfarm drainage systems and will have enough capacity to remove the runoff of a two- to three-year storm.

Spoil from the channels will be shaped in forested areas and spread in open areas. Vegetation will be established on disturbed areas. These vegetated areas will serve as buffer strips along the project channels.

Short recesses for the purpose of sediment interception and erosion control will be excavated as needed in laterals at their junctions with larger channels. Pipe drops will be installed in side drains as needed for grade stabilization and erosion control.

Travel ways will be maintained during construction to allow future maintenance of the channels. Culverts or bridges will be placed in side drains as needed to allow continuity of maintenance access facilities. Easements on these access routes will be obtained prior to construction by the sponsoring local organization. The exact location of the pipe drops and maintenance access routes will be made in the operations stage. Existing road systems, field roads, turnrows, and trails will be used for access wherever possible. Removal, relocation, or reconstruction of some existing facilities such as bridges, culverts, powerlines, pipelines, and fences will be necessary to insure proper functioning of planned structural measures. These include, but are not limited to replacing, altering, or changing three bridges and 15 culverts on State and Federal highways, 34 bridges and 110 culverts on parish and private roads, 37 utility lines, and 75 fences at about 105 locations. This work will be done concurrently with channel work. The specific locations of existing facilities to be altered are shown on the designs and cross sections in the working files. Replacement of any state and Federal highway bridge or culvert will be coordinated with the Louisiana Department of Transportation and Development, Office of Highways, early in the design phase, prior to construction. Designs will be in accordance with current standards for traffic and type of highway. Alteration of pipelines and utility lines are made by the owner of the utility under the closest supervision possible with stringent safety precautions taken. These modifications are included under land, easement, and right-of-way costs.

The table on the page 14 gives a summation by lengths of the type and flow characteristics of the project channels. The

Land Treatment Measures and Functions

LAND TREATMENT MEASURES	FUNCTIONS
Chiseling & Subsoiling	Loosening the soil without inverting & with a minimum of mixing of the surface soil, to shatter restrictive layers below normal plow depth that inhibit water movement or root development.
Conservation Cropping System	Rotating crops in order to control weeds, maintain or improve soil tilth & fertility, & reduce erosion.
Crop Residue Management	Managing plant residues to protect cultivated fields during critical erosion periods to prevent erosion.
Minimum Tillage	Limiting the number of cultural operations to those that are properly timed & essential to produce crops, prevent soil damage &, at the same time, reduce the formation of the tillage pans & improve soil aeration, tilth & reduce erosion.
Land Smoothing	Removing irregularities on the land surface to improve surface drainage, to obtain more uniformity in planting & cultivating, & to improve equipment operation efficiency.
Pasture & Hayland Management	Properly using or treating pastureland & hayland to provide maximum livestock forage & to control erosion.
Pasture & Hayland Planting	Establishing & reestablishing long-term stands of adapted species perennial, biennial, or reseeding forage plants for livestock forage & for controlling erosion.
Wildlife Wetland Habitat Management	Retaining, creating, or managing wetland habitat for wildlife to provide food & cover to improve wildlife production.
Wildlife Upland Habitat Management	Retaining, creating, or managing wildlife habitat other than wetland to provide maximum food & cover to improve wildlife production.
Drainage Mains or Laterals	Constructing outlet ditches to a designed size & grade in order to allow field ditches to function.
Drainage Field Ditches	Constructing open drainage ditches for collecting & removing excess water within a field.
Drainage Land Grading	Reshaping the surface of the land needing drainage by grading to planned slopes to improve drainage, providing for more effective utilization of rainfall and improving equipment operation and efficiency.
Structures for Water Control (Pipe Drops)	Using structures where the force of flowing water is sufficient to cause erosion. These structures provide a means of lowering the water from a higher elevation to a lower one in a short distance without causing erosion damage.

Channel Classification and Flow Characteristics
for Adequate Channels and Channels Requiring Work
in the Walnut-Roundaway Watershed

TYPE AND FLOW CHARACTERISTICS OF CHANNELS	ADEQUATE CHANNELS LENGTH (MILES)	ADEQUATE CHANNELS EXISTING (ACRES)	ADEQUATE CHANNELS PLANNED (ACRES)	CHANNELS REQUIRING WORK LENGTH (MILES)	CHANNELS REQUIRING WORK PORTION REQUIRING WORK (MILES)
Man-Made or Previously Modified (M)	36	475	567	250	214
Unmodified, well defined Natural Stream (N)	4	32	47	16	12
Nonexisting or No-Defined Channel (O)	0	0	0	22	22
Totals:	40	507	614	288	248
Ephemeral (E)	15	98	140	186	171
Intermittent (I)	10	127	152	34	24
Intermittent-Ponded (IS)	6	97	110	40	34
Perennial-Ponded (PrS)	7	163	185	19	12
Ephemeral-Ponded (S)	2	22	27	9	7
Totals:	40	507	614	288	248

NOTES: E - Ephemeral: flow only during periods of surface runoff, otherwise dry.
I - Intermittent: continuous flow during some seasons of the year but little or no flow during other seasons.
S - Ponded Water: no noticeable flow, caused by lack of outlet, high ground water table or elevation of the channel bottom in relation to mean sea level.
Pr - Perennial: flow at all times except during extreme drought.

Forty miles of channels are adequate and require no work, however, they will need to be maintained and will require additional rights of way when they are maintained. There are thirty-two miles of project channels that are adequate and require no operation and maintenance for the life of the project.

Length and Area Occupied by Project Channels' Rights-of-Ways for the Walnut-Roundaway Watershed

CHANNEL NUMBER	EXCAVATION			CLEAR AND SHAPE			CLEAR ONLY			ADEQUATE		
		RIGHT-OF-WAY			RIGHT-OF-WAY			RIGHT-OF-WAY			RIGHT-OF-WAY	
	LENGTH (FEET)	EXISTING (ACRES)	PLANNED (ACRES)	LENGTH (FEET)	EXISTING (ACRES)	PLANNED (ACRES)	LENGTH (FEET)	EXISTING (ACRES)	PLANNED (ACRES)	LENGTH (FFET)	EXISTING (ACRES)	PLANNED (ACRES)
M-1	62,675	134.85	234.87	15,825	39.29	39.29						
L-1A	2,300	4.87	7.50	675	1.45	1.45	4,000	9.63	9.63	3,025	6.58	6.58
L-1A1	4,600	0.00	6.86									
L-1A2	1,000	0.00	1.49									
L-1B	30,219	54.31	74.39									
L-1B1	7,400	1.55	11.04									
L-1B2	7,100	3.08	13.20									
L-1B2A	5,100	1.17	8.12									
L-1B3	4,150	2.11	8.40									
L-1B4	3,200	0.00	4.76									
L-1B5	10,800	12.40	19.84									
L-1B6	4,600	0.00	6.86									
L-1C	72,600	186.64	318.70	5,600	16.29	16.29				5,300	15.20	15.20
L-1C1	14,700	6.75	30.37									
L-1C3	9,000	5.79	17.25									
L-1C3A	18,600	6.40	27.75									
L-1C4	4,400	1.51	6.56									
L-1C5	6,500	4.30	9.38									
L-1C6	10,100	2.83	19.39									
L-1D	8,800	11.11	14.14									
L-1E	11,500	14.49	18.45									
L-1F	8,800	4.43	13.50									
L-1G	5,100	2.34	7.02									
L-1H	4,700	2.15	7.53									
M-6	65,880	161.52	270.46				21,500	59.22	93.78	17,100	80.17	96.69
M-6 Alt.	26,800	123.04	261.41									
M-6A	14,300	29.42	45.21									
L-6A	14,200	22.60	38.86									
L-6B	8,665	3.15	17.86									
L-6D	4,200	1.92	8.65	3,300	6.92	10.32						
L-6D1	9,200	4.76	19.17									
L-6D2	11,200	18.47	22.12									
L-6E				1,000	1.94	1.94				770	0.44	1.23
L-6E1	3,000	1.03	4.46									
L-6E2	6,800	9.36	17.16									
L-6F	2,400	0.15	2.99									
L-6G							4,400	3.03	7.57			
L-6H	3,500	0.00	5.18									
L-6I	9,200	12.26	22.08							4,700	9.93	12.08
L-6I1	8,800	3.12	18.15									

CHANNEL NUMBER	EXCAVATION LENGTH (FEET)	EXCAVATION RIGHT-OF-WAY EXISTING (ACRES)	EXCAVATION RIGHT-OF-WAY PLANNED (ACRES)	CLEAR AND SHAPE LENGTH (FEET)	CLEAR AND SHAPE RIGHT-OF-WAY EXISTING (ACRES)	CLEAR AND SHAPE RIGHT-OF-WAY PLANNED (ACRES)	CLEAR ONLY LENGTH (FEET)	CLEAR ONLY RIGHT-OF-WAY EXISTING (ACRES)	CLEAR ONLY RIGHT-OF-WAY PLANNED (ACRES)	ADEQUATE LENGTH (FEET)	ADEQUATE RIGHT-OF-WAY EXISTING (ACRES)	ADEQUATE RIGHT-OF-WAY PLANNED (ACRES)
L-6I2	17,275	7.27	29.71									
L-6I2A	4,200	9.63	14.44									
L-6I3	5,800	2.71	9.29									
L-6L	10,800	7.98	17.60				2,700	4.95	7.41			
L-6M	12,940	23.52	41.65	18,300	24.50	36.98						
L-6M1A	6,900	3.04	10.64									
L-6M1A1	500	0.22	0.78									
L-6M1B	7,600	5.24	12.15									
L-6M1B1	2,600	0.89	3.37									
L-6M2	5,000	4.12	8.07									
L-6M2A	3,600	0.00	6.34									
L-6M3	7,400	9.46	13.31									
L-6M4	4,800	0.20	6.57									
L-6N	14,200	10.55	28.46									
M-7	50,647	103.76	184.49							59,579	22[illegible].97	[illegible]
L-7A1	9,800	3.37	15.73							200	0.44	[illegible]
L-7A2	6,246	3.21	9.58							6,600	9.84	9.84
L-7A2B	6,463	1.57	9.35							200	0.09	0.24
L-7A3	6,059	4.17	12.50							500	0.22	[illegible].61
L-7A3A	1,790	0.41	2.24									
L-7A3B	3,010	0.34	3.10									
L-7B	17,800	22.53	39.18							200	0.29	0.58
L-7C							15,830	20.39	55.95			
L-7C1	11,871	20.42	29.97							264	0.15	0.[illegible]2
L-7C1A	5,323	0.00	7.32									
L-7C2A	1,822	0.36	2.10				600	0.60	0.67			
L-7C2B	1,235	0.00	2.11							1,000	0.57	1.36
L-7C3	9,000	4.13	12.38							1,000	0.34	1.13
L-7C4	12,100	6.08	25.32							900	0.50	1.30
L-7C4A	2,070	0.00	2.84									
L-7C4B	2,052	0.94	2.81									
L-7C5	7,137	3.27	10.63									
L-7C6	9,238	11.97	18.71							6,450	11.79	11.79
L-7C6A	3,843	2.20	7.04									
L-7C6B	2,988	0.68	3.75									
L-7C8	12,364	11.41	31.19				5,208	11.95	11.95	3,472	10.66	10.66
L-7C8C	8,576	2.01	11.04							4,324	5.44	5.44
L-7C8D	1,182	1.74	[illegible]							300	0.17	0.36
L-7C9	1,900	0.65	2.39							1,000	0.45	1.13
L-7C10	5,560	0.79	11.32							3,000	2.75	6.87
L-7C10B	3,443	3.16	7.90									
L-7C11	6,670	9.19	13.77							5,560	2.59	11.36
L-7C11A	4,125	1.89	7.56									
L-7C12	6,351	3.22	12.34				2,370	4.08	6.93	23,972	41.27	[illegible]
L-7C12A	13,000	4.05	20.86									
L-7C12B	5,600	2.57	8.99									
L-7C12C	5,625	2.58	9.03									
L-7C12D	4,292	3.98	8.86									
L-7C12D1	2,858	1.31	4.26									
L-7C13	2,328	0.00	3.75							950	0.87	1.73
L-7C14	12,370	7.16	25.41									

CHANNEL NUMBER	EXCAVATION LENGTH (FEET)	EXCAVATION RIGHT-OF-WAY EXISTING (ACRES)	EXCAVATION RIGHT-OF-WAY PLANNED (ACRES)	CLEAR AND SHAPE LENGTH (FEET)	CLEAR AND SHAPE RIGHT-OF-WAY EXISTING (ACRES)	CLEAR AND SHAPE RIGHT-OF-WAY PLANNED (ACRES)	CLEAR ONLY LENGTH (FEET)	CLEAR ONLY RIGHT-OF-WAY EXISTING (ACRES)	CLEAR ONLY RIGHT-OF-WAY PLANNED (ACRES)	ADEQUATE LENGTH (FEET)	ADEQUATE RIGHT-OF-WAY EXISTING (ACRES)	ADEQUATE RIGHT-OF-WAY PLANNED (ACRES)
L-7C14A	3,362	1.15	5.00									
L-7C14B	7,900	8.34	16.61									
L-7C15										16,500	24.43	37.63
L-7C15A	3,340	3.07	7.67									
L-7C15A1	1,320	1.20	1.82									
L-7C15B	1,142	0.26	1.57									
L-7C15C	1,058	0.97	2.42							5,114	7.04	11.72
L-7C15C1							1,608	2.38	2.38			
L-7C15C2	23,672	22.78	56.00							5,000	5.72	5.72
L-7C15C2B	10,376	3.57	13.09				3,974	2.73	6.37			
L-7C15C2C	7,756	2.67	9.79									
L-7C15C2D	10,200	3.50	14.04									
L-7C15C2E	3,824	1.31	5.25									
L-7C15C2F	3,769	1.29	5.19									
L-7C15C2G	10,510	5.55	15.93									
L-7C15C2G1	1,000	0.22	1.35									
L-7C15C2G2	3,020	0.00	4.14									
L-7C15C2G2A	1,246	1.27	1.56									
L-7C15C2G3	3,019	0.00	4.14									
L-7C15C3	3,600	1.65	4.95									
L-7C16	12,109	13.66	26.28									
L-7C16A	2.615	1.20	3.90									
L-7C17	7,540	10.38	17.30									
L-7C17A	12,635	13.05	21.75									
L-7C17A1	3,100	1.06	4.61									
L-7C17A2	5,348	2.46	7.99									
L-7C18	3,730	4.28	5.56									
L-7C19	5,749	7.23	9.87									
L-7C19A	4,117	2.82	6.20									
L-7C20	3,049	4.87	6.27									
L-7CC	14,664	30.44	60.81							19,984	29.35	35.19
L-7CC1	5,000	5.26	11.85									
L-7CC2	5,600	9.71	12.92							4,725	7.73	7.73
L-7CC2A	4,500	0.20	5.61									
L-7CC3	2,800	0.08	3.82									
L-7D	10,300	14.95	17.67							600	1.02	1.02
L-7D1	6,620	0.00	9.85									
L-7E	4,782	0.00	7.12									
L-7F	3,600	1.08	4.51									
L-7G	2,000	0.91	3.42							600	0.95	0.95
L-7H	5,400	3.09	8.65									
L-7I	5,700	1.96	8.49									
M-8	6,100	4.79	9.47							300	0.24	0.54
M-9	4,080	1.86	6.19							700	0.64	1.20
M-10	5,560	0.92	8.77							300	0.41	0.64
M-11	5,800	4.44	9.19							400	0.40	0.44
M-12	7,860	0.34	10.13				950	1.30	2.27	1,050	1.20	2.02
M-14	11,200	14.21	21.64							800	1.46	1.46
M-15	4,262	2.44	6.83							3,230	3.55	6.12
M-16	43,813	62.91	185.22				6,600	12.49	28.39			
TOTALS	1,196,189	1,463.23	3,117.98	44,700	90.39	106.27	69,940	132.[illegible]	233.40	[illegible]	[illegible]	[illegible]

lengths and areas to be occupied by individual project channel rights-of-ways are shown in the table on pages 15 through 17.

Biologists of the Louisiana Department of Wildlife and Fisheries, the U.S. Fish and Wildlife Service, and the Soil Conservation Service have studied the watershed and have made recommendations to reduce effects on the fish and wildlife resources. The following steps will be taken in the operations stage to insure protection of these natural resources:

1. All disturbed areas, except cropland with spread spoil, will be vegetated with a perennial grass species designed to establish permanent vegetation. Spoil that will not be spread will be vegetated with perennial species immediately after it has been placed and shaped. When it is determined that the spoil will be stacked and then later spread, the stacked spoil will be vegetated with an annual species for temporary protection. After the spoil is spread, perennial vegetation will be established on the spread spoil in all areas other than cropland.

2. Efforts will be made to maintain trees along channels for aesthetic and wildlife purposes and consideration will be given to requirements for construction, operation, and maintenance. Spoil will be placed in a manner that will not kill the trees. Spoil will be spread in open areas unless otherwise requested by the landowner.

3. Wastes and construction debris will be buried, burned, or removed from the construction sites.

4. Noise levels will be monitored by the Soil Conservation Service and standards set by the Occupational Safety and Health Act will be followed.

5. An archaeological survey was conducted by personnel of Northeast Louisiana University along proposed project channels. This survey encompassed all areas that could be affected by installation of project structural measures. Five sites were located that could possibly be affected by project installation. These 5 sites are 16 MA 1, 16 MA 82, 16 MA 132, 16 MA 147, and 16 MA 149. As recommended by the staff archaeologist of the State Historic Preservation Office, no project channel work will be installed within approximately one-half mile of site 16 MA 1. Site 16 MA 82 is located on a ridge that is bisected by an existing channel. This channel requires clearing, mostly willow trees and debris, and removal of silt bars in the low slough areas. No construction activity except the travelling of equipment will take place in the vicinity of this ridge. As a

result of a detail study of sites Site 16 MA-132, 16 MA-147, and 16 MA-149 by archaeological personnel of Northeast Louisiana University, it was determined that they would not be effected by the project. A careful watch for buried cultural remains will be maintained of all areas disturbed by project construction as work proceeds along channels. If prehistoric or historic artifacts or features are encountered, construction will be stopped. The Secretary of the Interior (National Park Service) and Office of the State Historical Preservation Officer will be notified, and will be given an opportunity to evaluate and make recommendations for salvage or mitigation before construction continues. Also, the Advisory Council on Historic Preservation will be afforded an opportunity to comment in accordance with the "Procedures for the Protection of Historic and Cultural Properties".

6. Construction permits are required by the U.S. Army Corps of Engineers (Engineering Regulation No. 1165-2-302) for channel work to be done. These permits, and any others that may become necessary for installation of structural measures, will be obtained by the sponsors prior to the installation of any structural measures.

7. Project channels located in forest land and those having wooded channel banks will be dug primarily from one side. In some locations such as at bridge crossings, utility lines, pipelines, and along property lines, the channel may have to be dug from both sides. In selecting which side to dig from, consideration will be given to providing the most effective shade for the channels containing ponded water. On channels without ponded water, the side with the lowest quality habitat will be worked. Structural measures for flood prevention and drainage, together with those measures necessary to minimize damage to wildlife, are expected to be completed in a five-year period.

8. About 40 acres of Types 6 and 7 Wetlands will be altered to a nonwet condition due to right-of-way clearing and spoil deposition along portions of Channels M-6, L-6M, and L-6M1A. An 80-acre wetland area will be created to mitigate the loss of 40 acres of Type 6 and 7 Wetlands due to the construction of project channels. This area will be located in Madison Parish in the southwestern corner of the watershed about 2 miles northeast of Quimby, La. The area is now composed of about 65 acres of overmature bottomland hardwoods and about 15 acres of open land. It will be a man-made wetland (Types 1 and 2) after the levees, well, and other appurtenances are installed and the management plan implemented. The

sponsors do not plan to provide public access to the planned wetland area inasmuch as the wetland being destroyed is on private land and public access was not provided. Providing public access would be enhancement instead of mitigation and would also increase the installation and operation and maintenance cost to the sponsors. These areas will be seasonally flooded and managed as wetlands. The management plan for this area is as follows: (1) Plant open field with browntop millet or other suitable species so seed crop will mature about three weeks prior to opening of waterfowl season. A soil test is needed to determine fertilizer needs; (2) Annually flood the area between October 1 and November 1 to an average depth of 12 to 15 inches. Maximum water level is 73.0 feet mean sea level; (3) Remove the water from the wetland by April 1; (4) A selective cutting of merchantable sweetgum trees would be beneficial to the oaks and increase their acorn production. Maintain mast-producing hardwoods. This development will be in the first construction contract and cost shared at the same percentage as other structural measures. This area will be managed as wetlands for the life of the project (50 years).

Operation and Maintenance

The Madison and East Carroll Soil and Water Conservation Districts, with technical assistance from the Soil Conservation Service, will assist and encourage landusers to maintain all land treatment measures.

Operation and maintenance of all phases of the completed structural measures will be the responsibility of the Madison and East Carroll Parish Police Juries. Planned channel maintenance includes periodic cleanouts, repair of eroded or washed-out areas, control of aquatic weeds, and repair or replacement of side inlets and other in-channel structures. The channels will be kept clear of excessive vegetation by mowing, hand labor, and use of approved herbicides. Maintenance of structures for water control and grade stabilization structures includes repairing erosion damage, maintaining or replacing vegetation on fills, repairing or replacing worn or broken parts, replacing short-lived parts, and other activities essential to the safety and functioning of the structures. The general aesthetics of the channel and structure sites are an important feature of the maintenance program.

As channel work is being performed, travel ways will be created by placing spoil in a manner to allow maintenance equipment access to the channels as the need arises. Existing public roads, farm roads, turnrows, trails, open areas, and other existing facilities will be used for maintenance equipment to reach the channels. If none are existing, travel ways will be provided. The sponsors have given assurances that there will be access for maintenance of these channels.

Herbicides such as ammonium sulfamate, bromacil, and others registered with the Environmental Protection Agency (EPA) and approved by the U.S. Department of Agriculture (USDA) will be applied in a manner consistent with their labeling. When this program is fully initiated, applicators will be certified under the USDA and EPA pesticide application certification program. Herbicides presently approved will not preclude the use of other EPA registered and USDA approved herbicides developed during the life of the project. Vegetation will be controlled in the summer months when the channels are most likely to have the least flow. Application during these months will also lower the possibility of runoff carrying herbicides into other areas.

Trees left in channel rights-of-way for landscape purposes and the seedlings planted in forested areas will not be destroyed by maintenance methods. An additional 107 acres of rights-of-way for maintenance of adequate project channels will be required. This acreage is comprised of 23 acres of open land, 19 acres of forest land, and 65 acres of wooded channel banks. Two mechanical cleanouts are anticipated during the life of the project.

Provisions will be made for representatives of the Soil Conservation Service, the Louisiana Office of Public Works, and the sponsors to have free access to all portions of the project measures at any reasonable time for the purposes of inspection, repair, and maintenance. The sponsors and representatives of the Soil Conservation Service will make a joint inspection annually, after severe storms, and after the occurrence of any other unusual condition that might adversely affect the structural measures. These joint inspections will continue for three years following installation of the structural measures. Inspections after the third year will be made by the Sponsors. They will prepare an annual report and send a copy to the Soil Conservation Service. Items of inspection will include, but will not be limited to: (1) conditions of vegetative cover and growth, (2) need for removal of sediment bars and debris accumulations, (3) brush control in channels, (4) structures for water control, (5) grade stabilization structures, (6) conditions of wetland development, and (7) general conditions.

The sponsors fully understand their obligation for operation and maintenance and will prepare a plan and execute a specific operation and maintenance agreement with the Soil Conservation Service prior to the execution of the project agreement for the installation of project measures. The operation and maintenance agreement will include specific provisions for retention and disposal of property acquired or improved with Public Law 566 financial assistance. (See an example of this type of agreement, appendix D).

The estimated annual maintenance cost of structural measures is about $221,300. The estimated cost by parish is Madison, $215,100; East Carroll, $8,100.

Project Costs

The total estimated cost of installing structural measures on the 248 miles of channels is $14,553,600; $9,093,275 of which will be borne by Public Law 83-566 and $5,460,325 by the sponsors. Of the amount borne by Public Law 83-566, $6,686,175 is for construction; $624,000, for engineering services; and $1,783,100 project administration. Of the amount borne by the sponsors, $2,050,600 is for construction; $2,964,100, land rights; and $267,500, project administration. Engineering services consist of surveys, investigations, designs, and preparation of plans and specifications. Project administration includes administration of contracts and construction inspection.

The cost of installing the land treatment program is estimated to be $3,867,300. Since the watershed was approved for operations, $1,010,900 has been used to install parts of the program. Of the $2,856,400 remaining, $624,100 is for technical assistance ($411,300 will be borne by Public Law 83-566 funds and $212,800 will be borne by other funds). The remaining $2,232,300 will be the landusers cost for installing the individual land treatment measures.

ENVIRONMENTAL SETTING

Physical Resources

The Walnut-Roundaway Watershed is located in the northeastern portion of Louisiana directly across the Mississippi River from Vicksburg, Mississippi. The watershed consists of 227,700 acres of which approximately 10,000 acres are in East Carroll Parish and 217,700 acres are in Madison Parish. Tallulah, the parish seat of Madison Parish, is in the center of the watershed. The watershed is bounded on the north by a meandering line running in an approximate east-west direction from the Mississippi River west bank to the Tensas River; on the east, southeast and south by the Mississippi River west bank levee; on the west by the Tensas River; and on the southwest by Mill Bayou and Bayou Vidal (appendix B). The watershed is located within the Tensas River subbasin which is a hydrologic unit of the Ouachita-Black River Drainage Basin. The Tensas River, at its mouth, drains an area of 2,517 square miles (Sloss, 1971). This area includes 356 square miles within the watershed. Two large tributaries, Mill Bayou and Alligator Bayou, drain about 80 percent of the watershed.

Within the watershed there are a number of important natural waterways and numerous smaller tributaries to the major stream network. In addition, many manmade channels have been constructed for the purposes of watershed protection, flood prevention and agricultural water management. For the purposes of irrigation or recreation, several lakes and ponds have also been constructed or altered. Open waters and wetlands of the watershed have been characterized into five types. Their acreages are given in the table on the following page.

The drainage system of the watershed generally flows southerly over an area characterized by flat topography. Development of diversion channels and canals has modified the normal flow regime. The main outlet is the Tensas River. The major tributaries are Bayou Mothiglam, Alligator Bayou, Mill Bayou, and Bayou Vidal.

Throughout the watershed there are adequate quantitites of good ground water. The total pumpage for the two-parish area in 1975 was about 30 million gallons per day (MGD). Pumpage has increased as a result of increased use of public supply and rice irrigation. Use of surface water increased in Madison Parish for rice irrigation and in East Carroll Parish for industrial use and rice irrigation (see table on page 25).

Water for public supply is drawn from the major aquifer (Mississippi River Alluvial Aquifer) for both Madison and East Carroll Parishes. As of 1975, no potable water was being obtained from surface sources.

Ground water pumpage for industrial use grew significantly between 1965 and 1970, but it decreased between 1970 and 1975. East Carroll Parish began using surface water for industrial use in the last period of record.

Wetlands of the Walnut-Roundaway Watershed

Wetland Type[1/]	Acreage	Water Depth[1/]
#1 - Seasonally Flooded Basins or Flats	2,594	Few inches in upland, few feet along rivers
#2 - Inland Fresh Meadows	129	Few inches during wet periods
#5 - Inland Open Fresh Water	609	Up to ten feet, marshy border may be present
#6 - Shrub Swamps	1,252	Up to six inches
#7 - Wooded Swamps	774	Up to one foot
Total	5,358	

[1/]Modified from U.S.D.I. Circular 39 (Shaw and Fredine, 1971).

Currently, there are no thermoelectric power plants in the watershed.

Except locally where cisterns are used, ground water is the only source of rural supplies. Rural-domestic supply pumpage for the two-parish area has been consistent for the 1965-1975 period. Rural livestock pumpage is from both ground and surface water and has diminished considerably over this same ten-year period (Bieber and Forbes, 1966; Dial, 1970; Cardwell, pers. comm.).

Pumpage of ground water for rice irrigation has increased significantly in Madison and East Carroll Parishes, since 1965, and pumpage of surface water has increased since 1970. Rice irrigation pumpage is affected from year to year by weather conditions. Ground water pumpage for the irrigation of other crops has increased since 1965 in Madison Parish and has decreased in East Carroll Parish. Between 1970 and 1975, no surface water was used for other crop irrigation (Bieber and Forbes, 1966; Dial, 1970; Cardwell, pers. comm.).

Average Daily Rates for Ground and Surface Water Used or Consumed in Madison and East Carroll Parishes for 1965, 1970 and 1975 in Million Gallons Per Day (MGD)

CATEGORY	MADISON PARISH 1965	MADISON PARISH 1970	MADISON PARISH 1975[2]	EAST CARROLL PARISH 1965	EAST CARROLL PARISH 1970	EAST CARROLL PARISH 1975[2]
Public Supplies[1]						
Ground	0.59	0.74	1.00[3]	0.33	0.40	1.10[3]
Industrial						
Ground	1.25	4.00	0.03	0.08	0.66	0.02
Surface	0.00	0.00	0.00	0.00	0.00	0.30
Thermoelectric						
Ground & Surface	0.00	0.00	0.00	0.00	0.00	0.00
Rural (Domestic)[1]						
Ground	0.20	0.20	[3]	0.29	0.30	[3]
Rural (Livestock)						
Ground	0.28	0.13	0.08	0.29	0.07	0.03
Surface	0.05	0.02	0.01	0.03	0.01	0.00
Irrigation (Rice)						
Ground	0.30	5.31	6.60	6.70	12.50	12.97
Surface	0.20	0.00	2.20	3.12	2.19	2.90
Irrigation (Other)						
Ground	0.00	0.73	1.20	1.00	1.18	0.13
Surface	0.08	1.20	0.00	0.00	0.00	0.00
TOTALS						
GROUND	2.62	11.11	8.91	8.69	15.11	14.25
SURFACE	0.33	1.22	2.21	3.15	2.20	3.20
TOTAL	2.95	12.33	11.12	11.84	17.31	17.45

Source: Bieber and Forbes, 1966; Dial, 1970; Cardwell, pers. comm.

1 - No surface water in these categories.
2 - Preliminary, subject to revision.
3 - Public Supplies category includes Rural (Domestic) Category for 1975.

NOTES:

Water Used - water withdrawn from a source and counted each time it is withdrawn even though it may be immediately returned. Although water used is confined to a season for many categories, the rate is averaged over a 12-month period.

Water Consumed - water used and not immediately returned to a source and which cannot be directly reused; temporarily removed by evaporation, transpiration, incorporation into a product or ingestion by humans or animals.

Public Supply - water pumped by privately-owned and municipally-owned systems and waterworks districts. It includes residential and commercial and unbilled water used in firefighting and line flushing. Leakage losses in the distribution lines are also included in the total pumpage.

Industrial - water of self-supplied businesses and industries, self-supplied schools, hospitals and other public institutions.

Thermoelectric - water used for condensation of steam by power plants.

Rural (Domestic) - water not supplied by a public water supply.

Rural (Livestock) - water consumed by livestock and computed as the product of head count and daily water requirements of each type of animal.

Ground Water - water obtained from wells.

Surface Water - water obtained from streams, lakes and ponds.

Winters are relatively mild in the watershed, with January temperatures averaging 47°F (U.S. Department of Commerce, 1973). The daily range of temperatures often exceeds 20°F in the watershed area (Mississippi River Commission, 1974). These averages are somewhat misleading, because in January the watershed is covered for considerable periods with warm, humid, maritime tropical air flowing northward from the Gulf of Mexico and the tropical Atlantic. During shorter periods of time, the watershed is dominated by very cold, dry continental arctic air. These distinct air mass contrasts make winter a season of strong temperature variability. Therefore, the typical winter day is difficult to characterize, because it is not simply described by the average temperatures for the month. Summers in the watershed are extremely hot. Average July temperatures are 81°F with a daily range of summer temperatures often exceeding 15°F. Absolute and relative humidites are also high. Combining heat and humidity result in periods of oppressive, sultry weather with little cooling power (Mississippi River Commission, 1974). The average length of the growing season is 250 days. Extreme temperatures recorded at the Winnsboro and Lake Providence stations over a period from 1951 through 1973 indicate temperature extremes at Tallulah of 109.5°F and -3°F. The average daily maximum and minimum readings based on the same period of record are 76.5°F and 53.7°F, respectively (U.S. Department of Commerce, 1975).

Precipitation is approximately 51 inches annually and is well-distributed (U.S. Department of Commerce, 1973). During winter and spring, polar masses push into the area accompanied by widespread and persistent cloudiness and general rainfall, along with some thunderstorm activity within the frontal zone. During the cooler months, rainfall is more frequent and intense in the watershed. Autumn brings the least precipitation to the watershed. It is during this period that atmospheric flow patterns are going through a transitional state. Atmospheric moisture availability and the occurrence of precipitation-inducing mechanisms are both at their annual minima (Mississippi River Commission, 1974). Rainfall frequency values are given in the table on the following page for the centroid of the watershed near Tallulah, Louisiana. Snow and sleet within the watershed are minor climatic phenomena. The mean annual snowfall for the period of record through 1960 was about 1.5 inches near the centroid of the watershed near Tallulah, Louisiana (Mississippi River Commission, 1974).

The average annual wind speed for the watershed area is 8.2 miles per hour. This average was based on 27 years of record from the Vicksburg, Mississippi station which was closed in 1966 (U.S. Department of Commerce, 1966). The prevailing wind direction for the months of May through August is from the south and for the months of September through February, from the north (U.S. Department of Commerce, 1974).

Rainfall Frequency Near Centroid of the Walnut-Roundaway Watershed
Near Tallulah, Louisiana
Rainfall (Inches)

FREQUENCY	30-MINUTES	1-HOUR	3-HOURS	6-HOURS	12-HOURS	24-HOURS	48-HOURS
1 Year	1.35	1.73	2.30	2.78	3.37	3.87	—
2 Years	1.55	1.95	2.75	3.28	3.96	4.52	5.28
5 Years	1.93	2.50	3.42	4.15	4.97	5.75	6.75
10 Years	2.17	2.77	3.89	4.75	5.69	6.75	7.75
25 Years	2.50	3.15	4.39	5.50	6.61	7.83	9.00
50 Years	2.72	3.50	4.92	6.00	7.50	8.63	10.75
100 Years	3.01	3.84	5.37	6.75	8.00	9.50	11.65

Source: U.S. Department of Commerce, 1963 and 1964.

Evaporation from various water bodies is highly influenced by temperature, humidity, and wind. The mean annual total pan evaporation for the watershed is 60 inches (U.S. Department of Commerce, 1959). Research has shown that pan evaporation exceeds natural evaporation of larger water bodies. Coefficients have been developed relating pan to lake evaporation and in the watershed this factor is about 0.75 (Mississippi River Commission, 1974). Within the watershed, the mean annual total lake evaporation is about 45 inches (U.S. Department of Commerce, 1959). Approximately 69 percent of the total annual evaporation occurs during the warmer half of the year, May through October (U.S. Department of Commerce, 1959).

The concept of potential evapotranspiration has had a major influence on attempts to predict water needs in irrigation, agriculture, and in general hydrologic research (Rosenberg, 1974). The annual potential evapotranspiration for the watershed is 86.76 inches, ranging from 1.38 inches in January to 14.15 inches in July. These values were calculated using mean monthly temperatures to obtain the heat index, which was then incorporated into the potential evapotranspiration equation developed by Thornthwaite (1948).

Hazardous weather conditions in the watershed consist primarily of occasional severe windstorms and heavy rainfall. In the vicinity of the watershed, the last outstanding windstorm occurred in February, 1971, when tornadoes occurred from northeast Louisiana to west-central and northwest Mississippi. The result was 113 people dead, 2,003 people injured, and an estimated $19,000,000 lost because of property damage (Mississippi River Commission, 1974). Heavy rainfall damages crops and properties almost every year, but poses only a slight threat to life. Drouths occasionally damage crops, but are less frequent than damaging rainfall. Other weather phenomena that result in damages or injuries and deaths, on rare occasions are hail, lightning, ice storms, snow storms, and extreme temperatures.

Surface water yields within the watershed is influenced by evaporation from open water bodies, evapotranspiration from vegetation, and ground water infiltration. The remainder of the precipitation is converted to runoff and streamflow. Mean annual runoff for the watershed is about 15 inches. The maximum estimated runoff per year is about 55 inches, and the minimum is about 1.5 inches (Mississippi River Commission, 1974).

Streamflow measurement stations in the vicinity of the watershed provide a brief hydrologic record. The three flow recording stations are equppped with automatic water-stage recorders and are located as follows: Tensas River at Tendal, Louisiana; Brushy Bayou at Tallulah, Louisiana; and Lower Roundaway Bayou, 1.5 miles south of Tallulah. These stations are read and maintained by the U.S. Geological Survey. Stage readings are at all of the above stations, while discharge readings are only taken at the Tensas River station.

Maximum flows occur in the late winter and early spring during and after the passage of major frontal systems. The table on the following page provides a summary of streamflow observations at the three stations.

A five-year frequency flood of the Tensas River inundates approximately 18,000 acres within the watershed (Gulf South Research Institute, 1974). A major portion of this flooded land is adjacent to the Tensas Bayou in the northwestern corner of the watershed along Bear Lake and Bull Bayou. Flood information is not available for Mill Bayou or Bayou Vidal. Extensive localized flooding as a result of direct rainfall occurs within the watershed where channels are inadequate.

The Louisiana Stream Control Commission (1973) has established water quality criteria for streams and some lakes in the state (see Appendix H for State and Federal criteria and recommendations). The general criteria state that all waters shall be capable of supporting desirable, diversified, aquatic life. The specific numerical criteria apply to other specifically classified by the Commission, as well as their navigable tributaries, distributaries, and auxiliary streams and waterbodies. Therefore, specific criteria for the Tensas River apply to the larger streams within this watershed. The water quality of the streams in the watershed, as illustrated in the tables on pages 31 through 35, was generally within the limits set by the Louisiana Stream Control Commission. However, water quality at the Roundaway Bayou-Vidal Cutoff was often outside of the acceptable ranges for various parameters, as shown in the table on page 35. Although pH was recorded as high as 9.0 units, this is common for Louisiana waters and it presents no problems or stressful conditions for aquatic life. However, low dissolved oxygen concentrations, especially 3 mg/l or below, are stressful and often result in fish kills (see Appendix G, page 4). Rain and dissolution in the drainage area are the most common sources of sulfate in natural waters. The importance of sulfate is discussed in Appendix G, page 8. Between February, 1975, and February, 1976, the water quality at five stations in the watershed was monitored and the data are presented in the tables on pages 31 through 35.

The Mississippi River Alluvial Aquifer yields the only fresh ground water in the watershed (Rollo, 1960). Much of the following is taken from the studies of Poole (1961) and Whitfield (1975).

The aquifer is a southeastward thickening wedge of deposits ranging in thickness from 20 to 135 feet. The Mississippi River Alluvium lies unconformably on the eroded surface of Tertiary sediments. Relationships between the alluvium and underlying Tertiary sediments have been detailed by Fisk (1944), Saucier (1967), and Fleetwood (1969). The Mississippi River alluvium grades downward from silt and clay at the surface to coarse sand and gravel at the base which is considered to be the Mississippi River Alluvial Aquifer.

Summary of Streamflow Observations
At Selected Stations

STREAM	LOCATION & STATION NO.	PERIOD OF RECORD	MEAN STAGE FEET-MSL	MEAN DISCHARGE CFS	HISTORICAL STREAMFLOWS: STAGE (FEET-MSL) MAXIMUM	STAGE (FEET-MSL) MINIMUM	DISCHARGE (CFS) MAXIMUM	DISCHARGE (CFS) MINIMUM
Tensas River	At Tendal, LA 07369500	Dec. 1935 - Sept. 1976	60.36 (1)	331	74.98 Jun. 12, 1975	55.7 Oct. 4-7, 1936	4,610 Nov. 19, 1948	2.8 Dec. 8, 1954
Brushy Bayou	At Tallulah, LA 07369455	Apr. 1974 - Sept. 1976	72.16 (2)	Not Recorded	74.77 (2) May 15, 1975	69.57 (2) Oct. 20, 1975	Not Recorded	Not Recorded
Lower Roundaway Bayou	1.5 Miles South of Tallulah, LA 07369457	Apr. 1974 Sept. 1976	67.38	Not Recorded	73.62 Jun. 11, 1975	65.43 Oct. 13, 1975	Not Recorded	Not Recorded

Note: (1) October, 1968 through September, 1976.
(2) Regulated.

Source: U.S. Army Corps of Engineers 1967 - 1974; U.S. Geological Survey 1975 and 1976.

Water Quality Data
from the Walnut-Roundaway Watershed

Station #1: Bear Lake

DATE	02/05/75	03/04/75	04/15/75	05/27/75	07/09/75	08/05/75	09/15/75	11/18/75	12/11/75	01/21/76	02/24/76
Color (PCU)	15	40	15	28	15	18	25	18	10	10	15
Hardness (mg/1 $CaCO_3$)	60	74	78	40	54	28	136	138	152	140	98
Nitrogen, Ammonia (mg/1 N)	0.05	0.35	0.35	0.50	0.62	0.48	0.25	0.68	0.53	0.70	0.35
Nitrogen, Nitrate (mg/1 N)	0.80	0.40	0.30	0.43	1.10	0.80	0.20	0.35	0.45	1.00	1.20
Oxygen (mg/1 O_2)	9	8	6	-	5	6	11	7	10	10	8
pH	7.5	7.0	7.0	8.5	6.7	7.5	8.8*	7.5	7.7	8.0	7.8
Phosphate, Ortho (mg/1 PO_4)	0.20	0.90	0.55	0.20	0.17	0.15	0.03	0.22	0.06	0.04	0.12
Sulfate (mg/1 SO_4)	5	2	8	6	15	5	11	15	17	22	15
Suspended Solids (mg/1)	205	310	155	285	420	190	5	40	45	20	135
Temperature ($^{\circ}F$)	64	58	68	98**	88	77	77	-	-	-	-
Turbidity (JTU)	390	490	230	510	650	255	20	90	80	70	245

* exceeds state maximum of 8.5 units
** exceeds state maximum of $90^{\circ}F$

Water Quality Data
from the Walnut-Roundaway Watershed

Station #2: Lake One

DATE	02/05/75	03/04/75	04/15/75	05/27/75	07/09/75	08/05/75	09/15/75	11/18/75	12/11/75	01/21/76	02/24/76
Color (PCU)	15	20	25	40	22	22	20	40	10	15	30
Hardness (mg/1 $CaCO_3$)	62	120	132	78	114	36	216	166	148	182	88
Nitrogen, Ammonia (mg/1 N)	0.30	0.62	0.25	0.60	0.68	0.60	0.98	1.00	0.88	0.58	0.70
Nitrogen, Nitrate (mg/1 N)	0.70	1.00	0.20	0.20	2.30	0.30	0.18	0.25	0.25	0.70	0.40
Oxygen (mg/1 O_2)	9	6	8	-	5	4*	5	6	6	10	8
pH	7.5	7.0	7.0	7.0	7.5	7.3	8.0	7.5	7.7	8.2	7.5
Phosphate, Ortho (mg/1 PO_4)	0.38	0.28	0.22	0.80	0.28	0.45	0.20	0.18	0.17	0.17	0.22
Sulfate (mg/1 SO_4)	8	11	16	5	17	16	15	20	29**	31**	24
Suspended Solids (mg/1)	220	140	160	95	180	310	20	35	100	50	500
Temperature (^{o}F)	57	56	62	83	86	77	77	-	-	-	-
Turbidity (JTU)	390	160	190	210	245	380	42	75	145	95	850

* below state minimum of 5 mg/1
** exceeds state maximum of 27 mg/1

Water Quality Data
from the Walnut-Roundaway Watershed

Station #3: Alligator Bayou

DATE	02/06/75	03/04/75	04/15/75	05/27/75	07/09/75	08/05/75	09/15/75	11/18/75	12/11/75	01/21/76	02/24/76
Color (PCU)	40	45	60	38	38	60	15	40	20	25	45
Hardness (mg/1 $CaCO_3$)	64	72	60	70	66	40	130	118	132	126	106
Nitrogen, Ammonia (mg/1 N)	0.00	0.75	0.50	0.33	0.80	1.05	0.55	0.70	0.80	0.78	0.72
Nitrogen, Nitrate (mg/1 N)	0.90	1.20	0.20	0.30	3.00	0.10	0.25	0.15	0.35	0.70	1.20
Oxygen (mg/1 O_2)	6	9	9	-	5	7	7	9	10	12	9
pH	7.0	7.5	7.5	7.5	7.5	6.7	8.0	7.7	7.8	8.3	7.7
Phosphate, Ortho (mg/1 PO_4)	0.30	0.40	0.32	0.63	0.35	0.48	0.25	0.22	0.25	0.50	0.20
Sulfate (mg/1 SO_4)	10	10	0	0	18	0	13	20	22	27	22
Suspended Solids (mg/1)	190	85	140	122	460	205	95	55	38	35	120
Temperature (^{o}F)	54	48	56	84	84	75	73	-	-	-	-
Turbidity (JTU)	320	150	220	195	570	230	105	105	80	85	210

Water Quality Data
from the Walnut-Roundaway Watershed

Station #4: Spring Bayou

DATE	02/06/75	03/04/75	04/15/75	05/27/75	07/09/75	08/05/75	09/15/75	11/18/75	12/11/75	01/21/76	02/24/76
Color (PCU)	42	10	30	37	40	25	25	40	40	20	40
Hardness (mg/1 $CaCO_3$)	60	66	76	72	80	66	138	90	86	112	84
Nitrogen, Ammonia (mg/1 N)	0.65	0.55	0.35	0.38	0.90	0.80	0.60	0.70	0.60	0.47	0.90
Nitrogen, Nitrate (mg/1 N)	0.80	1.00	0.20	0.10	0.95	0.10	0.85	0.25	0.15	0.80	0.15
Oxygen (mg/1 O_2)	6	7	6	-	4 *	4 *	5	6	7	11	8
pH	7.0	7.0	7.0	7.0	7.0	6.7	7.5	7.0	7.0	7.8	7.5
Phosphate, Ortho (mg/1 PO_4)	0.25	0.28	0.15	0.42	0.23	0.30	0.13	0.25	0.10	0.07	0.20
Sulfate (mg/1 SO_4)	7	0	0	0	8	0	8	10	17	16	8
Suspended Solids (mg/1)	20	50	25	38	5	15	5	8	8	5	60
Temperature (^{o}F)	54	48	5	73	80	75	70	-	-	-	-
Turbidity (JTU)	115	120	110	135	42	55	35	45	60	40	185

* below state minimum of 5 mg/1

Water Quality Data
from the Walnut-Roundaway Watershed

Station #5: Roundaway Bayou-Vidal Cutoff

DATE	02/06/75	03/04/75	04/15/75	05/27/75	07/09/75	08/05/75	09/14/75	11/18/75	12/11/75	01/21/76	02/24/76
Color (PCU)	55	25	30	18	38	25	20	10	5	10	30
Hardness (mg/1 $CaCO_3$)	76	142	76	194	92	108	412	278	210	208	120
Nitrogen, Ammonia (mg/1 N)	0.45	0.55	0.35	0.40	1.25	0.60	0.55	0.95	0.70	0.85	0.70
Nitrogen, Nitrate (mg/1 N)	1.20	0.50	0.20	0.30	6.70	0.15	0.05	0.20	0.10	0.43	0.20
Oxygen (mg/1 O_2)	8	5	6	-	3 *	5	5	2 *	4 *	8	8
pH	7.5	7.0	7.0	7.5	9.0 **	7.3	8.0	7.3	6.8	7.5	7.3
Phosphate, Ortho (mg/1 PO_4)	0.38	0.12	0.15	0.15	0.27	0.31	0.28	0.10	0.03	0.04	0.10
Sulfate (mg/1 SO_4)	13	15	0	25	130***	23	80 ***	8	20	32***	34***
Suspended Solids (mg/1)	105	145	25	35	640	230	20	20	10	8	295
Temperature (^{o}F)	56	50	55	80	81	77	72	-	-	-	-
Turbidity (JTU)	210	190	110	58	820	255	45	58	35	40	435

* below state minimum of 5 mg/1
** exceeds state maximum of 8.5 units
*** exceeds state maximum of 27 mg/1

SETTING

Evaluations of the ground water in the Mississippi River Alluvial Aquifer have been made by Veatch (1906), Poole (1961), Turcan and Meyer (1962) and Krinitzsky and Wire (1964). Both artesian and water table conditions exist in the watershed. However, in certain instances, near large-capacity wells, artesian conditions may prevail during the early part of a pumping period followed by water table conditions with continued pumping. Rainfall is the major source of recharge to the Mississippi River Alluvial Aquifer. The silt and clay are relatively permeable compared to typical clay because of their high content of organic material and because they have not been fully compacted by heavy overburden. In low-lying backswamp areas, where percolation is hampered by the thickness of the clayey soils, the rainwater that is not drained by streams either evaporates or is transpired by plants. Generally, the ground water moves southward normal to streamflow, discharging into major streams hydrologically connected. The Mississippi River forms a hydrologic boundary on the east side of the watershed. Natural discharge occurs by seepage into streams during their low stages (dry seasons). During high stages (wet season), ground water moves short distances into the aquifer from the streams, thus recharging the aquifer. Water levels in the aquifer fluctuate seasonally, declining from early summer to late fall or early winter and rising to seasonal highs in March, April or May and are, generally, less than 30 feet below the land surface. Water levels under the watershed are 70 to 80 feet above sea level (Whitfield, 1975). The magnitude of water level fluctuations diminishes with distance from the major streams.

The thickness, size, and arrangement of the sand and gravel are the principal factors controlling the hydraulic characteristics of the aquifer. Aquifer tests in Madison Parish indicate that transmissivity ranges from 13,000 to 45,000 square feet per day. The hydraulic conductivity ranges from 130 to 530 feet per day. Storage coefficients range from 0.001 to 0.05. Properly constructed, large diameter wells yield as much as 7,000 gallons per minute in Madison Parish near Tallulah, Louisiana. However, the average large-capacity well in the watershed is constructed to yield less than 2,000 gallons per minute. Measured specific capacities range from 35 to 92 gallons per minute per foot of drawdown. Theoretical specific capacities should range from about 45 to 150 gallons per minute per foot (Whitfield, 1975).

The chemical quality of the ground water controls the utilization of the water. Chemical analyses of water from wells penetrating the aquifer in the watershed are presented in the table on page 38.

The watershed lies in the Mississippi Embayment of the Central Gulf Coastal Plain. The embayment is a physiographic, structural, and sratigraphic feature extending from Cairo, Illinois south to Baton Rouge, Louisiana. Generally, Cretaceous and Tertiary sedimentary strata rest unconformably on a Paleozoic basement complex.

SETTING

The watershed is a portion of the Tensas River drainage basin. This drainage basin forms a lowland between the Mississippi River and the eastern escarpment of the Macon Ridge. Physiographic features include occasionally flooded lowlands, backswamps, dissected alluvial uplands and natural levees. The Tensas River drainage area slopes down to the southwest, with average elevations of 80 to 105 feet mean sea level (m.s.l.). Elevations within the watershed average 60 to 85 feet m.s.l. The total relief for the drainage area is about 25 feet; however, the low alluvial divides and meander-belt ridges are generally less than five feet above the level of the plain (Poole, 1961; Krinitzsky and Wire, 1964).

Subsurface stratigraphy for the watershed consists of Tertiary sequences. Tertiary rocks are less indurated and vary from clays and marls to siltstone, sandstone, lignites and glauconitic sands. The last major rise in sea level resulting from the diminishing action of the continental ice sheets, during Recent (Holocene) time, caused deposition of alluvium in the entrenched valleys until the streams reached their present-day poised level. Substratum deposits are composed of clean sand, as well as sands and gravels which become coarser with depth. Occasional cobbles are found at the base of the substratum. In addition, lenses of clay, silty sand, and sandy silt sometimes occur in the substratum. Topstratum deposits found in the Tensas River basin include those of braided streams, meander belts and backswamp deposits (Krinitzsky and Wire, 1964).

Structurally, the watershed is on the north edge of the Gulf Coast geosyncline, the west limb of the Mississippi structural trough and the southeastern flank of the Monroe uplift (Fisk, 1944; Poole, 1961). There are two fault traces, interpreted from physiographic evidence, which intersect in the southern portion of the watershed (Krinitzsky, 1950).

According to the National Oceanic and Atmospheric Administration's Seismic Risk Map, the watershed lies totally with Zone 1, a low risk earthquake zone (Algermissen, 1969).

The watershed is in the Ouachita River Basin within the Lower Mississippi Water Resource Region (U.S. Department of Agriculture, 1970a). It is fairly typical of other flatland watersheds in the region. The topography is level to nearly level with only a small portion having slopes greater than one percent. Most of the area is between the elevation of 65 to 80 feet above mean sea level. The watershed is located wholly within the Southern Mississippi Valley Alluvium Land Resource Area (U.S. Department of Agriculture, 1965). The principal soil associations are Commerce-Bruin, Dundee-Sharkey, Sharkey, and Tensas-Sharkey (U.S. Department of Agriculture, 1976). Refer to the general soil map on page 40 for the location of these associations.

Chemical Analyses of Water from Wells Tapping the Mississippi River Alluvial Aquifer in the Walnut-Roundaway Watershed

Well No.	Location Sec.	T. (N.)	R. (E.)	Date of collection	Screened interval (depth, in feet)	Temperature (°F)	Temperature (°C)	Silica (SiO_2), dissolved	Iron (Fe), dissolved	Manganese (Mn), dissolved	Calcium (Ca), dissolved	Magnesium (Mg), dissolved	Sodium (Na), dissolved	Potassium (K), dissolved	Bicarbonate (HCO_3)	Sulfate (SO_4), dissolved	Chloride (Cl), dissolved	Fluoride (F), dissolved	Nitrate (NO_3), dissolved	Dissolved solids, calculated, sum of determined constituents	Hardness as $CaCO_3$ (Ca, Mg)	Specific conductance (micromhos/cm at 25°C)	pH (units)	Color (platinum-cobalt units)
								Milligrams per litre																
MADISON PARISH																								
Ma-1	36	17	12	3-22-55	90-130	67	19.5	41	2.6	0.00	88	36	85	4.1	613	23	25	0.2	5.1	613	370	1,000	7.8L	5
Ma-2	5	16	13	11-22-55	94-136	67	19.5	40	8.6	.00	110	34	21	4.3	532	.1	7.8	.1	.2	454	410	794	7.2L	0
Ma-17	41	17	13	11-22-55	100	67	19.5	36	15	.14	120	36	14	4.0	563	.0	5.0	.1	.0	482	440	830	7.0L	5
Ma-18	44	16	14	11-22-55	66- 80	67	19.5	16	7.5	.00	100	32	16	3.0	487	10	2.5	.2	5.8	428	380	735	7.1L	0
Ma-25	49	17	13	9-12-57	110-160	67	19.5	33	19	1.0	110	27	12	3.7	494	.8	5.2	.2	.0	426	380	735	7.3L	0
Ma-28	31	16	12	6- 5-68	88-128	--	----	23	14	----	52	26	29	1.9	340	8.2	9.0	.3	.3	317	240	652	7.8L	15
Ma-29	15	16	15	6- 9-60	100-130	68	20.0	17	11	.00	83	48	16	1.7	493	14	11	.1	.0	434	400	751	7.0L	5
Ma-48	25	16	14	6- 5-68	90-100	--	----	28	11	----	80	37	29	2.7	453	22	16	.2	.1	438	350	------	7.7L	15
Ma-49A	22	17	11	2- 1-71	49- 52	--	----	41	1.3	.16	59	20	19	1.6	318	8.8	4.3	.4	.0	311	230	485	----	5
Ma-49B	22	17	11	2- 1-71	79- 82	--	----	42	1.0	.17	62	24	19	2.2	349	5.0	3.1	.3	.0	330	250	518	----	5
Ma-50	39	18	13	4- 1-71	99-109	68	20.0	32	12	.44	-----	-----	89	7.2	764	360	39	.6	.0	-----	880	1,740	7.2L	10
Ma-51	3	15	12	3-31-71	114-119	--	----	35	6.3	.29	110	30	41	4.2	572	7.2	11	.1	3.8	523	400	868	7.8L	5
Ma-53	29	17	12	1-10-72	97-100	--	----	38	6.4	.40	240	120	720	14	797	7.2	1,400	.2	----	2,930	1,100	5,350	8.0L	5
EAST CARROLL PARISH																								
EC-65	12	18	12	4-12-55	70-110	--	----	32	10	1.3	100	33	38	4.6	522	18	21	0.0	2.5	514	390	844	7.1L	--

Source: Whitfield, 1975.

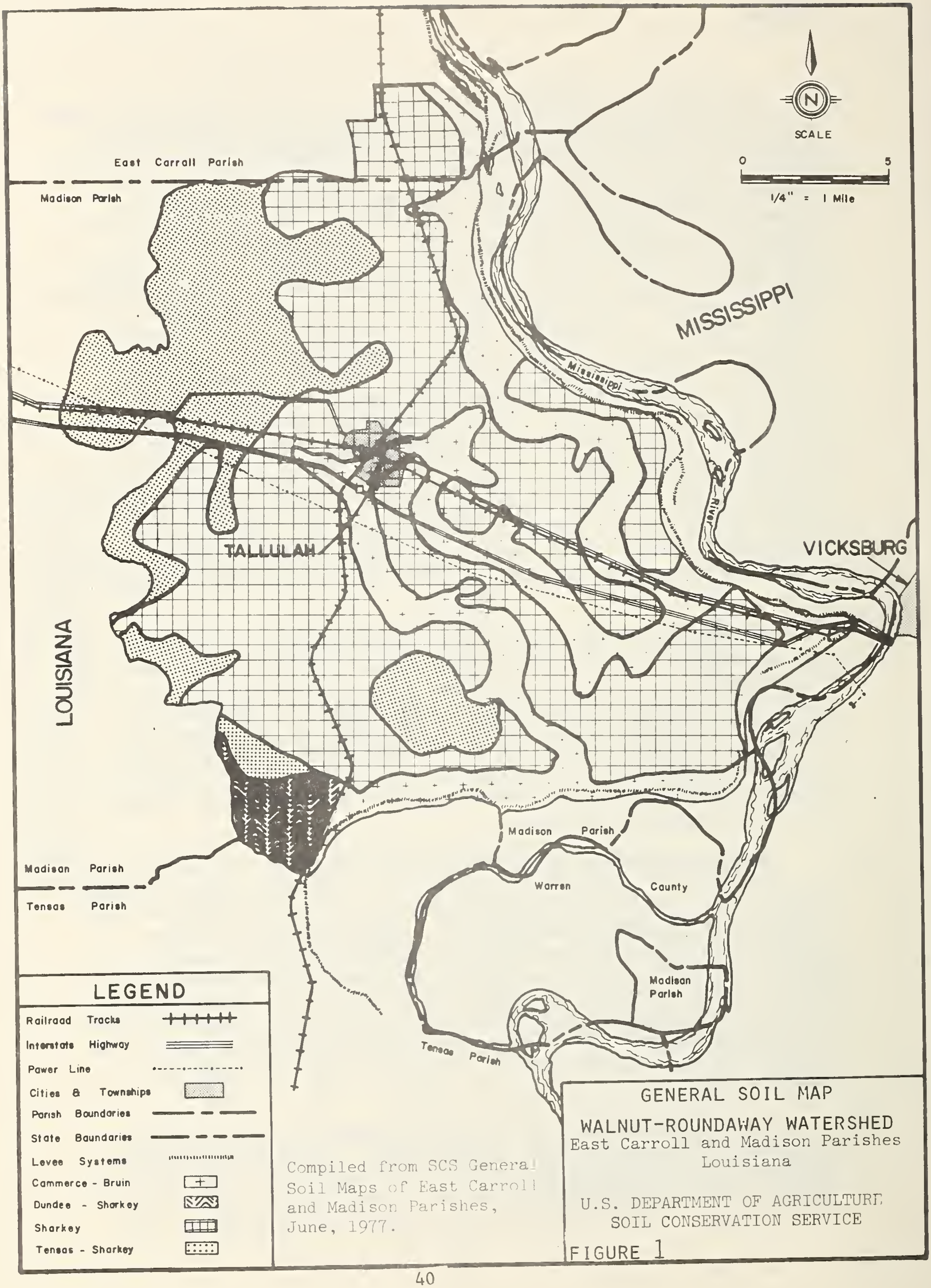
SETTING

As a basis for conservation planning, the soils of the watershed are grouped in accordance with the Soil Capability Classification System. Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. Capability Classes, the broadest groups, are designated by Roman numerals I through VIII. According to the definition of prime farmland, all the soils in the watershed are prime agricultural land. Class I soils have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. Class VIII soils and land forms are rough, shallow, or otherwise limited so that they do not produce worthwhile yields of crops, forage, or wood products. Classes I, II, and III are suitable for cropland; Class IV is marginal for cropland; and Classes V-VIII are unsuitable for cropland (U.S. Department of Agriculture, 1961). Capability Subclasses show soils in the same class that have similar problems; they are designated by adding a small letter, "e" or "w". The letter "e" shows the main limitation is risk of erosion unless close-growing plant cover is maintained; "w" shows that water in or on the soil surface interferes with plant growth or cultivation (U.S. Department of Agriculture, 1961). Soil capability classifications which correspond to the following associations are presented in the table on page 41.

The Commerce-Bruin association comprises about 21 percent of the watershed. The somewhat poorly drained Commerce soils occur on the higher part of the natural levee of the Mississippi River and other more recent streams. They are in Capability Subclass IIw. The moderately well drained Bruin soils occur on the highest part of the same natural levees and are in Capability Class I. Both soils are adapted to a wide range of cultivated crops. However, a compact layer (traffic pan) forms easily. This pan can be broken by deep plowing or chiseling.

The Dundee-Sharkey association, covering about one percent of the watershed, is composed of nearly level, somewhat poorly-drained loamy soils, and poorly-drained clayey soils. These soils are used mostly for cropland and pastureland. Dundee soils are on the higher parts of the natural levees. They are somewhat poorly drained, and have slow to medium and moderately slow permeability. Most of these soils are in Capability Subclass IIw. Sharkey soils are on the lower parts of natural levees, and occur on nearly level or depressed areas. They are poorly drained, have slow runoff, and very slow permeability. Most of these soils are in Capability Subclass IIIw.

The Sharkey association, comprising about 57 percent of the watershed, consists of level, nearly level, and gently undulating poorly-drained clayey soils. Most of the soils are in forest land. Sharkey soils are dominant and occur on level areas, ridges, and depressions. They are poorly drained, have slow runoff and are



GENERAL SOIL MAP
WALNUT-ROUNDAWAY WATERSHED
East Carroll and Madison Parishes
Louisiana

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FIGURE 1

Soil Capability Classifications in the Walnut-Roundaway Watershed

SOIL SERIES	PREDOMINANT CAPABILITY SUBCLASS	DESCRIPTION
Bruin	I	Moderately well-drained
Commerce	IIw	Somewhat poorly-drained
Dundee	IIw	Somewhat poorly-drained having a slow to medium and moderately slow permeability
Sharkey	IIIw	Poorly-drained, slow runoff and very slow permeability
Tensas	IIIw	Poorly and somewhat poorly-drained clayey soils

Source: U.S. Department of Agriculture, Soil Conservation Service, January, 1976.

very slowly permeable. These soils are in Capability Subclass IIIw. Other minor soils included in this association are Tunica, Dundee, and Tensas.

The Tensas-Sharkey association covers about 21 percent of the watershed. This association consists of level to gently undulating, poorly and somewhat poorly-drained clayey soils. They are used mostly for cropland. The somewhat poorly-drained Tensas soils occur on ridges in gently undulating conditions and level natural levees. Most of these soils are in Capability Subclass IIIw. The poorly-drained Sharkey soils occur in lows (swales) in undulating conditions and level depressed areas. They are in Capability Subclass IIIw.

In 1969, total sheet erosion was about 724,000 tons per year for the watershed. Approximately 127,000 acres of cropland had approximately 669,000 tons per year erosion or an average erosion rate of 5.3 tons per acre per year. One hundred, eight thousand acres of cropland had an erosion rate greater than five tons per acre per year. Five tons of erosion per acre per year is the maximum permissible soil loss recommended by the Soil Conservation Service for adequately treated land. In 1976, after six years of an accelerated land treatment program, the rate of sheet erosion on cropland decreased to 4.1 tons per acre per year. This is a decrease of 22 percent in the rate of erosion. Additional land was being cropped in 1976 (approximately 25,000 acres), therefore, the reduction in total sheet erosion only amounted to approximately 28,000 tons per year. Acreage with over five tons per acre per year sheet erosion decreased to about 34,000 acres. In 1970, sediment derived from the watershed and depsoited in a large body of water or delivered to the watershed boundary totaled about 46,000 tons per year and, in 1976, about 44,000. Refer to the table on page 71 for a complete breakdown of these figures by outlet.

Present and Projected Population

Since 1950, the populations of Madison and East Carroll Parishes have shown an overall decrease of approximately 5,800 persons. In 1970, there were approximately 26 persons per square mile compared to the 32 persons per square mile in 1950. In addition, population estimates for the two-parish area for 1975 also indicate a continued decrease likely to be followed by the trend favoring greater urbanization, which has characterized the area since 1950, along with the movement toward nonfarming among the rural populations of both parishes. There are presently three communities having a recorded population of more than 50 persons within the watershed: Tallulah, the parish seat of Madison Parish, population 9,643; Richmond (Madison Parish), population 162; Mound (Madison Parish), population 78 (Louisiana Office of Highways, 1976). Tallulah, which is also the largest and only incorporated city within the two-parish area, has shown an increased growth in population from 1950 to 1970, by approximately 1,900 people.

SETTING

Projected population statistics are determined by mortality, fertility and net migration. Current mortality rates have been used for the population projections for the next few decades. These rates are expected to change very slowly due to modern medicine and, therefore, the error introduced should be quite small (Segal et al., 1976). The fertility rates used were based on the 1970 statistics: Madison Parish - 2.93 white, 5.30 nonwhite; East Carroll Parish - 2.31 white, 4.79 nonwhite (Segal et al., 1976). These rates are affected by economic factors, social characteristics and cultural and institutional settings. Migration is also dependent on such factors. The assumed migration rates for the watershed were Madison Parish, - 11.00 (1970-1980) and - 10.00 (1980-2000) white and - 26.00 (1970-1980) and - 14.00 (1980-2000) nonwhite; East Carroll Parish, - 17.70 white and 25.00 nonwhite for all years (Segal et al., 1976). Based on these criteria, population projections for the watershed are given in the table on page 44. This table indicates an expected steady decrease in both the white and nonwhite segments of the population through the year 2000. This decline in the population is likely due primarily to the out-migration of small farmers and tenants.

Madison and East Carroll Parishes have predominantly nonwhite populations. Since 1950, there has been a steady, but slight, increase in the white population of Tallulah and a steady, but slight, decrease in the nonwhite population. The number of females under 30 years old has steadily increased from 1950 to 1970, in Tallulah; however, there has been a steady decline in the in under 30 female populations of both Madison and East Carroll Parishes. Similarly, the male population, which is slightly below the female population, has also steadily declined in numbers in both parishes.

In 1970, there were approximately 8,700 year-round housing units in the Madison-East Carroll area. Most of these units were owner-occupied (approximately 4,500) and less than 1,000 of these units were vacant. The median values for these units were $8,200 and $8,400 in Madison and East Carroll Parishes, respectively. Within the watershed, there are approximately 700 single farm units or dewllings in Madison Parish, and approximately 100 single farm units or dwellings in East Carroll Parish (Louisiana Office of Highways, 1976). In addition, in the watershed, there are approximately 40 group dwellings in Madison Parish and one row or group dwellings of five in East Carroll Parish (Louisiana Office of Highways, 1976).

The educational attainment of the Madison-East Carroll area is generally low. The median years of school completed for both parishes was 6.7 years in 1960, and 8.5 and 8.1 years in 1970, in Madison and East Carroll Parishes, respectively. However, since 1950, there has been a steady increase in the numbers of persons completing four years of high school and four years of college in the two-parish area. By 1970, only about 6.7 percent of the persons

Projected Populations
for Madison and East Carroll Parishes
by Decades and Race

DECADE	MADISON PARISH			EAST CARROLL PARISH		
	WHITE	NONWHITE	TOTAL	WHITE	NONWHITE	TOTAL
1980	5,628	8,118	13,749	4,631	6,779	11,406
1985	5,457	7,614	13,072	4,255	6,358	10,613
1990	5,241	7,179	12,420	3,946	5,983	9,929
1995	5,007	6,726	11,734	3,563	5,590	9,155
2000	4,796	6,309	11,102	3,202	5,238	8,444

Source: Segal _et al_., 1976.

in the two-parish area had received no formal education. The percent represented a significant decrease from the 1960 figure of approximately 10.4 percent of uneducated persons. Tallulah's population has shown similar progressive educational trends since 1950.

Economic Resources

The economy of the watershed is based primarily on agriculture. Most of these products are processed at plants located within the watershed or the west in the neighboring communities of Waverly, also in Madison Parish, and Delhi in Richland Parish. The economic status of both the Madison-East Carroll Parish area and Tallulah is presented below.

Employment statistics for the Madison-East Carroll area indicate that approximately 80 percent of the areas's residents, which are in the labor force (7,569 persons), are employed within the area. Of those persons in the labor force in 1970, 48 percent were unemployed. This represents a decrease of 264 persons in the unemployed segment of the labor force since 1960. In Tallulah and Madison Parish, the number of unemployed persons in the labor force decreased significantly from 1960 to 1970, while in East Carroll Parish the reverse is true.

Madison Parish census data for 1970, were used to determine that 19 percent of the employed labor force were engaged in basic industries, 20 percent were employed in the processing and manufacturing industries, and 61 percent were employed in the service industries. More persons are employed in agriculture than in any other single field. However, collectively, nonagricultural industries employ more persons. Between 1950 and 1970, major industries such as agriculture, forestry, and fisheries; manufacturing, especially furniture (includes lumber and wood products); railroads; eating and drinking; and miscellaneous personal services have shown a steady decline in employees in Madison Parish. In East Carroll Parish, those industries show less clear-cut declining trends, often with an increase in 1960.

Agriculture, followed by manufacturing, is the primary source of income in the watershed, where the average family income for 1969 was less than $4,000, but slightly above the poverty level ($3,388). The median family income in the watershed is below $4,000 per year and, therefore, only slightly above the proverty level. In the City of Tallulah alone, there are over 900 families receiving a below-the-poverty level income. In 1969, only 19 percent of Tallulah's 2,146 families were earning incomes in excess of $10,000 per year. The watershed is, for the most part, lying within a very economically depressed area.

Much of the land in the watershed is under private ownership and it has limited public access. Private forest landowners dominate the property lying in the southwestern section of the watershed. The major forest landowners are, in order of decreasing holdings, Chicago Mill and Lumber Company, Deltic Farm and Timber Company, Patrick Heirs and Anderson-Tully Company. Smaller tracts, privately-owned, are scattered throughout the watershed. Most of the publicly-owned lands in the watershed are held by the Madison Parish School Board (see table on following page).

In 1969, there were approximately 900 farms (average size 510.8 acres) in Madison and East Carroll Parishes. Primary livestock maintained on those farms included cattle, hogs, and pigs (Fielder, 1973b). Most of the farms were operated by whites, who, together with the nonwhite operators, maintained less than 20 percent tenancy. Data from the 1964 Census of Agriculture indicated that approximately 336 farms were in the watershed averaging 435 acres per farm. An unknown percent of these farms are family type and geographically distributed throughout the watershed. There are 107 minority landusers within the watershed, farming about 6,985 acres of land. Of these, 83 are cooperating with the Soil and Water Conservation District Program on about 5,234 acres. The 107 minority landusers account for 32 percent of the landusers in the watershed. These figures do not reflect the large forest land holdings.

The primary crops in the area are cotton and soybeans in both acreage and dollar value. Other crops include corn, rice, wheat, and various sorghums. Peaches and pecans are also popular in the watershed. Approximately 68 percent (or 154,700 acres) of the watershed is used as cropland. Generally, each year the cropland acreage increases at the expense of the wetlands and forest lands. Today, there are well over 400,000 acres of existing cropland in Madison and East Carroll Parishes. An additional 70,000 acres are used for pasture and other miscellaneous agricultural purposes.

The watershed lies within Farming Area 4 (comprised of Morehouse, Ouachita, Caldwell, Catahoula, Concordia, Tensas, Franklin, Richland, West Carroll, East Carroll and Madison parishes) known as the "Mississippi Delta Cotton, Soybeans, and Beef Area" (Ramsey and Corty, 1976). Within this area, the price per acre of land (parcels 10 acres or more) is as follows: mean, $460; median (middle value which divides an array of observations into two equal parts - an equal number above and below the median), $425; modal group, $300-$599; range $63-$4,800 (Ramsey and Corty, 1976). The land in this area, as well as in other principal farming areas in Louisiana, sells at prices more likely representing agricultural use value than prices in other regions of the state. In general, this area had fewer (307) and larger (129 acres average parcel, 48 acres median parcel) land units transferred, either as complete farms or as add-on units, to accommodate farming (Ramsey and Corty, 1976). In 1974, Farming Area 4 had a land market activity corresponding to 39,647

Public-Owned Lands
in the Walnut-Roundaway Watershed

PARISH	OWNER	LOCATION*	ACREAGE
Madison	School Board	15N-12E-16	640
		18N-13E-36	200
	Subtotal.		840
	Fifth Louisiana Levee Board	18N-11E-25	40
East Carroll	School Board	18N-12E-16	213
TOTAL			1,093

* Township-Range-Section

transferred acres of 0.9 percent of the total acreage of the area (Ramsey and Corty, 1976).

The watershed is bisected by U.S. Highway 80 in an east-west direction and in a north-south direction by U.S. Highway 65. An interstate highway (I-20) has recently been completed. It also runs in an east-west direction, approximately parallel to U.S. Highway 80. In addition, major rail lines, the Missouri Pacific Railroad and the Illinois Central Gulf Railroad, parallel both U.S. Highways (65 and 80, respectively). State and parish secondary roads branch from these major highways.

Plant and Animal Resources

The watershed lies in a region characterized by bottomland hardwoods and baldcypress which are common to other areas within the Mississippi River flood plain.

Forest lands - Approximately 52,100 acres (23 percent) of the watershed is forest land. The forests of bottomland hardwoods and baldcypress are primarily categorized as oak-gum-cypress and elm-ash-cottonwood and are found mainly in the southwestern section of the watershed. In some areas, 50 percent or more of the forested area is composed of baldcypress, sweetgum, blackgum, and tupelogum, and oaks. Cottonwoods, willows, ashes, elms, hackberries, and maples are also commonly associated. Other overstory species and understory species are similar to those given below for streamside vegetation.

Other Lands - Disturbed area vegetation includes those plants characteristically found in old fields, around abandoned habitations, along roadsides, in roadside ditches, in cut-over areas at the sites of transmission lines and the like, and in urban areas. Approximately eight percent (17,300 acres) or more of the watershed is characterized by this kind of vegetation, which includes several species of grasses and composites, and various vines such as morning glory, honeysuckle, and ladies' eardrops. Other common species include vervains, fleabanes, common and giant ragweeds, ironweed, dock, Johnsongrass, smartweeds, goldenrods, elderberry, sedges, willows, frogfruit, cattails, blackberries, and dewberries.

Streamside Vegetation - Streamside vegetation consists of many species associated with disturbed areas, in addition to those species more often associated with the damp areas along streams. Common overstory species include baldcypress, black locust, honey locust, water locust, sweetgum, sycamore, persimmon, hackberry, rough-leafed dogwood, bitter pecan, sweet pecan, box elder, black willow, cedar elm, American elm, winged elm, water oak, live oak, willow oak, and overcup oak. Common shrubby species include elderberry, buttonbush, lead plant, swampprivet, and red mulberry. Common vines and other common understory species include several species of greenbriar, rattan, Japanese honeysuckle, yellow jasmine, ladies' eardrops, peppervine, cross vine, red-berried moonseed, climbing hemp vine, Virginia creeper, poison ivy, water primroses, dewberries, dock, smartweeds, goldenrods, ragweeds, vervains, and several species of grasses.

Wetlands - The wetlands are primarily characterized by bald-cypress, persimmon, buttonbush, black willow, swampprivet, several species of greenbriar, other species of vines and Spanish moss, and have a lower percent of species such as grasses and composites, which are characteristic of drier disturbed areas. The wetlands vegetation of the watershed has been typed according to the U.S. Department of the Interior's (1971) criteria for wetland categorization and acreages are presented on page 24.

Croplands and Pasturelands - See page 46 for principal crops grown and yields and acreages in the watershed. During the growing season, these lands are dominated by the crops being grown. In association with these crops, a wide variety of native plants, primarily herbs and grasses, are found. The number and species of native plants found in these cultivated areas depend upon factors such as crops grown, soil type, wetness, length of time in cultivation, and management and farming techniques used by the landusers. Some of the common species found are foxtail, bermudagrass, panicum or panicgrass, Johnsongrass, clovers, vetch, coffeeweed, other legumes, cocklebur, ironweed, goldenrod, curley dock, morning glory, thistle, aster, giant ragweed, and pigweed.

Louisiana's mild climate, long growing season, numerous and varied plant species, rich soils, numerous streams, wet areas, and slight, but varying elevations provide a wide variety of habitats and favorable conditions for many terrestrial and semi-aquatic animals, including numerous game and nongame species, residents, migrants, and transients.

Mammals - The climate, plant communities, and edaphic conditions in the watershed are such that it is probably occupied by no less than 30 species of mammals. Of the numerous game, nongame and furbearing mammals in the watershed, the more common species include rabbits, squirrels, raccoons, and opossums. The white-tailed deer is the major big game species in the watershed. Population estimates for deer in suitable habitat throughout the watershed are one deer in every 15 acres as presented in the following table. Deer kill averages are given on page 50. Population estimates for other animals per acre of habitat in the watershed are also given in the table on the following page.

Birds - Many birds are common to the watershed. Estimated game bird populations per acre of habitat are given in the table on the following page. Various game birds occurring in the watershed include bobwhite and several species of waterfowl such as mallards, wood ducks, teals, and geese. Nongame birds common in the watershed

Animal Population Estimates
Walnut-Roundaway Watershed, Louisiana

SPECIES AND HABITAT	ANIMALS PER ACRE
Reptiles	
Alligator - Water	1/300
Birds	
Bobwhite - Open	1/3
Turkey - Forests	1/250
Dove - Open	1/0.8
Mammals	
Rabbit - Forests, Open	1/9
Squirrel - Forests	1/0.75
Deer - Forests	1/15
Bear - Forests	Common
Raccoon - Forests, Water	1/3
Opossum - Forests	1/2
Otter - Water	1/200
Fox - Forests	1/100
Coyote - Forests	1/200

Source: Louisiana Wildlife and Fisheries Commission, 1975 and Ouachita Wildlife Special Report.

Deer Kill Averages
by Parish

PARAMETER	MADISON PARISH	EAST CARROLL PARISH
Average Kill		
1965-1968	3,087	1,245
1969-1972	3,067*	1,691
Per Cent Change	0.64	35.82
Forest Acreage		
1971	211,700	82,525
Forest Acreage Per Deer Kill		
1968-1972	69	49

* Madison Parish ranked third in Louisiana for 1969-1972 in average deer kill.

Source: Louisiana Wildlife and Fisheries Commission, 1973.

Walnut-Roundaway Watershed
Fish Community Study
Station #1, Bear Lake
August 3-4, 1976*

NAMES SCIENTIFIC	COMMON	NUMBER OF INDIVIDUALS	TOTAL LENGTHS (RANGES IN CM.)	STANDING CROP/ BIOMASS KILOGRAMS PER ACRE
Dorosoma cepedianum	Gizzard Shad	3,776	5.5 - 32.0	116
Notropis sp.	Shiner	8	-7.0 -	Trace**
Ictiobus bubalus	Smallmouth Buffalo	24	22.0 - 38.0	10
Ictalurus natalis	Yellow Bullhead	224	5.0 - 25.0	12
Ictalurus punctatus	Channel Catfish	8	-13.0 -	Trace
Ictalurus furcatus	Blue Catfish	120	4.5 - 23.0	2
Gambusia affinis	Mosquitofish	-abundant, but not counted, measured or weighed-		
Lepomis spp. (juveniles)	Sunfish	3,616	< 4.5 - 7.0	4
Lepomis macrochirus	Bluegill	88	7.0 - 14.5	3
Aplodinotus grunniens	Freshwater Drum	8	-14.0 -	0.5
				Total 148

* two-day pickup of a 1/8-acre sampling plot adjusted for one acre; 3 pints of rotenone/acre-ft.
** less than one gram per acre
Source: VTN Louisiana, Inc., 1976.

Walnut-Roundaway Watershed
Fish Community Study
Station #2, Lake One
August 4-5, 1976*

NAMES: SCIENTIFIC	COMMON	NUMBER OF INDIVIDUALS	TOTAL LENGTHS (RANGES IN CM.)	STANDING CROP/ BIOMASS KILOGRAMS PER ACRE
Dorosoma cepedianum	Gizzard Shad	11,816	5.0 - 26.0	130
Notropis sp.	Shiner	8	-4.0 -	Trace**
Ictiobus bubalus	Smallmouth Buffalo	200	17.0 - 39.0	89
Ictalurus furcatus	Blue Catfish	128	9.5 - 16.0	2
Ictalurus melas	Black Bullhead	8	-28.0 -	2
Ictalurus natalis	Yellow Bullhead	8	-18.0 -	1
Pylodictis olivaris	Flathead Catfish	16	-6.0 -	Trace
Gambusia affinis	Mosquitofish	-abundant, but not counted, measured or weighed-		
Lepomis spp. (juveniles)	Sunfish	184	< 5.5 -	1
Lepomis macrochirus	Bluegill	464	4.0 - 19.0	9
Lepomis gulosus	Warmouth	8	-11.0 -	1
Micropterus salmoides	Largemouth Bass	32	5.0 - 10.0	1
				Total 236

* two-day pickup of a 1/8-acre sampling plot adjusted for one acre ; 3 pints of rotenone/acre-ft.
** less than one pound per acre
Source: VTN Louisiana, Inc., 1976.

Walnut-Roundaway Watershed
Fish Community Study
Station #4, Spring Bayou
August 7, 1976*

NAMES SCIENTIFIC	COMMON	NUMBER OF INDIVIDUALS	TOTAL LENGTHS (RANGES IN CM.)	STANDING CROP/ BIOMASS KILOGRAMS PER ACRE
Lepisosteus oculatus	Spotted Gar	24	34.0 - 60.0	10
Amia calva	Bowfin	32	30.0 - 35.0	11
Cyprinus carpio	Carp	16	30.0 - 42.0	13
Notropis spp.	Shiner	16	3.5 - 7.0	Trace
Ictiobus bubalus	Smallmouth Buffalo	32	16.0 - 24.0	5
Ictalurus furcatus	Blue Catfish	16	15.0 - 16.0	0.5
Ictalurus natalis	Yellow Bullhead	736	5.5 - 22.0	17
Noturus spp.	Madtom	328	5.5 - 8.5	1
Gambusia affinis	Mosquitofish	-abundant, but not counted, measured or weighed-		
Lepomis spp. (juveniles)	Sunfish	160	5.0 - 7.0	1
Lepomis cyanellus	Green Sunfish	760	3.5 - 17.0	15
Lepomis gulosus	Warmouth	16	10.0 - 12.0	0.5
Lepomis macrochirus	Bluegill	224	8.0 - 16.5	8
Lepomis megalotis	Longear Sunfish	256	8.5 - 14.0	6
Aplodinotus grunniens	Freshwater Drum	8	-21.0 -	2
				Total 90

* one-day pickup of 1/8-acre adjusted for one acre; 3 pints of rotenone/acre-ft.
** less than one pound per acre
Source: VTN Louisiana, Inc., 1976.

Walnut-Roundaway Watershed
Fish Community Study
Station #5, Roundaway-Bayou Vidal Cutoff
August 6, 1976*

NAMES		NUMBER OF INDIVIDUALS	TOTAL LENGTHS (RANGES IN CM.)	STANDING CROP/ BIOMASS KILOGRAMS PER ACRE
SCIENTIFIC	COMMON			
Lepisosteus oculatus	Spotted Gar	72	34.0 - 65.0	36
Amia calva	Bowfin	8	-38.0 -	5
Dorosoma cepedianum	Gizzard Shad	1056	5.0 - 32.0	107
Cyprinus carpio	Carp	152	20.5 - 47.0	46
Notropis spp.	Shiner	16	4.0 - 7.0	Trace**
Ictiobus bubalus	Smallmouth Buffalo	8	-21.0 -	1
Ictalurus furcatus	Blue Catfish	120	6.0 - 20.0	3
Ictalurus punctatus	Channel Catfish	16	19.0 - 21.0	1
Ictalurus natalis	Yellow Bullhead	144	12.0 - 35.0	15
Noturus spp.	Madtom	1368	4.0 - 7.0	4
Aphredoderus sayanus	Pirate Perch	56	7.0 - 8.5	Trace
Gambusia affinis	Mosquitofish	-abundant, but not counted, measured or weighed-		
Lepomis spp. (juveniles)	Sunfish	544	3.0 - 7.5	2
Lepomis cyanellus	Green Sunfish	336	4.0 - 9.5	2
Lepomis macrochirus	Bluegill	472	8.0 - 18.0	21
Lepomis megalotis	Longear Sunfish	8	-11.5 -	0.5
				Total 244

* one-day pickup of a 1/8-acre sampling plot adjusted for one acre; 3 pints of rotenone/acre-ft.
** less than one pound per acre
Source: VTN Louisiana, Inc., 1976.

include herons, cardinals, egrets, grackles, owls, woodpeckers, hawks, vultures, mockingbirds, and various sparrows. The birds are important to the natural balance of the watershed. They are a source of food for man and some animals, a source of enjoyment for the birdwatcher and photographer, and play an important role by consuming large numbers of noxious insects, rodents, weed seeds, and carrion.

Herpetofauna - Because of the many wet areas, several species of frogs, turtles, salamanders, and snakes are found in the watershed. The most common species are the Fowler's toad, the bronze frog, bullfrog, the leopard frog, the green anole, the red-eared turtle, the Mississippi map turtle, the false map turtle, the cottonmouth, and various water snakes.

Invertebrates

Aquatic - Aquatic invertebrates were sampled in the watershed and commonly include leeches, damselfly and dragonfly nymphs, mayfly nymphs, beetle larvae, creeping waterbugs, water scorpions, water boatmen, snails, limpets, clams, water mites, ectoprocts, sponges, grass shrimp, and oligochaetes. Many of these invertebrates, especially the insects and crustaceans, are extremely important in the food web of sport and commercial fishes, various reptiles, amphibians, and mammals.

Terrestrial - Terrestrial invertebrates common in the watershed are primarily insects such as leafhoppers, which are particularly abundant in open areas; and spittlebugs, crickets, grasshoppers, ants, and beetles, which are common in leaf litter, shrubs, along the streambanks, in open fields, and in other open and disturbed areas. Flies, bees, wasps, and numerous mosquitoes are found throughout the watershed. Many species of spiders are common, particularly in the forested areas and along the streams.

Fisheries

Many freshwater habitats within the watershed offer the potential for good quality fishing; however, no waters sampled (see tables on pages 51-54) indicated a quality fishery. Several dams on Walnut-Bayou and Roundaway Bayou have maintained the fishery in those areas at a somewhat high level. However, conversations with local residents indicated that in recent years the fish resources in other areas such as Bear Lake have been reduced significantly probably due, in part, to the flow of Bull Bayou through the lake, where it presently deposits sediment and, in part, to the pesticide applications on surrounding agriculture areas. Conversations with other local residents indicated that Lake One supports a fine "bream" fishery and that few bass are ever taken; the Roundaway-Bayou Vidal Cutoff at Louisiana Highway 603 is hardly ever fished because of poor catch and very frequent water level fluctuations due to drainage in the area. The most common species were gizzard shad, madtoms, yellow bullheads, green sunfishes, bluegills, and mosquitofishes. Less common species were smallmouth buffalos, blue catfishes, carp, and longear sunfishes. All other species comprised a very small segment of the fish communities.

Endangered, Threatened or Otherwise Unique Species

No plants listed as threatened, endangered or possibly extinct in the July 1, 1975 Federal Register or the June 16, 1976 Federal Register are known to occur in the watershed or the surrounding area. In addition, no other threatened or endangered vascular plants are known from the area.

Very little is known about the distribution and frequency of most invertebrates in Louisiana. Therefore, it is impossible to determine whether most species are rare and threatened or endangered. However, the Tensas River, which borders the western edge of the watershed, is presently believed to contain the richest molluscan fauna in Louisiana (Vidrine, pers. comm.).

No fishes listed by Miller (1972) or the U.S. Department of the Interior (1974) or amphibians listed by the U.S. Department of the Interior (1974) are known from the watershed. Other vertebrates that have been known from or are likely to occur within the watershed and which are classified as endangered by the U.S. Department of the Interior (1974), include one reptile and several species of mammals and birds.

Birds

1. Haliaeetus leucocephalus. There are only eight active bald eagle nests in Louisiana and all occur between New Orleans and Morgan City (Duffy, 1976). The nests are, however, located in cypress trees in swamps similar to those in the watershed, and it is not unlikely that eagles could be found in the area.

2. Campephilus principalis. The ivory-billed woodpecker was once (1933 to 1943) found in the forests around Tallulah (Lowery, 1974a). The ivory-billed woodpecker is, however, no longer expected to be found in the watershed.

3. Falco peregrinus. A pair of peregrine falcons with a nest in the top of a dead snag was observed near Tallulah (May 11, 1942) by Roger T. Peterson. This is the southernmost breeding record for the eastern United States, and it is the only breeding record for Louisiana (Lowery, 1974a). However, today the species is likely to be found in Louisiana only near the Gulf Coast (Lowery, 1974a).

Mammals

1. Canis rufus. The red wolf is known to have occurred throughout Louisiana west of the Mississippi River. Within or near the watershed, 11 specimens of the red wolf have been taken in Madison Parish (Lowery, 1974a). According to Lowery (1974a), the present status of the red wolf in Louisiana is "dismal" and the animal may possibly remain "somewhere in the Tensas or Atchafalaya basins" and in Cameron and Vermilion Parishes.

2. Felis concolor. The cougar or panther once occurred in great numbers in the bottomland swamps bordering the Mississippi and Tensas Rivers (Lowery, 1974a). In 1971, two large adult cougars were sighted in Madison Parish near Spring Bayou Plantation. The sightings in January and March could have been of the same animal (Lowery, 1974a).

Reptiles

1. Alligator mississippiensis. The American alligator is found throughout Louisiana in all river systems and swamps and is presently listed as endangered in the watershed.

Additional information on the status of "endangered" wildlife species which may occur in the watershed can be obtained from a study made by Michael A. Spindler for the Vicksburg District of the U.S. Army Corps of Engineers in February 1977 entitled "Endangered Species Study, Tensas River Project Area Louisiana".

Recreational Resources

The recreational demand in the Madison-East Carroll Parish area is not expected to increase as a result of an increasing population trend, but rather the demand is likely to increase due to the socioeconomic adjustment of increasing urbanization (Mississippi River Commission, 1974). At present, the land use trends of clearing forested areas for agricultural use are beginning to reduce the land resource base upon which recreational development depends. Consequently, although there are six hunting and recreation clubs generally leasing acreage in the watershed, their continued existence will depend on land use trends and on the owners of the remaining forests. There are no national parks or state parks in the watershed. The closest public recreation area of significance is the Lake Bruin State Park located south of the watershed in Tensas Parish, east of U.S. Highway 65 near St. Joseph. The park encompasses some 50 acres. Facilities available include those for picnicking, swimming, boating (rental and launching), fishing, water skiing, camping, rest rooms, and showers (Gulf South

Research Institute, undated). A beach and the acquisiton of an additional 150 acres are planned for the Lake Bruin State Park in the Louisiana State Parks Plan for 1975-1990 (Gulf South Research Institute, undated). In addition, there are several lakes and streams in the watershed and other oxbow lakes in the vicinity of the watershed, all capable of supporting water-related recreational activities.

Archaeological, Historical, Scientific, and Unique Scenic Resources

There are 137 known archaeological sites in Madison Parish. Forty-four of these sites are located along specified channels within the watershed. These 44 sites were surveyed by archaeologists from the Geosciences Department and the Research Institute of Northeast Louisiana University in Monroe. No sites in the watershed have been recorded by either the National Register of Historic Places or the Louisiana Historic Preservation and Cultural Commission. Sites which have been nominated for inclusion in the National Register of Historic Places include 16 MA 1 and 16 MA 38.

There are no historic sites within the area to be disturbed by construction which are listed on the national or state registers of historic places.

Unique scientific or unique scenic resources in the watershed include: Alligator Brake, the Texas Lake complex, the Spring Bayou complex, the McLemore Brothers forest lands, Roundaway Bayou through Tallulah, the Teddy Roosevelt Camp, Bayou Vidal, and most other natural waterways.

Soil, Water, and Plant Management Status

The primary existing land use in Madison and East Carroll Parishes, as well as the watershed, is agricultural. Since 1955, there has been a significant increase in the use of cropland for soybean production. Soybean acreage in Madison Parish has increased from about 14,000 acres in 1955 to 135,000 acres in 1974, and in East Carroll Parish from 14,000 acres in 1955 to about 105,000 acres in 1974 (Fielder and Parker, 1972; Fielder and Guy, 1975). This increase has resulted in the reduction of forest land and pastureland. Between 1968 and 1976, about 26,700 acres of forest land were cleared in the Walnut-Roundaway Watershed. Even though the total number of farms in Madison and East Carroll Parishes has diminished since 1959, the total acreage of farmland has increased from about 179,002 acres in 1959 to about 211,010 in 1969 in East Carroll Parish, and in Madison Parish from about 206,893 acres in 1959 to about 242,575 acres in 1969 (Fielder, 1973a). Between the years 1962 to 1971, approximately 778,000 acres of forest land was converted to cropland in the northeast portion of Louisiana; an average of 86,000 acres per year. In 1960, the average price received for soybeans was $2.00 per bushel; $2.41 in 1965; $2.87 in

1970; and $4.79 in 1975. This is an increase of over 200 percent since 1960, which provided the economic incentive for the large scale clearing of forest land. The table below shows the present land use acreages in the watershed. The majority of the forest land acreage in the watershed is currently being managed for timber and wildlife production. Pastureland comprises two percent of the watershed and is expected to increase slightly in the future. Cropland will increase as forest land decreases. Once the planned project is complete, use of existing cropland will intensify. The "other" land use category will increase somewhat due to new residential construction and new highway construction and improvement. Large-scale commercial or industrial development is unlikely.

Present Land Use

Land Use	Present Acres	Present Percent
Cropland	154,700	68
Grassland	3,600	2
Forest land	52,100	23
Other land[a/]	17,300	7
Total	227,700	100

[a/] Other land includes roads, channels, bayous, lakes, wetlands, communities, farmsteads, rights-of-ways, etc.

There are 390 farms covering 133,800 acres which have soil and water conservation plans. These farms comprise about 59 percent of the area. An estimated 20 percent of the needed conservation measures have already been applied with district assistance at an estimated cost of $1,010,800.

The Soil Conservation Service district conservationist works closely with soil and water conservation districts in establishing priorities of work to be undertaken. Information on sound conservation practices is disseminated by means of radio, television, and newsletters. One full-time conservation technician and a part-time clerk are employed by the district to assist Soil Conservation Service office personnel with the overall conservation program. The Louisiana Forestry Commission, through the various Federal-State cooperative forestry programs, provides forest management assistance, the distribution of planting stock, and forest pest control assistance to private landusers in the watershed. Additional acres of forest land outside the industrial ownership are in a relatively unmanaged condition. Since returns from forest land are lower than from row crops, timber stands on small tracts receive little management.

When timber reaches merchantable size, the better quality trees are harvested, resulting in poor stocking and low income potential. Timber stand improvement on private forest lands is needed to improve stocking, hydrologic conditions, and wildlife habitat. The main practices needed include thinning, improvement cuts, and regeneration. Although timber production is low in these areas, the forest land provides valuable wildlife habitat and flood plain protection.

Projects of Other Agencies

Along the eastern edge of the watershed lies the U.S. Army Corps of Engineers' flood protection levee for the west bank of the Mississippi River. The Vicksburg District, Corps of Engineers, has several channel improvement plans under consideration either within or in the vicinity of the watershed. These channel improvements are being considered to alleviate the flooding problem. They consist of several possible combinations of channel improvements, cutoffs, and auxiliary channels for the Tensas River, Mill Bayou, and Bayou Vidal. All the action plans being considered will increase the efficiency of runoff through increased flow capacity of the Tensas River or through diversion of local water by one of the three channels. In addition, these plans are expected to increase the efficiency of local drainage of cropland and forest land (Gulf South Research Institute, 1974). A study has been authorized, but not yet funded, on the Walnut-Roundaway Bayou system, to determine an economical method of regulating flows in the bayou, so that water would be available for irrigation, recreation, industry, and municipal and other uses (U.S. Army Corps of Engineers, 1975).

The State of Louisiana, Office of Public Works, under its State-parish drainage improvement program, has previously installed a system of channels, three test water wells, and water control structures that have provided a limited supply of water for irrigation, community welfare, recreation, and the enhancement of fish and wildlife habitat. Due to subsequent changes in land use and normal deterioration, most of the channels are no longer adequate to provide the needed protection.

WATER AND RELATED LAND RESOURCES PROBLEMS

Because of the flat terrain, problems with floodwater, drainage, land and water management, and agricultural water management are often inseparable. Therefore, problems discussed under one category are usually applicable to one or more of the other categories.

Land and Water Management

The soils in the watershed are high in natural fertility. Heavy rainfalls coupled with the generally flat terrain and medium to fine-textured soils contribute to a serious wetness problem. Such adversely wet conditions limit crop yields and result in reduced production. Therefore, an adequate drainage sytem is needed for optimum production of cotton, soybeans, corn, and pasture. In order to overcome the deficiency caused by poor drainage, farmers have installed partial drainage systems that provide some relief. Reduced prices paid for harvested crops and higher costs of production combine to produce a lower net income than would be expected with better water management.

Floodwater Damage

The watershed receives approximately 51 inches of rain annually, which is usually well distributed throughout the year. Flood damages from excessively heavy direct precipitation occur almost every year and, frequently, several times a year. The topography is such that some of the area, due to its elevation, location, or use, does not suffer from damages from excessively heavy direct precipitation. However, runoff from these areas contributes to the flood problems on low lying areas. In addition, damaging out-of-bank flow in most of the agricultural areas normally occurs three to four times each year. This out-of-bank flow causes landowners to use additional cultural practices in production and additional equipment and labor in harvesting to obtain normal yields. The quality and quantity of both cotton and soybeans are adversely affected when normal harvesting is delayed by flooding, which is often the case.

Erosion Damage

Sheet erosion often occurs in areas lacking vegetative cover. Without the planned structural measures, erosion rates are expected to increase from 724,000 to about 744,000 tons per year and the amount of land with greater than five tons per year per acre soil loss would increase to 43,000 acres.

Sediment Damage

Two general types of agricultural damage due to sediment occur when (1) sediment is deposited at the lower ends of fields as a normal function of sheet erosion, and (2) sediment is dropped from floodwater on agricultural land. However, in this watershed, sediment deposited from floodwater has such a scattered occurrence, limited amount, fine texture, and relatively high fertility, that the damages from this type of deposition were grouped with the other floodwater damages. Other types of sediment damage can generally be classed as downstream sediment damages. One type of damage is the accumulation of sediment in channels. These deposits create areas where willows will grow, causing reduced channel capacity. Channel deposition of this nature is frequently the result of improper protection where water enters the channel from the side. Removal of the sediment is necessary for the channel to regain its capacity. These conditions increase the cost of operation and maintenance for the system. In addition, increased sediment also lowers the water quality of the receiving water body by temporarily increasing the turbidity, which decreases light penetration necessary for photosynthesis. Larger terrestrial animals may be temporarily forced to seek a less turbid water source. Benthos will be covered by sediment and invertebrates and fishes which are filter feeders will experience a temporary mechanical disruption in their feeding activities. A temporary general decrease in productivity will result from the sedimentation.

Drainage Problems

Most of the main and lateral channels which provide outlets for farm drainage systems and group laterals are inadequate for disposal of the runoff even from normal rainfall. Some 30 years ago the Madison Parish Police Jury, in cooperation with the Louisiana Office of Public Works, constructed a parishwide drainage system for disposal of excessive rainfall runoff from agricultural land. Only the higher land was then being used for agriculture. In the intervening years, numerous residential areas have developed, roads and highways and airports have been constructed, utility transmission lines have crisscrossed the watershed, and more than 100,000 acres of forest land have been cleared. Each of these changes in land use has produced a higher rate of runoff and the drainage system has become inadequate and not capable of coping with the water disposal. Farm drainage systems and group laterals have been installed on more than 25 percent of the cropland and pastureland, but the benefits from these improvements generally have been limited to the higher land.

Soybean land best illustrates the severity of the drainage problem since it represents the largest acreage and suffers the most damages. The driest months are October, June, August, and May, in that order. Rainfall is highest in winter and lowest in late summer and early fall. Relatively little land preparation can be accomplished in early spring because of the flooding and wetness problems. Consequently, much of the crop is not planted until the end of May or the beginning of June and often as late as the first of July. Since June is one of the drier months, much difficulty is encountered in establishing a good stand. The low moisture content of the soil prevents germination and allows a black mold to form around the seed causing it to rot.

The root system of these late soybeans is not as extensively developed as the earlier beans. Therefore, their growth is affected more by lack of moisture in the dry months of August and October than they would be if they had been planted early. These late soybeans are not ready for harvest until late October, November, or early December. Thus, much of the harvest is delayed or performed under unfavorable conditions. Almost every year some crops are not harvested because of the wet condition of the soil.

The delays, because of wetness, cause the beans to mildew in the pond and retain more moisture than is desirable. The longer harvest is delayed, the greater the loss from pods shattering. When the ground is wet, the cutter bar of the harvester cannot be lowered as close to the ground as is desirable because the machine sinks and bogs. Therefore, soybeans that would have been harvested had a better drainage condition existed are left in the field. The harvested beans must be hauled from the combine to the truck by tractor and grain cart instead of the combine emptying directly into the truck. Harvesting a given acreage requires about twice as much time and causes unnecessary utilization of fuel and chemicals under these adverse conditions.

A research report entitled The Effects of Production Practices on Soybean Yields, Costs and Returns in the Mississippi River Delta of Louisiana, published by the Department of Agricultural Economics and Agribusiness of Louisiana State University, describes the problem in more quantified terms. One of the key points reflected in this report is a direct relationship between planting dates and soil type, surface and subsurface drainage, and land forming and yield per acres. Low-yield producers had less favorable soil types, poor drainage, and fewer land forming practices, and they planted a greater percentage of soybeans at a later date than high-yield producers.

The primary objective of the report was to determine how production practices differed among producers who obtained high yields and producers who obtained low yields per acre of soybeans, and how they affected income.

Several important implications from the summary of the study are as follows:

1. The number of acres of soybeans produced was not a factor limiting the yield of soybeans for any one group;

2. Low-yield producers can increase average yields and returns through increased crop rotation programs, whenever possible, primarily by helping control weed infestation;

3. Low-yield producers can increase yields and returns through more intensive drainage and land forming practices;

4. Low-yield producers with careful variety selection based on soil type, date of planting, maturity dates, and specific soil physical characteristics can increase yields and incomes;

5. Low-yield producers can generally increase yields by planting approximately one bushel of certified high quality seed per acre before May 31, because early maturing varieties (Hill, Dare, and Hood) suffer more from later planting dates than medium and late maturing varieties (Davis, Bragg, Lee, and Lee 68);

6. Low-yield producers can increase yields and returns by a more complete weed control program (both chemical and conventional) where weed and grass infestation is a problem;

7. Low-yield producers can lower costs of production for soybeans by the use of six-row equipment over four-row equipment with at least 600 to 800 acres and with careful consideration of the age of present four-row equipment, timeliness of operations, labor availability, etc., before changing to six-row equipment.

Other crops in the problem areas are affected similarly. Farmers are faced with an annual cycle of uneconomic conditions. They plant late because they cannot get the seedbed prepared early enough. Because of this, they harvest late. The late harvest is excessively costly and results in lower quality products. Instead of leaving crop residues on the ground or planting cover crops to protect the soil from the high intensity winter rains, farmers plow and disc during the fall to eliminate ruts that result from wet harvest conditions. This early spring plowing speeds seedbed preparation in the spring and early summer when time is critical. If good drainage was provided, the farmers would be more apt to maintain a good soil cover in winter because they would have more time for seedbed preparation in the spring.

Irrigation Problems

Droughts occur practically every year and often several times during the year. An adequate and dependable supply of good quality water for supplementary irrigation of cropland and pastureland is needed. Some landowners have tried to offset drought deficiencies through supplemental irrigation from Walnut and Roundaway Bayous or from wells. To date, supplementary irrigation has been only partially successful due to an insufficient supply of water in the Bayous and the high pumping cost from wells.

Municipal and Industrial Water Problems

The City of Tallulah presently obtains municipal water from wells. Although of adequate quality and quantity, the aquifer produces water that sometimes has a disagreeable odor and occasionally leaves an unsightly coloration on vegetation. The annual cost of pumping from these wells is high, and city officials feel that a cheaper source of water without these disagreeable features would induce industrial development into the area. There are, however, no sources of ground water pollution from either natural gas, sulfite or salt water in the watershed (Mississippi River Commission, 1974).

Recreational Problems

Limited access to areas suitable for recreation and limited facilities are the major recreational problems in the watershed. Consequently, there is need for increased recreational facilities with public access. Many of the lakes and waterways provide an excellent potential for the development of such facilities for water-based activities such as swimming, fishing, waterskiing, and boating. In addition, Delta Village, an existing recreational facility near Eagle Lake has experienced some problems caused by flooding.

Plant and Animal Resource Problems

Major problems affecting plant and animal resources are: land use changes, limited access, lack of proper management, poor water quality, and high pesticide residue levels.

Land use changes from forest land to cropland has had the greatest adverse affect on these resources, both in terms of degree and amount. This reduction in forest land has been the trend over the entire Mississippi Delta during the past decade. For example, between the years 1962 and 1971 about 778,000 acres of forest were converted to cropland in northeastern Louisiana. Almost all this increase in cropland has gone into soybean production. The economic and agronomic factors causing this sudden, large increase in soybean production are explained on pages 58 and 59 of this statement. This loss of bottomland forest is leading to a shortage of this habitat type. The remaining 52,100 acres of forest land in this watershed is an important forest wildlife resource needed to satisfy the growing demand for outdoor recreation activities and environmental balance and quality. Measures to maintain and improve existing forest habitat are needed to prevent further decline in the quantity and quality of this habitat type.

There is a lack of public access on much of the forested areas. In many areas only unimproved roads exist which become impassable during wet periods except with all-weather vehicles. Other areas lack vehicular access. Also, legal posting of private land limits public access to some areas.

There are some large acreages of openland habitat available in the watershed. However, only a very small portion of this is of high or even moderate quality year-round habitat for wildlife. The major factors causing this low percentage of openland habitat to be suitable for wildlife are lack of food and cover. When crops are harvested an abundance of wildlife food is shattered and left in the fields. However, in many cases these fields are disked or plowed soon after harvest and this food is covered with soil and becomes unavailable to wildlife. Also, this practice of plowing under crop residue after harvest further reduces available cover which is usually already quite sparse at this season. The trend toward very large fields has reduced the number of fencerows, ditch banks, wood lots, and added areas which formerly provided cover, travel lanes and headquarter areas for open land wildlife. The middle portion of large fields are not used by most wildlife. Improved management practices would greatly improve a portion of the available openland habitat.

The extensive land use change from forest land to cropland has adversely affected the aquatic ecosystems. Eutrophication in these systems has been accelerated as a result of greater amounts of fertilizers being applied, and increased erosion. Also, increases in turbidity, sedimentation, and pesticide residues are growing problems to the aquatic ecosystems of this area.

Water Quality Problems

The need for water quality control exists wherever pollutants or potential pollutants are discharged into water supplies. However, industrial waste production is relatively low in the watershed. In 1970, the combined municipal (domestic and commercial) and industrial load discharged into the Tensas River from Tallulah was 1,455 pounds of biochemical demand (BOD) per day (Mississippi River Commission, 1974). In addition, although only five percent of the total agricultural BOD waste production is estimated as entering the surface waters as point sources of pollution, these wastes may become an ultimate surface water problem.

Increased suspended solids, turbidities, plant nutrients, and pesticide residues are significant water quality problems of the area. As more of the forest land is converted to cropland, the volume and velocity of runoff is increased and, along with the associated changes in land management practices, leads to increases in suspended solids, plant nutrients, and pesticide levels. This problem is intensified by the fine-textured soil particles which remain in suspension, even in slow moving or still water for extended periods. The effects of sedimentation are included under the Sediment Damages discussions.

Even though there are problems with water quality, it is still satisfactory for its present usages and, in most cases, meets the quality criteria described by the Louisiana Stream Control Commission (1973).

Economic and Social Problems

The economic and social problems in the watershed are directly related to the low annual income of many of the residents as discussed in Section E.3. Such poverty level incomes and living conditions are the result of high unemployment, low educational attainment, and the spiraling increase in the cost of production. All result in an economically, and, consequently, socially depressed condition under which all energies must be channeled for watershed residents to maintain their standard of living.

RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

The watershed is in the Boeuf River, Tensas River and Bayou Macon Project subunit of the Mississippi River and Tributaries Project Basin study area. Portions of the Tensas River have been modified to increase the rate of flow. Bayou Vidal, Mill Bayou, and additional portions of the Tensas River are slated for channel modification to also increase rate of flow. The planned land treatment and structural measures included in the Walnut-Roundaway Watershed Work Plan are in harmony with all authorized plans of the U.S. Army Corps of Engineers. In addition, the work plan does not conflict with the completed interstate highway (I-20) from the western watershed boundary to the Mississippi River Bridge at Vicksburg, Mississippi. Land use changes resulting from the watershed work plan will consist of about 1,878 acres of additional rights-of-way. This additional right-of-way is comprised of 1,038 acres of open land, 211 acres of forest land, and 629 acres of wooded channel banks. Another land use change is anticipated to occur as the result of 1,500 acres of project-induced clearing of forest land.

The Louisiana Office of Public Works, in cooperation with the Madison Parish Police Jury, installed a system of channels for the disposal of excessive rainfall in the area about 30 years ago. Because of changed land use and channel deterioration, the system is no longer adequate. Following a 1956 study on the Mississippi River alluvial aquifer, the Madison Parish Police Jury agreed to operate and maintain three test wells, each with a capacity of 3,500 gallons per minute. Freshwater from these wells is pumped into Walnut and Roundaway Bayous, to enhance recreational value, community beautification, and water for limited irrigation. These on-going and future programs do not conflict with the work plan.

The Madison Parish Police Jury, in conjunction with the Louisiana Office of Public Works, has installed water control structures to enhance recreation and fish and wildlife habitat. These structures also provide a limited supply of water for irrigation and community welfare. The City of Tallulah has landscaped the banks of Walnut Bayou within the city limits for aesthetic value. The structures and landscaping do not conflict with the proposed work plan.

ENVIRONMENTAL IMPACTS

Conservation Land Treatment

The installation of the remaining land treatment measures will result in an additional 84,300 acres of cropland and pastureland being adequately treated, and 20,700 acres will be retained, created or managed for upland or wetland wildlife habitat. These measures will result in increased efficiency of the committed factors of production on cropland through increased production and increased quality of products. Also, they will protect the environment by improving the plant cover on pastureland. Wildlife will benefit by the planting of plants such as ryegrass, clovers, and bahiagrass on 2,000 acres of open land in forested areas, and the retention and management of 18,600 acres of bottomland hardwoods for wildlife habitat.

Although the soils in the watershed are prime farmland, the installation of the needed onfarm drainage systems on cropland and pastureland will provide for quicker drying of the soils following rainfall. This will permit timely performance of cultural practices for planting, growing, and harvesting of crops; and seeding, fertilizing, mowing, and grazing on pastureland. The plant response to the improved soil-moisture relationship and the timely performance of cultural practices will increase crop production and improve the quality of the pastures. Sheet erosion will be reduced due to early and full plant canopy development.

The application of a conservation cropping system will improve or maintain good physical soil conditions. Crop residue management will provide protection to the soil surface from raindrop erosion and reduce the amount of fine soil particles carried in suspension in the runoff into water courses. In addition, wildlife can utilize the crops grown for nesting, food, and corridors.

The application of the pastureland conservation practices on overused pasture will modify an already disrupted or degraded ecosystem on these lands. The environment will be improved through the establishment and maintenance of a denser and more productive soil cover which will reduce soil splash erosion and return the needed volumes of plant residues to the soil.

Structural Measures

Flood Prevention and Drainage - Installing both the land treatment and structural measures will provide a two- to three-year level of protection to crops and pastures in the benefited area. The anticipated future land use in the watershed, both without and with the project installed, is presented in the table on page 71. Benefits were computed using these acres. Changes in land use in the rights-of-way areas, as a result of installing structural measures and maintaining adequate project channels, are given in the table on page 71. Peak stages are expected to be increased at points immediately downstream from modified channel reaches (see table on page 71). The tabulated changes in stages include the effects of all proposed and installed Public Law 83-566 projects in the drainage areas of the channels which will serve as watershed outlets.

Structural measures will allow for the installation of the complete land treatment program. The installation of the combined program will benefit about 157,000 acres, allowing for an additional 84,400 acres of cropland and pastureland to receive adequate treatment. A short-term impact will result from the operation of construction equipment (i.e., noise, dust, and exhaust emissions).

Damage to crops and pasture will be minimized from floods up to the two- to three-year frequency level. Floods of greater magnitude will continue to inundate portions of the watershed, but the duration of inundation will be reduced, thereby reducing the probability of crop losses. Average annual damages will be reduced about 78 percent from $1,098,500 to $246,100.

The reduction in the flood and drainage hazards will permit farmers to more effectively use improved management and technology. Protection afforded can result in increased yields of crops that will give higher net returns per acre to the individual farmer.

Farmers will be able to improve soil conditions, plant earlier in the spring, control weeds and grasses better, harvest at more favorable times, produce better quality and higher yielding crops, and reduce fuel consumption. Direct primary benefits expected to accrue to agriculture are estimated to be $1,799,500 annually. This includes $852,400 which will accrue from flood prevention, $774,900 due to drainage, and $172,200 from more intensive use. The average annual benefits expected to accrue from redevelopment are $112,000.

Secondary benefits induced by the project and accruing to the local economy in the form of increased economic values, over and above the monetary effects of the project, are estimated to be $342,200. Secondary benefits from a national viewpoint will accrue to this project, but these were not evaluated.

Average annual primary benefits from structural measures are estimated to be $1,911,500. The average annual cost of structural measures (amortized installation cost plus operation and maintenance) is estimated to be $1,011,800, providing a benefit-cost ratio of 1.9 to 1. Total average annual benefits (including secondary benefits) from structural measures are estimated to be $2,253,700, providing a benefit-cost ratio of 2.2 to 1.

Future Land Use Without and With the Planned Project

LAND USE	FUTURE WITHOUT PROJECT (ACRES)	FUTURE WITH PROJECT (ACRES)
Cropland	163,200	163,569
Pastureland	3,600	3,600
Forest Land	42,800	41,109
Other Land	18,100	19,422
TOTAL	227,700	227,700

Changes in Right-of-Way Land Use

	EXISTING CHANNELS R-O-W (ACRES)		WITH PROJECT CHANNEL R-O-W (ACRES)		CHANGE DUE TO PROJECT (ACRES)	
LAND USE	STRUCTURAL MEASURES INSTALLATION	MAINTENANCE ADEQUATE PROJECT CHANNELS	STRUCTURAL MEASURES INSTALLATION	MAINTENANCE ADEQUATE PROJECT CHANNELS	STRUCTURAL MEASURES INSTALLATION	MAINTENANCE ADEQUATE PROJECT CHANNELS
Open Land						
Channel	552	56	664	56	112	0
Berm	60	9	344	18	284	9
Spoil	128	23	747	37	619	14
Subtotal	740	88	1,755	111	1,015	23
Forest Land						
Channel	128	109	148	109	20	0
Berm	18	12	53	18	35	6
Spoil	33	49	118	62	85	13
Subtotal	179	170	319	189	140	19
Wooded Channel Banks						
Channel	460	192	523	192	63	0
Berm	67	17	192	45	125	28
Spoil	163	40	529	77	366	37
Subtotal	690	249	1,244	314	554	65
Forest Type I Wetland						
Channel	7	0	11	0	4	0
Berm	1	0	5	0	4	0
Spoil	1	0	9	0	8	0
Subtotal	9	0	25	0	16	0
Forest Type 6 Wetland						
Channel	33	0	36	0	3	0
Berm	1	0	7	0	6	0
Spoil	2	0	20	0	18	0
Subtotal	36	0	63	0	27	0
Forest Type 7 Wetland						
Channel	5	0	5	0	0	0
Berm	0	0	2	0	2	0
Spoil	0	0	7	0	7	0
Subtotal	5	0	14	0	9	0
Wooded Channel Banks Type 1 Wetland						
Channel	12	0	13	0	1	0
Berm	1	0	3	0	2	0
Spoil	3	0	6	0	3	0
Subtotal	16	0	22	0	6	0
Wooded Channel Banks Type 6 Wetland						
Channel	10	0	10	0	0	0
Berm	0	0	1	0	1	0
Spoil	1	0	4	0	3	0
Subtotal	11	0	15	0	4	0
TOTAL	1,686	507	3,457	614	1,771	107

Project-Induced Stage Changes at Key Locations

LOCATION	STAGE CHANGE (FEET) 4-YEAR STORM*	10-YEAR STORM*	100-YEAR STORM*
Tensas Bayou at M-16	+0.5	+0.4	+0.3
M-8 at Tensas Bayou	+0.1	+0.1	+0.1
Tensas Bayou at M-8	+0.5	+0.4	+0.3
Tensas Bayou at M-14	+0.5	+0.4	+0.3
Tensas Bayou at M-15	+0.5	+0.4	+0.3
Tensas Bayou at M-7	+0.4	+0.3	+0.2
Mill Bayou at M-6	+0.2	+0.1	+0.1
Tensas River at Mill Bayou	+0.3	+0.2	+0.1
Tensas River at Bayou Macon	+0.2	+0.1	+0.1
Black River at Tensas River	0.0	0.0	0.0

* Storms with average recurrence intervals of 4, 10, and 100 years, respectively.

NOTE: Project Effects on downstream stages include effects of all planned and installed measures in the upstream drainage areas.

About 421 acres of forest land, 1,281 acres of wooded channel banks, and 1,755 acres of openland will be disturbed by construction. An additional 19 acres of forest land, 65 acres of wooded channel banks, and 23 acres of openland will be disturbed by maintenance of adequate project channels. About 1,500 acres of bottomland hardwood clearing is projected to be induced by the project. Topographical alterations will be minimal within the watershed. There will be increases in depths and widths of selected channels, the addition of new channels, and minimal increases in elevation due to deposition of soil.

Recreation - The planned project will result in the diversion of water around Eagle Lake, therefore, reducing the frequency of flooding to Delta Village, a privately-owned, public recreational facility. In addition, the clearing operations will result in the removal of unsightly debris from the project channels.

Archaeological Sites - Based on the archaeological survey conducted by personnel of Northeast Louisiana University (described in the SETTING Section), five sites (16 MA 1, 16 MA 82, 16 MA 132, 16 MA 147, 16 MA 149), were located that could possibly be affected by the project installation. However, no project channel work will be installed within approximately one-half mile of site 16 MA 1. Site, 16 MA 82, is located on a ridge that is bisected by an existing channel which requires only the clearing, mostly willow trees and debris, and the removal of silt bars in the low slough areas. No construction activity, except the movement of equipment, will take place in the vicinity of this ridge. As a result of a detail study of sites 16 MA 132, 16 MA 147, and 16 MA 149 by archaeological personnel of Northeast Louisiana University, it was determined that they would not be effected by the project. A careful watch for buried cultural remains will be maintained at all areas disturbed by project construction as work proceeds along channels. If prehistoric or historic artifacts or features are discovered, construction will be stopped. The Secretary of the Interior (National Park Service) and Office of the State Historical Preservation Officer will be notified, and given an opportunity to evaluate and make recommendations for salvage or mitigation before construction continues. Also, the Advisory Council on Historic Preservation will be afforded an opportunity to comment in accordance with the proper procedures for the protection of historic and cultural properties.

Erosion and Sedimentation - Erosion and the resulting sedimentation will decrease with the installation of the planned project measures. In 1970, when the watershed was approved for operation, sheet erosion amounted to 724,000 tons per year (5.3 tons per acre per year on cropland). At the end of the project installation period, it is estimated that sheet erosion will amount to 680,000 tons per year (3.8 tons per acre per year on cropland). This is a reduction of 44,000 tons per year or six percent. This reduction

Sediment Derived from Watershed by Outlet
(Tons/Year)

OUTLET	1970	1976	WITHOUT PROJECT	WITH PROJECT
Tensas Bayou	9,200	8,800	9,400	8,600
Mill Bayou	7,400	7,200	7,700	7,000
Tensas River	23,600	22,600	24,200	22,100
Island Chute	1,100	1,100	1,200	1,100
Bear Lake	4,400	4,200	4,500	4,100
TOTAL	45,700	43,900	47,000	42,900

Locations & Amounts of Delivered Sediment Derived from Construction

OUTLET	SYSTEM	SEDIMENT (TONS)	CONSTRUCTION YEAR (TONS) 1	2	3	4
Tensas Bayou	M-1	6,550				6,650
Mill Bayou	M-6	1,756			1,756	
Tensas River	M-7(M-6Alt.)	8,476	8,476			
Tensas River	M-16	4,374		4,374		
Tensas River	M-14	216	216			
Tensas River	M-15	192	192			
Island Chute	M-8	439	439			
Bear Lake	M-9,10,11,12	1,189		1,189		
TOTAL		23,192	9,323	5,563	1,756	6,550

is achieved despite an increase in the number of acres being utilized for row crop production. In 1970, there were 108,000 acres of land where sheet erosion amounted to over five tons per acre per year (the recommended allowable soil loss). After the project installation period, there will be 2,640 acres with erosion rates exceeding five tons per acre per year. This is a reduction of 97 percent.

In 1970, sediment derived from the watershed and delivered to the channel outlets (see table on page 73) amounted to 45,700 tons per year. After the project installation period, this amount of sediment will be reduced to 42,900 tons per year.

Channel construction will generate approximately 94,000 tons of sediment. Approximately 23,000 tons of sediment will be delivered to channel outlets as a result of this erosion (see table on page 73).

Plants and Animals - Channel work on about 69 miles or 94 acres of channels having water will cause an increase in turbidity, suspended solids, and sedimentation resulting in a lowering of water quality during and for a period of approximately six months after construction occurs. However, the reduction in sheet erosion and sedimentation which has resulted from the accelerated land treatment program more than offsets this temporary increase. The accelerated land treatment program commenced when the project was funded. Work on existing channels will lead to a lowering of primary productivity, which, in turn, will lower the standing crop of fishes. Sedimentation will result in the disruption of the existing benthic community. The channel work will also be detrimental to the existing fishery due to the removal of cover, spawning, and food production areas. In selecting which side to dig from, consideration will be given to providing the most effective shade for channels containing ponded water. Periodic maintenance needed to keep the channel functioning as designed may prevent complete recovery of these fishery areas to preproject conditions.

Construction will convert 421 acres of forest land including wetlands and 1,281 acres of wooded channel banks to open land. An additional 19 acres of forest land and 65 acres of wooded channel banks will be disturbed by the maintenance of adequate project channels. An estimated 1,500 acres of forest land, including about 120 acres of Type 1 Wetlands, will go to open land as a result of project-induced clearing. The loss of this habitat will be detrimental to forest wildlife species, such as white-tailed deer, turkey, black bear, squirrels, swamp rabbit, wood duck and some nongame species (see the table on page 75). (This loss will be partially offset by planting the project-created spoil in forest land to hardwood seedlings, such as water oak, sweet pecan, and willow oak. However, it will require at least 30 years for these trees to mature enough to provide forest habitat equal to that

Changes in Habitat Types and Estimated Numbers of Game Species
As a Result of Right of Way Clearing and Induced Clearing in the Walnut-Roundaway Watershed

			RIGHT OF WAY CLEARING		INDUCED CLEARING	
SPECIES	ANIMAL TO ACRE RATIO	HABITAT TYPE	ACRES GAINED(+) OR LOST(-)	NUMBER OF ANIMALS GAINED(+) OR LOST(-)*	ACRES GAINED(+) OR LOST(-)	NUMBER OF ANIMALS GAINED (+) OR LOST (-)
Deer	1:15	Forest Land**	-1,047	-70	-1,500	-100
Dove***	1:0.8	Openland	+1,203	+1,504	+1,500	+1,875
Rabbit	1:9	Forest Land Openland	-1,047 +1,203	+17	-1,500 +1,500	0
Squirrel	1:0.75	Forest Land	-1,047	-1,396	-1,500	-2,000
Bobwhite***	1:3	Openland	+1,203	+401	+1,500	+500
Waterfowl (Resident)	1:50	Forest Land	-1,047	-21	-1,500	-30
Waterfowl (Migratory)	1:15	Forest Land Openland	-1,047 +1,203	+10	-1,500 +1,500	0
Wild Turkey	1:250	Forest Land	-1,047	-4	-1,500	-6

* Based on present carrying capacity of the habitat.
** All forest land figures include wooded channel banks.
***Temporary increases.

which now exists. Vegetation established on disturbed areas will provide forage and seed for many forest wildlife species.

Project channel work will reduce the duration of flooding on about 266 acres of Type 1 Wetlands. This acreage is comprised of about 47 acres (25 acres in forest land and 22 acres in wooded channel banks) to be occupied by project channel rights-of-way and 219 acres outside the rights-of-way limits.

Openland wildlife species which prefer edge and open (agricultural) habitat will be benefited by the project by the addition of 1,203 acres of habitat. During construction, this habitat, along with about 188 acres of existing openland habitat, will be temporarily disturbed. Wildlife populations supported by this 1,755 acres of habitat will be decreased until these areas are revegetated and returned to their former condition. About 18,600 acres of bottomland hardwoods will be retained, as they exist, by individual landusers as part of their conservation plan for wildlife habitat for deer, squirrel, rabbit, and other forest wildlife species. Plots or strips, one to five acres in size, totaling 2,000 acres of open land in forested areas will be planted for wildlife food. Population levels will be equal to or better than those presently occurring. The quality of upland openland wildlife habitat will increase as a result of better drainage and flood protection.

About 31 acres of Type 6 and nine acres of Type 7 Wetlands will be eliminated within the project rights-of-way. Adjacent wetlands will be affected by temporary increases in turbidity, suspended solids, and sedimentation as a result of construction. These impacts will lower the value of these areas for fish and wildlife habitat. Some of the remaining wetlands could receive minor effects due to changes in flow conditions and reductions in out-of-bank flows. The loss of these 40 acres of Types 6 and 7 Wetlands will be mitigated by the development of an 80-acre wetland habitat elsewhere in the watershed. This area will be managed as wetland for the life of the project (50 years).

Endangered or threatened wildlife species which do inhabit or could inhabit or visit the area will be affected by the disturbance caused by construction of 421 acres of forest land and 1,281 acres of wooded channel bank habitat types. They could also be affected by the anticipated loss of 1,500 acres of forest land due to project-induced clearing. An additional 19 acres of forest land and 65 acres of wooded channel banks and 23 acres of open land will be disturbed by maintenance of adequate project channels. Most of the endangered wildlife species that could occur in the watershed are found in association with bottomland hardwood habitat types.

The quality of water on about 69 miles or 94 acres will be temporarily reduced in the existing channels requiring channel work and their receiving water bodies. The pH will temporarily decrease and organic nutrients and available free carbon dioxide will temporarily increase as a result of the organic degradation of debris introduced by clearing operations on portions of Channels M-1, L-1C, M-6, L-6M, L-7C, L-7C8, and M-16.

Bull Bayou and other smaller drainage systems presently drain into Bear Lake. In recent years, the fishery of Bear Lake has been significantly reduced because of increased sediment and agricultural runoff into the Lake. Diverting about 10,000 acres of agricultural runoff from Bear Lake into the Tensas River will reduce the amount of sediment and agricultural runoff entering the Lake. Such reductions should improve the quality of the fishery by improving the water quality and creating more favorable conditions for planktonic and benthic organisms. However, there will be an impact on the Tensas River due to a temporary increase in turbidity caused by construction.

Alligator Brake is an area characterized by Type 5, 6, and 7 Wetlands which provide excellent waterfowl habitat. Channel work upstream will temporarily reduce the water quality primarily due to an increase in turbidity which will impact the primary productivity and, therefore, reduce the value of the area as a fishery and for waterfowl use. However, one the water quality has stabilized, maintaining the water level in the area will insure that fish and wildlife values will return to their former state or condition.

The Texas Lake Complex is an attractive waterfowl area. Excavation activities in the complex will temporarily reduce the water quality and productivity of the area. Once the area stabilizes and structures are installed to maintain and manage the water level, the quality of the fishery and the waterfowl habitat will be improved. The management plan for this area is on page 11 of the PLANNED PROJECT Section.

Willow Lake, Lake One, Eagle Lake and Lake Despair are all in areas characterized by Type 5 Wetlands. Excavation activities upstream of these lakes will temporarily reduce the water quality primarily in Willow Lake, Eagle Lake, and Lake Despair. There will be a lesser impact on the water quality in Lake One, which receives water from Willow Lake and Eagle Lake. Temporarily decreased water quality will temporarily decrease the productivity of the area for fish and wildlife, but this lake system will benefit from the diversion of about 7,000 acres of agricultural runoff away from it.

Excavation upstream from Brushy Bayou, which passes through the City of Tallulah, will temporarily reduce the water quality. However, there will be little change in the fishery of this bayou.

The temporarily decreased water quality will be stressful to some fishes, phytoplankton, zooplankton, and benthos. Turbidity and sediment will create problems, especially for filter-feeders and benthos. All benthos, especially sessile or sedentary organisms, will be temporarily destroyed and eliminated from the excavated areas. In addition, the removal of snags and other debris will reduce the amount of habitat available to fishes in perennial, intermittent, or ponded channels where clearing operations will be undertaken.

Some adverse effects resulting from the channel work will be experienced by the resident wildlife. Maintenance operations will cause wildlife, presently established along or immediately adjacent to the project areas, to retreat several yards and redetermine their territory after finding adequate cover and food. However, temporary displacement may result in permanent loss of species due to inter- and intraspecific competition or stresses. The animals will be forced to move from the channel banks and further into adjacent woods. This may result in overcrowding and increase susceptibility to predation and disease. The disturbed areas, however, will remain within the normal range of the species. Also, depending on the intensity of the turbidity created by excavation, the animals may be forced to seek a new and/or temporary water supply.

Economic and Social

Agriculture, the economic base of the watershed, will be enhanced with the installation of the planned project. Increasing agricultural development will increase the sales of processors and dealers in agricultural equipment and ancillary goods.

Installation of the project will create about 272 man-years of local labor. Of this total, 194 man-years will be created from installation of land treatment measures; 56 man-years from structural measures; and 22 man-years from operation and maintenance. All of these 272 man-years of labor are available to both minorities and nonminorities.

Stimulating the agricultural industry will cause farming to become more competitive with other industries, inducing more people to remain on the farm, slowing the current out-migration trend.

About 300 farmers, 1,100 farm family members, and the employees of those farmers will benefit from the project. Of these individuals, 107 are minority farmers, 83 of which are cooperators with the soil and water conservation district program. Benefits will include increased income resulting in improved living conditions, better farming equipment, higher education, and better health care.

The average annual overall net farm income will increase about $5,300 per farm or about $11 per acre. With this increase and more stable income, the farmer may improve his living conditions and the conditions of his employees.

More efficient use of labor, capital, and management can be expected because of reduction in the frequency of replanting and cultivation, more effective use of chemical weed control measures, and a reduction in the cost of production. Frequency of cultivation can be reduced as much as once annually. Cost of production can be reduced due to less frequent replanting. Longer periods of time will be available during critical production periods for maximum utilization of equipment and other factors of production. More profitable cropping patterns can be used when the project is installed.

The problems caused by flooded roads and damaged bridges will be reduced. School buses will be able to travel their scheduled routes more regularly, which will improve school attendance. The general public will be better able to utilize the roads for farming operations and marketing, for commuting to places of employment and business, and for access to emergency medical treatment.

Temporary interruption of local traffic patterns during the replacement of bridges and culverts will result in inconveniences to the people involved. Detour routes will be available so that no one will be deprived of access to their destination. There is a possibility of temporary power transmission disruptions when utility lines are altered at project channel locations. Also, noise levels will increase at the construction sites.

Eliminating areas with standing or trapped water will prevent the breeding of vectors which could affect human health conditions.

Because most of the agricultural products produced are processed outside of the watershed, economic activity in the region will also be increased.

International Impacts

A large demand for soybeans in Western Europe, Japan, and Canada has created a major market for this crop. One of the main reasons for this is a world shortage of high-energy and protein-rich foods. According to a 1967 report of the Foreign Policy Association, every day about 10,000 people in the underdeveloped areas of the world die as a result of illnesses caused by malnutrition, and of every 20 children born in these countries, 10 are likely to perish in fancy from hunger or from the effects of improper diet. Half the world's population consumes only about three-fourths the calories, two-thirds the proteins, and one-third the fats considered desirable for an adequate diet. Consequently, the soybean is a unique crop that supplies all these major needs and the importance of American-grown soybeans to the world should not be underestimated.

The soybeans grown in this watershed represent an incremental share to the available world supply. If soybeans are going to be the major commodity responsible for improving the nourishment of the world's developing countries, the supply must include the soybeans being produced in the Walnut-Roundaway Watershed. The international impact of the Walnut-Roundaway Watershed Project will be manifested in its ability to enable farmers of the area to increase their production of soybeans, thereby increasing the available supply for world consumption.

Favorable Environmental Impacts

Economic activity in the watershed will increase.

Average annual agricultural damage due to flooding will be reduced by 78 percent. Agricultural damage due to poor drainage will be reduced.

Sheet erosion will be reduced from 724,000 tons per year to 680,000 tons per year. The total acreage with over five tons of soil loss per acre per year will be reduced from 108,000 to 2,640.

Sediment delivered to the watershed outlets and lakes within the watershed will be reduced from 45,700 tons per year in 1970 to 42,900 tons per year. This reduction is about six percent.

Diverting about 10,000 acres of agricultural runoff from Bear Lake into the Tensas River will reduce the amount of sediment and agricultural runoff entering the lake thereby beneficially effecting the fishery.

The Willow Lake-Eagle Lake-Lake One Complex will benefit from the diversion of about 7,000 acres of agricultural runoff away from it.

Average annual net farm income will increase by $5,300 or about $11 per acre.

A total of approximately 157,000 acres of cropland and pastureland will benefit from the combined program of land treatment and structural measures.

The installation of the project will allow for an additional 84,300 acres of cropland and pastureland to receive adequate treatment.

Approximately 20,700 acres (2,000 open land and 18,700 forest land) of multiple use on cropland, pastureland, and forest land will be used for wildlife habitat.

About 300 farmers, 1,100 farm family members, and the employees of those farmers will benefit from the project. Of these individuals, 107 are minority farmers, 83 of which are cooperators with the soil and water conservation districts.

All new employment attributed to this project is available to both minorities and nonminorities.

Improved farming efficiency resulting from project installation will reduce the average annual fixed cost of production.

Mosquito habitat areas will be reduced as a result of project installation.

There will be an increase in habitat for openland species.

Damages to roads will be reduced.

The quality of upland openland wildlife habitat will increase as a result of better drainage and flood protection.

The clearing operations will result in the removal of unsightly debris from the project channels.

Installation of the project will reduce some of the high risks involved in farming due to flooding and inadequate drainage and make it a more profitable business enterprise.

More efficient use of labor, capital, and management can be expected.

More efficient cropping patterns can be used when the project is installed.

The reduction in the flood and drainage hazards will permit farmers to more effectively use improved management and technology. Protection afforded can result in increased yields of crops that will give higher net returns per acre to the individual farmer.

Average annual benefits from improved drainage will amount to about $774,900; flood prevention benefits will be about $852,400 and more intensive land use benefits will be approximately $172,200. The total of these benefits, $1,799,500, represents an average annual increase in net farm income to farmers in the watershed.

Benefits will include increased income resulting in improved living conditions, better farming equipment, higher education, and better health care.

Adverse Environmental Impacts

It is estimated that an average of 5,800 tons of sediment per year for four years will be generated by construction.

About 421 acres of forest land, 1,281 acres of wooded channel banks, and 1,755 acres of open land will be disturbed by construction.

Project channel work will reduce the duration of flooding on about 266 acres of Type 1 Wetlands. This acreage is comprised of about 47 acres to be occupied by project channel rights-of-way and 219 acres outside of rights-of-way limits.

About 1,500 acres of bottomland hardwood clearing, including about 120 acres of Type 1 Wetlands are projected to be induced by the project. These changes will result in reductions of both game and nongame habitat and monetary loss of forest products.

Monetary losses in forest products will result from disturbance of 421 acres of forest land for rights-of-way needs.

Losses of wildlife values will result from disturbance of 421 acres of forest land and 1,281 acres of wooded channel banks for rights-of-way needs.

Channel work on about 69 miles or 94 acres of channels having water will temporarily increase the turbidity of the water which will indirectly decrease the dissolved oxygen available and increase temperature (due to the removal of overhanging trees).

The pH will temporarily decrease and organic nutrients and available free carbon dioxide will temporarily increase as a result of the organic degradation of debris introduced by the clearing operations on portions of channels M-1, L-1C, M-6, L-6M, L-7C, L-7C8, and M-16.

The quality of water will be temporarily reduced. The water will be stressful to some fishes, phytoplankton, zooplankton, and benthos, especially those which are filter-feeders. All benthos, especially sessile and sedentary organisms, will be temporarily destroyed and eliminated from the excavated areas. In addition, the removal of snags and other debris will reduce the amount of habitat available to fishes in perennial, intermittent, or ponded channels where clearing operations will be undertaken.

Short-term adverse impacts from the operation of equipment will be noise, dust, exhaust emissions, the displacement of resident wildlife populations along the rights-of-way, and the removal of existing vegetation.

Landform change in the watershed will be minimal because there will be only increases in depth and width of selected channels and the addition of new channels.

An additional nine acres of forest Type 7 Wetlands, 27 acres of forest Type 6 Wetlands, and four acres of wooded channel banks Type 6 Wetlands will be affected within the project channel rights-of-way; however, measures will be implemented to mitigate their loss through the development of an 80-acre wetland elsewhere in the watershed.

An additional 19 acres of forest land, 65 acres of wooded channel banks, and 23 acres of open land will be disturbed by maintenance of adequate project channels.

Diverting the full flow of Bull Bayou from Bear Lake will cause an adverse impact on the Tensas River, similar but much less severe to that previously experienced by Bear Lake.

Alligator Brake is an area characterized by Types 5, 6, and 7 Wetlands which provide excellent waterfowl habitat. Channel work upstream will temporarily reduce the water quality primarily due to an increase in turbidity which will impact the primary productivity and, therefore, reduce the value of the area as a fishery and for waterfowl use. However, once the water quality has stabilized, maintaining the water level in the area will insure that fish and wildlife values will return to their former state.

The Texas Lake Complex is an attractive waterfowl area. Excavation activities in the Complex will temporarily reduce the water quality and productivity of the area. Once the disturbed areas have been revegetated and the structure for water control is installed to regulate the water level, the quality of the fish and wildlife habitat will return to pre-construction levels.

Willow Lake, Lake One, Eagle Lake and Lake Despair are all in areas characterized by Type 5 Wetlands. Excavation activities upstream of these lakes will temporarily reduce the water quality. primarily in Willow Lake, Eagle Lake, and Lake Despair. There will be a lesser impact on the water quality in Lake One, which receives water from Willow Lake and Eagle Lake. Temporarily decreased water quality will temporarily decrease the productivity of the area for fish and wildlife.

Excavation upstream from Brushy Bayou, which passes through the City of Tallulah, will temporarily reduce the water quality. However, there will be little change in the fishery of this Bayou.

ALTERNATIVES

Alternatives under consideration for the Walnut-Roundaway Watershed Work Plan include: (1) land treatment only; (2) original plan - channel work and land treatment; (3) channel work, land treatment, and restrictive easements on 18,300 acres of bottomland hardwoods; and (4) no project. During development of alternatives, the planned project was considered along with the others prior to final selection. Water impoundments are not applicable because the topography of the watershed is relatively flat, therefore, floodwater retarding structures are not considered as an alternative.

1. Land Treatment Only

The major land treatment measures that could be installed are chiseling and subsoiling, conservation cropping systems, crop residue management, minimum tillage, land smoothing, pasture and hayland management, pasture and hayland planting, wildlife wetland habitat management, and wildlife upland habitat management. Other practices that could be installed to a lesser degree are drainage mains and laterals, drainage field ditches, drainage land grading, and structures for water control (pipe drops). See the table on page 13 for further detail. These measures could be installed to adequately treat only about 57,000 acres of primarily cropland and pastureland. In addition, some land treatment could be installed on some marginal land. However, the effectiveness would be limited due to floodwater and drainage problems. The installation cost would be about $1,968,000. The installation of the practices on cropland would increase ground cover and reduce splash erosion and runoff rates. The measures to be installed on pastureland would improve plant composition, thereby improving the animal carrying capacity. The wildlife practices would improve the habitat for species of wildlife now found in the watershed. The installation of land treatment only would result in improved agronomic practices on cropland and improved grazing, seeding and management practices on pastureland. However, onfarm water management practices for improvement of soil conditions on areas of impaired surface drainage and on the lands subject to flooding can be installed only to a limited extent because of inadequate outlets. For this reason, land treatment alone would not meet the project objectives. However, by concentrating a land treatment acceleration program in areas that, at the present time, are not presently receiving any floodwater damage, a reduction in erosion and sedimentation can be achieved. However, it must be realized that, in time, flooding would become more frequent and be of longer duration than at present, due to the decrease in channel capacity caused by sediment. There would be no construction-induced erosion with this alternative. If this alternative was installed, $1,926,300 net annual benefits would be foregone as compared to the planned project.

2. Original Plan (Channel Work and Land Treatment)

This alternative is the original plan approved by Congress in 1969 except the land treatment program is the same as the planned project. Structural measures differ considerably as compared to the planned project. It does not include the following structural measures: (1) diversion of Bull Bayou (M-16) around the north side of Bear Lake; (2) routing part of the M-6 channel system through Brushy Bayou; (3) modification of the Englewood Structure (Water Control Structure No. 2); (4) three weirs; (5) one earthfill dam; and (6) two grade stabilization structures. It includes work on an additional 4 miles (83 acres of right-of-way) on channels through Types 1, 5, 6, and 7 Wetlands. Included is work on an additional 11 miles (275 acres of right-of-way) through bottomland hardwoods. Also included is 16 miles (293 acres of right-of-way) of adequate project channels through Types 1, 5, 6, and 7 Wetlands that would be maintained for the life of the project (50 years).

Structural measures would consist of approximately 280 miles of channel work for flood prevention and drainage, together with appurtenant measures for channel protection and maintenance access; two weirs, five dams in existing channels or streams, and two water control structures to minimize damage to fish and wildlife habitat. The weirs and water control structures may be equipped with flashboards for the drawdown of water needed for management of the affected area for wildlife. New sections of channels will be constructed for better alignment of existing channels or to more effectively utilize existing land use patterns and drainage systems. In addition to the 280 miles of channels to be worked, the sponsors will continue to maintain the 34 miles of channels which are now adequate including those previously mentioned. Channel work will also provide adequate outlets for onfarm drainage systems and will have sufficient capacity to remove the runoff of a 2- to 3-year frequency storm. The land treatment program in this alternative is the same as the Planned Project and it has similar effects. The total installation cost of the project is estimated to be $14,902,900. Included in the total project cost is $3,867,300 for land treatment measures and $11,035,600 for structural measures. The annual operation and maintenance cost is $119,500. Expected benefits would be the same as the Planned Project. Wildlife habitat changes and the loss or gain of habitat units for game species are shown in the table on the following page. Existing types and flow characteristics involved in this alternative are also presented in the table at the bottom of the following page.

3. Channel Work, Land Treatment, and Restrictive Easements on 18,300 Acres of Bottomland Hardwoods

Consideration of this alternative was given as a result of comments received during interagency review. A major concern was the clearing of bottomland hardwoods (both induced and trend clearing).

Changes in Habitat Acres and Habitat Units for Game Species in the Channel Work and Current Land Treatment Measures (Alternative 2)

SPECIES	ANIMALS PER ACRE	HABITAT TYPE	HABITAT CHANGED (ACRES)	HABITAT* UNITS OPENLAND	FORESTLAND
Dove	1:0.8	Openland	1,603	+534**	-
Bobwhite	1:3	Openland	1,603	+ 32**	-
Squirrel	1:0.75	Forestland	1,754	-	-1,169
Deer	1:15	Forestland	1,754	-	-88
Turkey	1:250	Forestland	411	-	-5
Rabbit	1:9	Forestland & Openland	-	No Change	-
Waterfowl (Resident)	1:50	Forestland & Water Areas	1,830	-	-37***
Waterfowl (Migratory)	1:15	Forestland & Openland & Water Areas	1,830	-	-122***

* Current acreage required to support one animal year-round.
** Temporary Gain.
***Includes Wetlands.

Existing Types and Flow Characteristics of Channels in the Channel Work and Current Land Treatment Measures Alternative

TYPES OF CHANNELS		LENGTH OF CHANNELS	LENGTH REQUIRING WORK
		MILES	
Man-Made or Previously Modified	(M)	272	242
Natural	(N)	17	13
Nonexisting or No-Defined Channel	(O)	25	25
Totals		314	280
FLOW CONDITIONS			
Ephemeral	(E)	201	194
Intermittent	(I)	36	25
Ephemeral - Ponded	(S)	11	9
Intermittent - Ponded	(Is)	43	39
Perennial - Ponded	(Prs)	23	13
Totals		314	280

The alternative includes a proposal to obtain restrictive easements to prevent clearing of bottomland hardwoods that will be affected by project channels.

This alternative would consist of the same structural measures as the selected plan. In addition, easements limiting land use conversion of bottomland hardwoods to cropland on 18,300 acres of existing bottomland hardwoods would be obtained. The easements would be obtained on lands served by the channel work and which have a potential for being converted to cropland due to higher economic returns to landowners. Easements would not be obtained on the 33,800 acres of bottomland hardwoods which are either located outside of the areas served by the channel or the flow regime will not be modified sufficiently to induce land use conversions. It was determined that easements would be needed on the entire acreage subject to land use conversion rather than the amount projected to be cleared by landowners because of the impossibility of specifying which acreage would be cleared.

The easements would limit the use of the land to that compatible with maintaining the existing vegetative composition or possibly enhancing the carrying capacity for existing species of wildlife. Selected logging would be allowed. Public access would be at the discretion of the landowner.

The cost of this alternative would be $25,533,600. The cost would be essentially the same as the selected plan plus the cost of the easements which are estimated to be $10,980,000 or $600.00 per acre. This cost would be borne with other than Public Law 566 funds inasmuch as there would be only land rights costs involved and there are no provisions for P.L.-566 cost sharing on land rights in this situation.

The impacts of this alternative would be the same as the selected plan with the following exceptions:

1. The projected 10,800 acres (1,500 project-induced and 9,300 trend) of bottomland hardwood clearing by landowners would be prevented.

2. The associated adverse impacts to wildlife caused by the subject clearing would be eliminated.

3. The economic benefits to landowners realized by converting the 10,800 acres of hardwoods to cropland would be foregone. This amounts to $1,447,200 per year or $134.00 per acre (based on 1976 prices and costs).

4. The land values would be reduced to $300 per acre.

4. No Project

The "No Project" alternative would include the ongoing land treatment program. Without the project, seven percent of the cropland and pastureland has received adequate land treatment. Land adequately treated is defined as land used within its capabilities with proper conservation practices applied to compensate for its limitations. With "No Project", the rate of installation of land treatment measures on agricultural land would remain about the same. There would be no change in the land treatment program of forest land. No losses of forest land for installation of project channels would occur. The "No Project" alternative would forego the reductions in erosion and sediment on the watershed as a whole. Also, the frequency and duration of flooding would increase due to the continued reduction of present channel capacity caused by sediment accumulation. Water problem areas will continue to exist with this alternative. Sponsors do not have sufficient funds to finance the installation of a complete channel system. Only limited work on certain channels would be done. No overall orderly, planned procedure would be followed. Appurtenant measures needed to control erosion and sediment would not be installed. This haphazard approach would result in damages to the vegetative communities and aquatic ecosystems. These damages would not be reduced. The pursuit of this alternative would result in little emphasis being placed on environmental values. If the project is not installed, net annual benefits of about $2,253,700 will be foregone.

PLAN SELECTION

The sponsoring local organizations, after careful consideration of the favorable and adverse impacts on their objectives, and other environmental factors, selected alternative plan 5 (see summary comparison table, page 90). This table illustrates the impacts that the alternatives plans as well as the selected plan have on major economic, environmental, or social factors. An evaluation of the table indicates that:

1. Alternative 1 would make limited contributions to two major planning purposes (flood prevention and drainage); would have a moderate effect on erosion and sediment reduction; and would generate annual economic benefits equal to annual costs. No adverse environmental impacts would occur. This alternative would not contribute significantly to the planning goals.

2. Alternative 2 would maximize economic benefits as compared to cost as well as maximizing total net economic benefits. The primary planning objectives would be met and significant reductions in erosion and sediment would be realized. However, Alternative 2 would have the greatest adverse

impact on fish and wildlife habitat, wetlands, and bottomland hardwoods.

3. Alternative 3 would have the least adverse impact on fish and wildlife habitat, wetlands, and forest land. However, Alternative 3 is the most costly of the alternatives and generates the least return per dollar spent. The annual economic benefits are approximately half of annual costs for this alternative. The additional favorable impacts did not warrant the sustantial increase in cost.

4. Alternative 4 would allow existing environmental and economic problems to continue. No adverse impacts would be induced nor would any favorable environmental or economic impacts be realized. All economic benefits of the selected plan ($2,253,700 annually) would be foregone. Erosion and sediment would increase as compared to a reduction in all other alternatives. Except for the ongoing land treatment program, no planning objectives would be met with this alternative.

5. The selected plan would also maximize net economic benefits although at a slightly higher cost per dollar spent than Alternative 2. The higher costs are due to the structures for water control (weirs) added for environmental reasons as well as the addition of grade stabilization structures and diversions for improved water quality. The selected plan would optimize planning objectives (greatest flood prevention and drainage acreage, greatest total net economic benefit, and substantial sediment and erosion reduction) while reducing adverse environmental impacts in Alternative 2. The selected plan would realize more economic benefits than Alternative 3 at about 57 percent of the costs. The selected plan would also provide the largest land area to be adequately protected under the land treatment program.

SUMMARY COMPARISON TABLE
Walnut-Roundaway Watershed

Economic Environmental, or Social Factors	Goals 1/	Alternative 1 (Land Treatment only)	Alternative 2 (Land Treatment, 314 miles channel)	Alternative 3 (Land Treatment, 288 miles channel, restrictive erosion)	Alternative 4 (No Project)	Alternative 5 Selected Plan (Land Treatment, ment, 288 miles channel)
Installation costs	NA	2,481,000	11,035,600	25,553,600	-	14,553,600
Local share installation costs	NA	1,968,000	4,193,500	16,440,300	-	5,460,300
Annual O&M costs	NA	54,200	119,500	223,200	-	223,200
Annual costs	NA	327,400	856,500	1,595,900	-	1,011,800
Land treatment costs	NA	2,481,000	3,058,600	2,804,400	962,100	2,991,000
Annual benefits	NA	327,400	2,253,700	806,500	-	2,253,700
Flood reduction & drainage	Affected Acres	-	142,500	146,200	-	157,000
Land treatment program	Acres treated 2/	57,000	68,800	80,000	25,300	84,300
Sheet erosion	Reduction tons/year	26,000	44,100	69,000	19,900 3/	44,100
Sedimentation	Reduction tons/year	1,700	2,800	4,300	1,300 3/	2,800
Water quality	Meet 1983 criteria					
During construction		Minor + 4/	Moderate - 4/	Moderate -	No effect	Moderate +
Life of project		Moderate +	Minor -	Moderate +	Minor +	Moderate +
Wetlands	Protect and Improve	Minor +	Moderate -	Minor +	Minor -	Minor +
Endangered species	Protect	Minor +	Moderate -	Minor +	Minor -	Minor -
Fish habitat	Protect and Improve					
Lakes		Minor +	Moderate -	Moderate +	Minor -	Moderate +
Streams		Minor +	Moderate -	Moderate -	Minor -	Moderate -
Wildlife habitat	Protect and Improve					
Open land		Moderate +	Minor -	Minor +	Minor -	Minor +
Forest land		Minor +	Moderate -	Minor -	Minor -	Minor -
Visual Resources	Maintain	Minor +	Moderate -	Minor -	Minor -	Minor -

1/ NA - Not applicable.
2/ Acres adequately treated.
3/ Increases in sheet erosion and sedimentation.
4/ (+) and (-) indicates beneficial or adverse changes over existing conditions.

SHORT-TERM VS. LONG-TERM USE OF RESOURCES

The Walnut-Roundaway Watershed is located in the Ouachita Water Resource Subregion of the Lower Mississippi Region. The Subregion includes all or parts of 39 soil and water conservation districts. Adequate land treatment has been established on about 40 percent of the Subregion. The status of Public Law 83-566 projects for flood control is shown in the table on the following page. Of the total land area in the Subregion, about 33 percent is in some stage of development or investigation under Public Law 83-566. Approximately 15 percent of the total land in the region is covered by Public Law 83-566 projects which are either installed or approved for planning. Extensive flood control measures other than those in Public Law 83-566 projects have been installed throughout the region. Approximately 35,000 square miles of the region would be overflowed by a great flood on the Mississippi River if it were not for a system of mainline and backwater levees, floodways, reservoirs, and channel works. As a result of these improvements, approximately 24,000 square miles receive essentially complete protection from flooding from the Mississippi River and about 3,600 square miles in backwater areas and floodways receive a lesser degree of protection. In addition, systems of reservoirs, levees, and channel works reduce or prevent headwater flooding.

A Type 4 river basin study is in progress in the Ouachita Water Resource Subregion. The purpose of this study is to determine the coordinated needs and availability of soil and water resources and to outline the requirements for managing these resources to meet anticipated future needs.

Approximately 26 percent of the drainage area of the Ouachita River Basin is covered by applications for assistance under Public Law 566. Plans similar to Walnut-Roundaway Watershed Project have been developed and approved for installation on approximately 13 percent of this area.

There are eight P. L.-566 projects that outlet wholly or partially into the Tensas River, an authorized U. S. Corps of Engineers' project. The Corps' re-evaluation of portions of this project are presently in progress. These P. L.-566 projects are Central Madison, East Franklin, West Carroll, North Tensas, South Tensas, West Madison, East Carroll, and Walnut-Roundaway.

All planned works in North Tensas, South Tensas, and West Madison Watersheds have been installed. At the time these projects were planned no estimates were made of the amount of induced clearing, or wetlands affected.

The estimated cumulative effects of the eight projects based on available information are:

1. Approximately 731,000 acres of crop and pasturelands will benefit from reduced flooding and improved drainage.

2. Sheet erosion causing the movement of soils from these watershed areas will be reduced approximately 246,000 tons annually.

3. Sediment delivered to the outlet for these watersheds will be reduced approximately 440,000 tons annually.

4. Approximately 2,500 acres of bottomland hardwoods will be cleared as a result of the installation of these watersheds. This includes anticipated project induced clearing, and areas needed for project channel right-of-ways.

5. Approximately $13,228,000 in annual crop and pasture benefits will be realized as a result of the installation of these projects.

6. An estimated 200 acres of Types 1, 6, and 7 Wetlands will be destroyed by the installation of these projects.

7. About 800 acres of lands in these watersheds will be retained by easements for the life of these projects to mitigate losses to fish and wildlife habitat resources.

Loss of forest land and woody channel banks will reduce the quantity of forest habitat for the life of the project. Loss of woody channel banks will reduce the quality of both open land and forest land habitats for many wildlife species. In areas not required to be kept free of woody growth for maintenance purposes, the forest land and woody channel banks are expected to return to preproject conditions in 15 to 20 years. Fish habitat quality will be reduced in channels receiving work because of loss of in-channel cover, pot holes, woody bank vegetation, and adverse changes in flow conditions. Stream fish habitat will begin recovery after construction ceases but its overall quality and quantity will be lowered for the life of the project.

The productivity of existing wildlife habitat, both open land and forest land, will be maintained or increased on 20,600 acres for the life of the project. Water quality in the lakes, bayous, and downstream areas will be improved for the life of the project by reducing suspended sediment. The reduction in sediment will have a long-term beneficial effect on the fishery in the Watershed. Bear Lake will be significantly benefited by the diversion of about 10,000 acres of agricultural runoff out of the lake. The Willow Lake-Eagle Lake-Lake One Complex will also benefit from the diversion of about 7,000 acres of agricultural runoff away from it. Several other wetland areas will be protected from excessive sedimentation or drainage by the diversion of channels around them. Also, 1,574 acres of Types 5, 6, and 7 Wetlands will have their water levels maintained for the life of the project by the installation of 5 weirs. There will be a slight increase in the amount of openland habitat. The quality of existing upland habitat for nonwetland wildlife will be improved by flood reduction and better drainage.

Status of Public Law 83-566 Projects

ITEM	PROJECTS INSTALLED		PROJECT APPROVED FOR OPERATION		PROJECT APPROVED FOR PLANNING		PROJECT APPLICATIONS RECEIVED		TOTAL	
	(NO.)	(ACRES)	(NO.)	(ACRES)	(NO.)	(ACRES)	(NO.)	(ACRES)	(NO.)	(ACRES)
OUACHITA WATER RESOURCE SUBREGION										
Louisiana	3	369,972	6	1,147,550	2	468,400	6	554,680	17	2,540,602
Arkansas	11	318,647	7	348,673	1	45,000	2	357,000	21	1,069,320
TOTAL	14	688,619	13	1,496,223	3	513,400	8	911,680	38	3,609,922
LOWER MISSISSIPPI WATER RESOURCE REGION										
Louisiana	10	702,562	23	3,681,420	3	576,400	15	1,316,905	51	6,277,287
All Other States	33	936,975	28	1,949,347	11	631,585	6	532,422	78	4,050,329
TOTAL	43	1,639,537	51	5,630,767	14	1,207,985	21	1,849,327	129	10,327,616

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The total monetary value which will be expended for installing the land treatment and the structural measures amounts to $18,349,300. In addition, $221,200 will be spent annually for operation and maintenance. The expenditure of labor and capital for the project installation is irretrievable. Land presently committed to project channels, berms, and spoil disposal sites comprises a total of 2,193 acres. This land is distributed according to land use and presented in the table on page 71. After construction is completed, land devoted to channels, berms, and disposal areas will comprise an additional 1,771 acres. Maintenance of adequate project channels will require an additional 107 acres. This 1,878 acres of additional right-of-way required plus the 2,193 acres of existing rights-of-way gives a total of 4,071 acres of right-of-way required for project installation and maintenance.

To function as planned, the channels must be maintained and kept free of obstructions. Therefore, for at least the life of the project (50 years), right-of-way occupied by channels will preclude the use of 1,767 acres of land for any other purpose. Grasses and forbs will be permitted to grow on the berms and spoil sites. Only one side of the channels in forest land will be disturbed during construction except for short distances such as bridges, pipelines, and weir locations. The undisturbed side will be left natural for the life of the project and the side originally used for construction will be kept accessible for maintenance purposes. This means that selected trees will be allowed to grow on the berms. In areas where spoil is deposited on forest land cleared for this purpose, reforestation will be allowed. The use of spoil for any purpose on open land will not be precluded.

When the 1,500 acres of anticipated project-induced clearing occurs it will be irreversible and irretrievable for the life of the project.

CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

General

The Walnut-Roundaway Watershed Work Plan was approved for operations on July 24, 1969. From the work plan's inception, this watershed has been studied by the Louisiana Department of Wildlife and Fisheries, the Louisiana Office of Public Works, the U.S. Fish and Wildlife Service, the Soil Conservation Service, and the U.S. Forest Service. Archaeologists from the Geoscience Department and Research Institute of Northeast Louisiana University provided the locations and conducted a field survey of the historical and archaeological sites of importance. A supplemental watershed work plan agreement was executed on December 16, 1971, to make provisions for administering the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894).

Since the work plan was approved for operations, the East Carroll-Madison Soil and Water Conservation District was divided to form the East Carroll Soil and Water Conservation District and the Madison Soil and Water Conservation District. The East Carroll Parish Police Jury has also been added as a sponsor.

A public meeting was held on October 19, 1973 in the Police Jury Room, Madison Parish Courthouse, Tallulah, La. The purpose of this public meeting was to provide an early opportunity for public involvement in the preparation of the EIS. This meeting was given statewide publicity and letters were mailed to individuals, organizations and agencies which had either requested they be placed on the mailing list or were known to wish notification. Thirty people were present at this meeting. Each was given an opportunity to make a statement and ask questions concerning the project.

A field review of the watershed plan was made on April 19-21, 1976. In attendance were representatives of the Louisiana Wild Life and Fisheries Commission (now the Department of Wildlife and Fisheries), the U.S. Fish and Wildlife Service, and the Soil Conservation Service. As a result, the watershed work plan has been restudied to determine changes needed to provide a plan more compatible with present land use and one that would minimize adverse affects on the environment.

Another public meeting, divided into a morning and an afternoon session, was held on September 16, 1976 in the Parish Police Jury Room, Madison Parish Courthouse, Tallulah, La. The purpose of the morning session was to discuss the results of the sponsors request for the study of possible alternative routes for draining the lands that now drain through Brushy Bayou. Forty-two people were present. Four possible alternative routes were explained. Everyone present was offered an opportunity to ask questions and comment on these routes. Following extensive discussion the route accepted by the

Sponsors was the present route from Brushy Bayou through the Englewood Structure, Roundaway Bayou, Bayou Mothiglam, and then to Tensas River.

The purpose of the afternoon session was to discuss the effects of this project on the Willow Bayou and Bear Lake areas. Thirty-two people were present. Following a brief description of the works planned for these areas, a petition was presented to the sponsors objecting to this portion of the project as planned. Following lengthy questions, answers, and discussions, the sponsors officially requested that the Soil Conservation Service and the Office of Public Works make another survey study to reroute Bull Bayou water out of Willow Bayou. The results of this study is contained in the Planned Project. These changes in the two channel routes do not affect the benefited area. Supplement No. 2 to the Watershed Work Plan Agreement includes these changes and supercedes the original Work Plan Agreement and all prior supplements.

Copies of the draft environmental impact statement were distributed to local, State, and Federal agencies and to concerned groups for a local agency review. Following this review, a public meeting was held at 10:00 a.m. on November 29, 1977, in the Madison Parish Courthouse, Tallulah, Louisiana.

Twenty-four people attended this public meeting. Each person was given an opportunity to comment on the plan, make a statement, or ask questions concerning the plan and its impacts.

Comments were requested on the draft environmental impact statement from the following agencies, organizations, and individuals: (See list in the Summary)

Due to the extensive comments received from the U.S. Department of the Interior (USDI), the sponsors and the state conservationist jointly decided to hold another public meeting to discuss these comments.

The public meeting was held in the Madison Parish Police Jury room in Tallulah, Louisiana, on July 13, 1978. Twenty-eight people attended this public meeting. Major comments made by the USDI were read aloud and responded to by representatives of the SCS and the U.S. Fish and Wildlife Service of USDI. The main objection to the project by the USFWS is that, in their opinion, adequate mitigation for fish and wildlife losses is not included in the planned project.

Following questions and comments from those present, the sponsors asked what the USFWS would consider as adequate mitigation. The USFWS representative responded that the USFWS had been interested for a long time in obtaining title to Alligator Brake (Bayou), Texas Lake complex, and Horseshoe Lake. Acreage desired would be about 1,000 acres in the Horseshoe Lake area and 2,000 each in the other two. He suggested that the sponsors purchase about 1,000 acres in one of these areas and give it to the USFWS and they, the USFWS, would purchase the other areas. The sponsors took this suggestion under advisement.

In letters dated July 28, 1978, and August 1, 1978, the sponsors notified SCS of their decision concerning additional mitigation. The sponsors stated that after fully considering the pros and cons concerning additional mitigation, they feel that the mitigation measures included in the planned project are adequate and that additional mitigation is not needed.

Discussion and Disposition of Each Comment on Draft Statement

Each issue, comment, or suggestion for improvement is summarized and a response is given on the following pages. Comments are numbered where agencies have supplied multiple comments. Copies of the original letters of comment appear in appendix B.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Comment: We have reviewed the Draft Environmental Impact Statement (EIS) for the proposed Walnut-Roundaway Watershed project located in Madison and East Carroll Parishes, Louisiana. This project will provide for watershed protection, flood prevention, and agricultural water management for the Walnut-Roundaway Watershed. The project will be implemented under the authority of the Watershed Protection and Flood Prevention Act (PL 566, 83d Congress, 68 Stat. 666) as amended. The project will include structural measures, channel work for flood prevention and drainage with appurtenant measures for channel protection and maintenance access. In addition, fifteen structures including five weirs, six dams, two grade stabilizations and two water control structures to minimize damage to fish and wildlife will be installed.

The Statement adequately discussed the impacts which would be associated with the proposed project; however, the Final Statement would be strengthened if it included a land use map of the watershed area.

We classify your Draft Environmental Impact Statement as LO-1. Specifically, we have no objections to the project as it relates to Environmental Protection Agency's (EPA) legislative mandates. The statement contained sufficient information to evaluate adequately the possible environmental impacts which could result in from project implementation. Our classification will be published in the Federal Register in accordance with our responsiblity to inform the public of our views on proposed Federal actions, under Section 309 of the Clean Air Act.

Definitions of the categories are provided on the enclosure. Our procedure is to categorize the EIS on both the environmental consequences of the proposed action and on the adequacy of the Impact Statement at the draft stage, whenever possible.

Response: None necessary.

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration

Comment: We have reviewed the statement and supplemental watershed work plan agreement and have no comments to offer.

Response: None necessary.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control

Comment: Our review of this statement indicates that most of the project work will be centered upon land improvement for erosion control and for more efficient draining. The proposed work will benefit vector mosquito problems by eliminating or minimizing certain existing larval habitats. This is mentioned in the statement as a favorable impact and we concur with the observation.

Response: None necessary.

DEPARTMENT OF TRANSPORTATION
United States Coast Guard

Comment: The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. The Coast Guard had the following comments to offer:

"Page 14 of the EIS states 3 bridges and 15 culverts will be constructed on State and Federal routes, and 34 bridges and 110 culverts will be constructed on private roads. Although exact crossings have not been selected, Bayou Macon is considered to be a navigable waterway from its mouth to mile 35.4; and, Tensas River is considered to be a navigable waterway from its mouth to mile 81.0. Bridges constructed across these waterways will require Coast Guard bridge permits. In addition, when constructing these bridges, it is recommended that consideration be given to minimizing the number of piers in the water and situating them so as to minimize impedance to passing flood water and draft. Further information can be obtained by contacting: Commander (obr), Second Coast Guard District, 1430 Oliver Street, St. Louis, Missouri, 63104, Telephone: 314-425-4607."

The Department of Transportation has no other comments to offer nor do we have any objections to this project. The final statement, however, should address the concerns of the Coast Guard.

Response: Bayou Macon is not in this watershed area. Tensas River is the outlet for this area and is not a part of any P.L. 566 project. It is a channel for which the U. S. Army Corps of Engineers has responsibility as indicated on the project map, appendix C.

UNITED STATES DEPARTMENT OF THE INTERIOR
Office of the Secretary

General Comments: The proposed project involves the permanent alteration of approximately 2,000 acres of types 1 and 2 wetlands. Section 1(a) of Executive Order 11990 on the protection of wetlands states that "...each agency shall provide leadership and shall take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands..." Section 1 of Executive Order 11988, Floodplain Management, makes essentially the same requirement for all floodplain areas. Section 2(2)(i) of E. O. 11988 and Section 2(a)(2) of E. O. 11990 require the minimization of any harm to floodplains or wetlands as part of any project. This proposed project's apparent snub of these Executive Orders should be addressed in the final statement. In addition, these documents do not adequately consider fish and wildlife resources, particularly measures to mitigate adverse impacts of the project.

Response:

The statement that 2,000 acres of Types 1 and 2 Wetlands will be permanently altered is in error.

No type 2 wetlands will be altered by the project. The following statement has been inserted in the EIS on pages 3, 76, and 81 to clarify the effects on Type 1 Wetlands:

> Project channel work will reduce the duration of flooding on about 266 acres of Type 1 Wetlands. This acreage is comprised of about 47 acres (25 acres in forest land and 22 acres in wooded channel banks) to be occupied by project channel rights-of-way and 219 acres outside of rights-of-way limits.

The sentences on pages 4, 74, and 82 concerning the 1,500 acres of project-induced clearing has been rewritten as follows:

> The 1,500 acres of bottomland hardwood clearing, including about 120 acres of Type 1 Wetlands, are projected to be induced by the project.

Executive Order 11990 further states that:

"Sec.. 2. (a) In furtherance of Section 101(b)(3) of the National Environmental Policy Act of 1969 (42 U.S.C. 4331(b)(3) to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may attain the widest range of beneficial uses of the environment without degradation and risk to health or safety, each agency, to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. In making this finding the head of the agency may take into account economic, environmental, and other pertinent factors."

The responsible Federal offical (RFO) of the Soil Conservation Service recognizes that there will be an additional loss of 159 acres of bottomland hardwoods, 16 acres of Type 1 Wetlands, and 40 acres of Types 6 and 7 Wetlands by project channel rights-of-way clearing. It is anticipated that about 1,380 acres of bottomland hardwoods and 120 acres of Type 1 Wetlands will be cleared as a result of project-induced clearing. As stated in the EIS, the following practicable measures have been taken to minimize harm to wetlands in the project area:

1. Divert drainage of 10,000 acres of agricultural land from Bear Lake.

2. Divert 7,000 acres of agricultural runoff from the Willow Lake, Lake One, and Eagle Lake Complex.

3. Provide a fixed crest weir in Alligator Bayou (Channel M-6) to maintain existing water level in Alligator Lake.

4. Provide two weirs in Channel M-6A to maintain and manage water level in the Texas Lake area.

5. Provide a fixed crest weir in Channel L-6M to maintain water level in a wetland area.

6. Install an 80-acre (Types 1 and 2) wetland to mitigate the loss of 39 acres of Types 6 and 7 Wetlands.

The planned project is in compliance with proposed SCS policy for complying with the subject Executive Orders as published in the Federal Register, Volume 43, Number 107, Friday, June 2, 1978, page 24223, and Volume 43, Number 127, Friday, June 30, 1978, page 28787.

Specific Comments

Comment No. 1: Planned Project, Page 10, Paragraph 3 - The statement discusses the retention of 18,600 acres of bottomland hardwoods by landowners as part of their conservation plan for wildlife habitat. The final statement should explain exactly what the conservation plan for wildlife would be. The plan should address timber cutting, age class of hardwoods emphasized for wildlife habitat, public hunting, wildlife observation, and other related activities allowed on these bottomland hardwoods.

Response: The plan for wildlife or management plan will vary from simply retaining existing habitat to intensive management. The degree of management will depend upon the present condition of the habitat and the decisions of the landowner. However, in all cases the needed minimum practices will be applied in order for it to meet the requirements for wildlife land adequately treated. The kind and number of practices needed will depend upon the habitat type and its present condition.

The cost of installing these planned measures is borne totally by the landowner. Public access, hunting, etc., are at his discretion. No change made in EIS.

Comment No. 2: Page 21, Paragraph 7 - This section goes on to discuss that plots or strips 1 to 5 acres in size and totaling 2,000 acres of open land in forested area, would be planted for wildlife food. There is no guarantee that these food plots would be planted considering the statement on page 12, "However, these measures do not preclude the use of other practices that may be needed." Details of these food plots should be explained in the final statement. The specific time frame when the food plots will be planted should be provided. The final statement should also explain whether or not the landowners would be assessed expenses for food plots, and if so, indicate if public hunting will be allowed at these food plots.

Response: The sentence concerning "does not preclude" is only pointing out that the list is not all inclusive. A detailed description of the food plots would not be practical in this document because they will vary, depending on soils, drainage and flooding, habitat type, condition of habitat, wildlife present, size and location of habitat, size and location of opening, condition of existing food supply and decisions of the landowner.

See response to Comment No. 1 concerning public hunting being allowed at these food plots. No change made in EIS.

Comment No. 3: The final environmental statement should specify the locations at which channels would be dug primarily from one side. In selecting the side from which to dig the channels, the side providing the greatest shade cover should be left undisturbed. Also, this type of selection should not be limited only to those sites having ponded water, but also to all reaches of the channel that pass through forest or any woody riparian habitat. Undisturbed buffer strips should be included throughout the project area.

Response: The following has been added to item 7, page 19, before the last sentence:

> "On channels without ponded water, the side with the lowest quality habitat will be worked."

The following has been added to the first full paragraph on page 12:

> "These vegetated areas will serve as buffer strips along the project channels."

Comment No. 4: Page 22, Paragraph 2 - The final statement should address public access and available use of the proposed 80-acre wetland as well as the type of wetland to be created and the development method involved.

Response: The sponsors do not plan to provide public access to the planned wetland area inasmuch as the wetland being destroyed is on private land and public access was not available. Providing public access would be enhancement instead of mitigation and would also increase the installation and operation and maintenance cost to the sponsors. It will be a manmade Types 1 and 2 Wetland after the levees, well, and other appurtenances are installed and the management plan implemented.

These two statements have been inserted on page 19 of the EIS.

Although public access to the planned mitigation area is not expected, the public will receive secondary benefits from it such as: (1) surrounding land can receive excess wildlife produced on, or using this area, (2) reduce user pressure on similar areas that are open to the public, (3) receive economic benefits from people who do use it, (4) increase value of surrounding habitat, and (5) it is not totally lost, therefore, it could become available for public use (park, refuge, or natural area) in the future.

Comment No. 5: Impacts, Page 104, Table

The final statement should delineate under the "Habitat Types" column that the waterfowl habitat to be affected is a forested wetland.

Response: The resident waterfowl habitat affected is all forest land which includes only a small percentage of wetlands. This is compatible with the population level (the 1:50 ratio data) which is also figured on a total of all forest land. No change made in EIS.

Comment No. 6: Page 107, Paragraphs 2 and 3 - The statement should consider temporary measures such as sediment traps to minimize increased turbidity in the Tensas River resulting from upstream channel work and structural measures. No change made in EIS.

Response: Grade control structure no. 2 (see figure F-10) temporarily ponds about 6,000 linear feet of water averaging 1 to 5 feet deep upstream from it in Channel M-16. This will serve as a trap for construction-induced sediment. No change made in EIS.

Comment No. 7: Social and Economic Impacts, Pages 109-111 - Known mineral resources in the two-parish area include petroleum and sand and gravel. Although the structural measures to be made appear largely to be a reworking of existing channels, the statement should discuss what impacts the project may have on production of or access to these resources. Also there should be some discussion of measures to protect petroleum or natural gas pipelines from project activity. The project map (appendix C) shows what appears to be a major pipeline crossing the project area.

Response: Alteration of pipelines and utility lines are made by the owner of the utility under the closest supervision possible with stringent safety precautions taken.

Temporary interruption of local traffic patterns during the replacement of bridges and culverts will result in inconveniences to the people involved. Detour routes will be available so that no one will be deprived of access to their destination. There is a possibility of temporary power transmission disruptions when utility lines are altered at project channel locations. Also, noise levels will increase at the construction sites.

These two statements have been inserted in the EIS on pages 12 and 79, respectively.

Comment No. 8: Page 115, Last Paragraph - It is stated that "...1,755 acres of open land will be disturbed by construction." The words "open land" and "disturbed" are vague and should be thoroughly defined in the final statement.

Response: This 1,755 acres of open land (nonforested land) is the same that is on the tabulation on page 71 and discussed in the second paragraph on page 76. Disturbed means to break up or destroy the vegetative cover. No change made in EIS.

Comment No. 9: Pages 115-118 - Our Fish and Wildlife Service (FWS) notes that this subsection does not mention the loss of approximately 2,000 acres of wooded wetlands that presently provide wildlife habitat. This loss is a major adverse environmental impact and should be included in the final statement.

Response: The 421 acres of project channel rights-of-way in forest land comprises 334 acres of bottomland hardwoods and 87 acres of forested wetlands. The 1,281 acres of project channel rights-of-way with wooded channel banks comprises 1,244 acres of bottomland hardwoods and 37 acres of forested wetlands. This is shown on the tabulation on page 71. The impacts of the project on these habitats are discussed in the second and third paragraphs on page 76. These impacts are summarized or highlighted in the second and third paragraphs under Adverse Impacts, page 81.

The 1,500 acres of bottomland hardwoods, including about 120 acres of Type 1 Wetlands expected to be cleared as a result of the project is discussed on page 76 and highlighted under adverse impacts on page 81 and page 3 of the summary. The EIS was modified to show the Type 1 Wetlands expected to be cleared.

Comment No. 10: Page 119, Paragraph 1 - Our FWS finds that the Land Treatment Only alternative is most compatible for fish and wildlife purposes. However, we would recommend that any new drainage laterals, mains, or ditches not be included as part of the land treatment measures. This alternative would prevent the destruction of valuable fish and wildlife habitat that would occur with the channel work and land treatment alternative.

Response: The Land Treatment Only alternative described on page 84 would not meet the project purposes and goals. No change made in EIS.

Comment No. 11: Pages 124-127 - The final statement should point out that the long-term productivity and use of fish and wildlife resources would be adversely affected by the construction of the proposed project.

Response: The reduction in sediment (page 88, paragraph 3) will benefit the fishery. Bear Lake will benefit by the diversion of about 10,000 acres of agricultural runoff out of the lake. The Willow Lake-Eagle Lake-Lake One complex will benefit from the diversion of about 7,000 acres of agricultural runoff away from it. The Short-Term Versus Long-Term Uses of Resources section has been expanded to include this plus the cumulative effects. Also, further discussion on this subject is contained in the response to Comment No. 17 of Louisiana Wildlife and Fisheries Commission on pages 114 and 115.

Comment No. 12: Pages 128-129 - The final statement should state that the destruction or damage of 3,457 acres of fish and wildlife habitat is for all practical purposes an irreversible and irretrievable commitment of resources.

Response: Refer to the tabulation on page 71. The 3,457 acres referred to includes the rights-of-way necessary for channel work or maintenance (channel, berm, and spoil areas). The only area considered irreversible and irretrievable are the channels. There are 1,564 acres existing in channels and this will be increased by 629 to a total of 1,767 with the project in place and 720 acres of this total is open land. Therefore, 1,047 acres of channels are in wooded channel banks or forest cover. No change made in EIS.

Comment No. 13: Appendix C, Project Map - To aid the reader's review of the final statement, the project map should delineate wetlands and forest areas contained in the project area. In addition, those wetlands and forest areas altered by the project should be identified on the project map.

Response: The forested areas, including wetlands, are the nonbenefitted (white) areas on the project map, except for the higher ridges along Brushy, Walnut, and Roundaway bayous. The affected wetlands are given on pages 19 and 20. If more detailed information is needed, it is available at the SCS office in Alexandria, Louisiana. No change made in EIS.

Summary Comments

Comment No. 1: As stated in our FWS letter dated November 18, 1977, we are opposed to the project as it would result in losses or severe damage to 3,457 acres of forest and riverine habitat. The proposed mitigation (planting vegetation and 142 acres of hardwood seedlings and creation of an 80-acre wetland) is not adequate to compensate for this loss.

Response: See response to specific comment No. 12 concerning the 3,457 acres. The SCS policy concerning alteration of wetlands is discussed on page 9.

Comment No. 2: We favor the Land Treatment Only alternative, without any new drainage laterals, mains or ditches, as the most compatible for fish and wildlife interests. We are deeply concerned over the continual loss of bottomland hardwood habitat, particularly in major flyways.

Response: See response to specific comment no. 10. The loss of the bottomland hardwoods is addressed as an adverse impact in the EIS.

Comment No. 3: Alternate methods seem to be available that approach the goals of the project while minimizing adverse impacts to fish and wildlife resources in the project area. We are advising you at the earliest possible time that we may refer this proposed project to CEQ as environmentally unsatisfactory. Such action is contingent upon our review of the final environmental statement and work plan.

Response: It is the policy of the Soil Conservation Service to use an interdisciplinary planning process which will permit a balancing of the need to maintain a viable, naturally functioning ecosystem and projected food and fiber, economic, and other social needs. In the plan formulation process, studies made by the interdisciplinary planning team composed of the SCS, the Forest Service, the Louisiana Office of Public Works, the Louisiana Department of Wildlife and Fisheries, and the U.S. Fish and Wildlife Service did not reveal any other alternatives that would further minimize adverse impacts to fish and wildlife resources and still meet the economic and social well-being goals of the project. Nor did the public involvement process reveal any other alternatives. Therefore, the sponsors and the Soil Conservation Service believe that the plan as formulated is the most balanced between economic, social well-being, and environmental factors.

It is unfortunate that the U.S. Department of the Interior, after three joint field studies by the SCS and the USFWS and four public meetings held during plan formulation and EIS development, chooses at this time to refer this project to CEQ as environmental unsatisfactory.

The Soil Conservation Service, along with other agencies including the USFWS, has expended considerable time conducting studies to formulate a project that will meet project goals and objectives with minimum adverse impact on fish and wildlife resources. After interagency review, the SCS and USFWS met on May 15, 1978 to discuss the potential adverse impacts and possible ways to minimize the damage. No alternatives to minimize damage surfaced at this meeting. Another alternative (No. 3) with suggestions for mitigation was developed and presented to the Sponsors. This alternative is now included in the EIS.

The EPA, after a review of the project area and the draft environmental impact statement, issued the following statement regarding this project:

"We classify your Draft Environmental Impact Statement as LO-1. Specifically, we have no objections to the project as it relates to Environmental Protection Agency's (EPA) legislative mandates. The statement contained sufficient information to evaluate adequately the possible environmental impacts which could result from project implementation. Our classification will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions, under Section 309 of the Clear Air Act."

Comment No. 4: Page 21 of the draft statement indicates that a federal permit pursuant to Section 404 of the Federal Water Pollution Control Act Amendments of 1972 will be required for this project. Because of the destruction of fish and wildlife habitat without suitable mitigation, our FWS would recommend denial of such a permit.

Response: No response necessary.

STATE OF LOUISIANA
WILDLIFE AND FISHERIES COMMISSION

Personnel of our technical staff have reviewed the above referenced documents furnished by your agency. As the result of this evaluation we have developed a list of comments concerning the fish and wildlife resources associated with the project area.

DRAFT ENVIRONMENTAL IMPACT STATEMENT:

Comment No. 1: Page 2, paragraph 8. If 18,600 acres of forest land will be unaffected by project and used exactly as in the past, why should this statement be made?

Response: Historically, there has been a tremendous amount of forest land cleared in Madison Parish. This statement was made to show, through the efforts of the land treatment program, that at least this amount of land will be available for wildlife habitat. No change made in the EIS.

Comment No. 2: Page 2, paragraph 12. How will mosquito habitat be reduced? Temporary waters are conducive to mosquito production.

Response: This project will benefit vector mosquito problems by eliminating or minimizing existing larval habitat. No change made in EIS.

Comment No. 3: Page 3, paragraph 2. How can this be of benefit unless constant maintenance is performed?

Response: The clearing operations mentioned in this sentence is the type of structural measure channel work commonly referred to as "Clear Only". This type of work is performed where excavation is not necessary yet, the channel is clogged with debris and woody vegetation thereby restricting flows to the extent that it is inadequate to accommodate design flows. Operation and maintenance procedures are described on pages 20-22. No change made in EIS.

Comment No. 4: Page 3, paragraph 12. Project will induce 1,500 acres of land clearing in the bottomland hardwood type.

Response: "Forest land" has been changed to "Bottomland hardwood".

Comment No. 5: Page 4, paragraph 5. How long will this water quality be reduced? Removing unsightly debris will also cause damages.

Response: Water quality will be reduced in channels where construction is in progress. The schedule for construction is extended over a five-year period. Therefore, the effects on water quality will be distributed over this period with the effects to water quality of the watershed moderated because only a portion of the channels will be under construction (including removal of unsightly debris) during a given time. After construction is completed in an area with a common outlet and disturbed areas revegetated, the water quality will return to preconstruction conditions. No change made in EIS.

Comment No. 6: Page 10, paragraph 2, line 7. How can benefits be claimed on lands which will be retained as they exist and be managed exactly as they have been for years before the watershed project was developed?

Response: Benefits are not claimed on these areas. However, it is a favorable impact of the project, in that an effort is being made, through the land treatment program, to assure that at least this amount of forest land will be available for wildlife habitat. No change made in EIS.

Comment No. 7: Page 11, paragraph 9. How will upland habitat be created?

Response: "Create", as used in this context, means to make by investing with new character or function. That is, land that was not previously set aside for wildlife habitat is now done so; and some special provisions are made for wildlife. One example would be the planting of wildlife food. No change made in EIS.

Comment No. 8: Page 12, paragraph 2, line 6. What are the capabilities of weir No. 2; by whom and how will it be operated? The EIS figure F-5 is not clear. What is the planned water level? Where is the management plan for this structure?

Response: The original location, operation or functions of Weir No. 2 has not been changed from the description in Item 4, page 18, of the watershed work plan. Detailed dimensions and crest elevations are shown on table 3B, page 29 of Supplement No. 2 to the

Watershed Work Plan Agreement. The maximum drawdown of this weir is 1.5 feet. All structural measures will be operated and maintained by the Madison Parish Police Jury as described on page 20 of the Watershed Work Plan. A detailed management plan has been developed and inserted in Supplement No. 2 to the Work Plan Agreement and EIS.

Comment No. 9: Page 19, paragraph 1, line 10. What species of hardwood seedlings will be planted? Preferred species for wildlife should be used and the names of these species stated.

Response: Due to different criteria for spoil placement, which will considerably reduce the amount of right-of-way cleared, the planting of hardwood seedlings on project-created spoil in forest land will also be reduced by a like amount. This was agreed to by a representative of the Louisiana Department of Wildlife and Fisheries at a conference in the SCS office in Alexandria on January 27, 1978. Species to be planted are described on page 76 of the EIS. No change made is the EIS.

Comment No. 10: Pages 21 and 22, paragraph 4. See page 8, paragraph 1, line 17. New policy dictates SCS cannot provide assistance to drain or alter wetland types 3 through 20. This appears to be a conflict of statements.

Response: SCS policy provides that the SCS will not provide technical and financial assistance to drain or otherwise alter Wetlands Types 3 through 20 for the <u>purpose of converting them to other uses</u>. The purposes of this project are watershed protection, flood prevention, and agricultural water management for open agricultural land, not to drain or otherwise alter any wetlands. No change made in EIS.

Comment No. 11: Page 22, paragraph 1. The practice of mitigating project-induced damages is commendable. However, this concept of mitigation will benefit only one man and/or his guests, while the damages will have occurred throughout the project area and affected many people. This is a very bad approach to mitigation. Also, the management plan needs to be clarified.

Response: In view of the fact that the wetlands being destroyed is in private ownership, the SCS feels that no Federal statute; including NEPA, requires public access on mitigated areas. The sponsors chose not to provide public access on the planned mitigation area because of the increase in installation and operation and maintenance costs. Also, providing public access would be enhancement instead of mitigation. Further detail of the mitigation plan and its planned operation are on file in the SCS office in Alexandria and can be seen at any time upon request. No change made in EIS.

Comment No. 12: Page 23, last paragraph. The applicators using these herbicides should also be required to have the appropriate certificate under the USDA and EPA applicator certification program.

Response: When this program is fully initiated, applicators will be certified under the USDA and EPA pesticide applicator certification program. This statement has been inserted on page 21 of the EIS following the first sentence of the first full paragraph.

Comment No. 13: Page 65, paragraph 2. Wild turkeys occur in the watershed project area.

Response: The list on pages 49 and 55 is only a partial list intended to give the reader a general idea of what birds are found in the project area. Wild turkeys were omitted from this list but are included in the wildlife population table on page 50. No change made in EIS.

Comment No. 14: Page 66. The black bear is not rare in the project area. Kill by parish should show 69 acres rather than .69 acres for Madison Parish.

Response: Concur; changes made as suggested.

Comment No. 15: Page 71, paragraph 1. Rattlesnakes occur in watershed.

Response: The canebreak and pigmy rattlesnakes do occur in the watershed. The list on page 55 did not attempt to list all reptiles found in the watershed and these two species were omitted. No changes made in EIS.

Comment No. 16: Page 114, paragraph 3. Mosquito habitat? Paragraph 6. How will upland game habitat be increased with more efficient cropping patterns? Paragraph 7. How will the debris removal benefit fish and wildlife?

Response: See response to Comment No. 2 covering mosquito habitat.

Upland wildlife habitat quality will not usually be increased by more efficient cropping patterns. However, in most cases improved drainage and flood protection will improve the quality of existing wildlife habitat by providing a more diverse, greater quantity, longer lasting food and cover supply. Also, it will improve the habitat for nesting, brooding, and rearing of young. Also, it is easier to get needed wildlife practices installed on wildlife land with good drainage and flood protection. In some cases these benefits to wildlife upland habitat are nullified or offset by changed land use, more intensified farming operations, etc.

No benefit to fish and wildlife were claimed from debris removal. The favorable impact claimed for this method of channel work is to other than fish and wildlife because of better drainage, reduced flooding, improved asthetics through the removal of unsightly debris, etc. No change made in EIS.

Comment No. 17: Page 117, paragraph 6. What is status of interdisciplinary team's classification of M-11 and M-12 in Category 2? Why not divert M-11 and M-12 away from Bear Lake and into Bull Bayou.

Response: The studies concerning the diversions of agricultural runoff away from or around Bear Lake have been very extensive. Included in these studies are hydraulic, biologic, and economic considerations. All recommendations made by individuals, groups, or agencies concerning Bear Lake were also considered. A special public meeting was held in the afternoon of September 16, 1976 specifically for the purpose of receiving public input on this subject. At the present time, about 13,000 acres of agricultural land drains into Bear Lake. By diverting Bull Bayou flows into Tensas River* and a portion of the flows of L-7C10 to the east, about 3,000 acres would drain into Bear Lake after the project is installed. This is a small drainage area in relation to the storage capacity of this lake. Even though it may be physically possible to divert Channel M-11 (not M-12) into Bull Bayou, we feel that any further reduction of the lakes drainage area would create an imbalance in the lakes storage capacity versus drainage area. No change made in EIS.

* This diversion also includes the runoff from about 7,000 acres of agricultural land that presently drains through the Willow Lake-Eagle Lake-Lake One complex.

Comment No. 18: Page 118, paragraph 2. This depends entirely on the management plan, and this must be presented in detail to determine if benefits are to be obtained.

Response: The management plan has been inserted in the EIS and Supplement No. 2 to the Watershed Work Plan Agreement. The last sentence in the third full paragraph on page 77 has been rewritten as follows. Once the disturbed areas have been revegetated and the structure for water control installed to regulate the water level, the quality of the fish and wildlife habitat will return to preconstruction levels.

Comment No. 19: Page 119. What type upland wildlife habitat management will be practiced and by whom?

Response: See page 13 of the EIS for the land treatment measure in question and its functions. The land treatment program is installed voluntarily by individual landusers as stated on page 10 of the EIS. No change made in the EIS.

Comment No. 20: Page 122. In Table I, why are the "habitat changed" acres different for deer and turkey?

Response: The habitat change for deer includes both forest land and wooded channel banks while the habitat changes for wild turkey include only forest land. No change made in the EIS.

Comment No. 21: Page 123, paragraph 1, line 7. Why claim benefits to 18,000 acres. Line 11. Extent of duration of flooding is backbone of fisheries. When reduced, fisheries are reduced. Line 21. A reduction in the extent and duration of flooding will reduce fisheries values. Project will also include land clearing. Will this project in fact benefit fish and wildlife?

Response: Page 123 of the draft is the description of the "No Project" alternative. No change made in EIS.

STATE OF LOUISIANA
DEPARTMENT OF URBAN AND COMMUNITY AFFAIRS
OFFICE OF PLANNING AND TECHNICAL ASSISTANCE

Comment: We have reviewed the above referenced project with reference to agency expertise and review responsibility and recommend no additions to your list of agencies. We will forward any comments not received by your office to you and complete our review responsibilities by April 7, 1978.

A copy of the statement will be kept on file in our office for public inspection. If we can be of further assistance please give me a call.

Response: None necessary.

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
SOIL AND WATER CONSERVATION COMMITTEE

Comment: We have reviewed the supplemental work plan agreement along with the environmental impact statement and have no further statement to make.

The Louisiana State Soil and Water Conservation Committee endorses this project.

Response: None necessary.

STATE OF LOUISIANA
OFFICE OF SCIENCE, TECHNOLOGY & ENVIRONMENTAL POLICY

Comment: The above-referenced matter concerning environmental quality has been received and reviewed by the staff of the Office of Science, Technology and Environmental Policy. From the information contained in the package sent to our office, the staff of OSTEP issues a no objection on this particular project. The rules and regulations govering this project should continue to be in full compliance with all State and Federal regulatory agencies.

The staff of OSTEP appreciates this opportunity to participate in the review process.

Response: None necessary.

STATE OF LOUISIANA
DEPARTMENT OF NATURAL RESOURCES
OFFICE OF FORESTRY

Comment: I have examined the subject documents in detail and have no comments to make. I note the work plan for this project was approved in 1969, and there, apparently, have been no significant changes since that date.

Response: None.

STATE OF LOUISIANA
DEPARTMENT OF CULTURE, RECREATION AND TOURISM
OFFICE OF PROGRAM DEVELOPMENT

Comment: On pages 76-77 a misleading statement is made concerning the nomination of properties to the National Register. Many significant archaeological and historical sites are located in the vicinity of the watershed and some of these are eligible to be included in the National Register. We cannot predict how many of these sites will be nominated to the state or national registry before the year 2020.

Response: The statement in question has been changed to read as follows: There are no historic sites within the area to be disturbed by construction which are listed on the National or state registers of historic places.

The sentence concerning the year 2020 has been deleted.

LIST OF APPENDICES

Approved by: Alton Mangum
Alton Mangum
State Conservationist

Date: February 12, 1979

APPENDIX A

COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Walnut-Roundaway Watershed, Louisiana

(Dollars)

Evaluation Unit	Flood Prevention 1/ Damage Reduction	Flood Prevention 1/ Intensive Use	Drainage 1/	Redevelopment 2/	Secondary 1/	Total	Average Annual Cost 3/	Benefit-Cost Ratio
MULTIPLE PURPOSE								
East Carroll Parish								
Channel Work With Appurtenances	56,000	11,300	50,900	7,400	22,500	148,100	38,200	3.9:1
Madison Parish								
Channel Work With Appurtenances, Grade Stabilization Structures, Water Control Structures, Low-Level Weirs, and Earthfill Dams	796,400	160,900	724,000	104,600	319,700	2,105,600	862,500	2.4:1
Subtotal	852,400	172,200	774,900	112,000	342,200	2,253,700	900,700	2.5:1
Project Administration	XXX	XXX	XXX	XXX	XXX	XXX	111,100	XXX
GRAND TOTAL	852,400	172,200	774,900	112,000	342,200	2,253,700	1,011,800	2.2:1

1/ Price base: Current normalized prices - 1976.

2/ Price base: 1976.

3/ Price base: from Table 4.

November 1978

APPENDIX B

LETTERS OF COMMENT RECEIVED ON DRAFT ENVIRONMENTAL IMPACT STATEMENT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

FIRST INTERNATIONAL BUILDING
1201 ELM STREET
DALLAS, TEXAS 75270

March 31, 1978

Mr. Alton Magnum
State Conservationist
United States Department of Agriculture
Soil Conservation Service
P.O. Box 1630
Alexandria, Louisiana 71301

Dear Mr. Magnum:

We have reviewed the Draft Environmental Impact Statement (EIS) for the proposed Walnut-Roundway Watershed project located in Madison and East Carroll Parishes, Louisiana. This project will provide for watershed protection, flood prevention, and agricultural water management for the Walnut-Roundway Watershed. The project will be implemented under the authority of the Watershed Protection and Flood Prevention Act (PL 566, 83d Congress, 68 Stat. 666) as amended. The project will include structural measures, channel work for flood prevention and drainage with appurtenant measures for channel protection and maintenance access. In addition, fifteen structures including five weirs, six dams, two grade stabilizations and two water control structures to minimize damage to fish and wildlife will be installed.

The Statement adequately discussed the impacts which would be associated with the proposed project; however, the Final Statement would be strengthened if it included a land use map of the watershed area.

We classify your Draft Environmental Impact Statement as LO-1. Specifically, we have no objections to the project as it relates to Environmental Protection Agency's (EPA) legislative mandates. The statement contained sufficient information to evaluate adequately the possible environmental impacts which could result from project implementation. Our classification will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions, under Section 309 of the Clean Air Act.

Definitions of the categories are provided on the enclosure. Our procedure is to categorize the EIS on both the environmental consequences of the proposed action and on the adequacy of the Impact Statement at the draft stage, whenever possible.

We appreciate the opportunity to review the Draft Environmental Impact Statement. Please send our office two copies of the Final Environmental Impact Statement at the same time it is sent to the Office of Federal Activities, U. S. Environmental Protection Agency, Washington, D. C.

Sincerely,

Myron O Knudson

for Adlene Harrison
Regional Administrator (6A)

Enclosure

ENVIRONMENTAL IMPACT OF THE ACTION

LO - Lack of Objections

EPA has no objections to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER - Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to re-assess these aspects.

EU - Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

ADEQUACY OF THE IMPACT STATEMENT

Category 1 - Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2 - Insufficient Information

EPA believes the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3 - Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement. If a draft statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make a determination.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION SIX

750 Florida Boulevard
Baton Rouge, Louisiana 70801

February 24, 1978

IN REPLY REFER TO

Supplement No. 2 to the
Watershed Work Plan Agreement
The Walnut Roundaway Watershed
Draft Environmental Impact Statement
Madison and East Carroll Parishes

United States Department of Agriculture
Soil Conservation Service
P. O. Box 1630
Alexandria, Louisiana 71301

Gentlemen:

Reference is made to Mr. Alton Mangum's letter of February 6, 1978, transmitting a copy of Supplement No. 2 to the Watershed Work Plan Agreement and Draft Environmental Impact Statement for the Walnut Roundaway Watershed project.

We have reviewed the statement and supplemental watershed work plan agreement and have no comments to offer.

Sincerely yours,

M. C. Reinhardt

M. C. Reinhardt
Division Administrator

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333
TELEPHONE: (404) 633-3311

April 14, 1978

Mr. Alton Mangum
State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
P.O. Box 1630
Alexandria, Louisiana 71301

Dear Mr. Mangum:

We are responding to the Draft Environmental Impact Statement relating to the Walnut-Roundaway Watershed, Madison and East Carroll Parishes, Louisiana, on behalf of the Public Health Service.

Our review of this statement indicates that most of the project work will be centered upon land improvement for erosion control and for more efficient draining. The proposed work will benefit vector mosquito problems by eliminating or minimizing certain existing larval habitats. This is mentioned in the statement as a favorable impact and we concur with the observation.

We appreciate the opportunity to have reviewed this statement.

Sincerely yours,

for William H. Foege, M.D.
Assistant Surgeon General
Director

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS
U.S. COAST GUARD(G-WS/73)
WASHINGTON, D.C. 20590
PHONE:(202) 426-2262

14 APR 1978

Mr. Alton Mangum
Acting State Conservationist
Soil Conservation Service
P. O. Box 1630
Alexandria, Louisiana 71301

Dear Mr. Mangum:

This is in response to your letter of 6 February 1978 concerning a draft environmental impact statement for the Walnut-Roundway Watershed, East Carroll and Madison Parish, Louisiana.

The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. The Coast Guard had the following comments to offer:

"Page 14 of the EIS states 3 bridges and 15 culverts will be constructed on State and Federal routes, and 34 bridges and 110 culverts will be constructed on private roads. Although exact crossings have not been selected, Bayou Macon is considered to be a navigable waterway from its mouth to mile 35.4; and, Tensas River is considered to be a navigable waterway from its mouth to mile 81.0. Bridges constructed across these waterways will require Coast Guard bridge permits. In addition, when constructing these bridges, it is recommended that consideration be given to minimizing the number of piers in the water and situating them so as to minimize impedance to passing flood water and drift. Further information can be obtained by contacting: Commander (obr), Second Coast Guard District, 1430 Oliver Street, St. Louis, Missouri, 63104, Telephone: 314-425-4607."

The Department of Transportation has no other comments to offer nor do we have any objections to this projects. The final statement, however, should address the concerns of the Coast Guard.

The opportunity to review this draft statement is appreciated.

Sincerely,

...ine
...ems
By ... the Commandant

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PEP ER-78/131

APR 18 1978

Mr. Alton Mangum
State Conservationist
Soil Conservation Service
Department of Agriculture
Post Office Box 1630
Alexandria, Louisiana 71301

Dear Mr. Mangum:

Thank you for the letter of February 6, 1978, requesting our views and comments on the draft environmental statement and work plan for Walnut Roundaway Watershed, Madison and East Carroll Parishes, Louisiana. In reviewing the documents, we have noticed several areas of discussion which we feel merit reexamination.

General Comments

The proposed project involves the permanent alteration of approximately 2,000 acres of types 1 and 2 wetlands. Section 1(a) of Executive Order 11990 on the protection of wetlands states that "...each agency shall provide leadership and shall take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands...." Section 1 of Executive Order 11988, Floodplain Management, makes essentially the same requirement for all floodplain areas. Section 2(2)(i) of E. O. 11988 and Section 2(a)(2) of E. O. 11990 require the minimization of any harm to floodplains or wetlands as part of any project. This proposed project's apparent snub of these Executive Orders should be addressed in the final statement. In addition, these documents do not adequately consider fish and wildlife resources, particularly measures to mitigate adverse impacts of the project.

Specific Comments

Planned Project, Page 10, Paragraph 3

The statement discusses the retention of 18,600 acres of bottomland hardwoods by landowners as part of their conservation plan for wildlife habitat. The final statement should explain exactly what the conservation plan for wildlife would be. The plan should address timber cutting, age class of hardwoods emphasized for wildlife habitat, public hunting, wildlife observation, and other related activities allowed on these bottomland hardwoods.

Page 21, Paragraph 7

This section goes on to discuss that plots or strips 1 to 5 acres in size and totaling 2,000 acres of open land in forested areas, would be planted for wildlife food. There is no guarantee that these food plots would be planted considering the statement on page 12, "However, these measures do not preclude the use of other practices that may be needed." Details of these food plots should be explained in the final statement. The specific time-frame when the food plots will be planted should be provided. The final statement should also explain whether or not the land-owners would be assessed expenses for food plots, and if so, indicate if public hunting will be allowed at these food plots.

The final environmental statement should specify the locations at which channels would be dug primarily from one side. In selecting the side from which to dig the channels, the side providing the greatest shade cover should be left undisturbed. Also, this type of selection should not be limited only to those sites having ponded water, but also to all reaches of the channel that pass through forest or any woody riparian habitat. Undisturbed buffer strips should be included throughout the project area.

Page 22, Paragraph 2

The final statement should address public access and available use of the proposed 80-acre wetland as well as the type of wet-land to be created and the development method involved.

Impacts, Page 104, Table

The final statement should delineate under the "Habitat Types" column that the waterfowl habitat to be affected is a forested wetland.

Page 107, Paragraphs 2 and 3

The statement should consider temporary measures such as sediment traps to minimize increased turbidity in the Tensas River resulting from upstream channel work and structural measures.

Social and Economic Impacts, Pages 109-111

Known mineral resources in the two-parish area include petroleum and sand and gravel. Although the structural measures to be made appear largely to be a reworking of existing channels, the statement should discuss what impacts the project may have on production of or access to these resources. Also there should be some discussion of measures to protect petroleum or natural gas pipelines from project activity. The project map (Appendix C) shows what appears to be a major pipeline crossing the project area.

Page 115, Last Paragraph

It is stated that "...1,755 acres of open land will be disturbed by construction." The words "open land" and "disturbed" are vague and should be thoroughly defined in the final statement.

Pages 115-118

Our Fish and Wildlife Service (FWS) notes that this subsection does not mention the loss of approximately 2,000 acres of wooded wetlands that presently provide wildlife habitat. This loss is a major adverse environmental impact and should be included in the final statement.

Page 119, Paragraph 1

Our FWS finds that the Land Treatment Only alternative is most compatible for fish and wildlife purposes. However, we would recommend that any new drainage laterals, mains, or ditches not be included as part of the land treatment measures. This alternative would prevent the destruction of valuable fish and wildlife habitat that would occur with the channel work and land treatment alternative.

Pages 124-127

The final statement should point out that the long-term productivity and use of fish and wildlife resources would be adversely affected by the construction of the proposed project.

Pages 128-129

The final statement should state that the destruction or damage of 3,457 acres of fish and wildlife habitat is for all practical purposes an irreversible and irretrievable commitment of resources.

Appendix C, Project Map

To aid the reader's review of the final statement, the project map should delineate wetlands and forest areas contained in the project area. In addition, those wetlands and forest areas altered by the project should be identified on the project map.

Summary Comments

As stated in our FWS letter dated November 18, 1977, we are opposed to the project as it would result in losses or severe damage to 3,457 acres of forest and riverine habitat. The proposed mitigation (planting vegetation and 142 acres of hardwood seedlings, and creation of an 80-acre wetland) is not adequate to compensate for this loss.

We favor the Land Treatment Only alternative, without any new drainage laterals, mains or ditches, as the most compatible for fish and wildlife interests. We are deeply concerned over the continual loss of bottomland hardwood habitat, particularly in major flyways.

Alternate methods seem to be available that approach the goals of the project while minimizing adverse impacts to fish and wildlife resources in the project area. We are advising you at the earliest possible time that we may refer this proposed project to CEQ as environmentally unsatisfactory. Such action is contingent upon our review of the final environmental statement and work plan.

Page 21 of the draft statement indicates that a Federal permit pursuant to Section 404 of the Federal Water Pollution Control Act Amendments of 1972 will be required for this project. Because of the destruction of fish and wildlife habitat without suitable mitigation, our FWS would recommend denial of such a permit.

Sincerely,

Larry E. Meierotto

Deputy Assistant SECRETARY

State of Louisiana

WILD LIFE AND FISHERIES COMMISSION
400 ROYAL STREET
NEW ORLEANS 70130

J. BURTON ANGELLE
DIRECTOR

EDWIN EDWARDS
GOVERNOR

21 March 1978

Mr. Alton Mangum
State Conservationist
United States Department of Agriculture
Soil Conservation Service
Post Office Box 1630
Alexandria, LA 70130

RE: Walnut-Roundaway Watershed
Supplemental Work Plan
Draft Environmental Impact Statement

Dear Mr. Mangum:

Personnel of our technical staff have reviewed the above referenced documents furnished by your agency. As the result of this evaluation we have developed a list of comments concerning the fish and wildlife resources associated with the project area.

DRAFT ENVIRONMENTAL IMPACT STATEMENT:

Page 2, paragraph 8. If 18,600 acres of forestland will be unaffected by project and used exactly as in the past, why should this statement be made?

Page 2, paragraph 12. How will mosquito habitat be reduced? Temporary waters are conducive to mosquito production.

Page 3, paragraph 2. How can this be of benefit unless constant maintenance is performed?

Page 3, paragraph 12. Project will induce 1,500 acres of land clearing in the bottomland hardwood type.

Page 4, paragraph 5. How long will this water quality be reduced? Removing unsightly debris will also cause damages.

Page 10, paragraph 2, line 7. How can benefits be claimed on lands which will be retained as they exist and be managed exactly as they have been for years before the watershed project was developed?

Page 11, paragraph 9. How will upland habitat be created?

Page 12, paragraph 2, line 6. What are the capabilities of weir No. 2; by whom and how will it be operated? The EIS figure F-5 is not clear. What is the planned water level? Where is the management plan for this structure?

Page 19, paragraph 1, line 10. What species of hardwood seedlings will be planted? Preferred species for wildlife should be used and the names of these species stated.

Pages 21 and 22, paragraph 4. See page 8, paragraph 1, line 17. New policy dictates SCS cannot provide assistance to drain or alter wetland types 3 through 20. This appears to be a conflict of statements.

Page 22, paragraph 1. The practice of mitigating project induced damages is commendable. However, this concept of mitigation will benefit only one man and/or his guests, while the damages will have occurred throughout the project area and affected many people. This is a very bad approach to mitigation. Also, the management plan needs to be clarified.

Page 23, last paragraph. The applicators using these herbicides should also be required to have the appropriate certificate under the USDA and EPA applicator certification program.

Page 65, paragraph 2. Wild turkeys occur in the watershed project area.

Page 66. The black bear is not rare in the project area. Kill by parish should show 69 acres rather than .69 acres for Madison Parish.

Page 71, paragraph 1. Rattlesnakes occur in watershed.

Page 114, paragraph 3. Mosquito habitat? Paragraph 6. How will upland game habitat be increased with more efficient cropping patterns? Paragraph 7. How will the debris removal benefit fish and wildlife?

Page 117, paragraph 6. What is status of interdisciplinary team's classification of M-11 and M-12 in Category 2? Why not divert M-11 and M-12 away from Bear Lake and into Bull Bayou.

Page 118, paragraph 2. This depends entirely on the management plan, and this must be presented in detail to determine if benefits are to be obtained.

Page 119. What type upland wildlife habitat management will be practiced and by whom?

Page 122. In Table I, why are the "habitat changed" acres different for deer and turkey?

Page 123, paragraph 1, line 7. Why claim benefits to 18,600 acres. Line 11. Extent of duration of flooding is backbone of fisheries. When reduced, fisheries are reduced. Line 21. A reduction in the extent and duration of flooding will reduce fisheries values. Project will also include land clearing. Will this project in fact benefit fish and wildlife?

SUPPLEMENTAL WORK PLAN:

Page 2, paragraph 3. Restudy was brought about as a result of the National Environmental Policy Act.

Page 4. Movement of weir No. 1. Does this benefit fish and wildlife or drainage? What is the operational plan? What is the present level and what level will be held by the proposed structure?

Page 5, paragraph 3. Modification will apparently drop water level four (4) feet. What effect will this have on fisheries and wetlands? See figures in E.I.S., Figure F-9.

Page 6. See E.I.S. comments for greentree mitigation area. Greentree operation recommendations: Half-day shooting (til noon) recommended. Plantings should coincide with flooding November 1 and dewatering April 1.

Page 8. What species of hardwood will be planted? Recommend digging start at upper end. Conflict with page 10 concerning consideration to wildlife habitat and consideration to construction, operation, and maintenance.

Page 11, paragraph 4. Two cleanouts during the 50 years project life would mean that some construction will be taking place many years during the project if you assume that 14 years are needed to complete project. If this is the case, how would you account for a decrease in turbidity?

Page 17. Treatment of 21,600 acres would include woodland left in present condition.

PROJECT CHANNELS THAT NEED FURTHER CLARIFICATION:

L6M2A	Appears to cross non-benefitted area
L1C6	Appears to cross non-benefitted area
M6	Appears to cross non-benefitted area
M6A	Appears to cross non-benefitted area
L6M1A	Appears to cross non-benefitted area
L6I	Elevation in non-benefitted area no lower than in benefitted area.

Department of Wildlife and Fisheries comments on following channels not apparent: L-6D1, L-6D2, L-6E1, L-6A, L-6B, L-6I, L-1A, L-6M, L-6M4, L-6M3, L-7C19, L-7C, M-6, L-7C10, L-7C11, M-11, and M-12.

We very much appreciate the opportunity to comment on this project and hope our remarks will be useful.

Sincerely,

J. Burton Angelle

J. Burton Angelle
Secretary

JBA:ms

cc: Fish and Wildlife Service - Vicksburg

State of Louisiana

Department of Urban and Community Affairs

Office of Planning and Technical Assistance

February 21, 1978

EDWIN EDWARDS
GOVERNOR

LEON R. TARVER, JR.
SECRETARY

CARL WILKINS
ASSISTANT SECRETA

Mangum
McGowen
Rucker
Holdman
Agnew
Touchet
Douglas
Greene
Tech. Spec.

Mr. Alton Mangum
Acting State Conservationist
United States Department of
Agriculture
Soil Conservation Service
Post Office Box 1630
Alexandria, Louisiana 71301

Re: Draft Environmental Impact Statement
Walnut-Roundway Watershed, Madison and
East Carroll Parishes, Louisiana

Dear Mr. Mangum:

We have reviewed the above referenced project with reference to agency expertise and review responsibility and recommend no additions to your list of agencies. We will forward any comments not received by your office to you and complete our review responsibilities by April 7, 1978.

A copy of the statement will be kept on file in our office for public inspection. If we can be of further assistance please give me a call.

Sincerely,

George P. Gullett
Environmental Coordinator
Office of Planning and Technical
Assistance

GPG:se

State of Louisiana
Department of Transportation and Development

EDWIN EDWARDS
GOVERNOR

GEORGE A. FISCHER
SECRETARY

Soil and Water Conservation Committee
Post Office Drawer CS · Louisiana State University Baton Rouge, Louisiana 70893

February 22, 1978

Mangum
McGowan
Rucker
Holdman
Agnew
Touchet
Douglas
Warren
Greene
Tech. Spec.
W/S&R/8

Mr. Alton Mangum, State Conservationist
Soil Conservation Service
P.O. Box 1630
Alexandria, Louisiana 71301

Dear Mr. Mangum:

Your letter of February 6, 1978, with a copy of the supplemental work plan agreement and draft of the environmental impact statement for the Walnut-Roundaway Watershed has been received.

We have reviewed the supplemental work plan agreement along with the environmental impact statement and have no further statement to make. The Louisiana State Soil and Water Conservation Committee endorses this project.

If any additional information is needed concerning this matter, please let us know.

Sincerely,

Charley S. Staples
Executive Director

CSS:ls

cc: Fred Huenefeld, Jr.

OSTEP

OFFICE OF SCIENCE, TECHNOLOGY & ENVIRONMENTAL POLICY

Edwin W. Edwards, Governor • • Lee W. Jennings, Director

February 28, 1978

Mr. Alton Mangum
State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
Post Office Box 1630
Alexandria, LA 71301

RE: Supplement No. 2 to the Watershed Work Plan Agreement
Walnut Roundaway Watershed

Dear Mr. Mangum:

The above-referenced matter concerning environmental quality has been received and reviewed by the staff of the Office of Science, Technology and Environmental Policy. From the information contained in the package sent to our office, the staff of OSTEP issues a no objection on this particular project. The rules and regulations governing this project should continue to be in full compliance with all State and Federal regulatory agencies.

The staff of OSTEP appreciates this opportunity to participate in the review process.

Sincerely,

William J. Mollere
Manager, Administration and Operations

WJM/cdh

cc: Mr. George Gullett, Environmental Coordinator
Office of Planning and Technical Assistance
Department of Urban and Community Affairs

STATE CAPITOL BUILDING POST OFFICE BOX 44095. BATON ROUGE. LA. 70804 (504) 389-2849

State of Louisiana

WILLIAM C. HULS
SECRETARY

DEPARTMENT OF NATURAL RESOURCES
OFFICE OF FORESTRY
(LOUISIANA FORESTRY COMMISSION)

D.L. McFATTER
ASSISTANT SECRETARY AND
STATE FORESTER

March 21, 1978

Mr. Alton Mangum
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
P. O. Box 1630
Alexandria, Louisiana 71301

Re: Walnut-Roundaway Watershed Project
Draft Environmental Impact Statement
Supplement 2 to Watershed Work Plan Agreement
Madison and E. Carroll Parishes, Louisiana

Dear Sir:

We are in receipt of your letter and attachments of February 6 in connection with the above captioned project, and your request for comments on same.

I have examined the subject documents in detail and have no comments to make. I note the work plan for this project was approved in 1969, and there, apparently, have been no significant changes since that date.

Thank you for the opportunity of reviewing this material.

Vernon E. Robinson

VERNON E. ROBINSON - CHIEF, ENVIRONMENTAL RELATIONS

JB

cc: District 9

DWARDS
INOR
THOMPSON
TARY
RRIER, PH.D.
ECRETARY

State of Louisiana

Department of Culture, Recreation and Tourism

Office of Program Development

DIVISIONS

OUTDOOR RECREATION
(504) 389-5888
HISTORIC PRESERVATION
(504) 389-5086
ARCHAEOLOGY
(504) 389-6751
ARTS
(504) 389-6291

April 10, 1978

Mr. Alton Mangum
Soil Conservation Service
Post Office Box 1630
Alexandria, Louisiana 71301

Re: A) Amendment to a Cultural Resource Survey of Walnut-Roundaway Watershed;

B) Evaluation of Effects of Proposed Channel Construction on Archaeological Sites 16 MA 132, 16 MA 147 and 16 MA 149;

C) Walnut-Roundaway Watershed, Madison and East Carroll Parishes, Draft EIS;

D) Supplement No. 2 to the Watershed Work Plan Agreement.

s

Dear Mr. Mangum:

The staff of the State Archaeologist's office has reviewed the above cited projects in the Walnut-Roundaway Watershed. Before this office can clear the projects, the following additional information is requested:

A) Amendment to a Cultural Resource Survey of Walnut-Roundaway Watershed, September, 1977.

1) In order to assess adequately the impact of proposed construction projects on cultural resources, the State Archaeologist's office needs completed site forms on all archaeological sites found during surveys. These forms provide additional information which is often excluded from the archaeological report. During the original survey (September, 1977) five archaeological sites and fourteen accessioned locations were found along the bank of Bull Bayou. If the accessioned locations do not meet the requirements for an archaeological site, then these locations should be assigned spot find numbers and the information incorporated into the central state files.

2) Flow disturbance appears to be the most significant factor for not assigning site numbers to most of these cultural locations. However, it is not clear from the report whether or not the reported destruction of in situ deposits was verified by shovel testing or augering. In alluviated areas such as the Bull Bayou region, many sites may be buried as much as several feet.

3) At location NLU-77-78, an intact brick foundation was found, but the age or possible identity of this feature was not given. More information is needed to determine the significance of this feature.

4) It is difficult to assess accurately the age of the historic locations using the artifact analysis given in the survey report. For instance, it is impossible to verify whether a site dates to the 18th, 19th or 20th century when the analysis states only that "fragments of brick, glass, iron and porcelain" were found.

5) Prehistoric ceramics from a number of the accessioned locations suggest Plaquemine components which, added together, might define an important part of the local settlement pattern for the Plaquemine population using the large ceremonial center known as the Raffman site (16 MA 20). The survey data could be used to evaluate and, if possible, amplify this or other hypotheses.

B) Evaluation of Effects of Proposed Channel Construction on Archaeological Sites 16 MA 132, 16 MA 147 and 16 MA 149, March 1978.

1) In the cultural resource amendment report, site 16 MA 132 was dated to the late 19th or possibly late 18th century. Yet, the evaluation report stated that the artifacts "appear to date to the 20th century." Were the earlier materials collected only from the historic artifact scatters 200 feet south of the planned construction limits? (A surveyor plat for T 18 N, R 11 E in the Madison Parish courthouse may provide additional information. The plat indicates that this location was being farmed between 1846 and 1848.)

2) The locations of the test holes are not indicated on Figure 1 of the evaluation report.

3) At 16 MA 132, more information is needed on the site of a recently removed structure located ten feet south of the planned limits of construction. How old do the foundations of the structure appear to be? Could it conceivably be the camp visited by President

Roosevelt? Will the structure be impacted by spoil deposition or erosion during the completion of channel construction? Is the site eligible for the National Register? Should the site be protected?

C) Draft Environmental Impact Statement, December 1977.

On pages 76-77 a misleading statement is made concerning the nomination of properties to the National Register. Many significant archaeological and historical sites are located in the vicinity of the watershed, and some of these are eligible to be included in the National Register. We cannot predict how many of these sites will be nominated to the state or national registry before the year 2020.

D) Supplement No. 2 to the Watershed Work Plan Agreement.

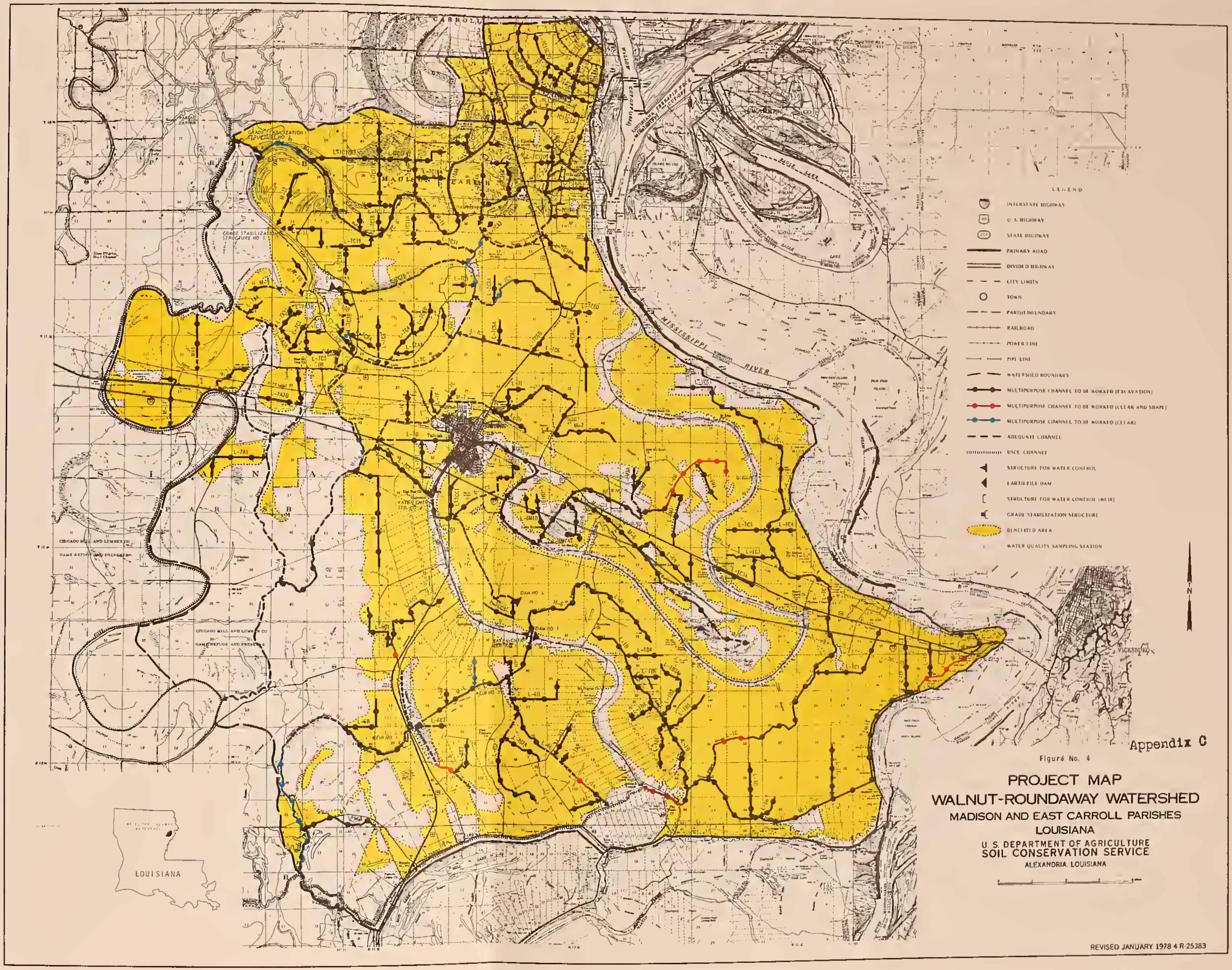
We have no comment on this supplement since it is not concerned with cultural resources.

Thank you for the opportunity to comment on this project. We will be happy to expedite our final review and clearance as soon as we receive this additional information.

Sincerely yours,

E. Bernard Carrier
State Historic Preservation Officer

EBC:GC:mp



Appendix C

Figure No. 4

PROJECT MAP
WALNUT-ROUNDAWAY WATERSHED
MADISON AND EAST CARROLL PARISHES
LOUISIANA
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ALEXANDRIA, LOUISIANA

APPENDIX D

Operation and Maintenance Agreement for Structural Measures

____ PROJECT

THIS AGREEMENT made and entered into the ______ day of _________, 19__ is between the Soil Conservation Service, United States Department of Agriculture, hereinafter referred to as the "Service," and the following organization(s), hereinafter referred to as the "Sponsor(s)":

> Show name(s) of Sponsoring Local Organization(s) responsible for operation and maintenance.

The measures covered by this Operation and Maintenance Agreement are identified as:

> Individually name and identify the works of improvement listed in the Work Plan.
>
> As an example:
>
> All multiple-purpose channels listed in the Watershed Work Plan.

A. OPERATIONS

1. The Sponsor will be responsible for and will operate or have operated without cost to the Service the structural measures in compliance with any applicable Federal, State, and local laws, and in a manner that will assure that the structural measures will serve the purpose for which installed as set forth in the Work Plan.
2. The Service will, upon request of the Sponsor and to the extent that its resources permit, provide consultative assistance in the operation of the structural measures.

B. MAINTENANCE

1. The Sponsor will:
    a. Be responsible for and promptly perform or have performed without cost to the Service except as provided in Paragraph C, Established Period, all maintenance of the structural measures determined by either the Sponsor or the Service to be needed.
    b. Obtain prior Service approval of all plans, designs, and specifications for maintenance work involving major repair.
2. The Service will, upon request of the Sponsor and to the extent that its resources will permit, provide consultative assistance in the preparation of plans, designs, and specifications for needed repair of the structural measures.

C. ESTABLISHMENT PERIOD

1. During the Establishment Period, as herein defined, the Service will bear such part of the cost of any needed major repairs to the structural measures, including associated vegetative work, as is proportionate to the original construction costs borne by the Service in the construction of the structural measures except that the Service will not bear any of the cost for:

    a. Repairs to channels or portions thereof which do not have permanent linings such as concrete, riprap, or grouted rock.

    b. Repairs determined by the Service to have been occasioned by improper operation or maintenance, or both.

    c. Repairs that are mutually determined by the Sponsor and the Service as being items of normal maintenance rather than major repair and are not therefore in keeping with the spirit and intent of the Establishment Period provisions.

2. The Establishment Period for structural measures (exclusive of any associated vegetative work) is a period of 3 years ending at midnight on the third anniversary of the date on which the structural measure is accepted.

3. The Establishment Period for vegetative work associated with a structural measure is a period from date of acceptance of the initial vegetative work to midnight of the date on which the Service writes the Sponsor advising that an adequate vegetative cover has been obtained. However, this period shall not exceed two growing seasons or the end of the Establishment Period for the associated structural measure whichever is greater at the time.

4. As used in the two preceding paragraphs, and elsewhere in this Agreement, the following words have the meanings described below:

    ACCEPTED, ACCEPTANCE: The date structural or vegetative measures are accepted from the contractor when a contract is involved, or the date structural or vegetative measures are completed to the satisfaction of the Service when force account operations are involved.

    ADEQUATE VEGETATIVE COVER: A minimum of seventy per cent (70%) evenly distributed cover of the desirable species, with no active rilling that cannot be controlled by the vegetation.

5. Major repair may involve such things as (1) replacing significant backfill around structures resulting from major erosion

damages, (2) revegetating where adequate cover was not obtained, (3) restoring areas with significant erosion, and (4) removing trash and debris from bridges, culverts, and fence crossings.

6. No action with respect to needed repairs during the Establishment Period will be taken by the Sponsor or the Service which would lessen or adversely affect any legal liability of any contractor or his surety for payment of the cost of the repairs.

D. <u>INSPECTIONS AND REPORTS</u>

1. During the Establishment Period the Sponsor and the Service will jointly inspect the structural measures at least annually and after unusually severe floods or the occurrence of any other unusual condition that might adversely affect the structural measures. It is desirable that the annual inspections be performed during the month shown below. Any supplemental inspections then determined necessary will be scheduled and agreed to at that time.

    ____
    (Month)

2. After the Establishment Period, the structural measures will be inspected annually by the Sponsor, preferably during the month shown below, and after unusually severe floods or the occurrence of any other unusual condition that might adversely affect the structural measures.

    ____
    (Month)

3. After the Establishment Period, the Service may inspect the structural measures at any reasonable time.

4. A written report will be made of each inspection. The report of joint inspections will be prepared by the Sponsor with the assistance of the Service. A copy of each report will be provided by the party preparing the report to the other party within 10 days of the date on which the inspection was made.

E. <u>RECORDS</u>

The Sponsor will maintain in a centralized location a record of all inspections performed both individually and jointly by the Sponsor and the Service, and of all significant actions taken by the Sponsor with respect to operation and maintenance. The Service may inspect these records at any reasonable time.

F. <u>GENERAL</u>

1. The Sponsor will:

    a. Prohibit the installation of any structures or facilities that will interfere with the operation or maintenance of the structural measures.

b. Obtain prior Service approval of the plans and specifications for any alteration or improvement to the structural measures.

c. Obtain prior Service approval of any agreement to be entered into with other parties for the operation or maintenance of all or any part of the structural measures, and provide the Service with a copy of the agreement after it has been signed by the Sponsor and the other party.

2. Service personnel will be provided the right of free access to the structural measures at any reasonable time for the purpose of carrying out the terms of this agreement.

3. The responsibilities of the Sponsor under this agreement are effective simultaneously with the acceptance of the works of improvement in whole or in part.

G. SPECIAL PROVISIONS

An Operation and Maintenance (O&M) Plan will be prepared for each structure or channel (or similar groups of structures of channels) listed on page one of this agreement at the time of advertisement for bids for such structures of channels. Such O&M Plans will be made a part of this agreement.

H. AUTHORIZATION

Name of Sponsor ______________________________

By ______________________ Title ______________

This action was authorized at an official meeting of the Sponsor named immediately above on ____________ at ____________

Attest ______________________ Title ______________

Name of Sponsor ______________________________

By ______________________ Title ______________

This action was authorized at an official meeting of the Sponsor named immediately above on ____________ at ____________

Attest ______________________ Title ______________

Soil Conservation Service, United States Department of Agriculture

By ______________________ Title ______________

Operation and Maintenance Plan (Channels)

These channels have been designed and constructed to provide flood protection and drainage for the surrounding lands. This will be accomplished if the channel dimensions are not reduced and the flow of water is not obstructed by trees, bursh, weeds, cross fences, and heavy trash. For example, a moderately heavy growth of 2-year old willows in the channel could cut the planned capacity by 50 per cent or more. The same is true for equivalent growths of cotton woods, alders, and water-loving plants, such as cattails.

Another important feature of the channel job is the service road along the banks. It is essential that this road be passable with maintenance equipment at all times.

Many of the things required to keep the channel in good working condition could be called routine maintenance, which is really nothing more than "normal good care." This includes:

1. Control of brush and weeds. Removal of willows, cottonwoods, alders, the larger woody-stemmed weeds and water plants is a yearly job. They may need attention twice a year in those years when conditions are unusually favorable for rapid regrowth. The job of control more than doubles with the age of the plants. As an example, the difficulty and cost of killing 2-year old willows can be about four times as difficult and costly as killing them in the early seedling stage. In addition, the 2-year old and older willows tend to block the channel even after they are killed.

   Spraying, chopping, or mowing are all effective ways of getting rid of brush and weeds. Remember, the service road and the berms need attention the same as the channel.

   The kinds of brush that are likely to give the most trouble are blackwillow, buttonbush, cottonwood, and sycamore.

   The best time to spray is about the time the brush becomes full-leaved.

   CAUTION: If herbicides are handled or applied improperly or if unused portions are not disposed of safely, they may be injurious to humans, domestic animals, desirable plants, fish, or wildlife, and they may contaminate water supplies. Drift from aerial spraying can contaminate nearby crops and other vegetation. Follow the directions and heed all precautions on the container label.

2. Keep fences and water gaps in good condition. Look them over after each bank-full flow. Replace missing staples and posts; replace broken wire.

3. Maintain side inlet structures and bridges. Replace any soil that washes from around the metal pipes under the service road.

4. Remove sediment deposits as soon as possible after they are formed. If allowed to remain, they not only reduce the size of the channel, they provide good sites for willows and other brush to get a foothold. They may also divert the flow and cause erosion of the channel banks.

APPENDIX E

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APPENDIX F

FIGURES

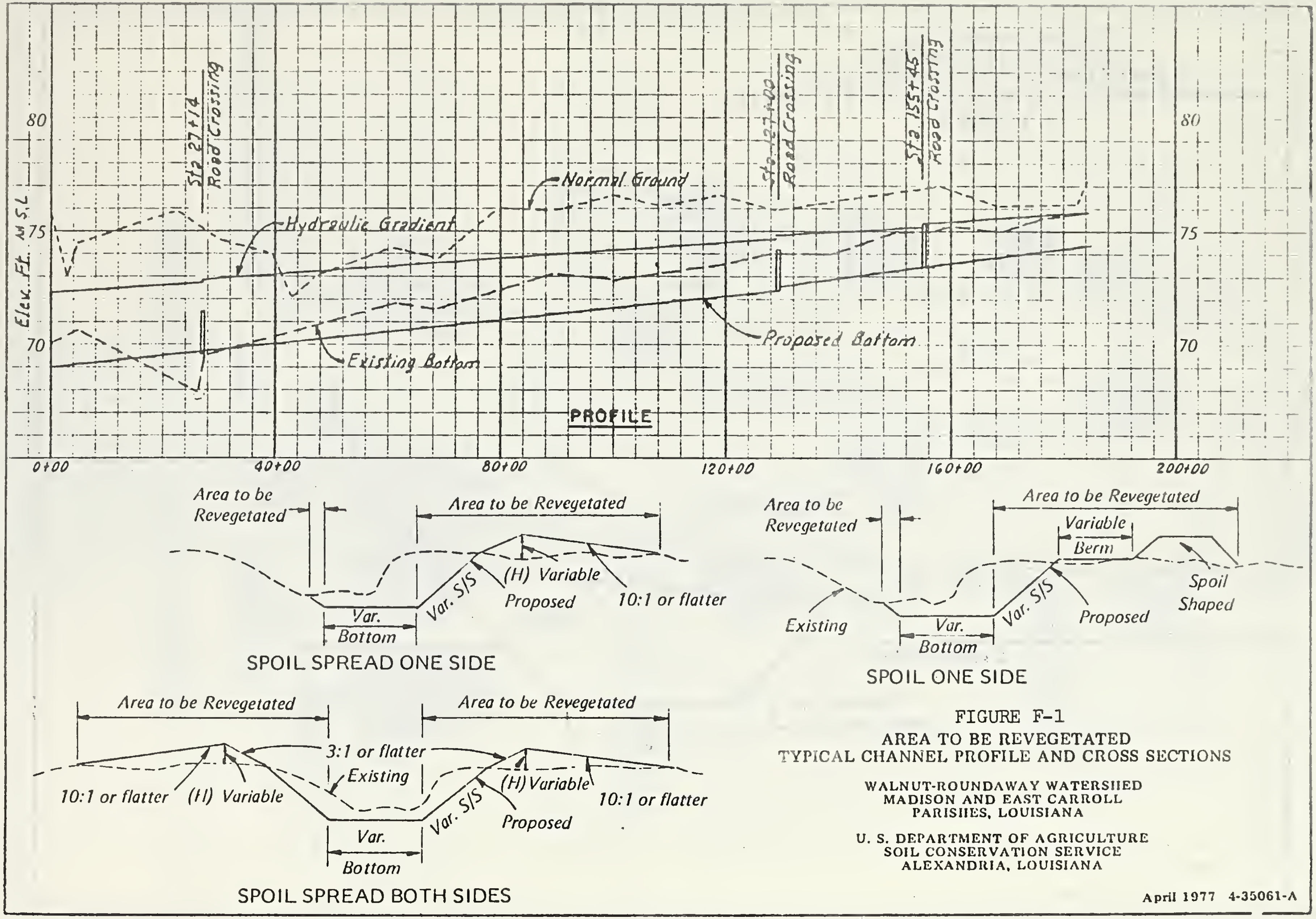

FIGURE F-1
AREA TO BE REVEGETATED
TYPICAL CHANNEL PROFILE AND CROSS SECTIONS

WALNUT-ROUNDAWAY WATERSHED
MADISON AND EAST CARROLL
PARISHES, LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ALEXANDRIA, LOUISIANA

April 1977 4-35061-A

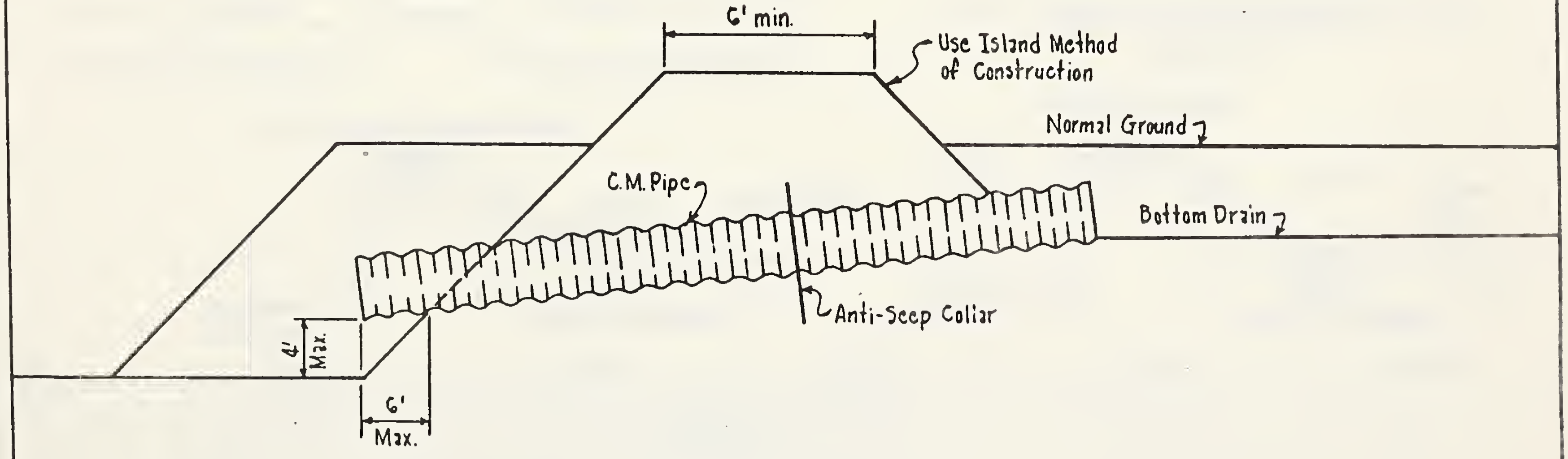

FIGURE F-2

TYPICAL STRUCTURE FOR WATER CONTROL (PIPE DROP)
WALNUT-ROUNDAWAY WATERSHED
MADISON AND EAST CARROLL
PARISHES, LOUISIANA

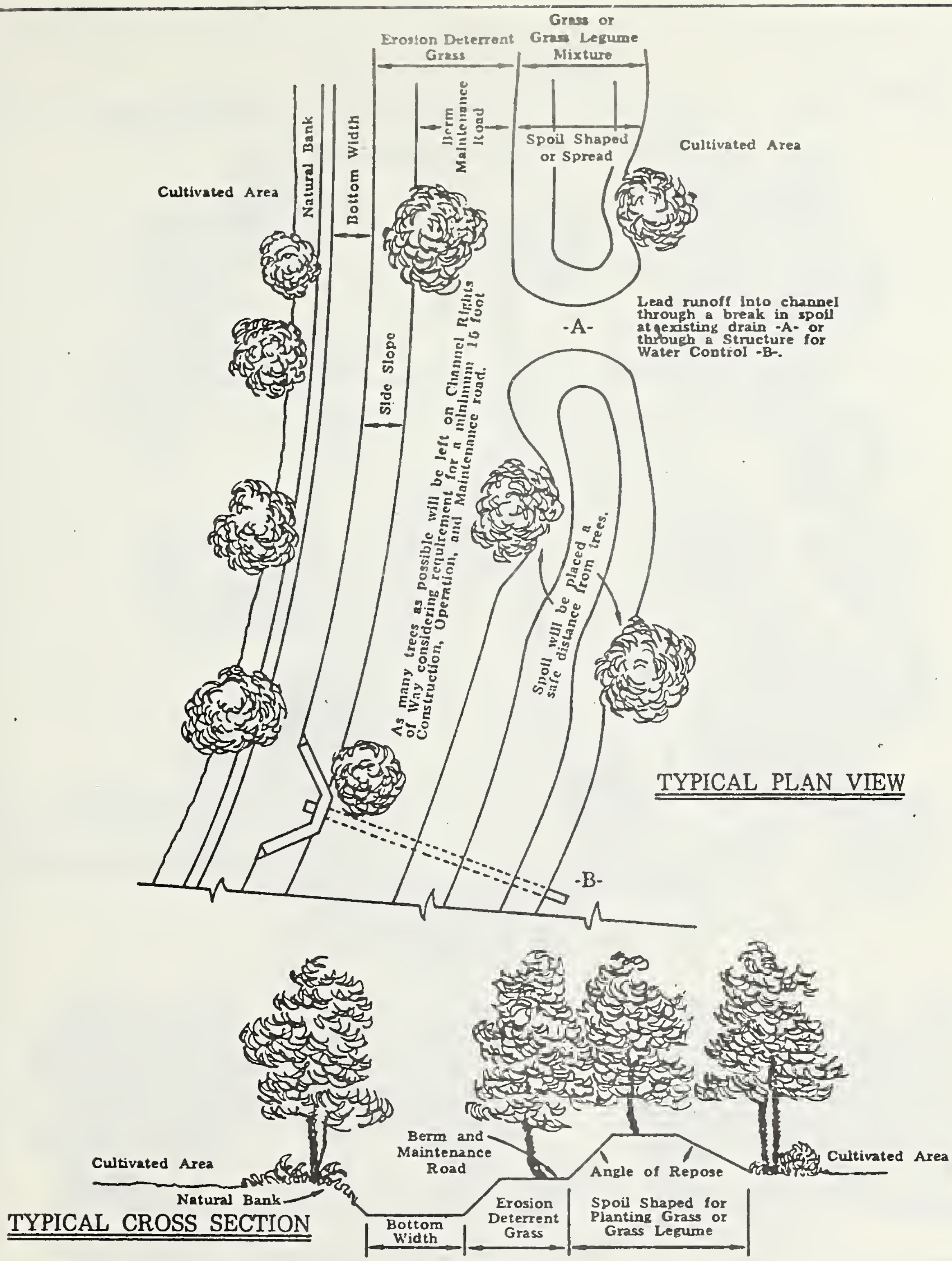

FIGURE F-3

TYPICAL PLAN VIEW AND CROSS SECTION OF CHANNELS WHERE WOODY VEGETATION EXISTS ADJACENT TO CULTIVATED AREA

WALNUT-ROUNDAWAY WATERSHED
MADISON AND EAST CARROLL
PARISHES, LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ALEXANDRIA, LOUISIANA

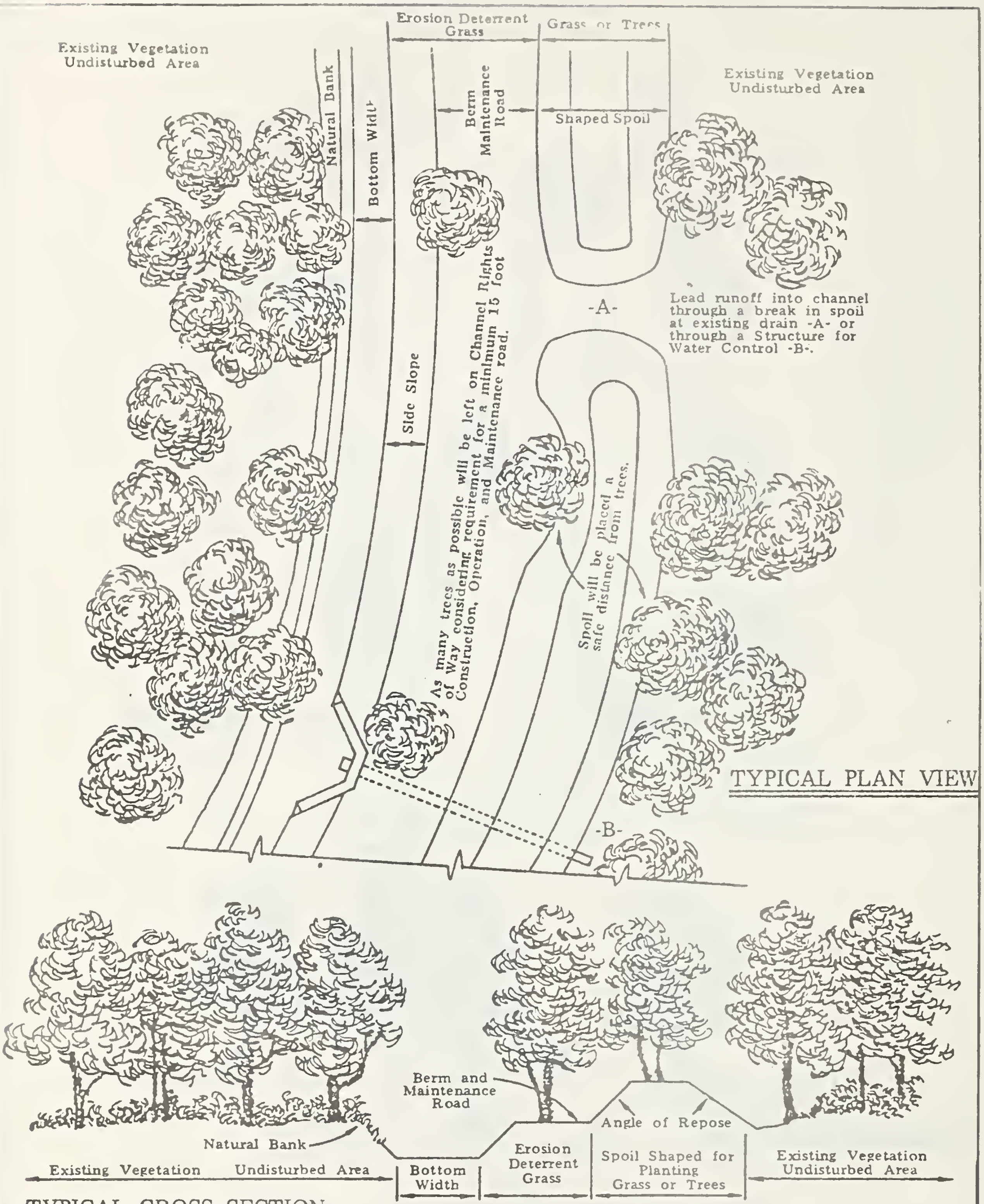

FIGURE F-4

TYPICAL PLAN VIEW AND CROSS SECTION OF
CHANNELS THROUGH FOREST LAND

WALNUT-ROUNDAWAY WATERSHED
MADISON AND EAST CARROLL
PARISHES, LOUISIANA

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ALEXANDRIA, LOUISIANA

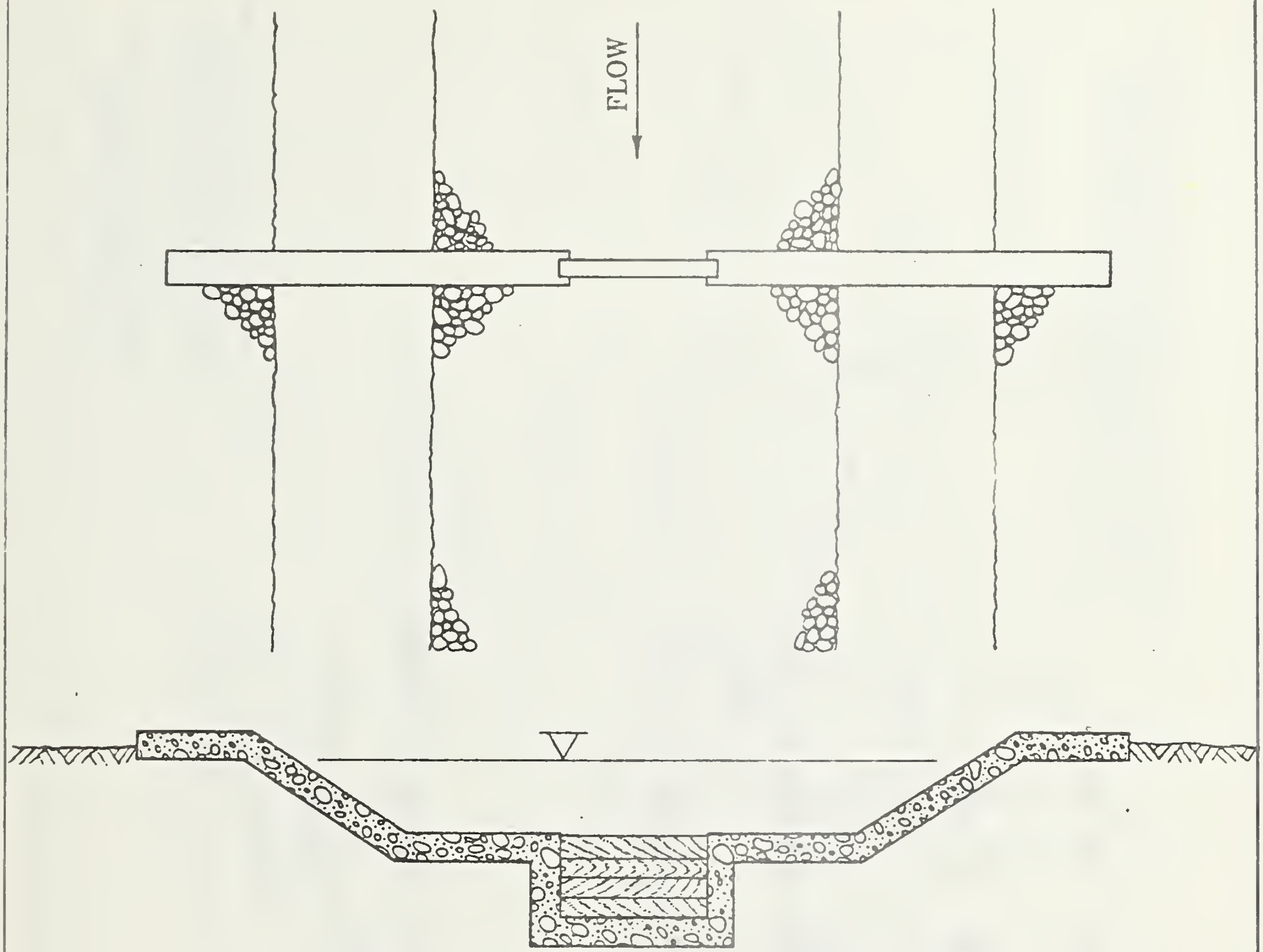

FIGURE F-5

STRUCTURE FOR WATER CONTROL
(STOP LOG WEIR)

WALNUT-ROUNDAWAY WATERSHED
MADISON AND EAST CARROLL
PARISHES, LOUISIANA

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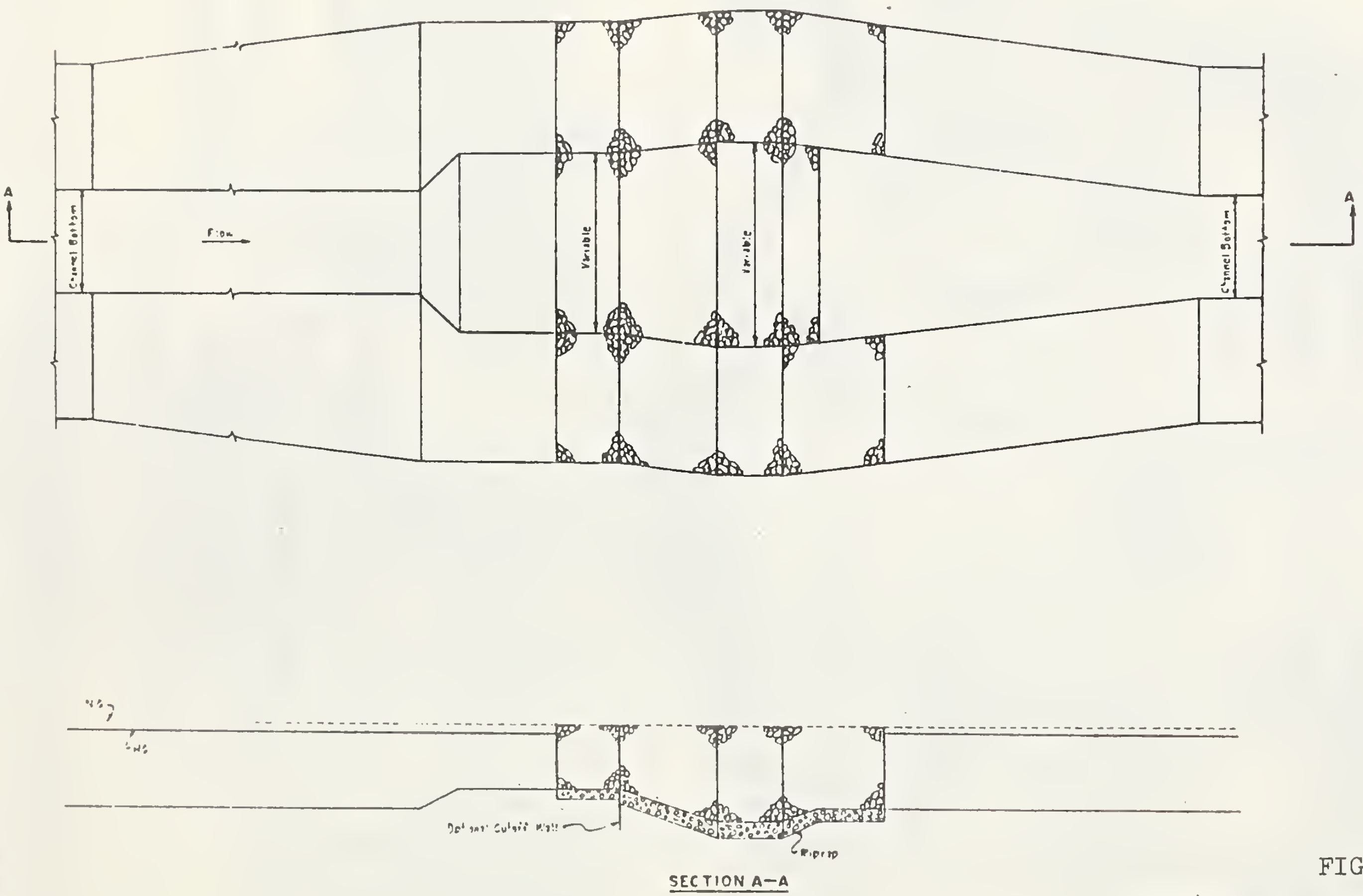

FIGURE F-6

STRUCTURE FOR WATER CONTROL (WEIR)

WALNUT-ROUNDAWAY WATERSHED
MADISON AND EAST CARROLL
PARISHES, LOUISIANA

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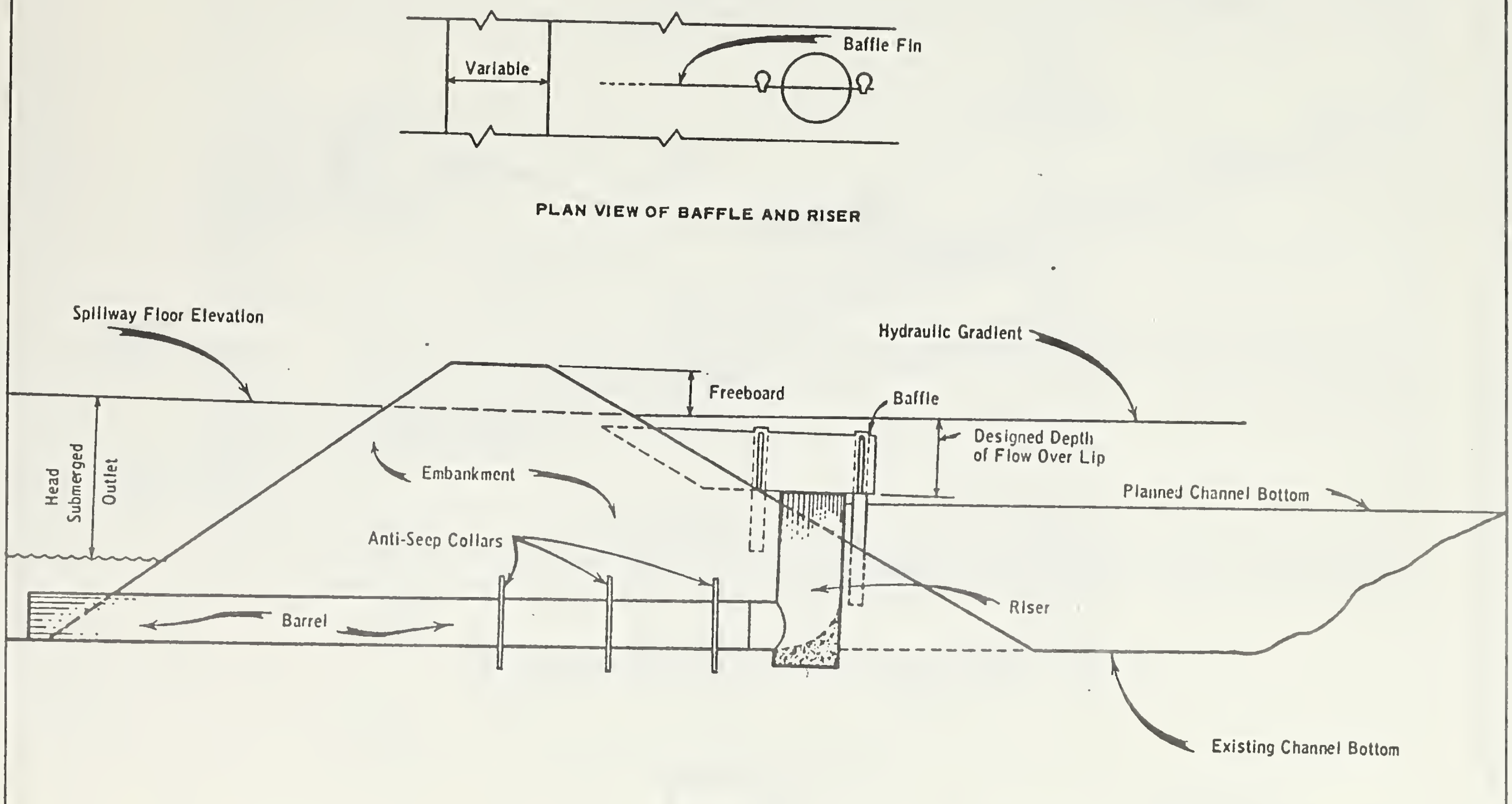


FIGURE F-7
TYPICAL GRADE STABILIZATION STRUCTURE
WALNUT-ROUNDWAY WATERSHED
MADISON & EAST CARROLL PARISHES, LOUISIANA

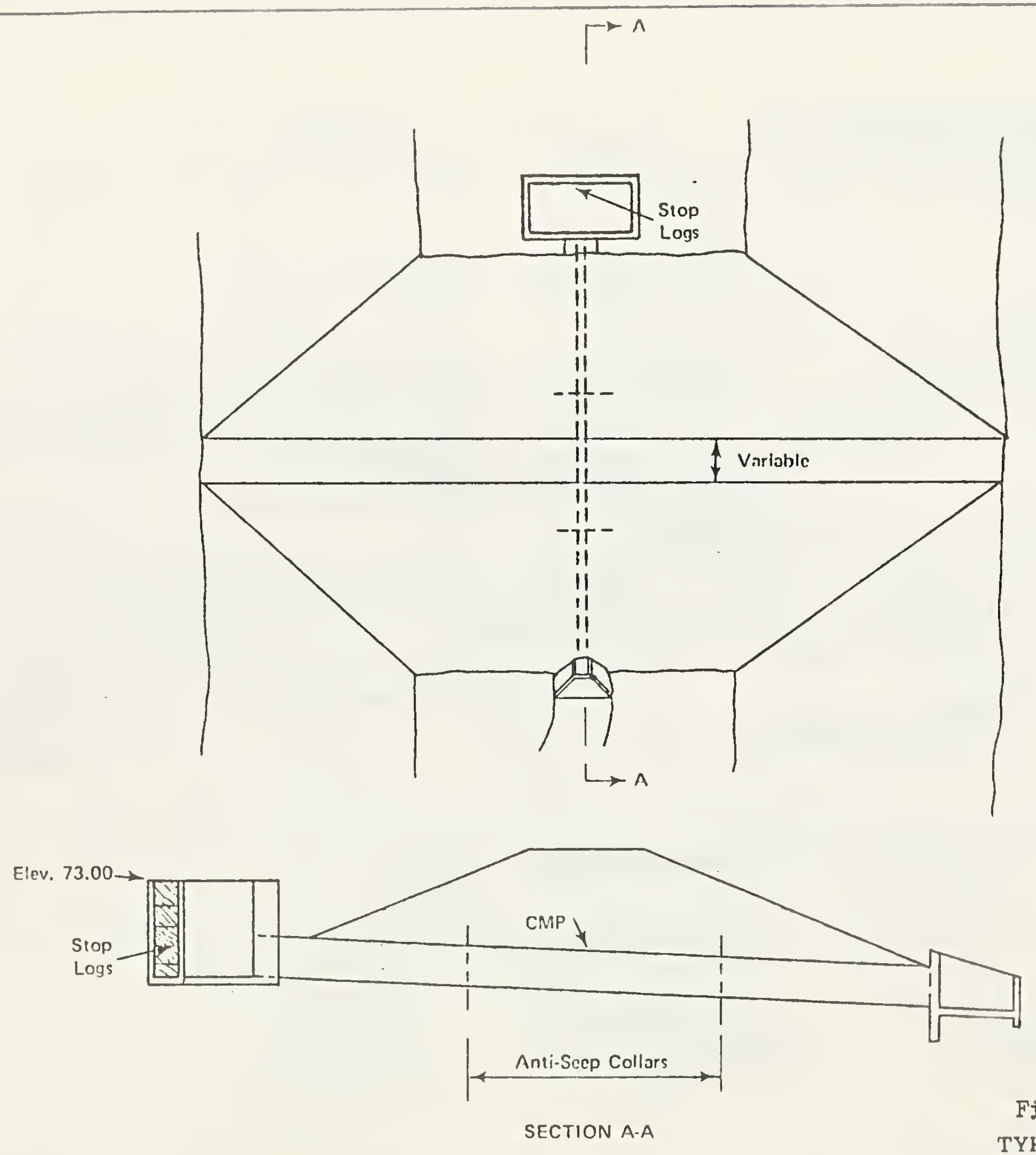
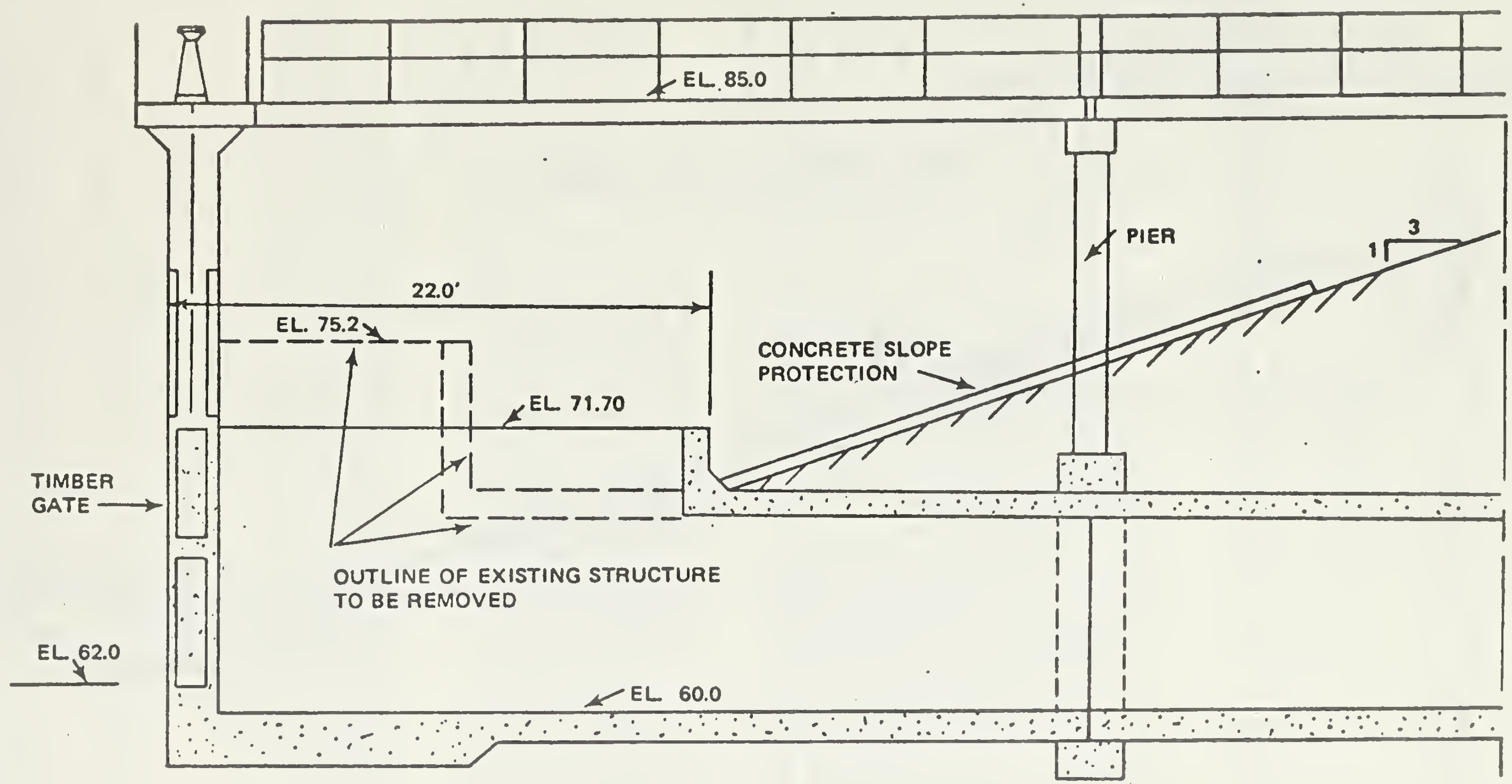


Figure F-8
TYPICAL PLAN
WATER CONTROL STRUCTURE NO. 1
WALNUT-ROUNDAWAY WATERSHED
MADISON AND EAST CARROLL
PARISHES, LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



PLANNED MODIFICATION OF EXISTING STRUCTURE

Figure F-9

WATER CONTROL STRUCTURE NO. 2

WALNUT-ROUNDAWAY WATERSHED
MADISON AND EAST CARROLL
PARISHES, LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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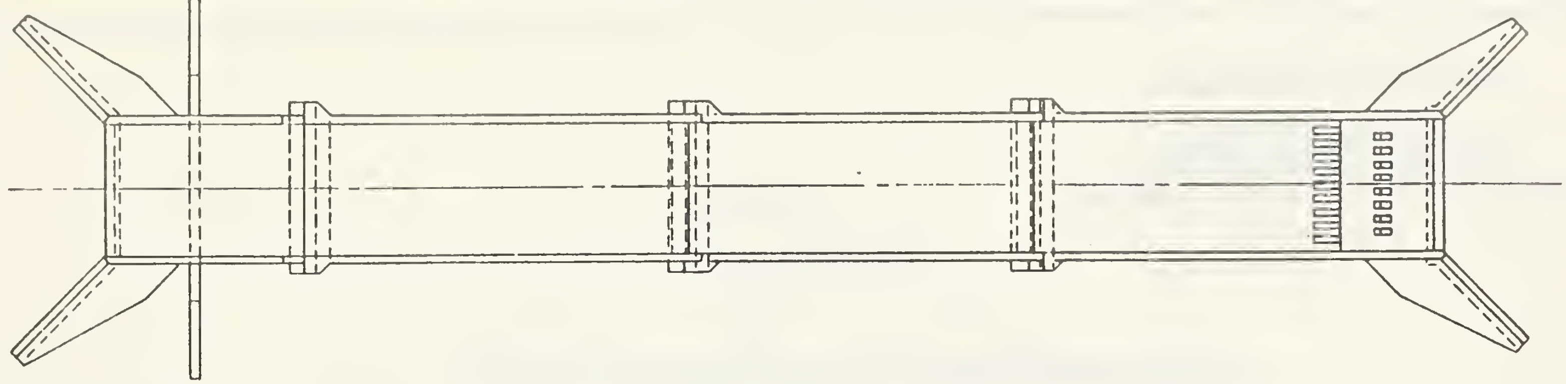
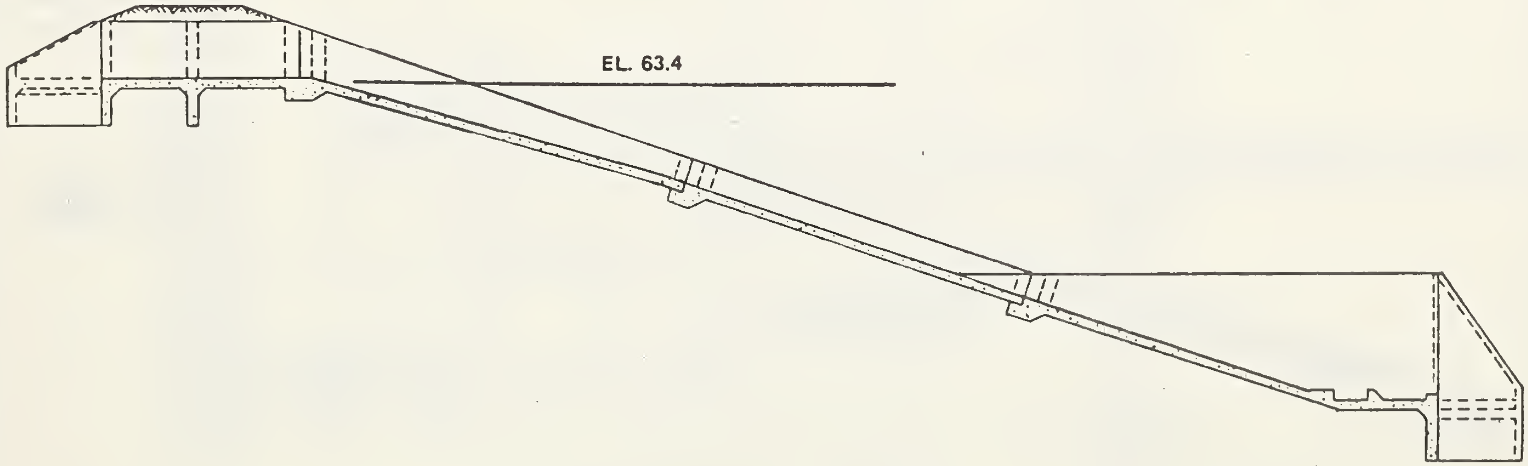


PLAN VIEW



SECTION ALONG CENTER LINE

FIGURE F-10

GRADE STABILIZATION STRUCTURE NO. 2

WALNUT-ROUNDAWAY WATERSHED
MADISON AND EAST CARROLL
PARISHES, LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

APPENDIX G

INTERPRETATIONS OF WATER QUALITY PARAMETERS

CHLORIDE (Cl)

Water quality is dependent upon the use(s) of the water. The following data is not all inclusive but summarizes water quality criteria for some common uses.

Chloride is found in natural waters. It may originate from natural mineral origin or from (1) seawater contamination of underground water supplies, (2) salts spread on roads and bridges, (3) human or animal sewage, and (4) industrial effluents such as those from paper works, water softening plants, oil wells, and petroleum refineries. It is recommended that the chloride concentration not exceed a monthly average of 125 mg/l and that the maximum concentration not exceed 250 mg/l. The primary concern in setting these standards is economic damage rather than public health. For public supplies, water with a chloride concentration of less than 125 mg/l is rated "acceptable"; between 125 and 250 mg/l "doubtful"; and over 250 mg/l "unsatisfactory." For industrial use, the corresponding limits are: less than 50 mg/l, 50-175 mg/l, and over 175 mg/l, respectively.

"The Aquatic Life Advisory Commission of the Ohio River Valley Water Sanitation Commission concluded that it is impossible to generalize on the effects of chloride concentrations on aquatic life, because each mixture of chlorides with other salts must be evaluated separately. Hart, *et al.*, cite data indicating that among U.S. waters supporting a good fish fauna, ordinarily the concentration of chlorides is below 3 mg/l in 5 percent; below 9 mg/l in 50 percent; and below 170 mg/l in 95 percent of such waters."1/

In summary, it appears that the following chloride concentrations will not normally be deleterious to the specified use: (1) Domestic water supply, 125 mg/l; (2) Industrial water supply, 50 mg/l; (3) Irrigation water, 100 mg/l; and (4) Stock and wildlife, 1,500 mg/l.

1/ Jack Edward McKee and Harold W. Wolf, *Water Quality Criteria*, publication No. 3-A, (2nd edition; Sacramento: State Water Quality Board, 1963), p. 161.

COLOR (APPARENT)

Color of natural waters is derived from substances in solution or from materials in colloidal state.2/ The standard unit used to measure color is the amount of color produced by adding 1 mg/l of platinum to water. Results are expressed as units of color. "Color in excess of 50 units may limit photosynthesis and have a deleterious effect upon aquatic life, particularly phytoplankton and the benthos."3/

DISSOLVED SOLIDS

Water without some dissolved solids does not occur in nature and will not support aquatic life. Natural water contains a variety of dissolved materials in concentrations that will vary widely from place to place and from time to time. Some commonly occurring dissolved solids are: carbonates; bicarbonates; chlorides; sulfates; phosphates; nitrates of calcium, magnesium, sodium, and potassium; and traces of iron, manganese, and other elements. Many of these dissolved solids are essential to aquatic organisms for their growth, reproduction, and general well-being. All dissolved solids, which are necessary to aquatic organisms, have a range of concentrations that are both essential and tolerable. The tolerance level for any one dissolved solid varies depending on the concentrations and kinds of other substances present. In general, the concentrations of dissolved materials in natural freshwaters are below the optimum for maximum productivity. In many instances, the addition of any of a large number of substances would be beneficial. However, the addition of what may be considered a beneficial substance must be planned and controlled so that it will not exceed favorable limits.4/ It is believed that the total dissolved solids in a water course should not be increased more than one-third of the concentration it has under natural conditions.

Dissolved solids may influence the toxicity of heavy metals and organic compounds to fish and other forms of aquatic life. This is a result primarily of the counteracting effect of hardness

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2/ George K. Reid, Ecology of Inland Waters and Estuaries, (New York: Reinhold Publishing Corporation, 1961), p. 101.

3/ U.S. Department of the Interior, Federal Water Pollution Control Administration, Water Quality Criteria, (Washington: U.S. Government Printing Office, 1972), p. 48.

4/ Ibid., p. 39.

producting metals. "It has been reported that among inland waters in the United States supporting a good mixed fish fauna, about 5 percent have a dissolved solids concentration under 72 mg/1, about 50 percent under 169 mg/1, and about 95 percent under 400 mg/1."5/

In summary, based on a literature review, dissolved solids up to the following limits should not interfere with the indicated use: (1) Domestic water supply, 1,000 mg/1; (2) Irrigation water, 700 mg/1; (3) Stock and wildlife water, 2,500 mg/1; and (4) Freshwater fish and aquatic life, 2,000 mg/1.

HARDNESS

Hardness or calcium carbonate determinations are made with the Titration Method and expressed as mg/1. "In natural waters, hardness is a characteristic of water which represents the total concentration of just the calcium and magnesium ions expressed as calcium carbonate."6/ Hardness in water may be caused by the natural accumulation of salts from contact with soil and geological formations, or it may enter from direct pollution by industrial wastes. Water with less than 40 mg/1 is considered soft water, 90-150 mg/1 is medium, and above 150 mg/1 is considered hard water. Hardness of waters is not considered a problem for fisheries in Louisiana.

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NITROGEN, AMMONIA (NH_3)

Nitrogen is present in natural waters in compounds such as ammonia. Nitrogen, (ammonia) determinations are made by the Nessler method and expressed in mg/1. The chemical state of nitrogen is dependent on the overall limnological conditions of the waterway since nitrogen, (ammonia) is quite unstable. In most freshwaters, the concentrations of this inorganic compound are relatively slight; but nevertheless, very important in determining the productivity of a given community. "Rivers known to be unpolluted have low ammonia concentrations, generally less than 0.2 mg/1 as N."7/

5/ McKee and Wolf, op. cit., p. 183.

6/ U.S. Department of the Interior, Federal Water Pollution Control Administration, Chemical Analysis for Water Quality, 1967, p. 18-1.

7/ McKee and Wolf, op. cit., p. 132.

NITROGEN, NITRATE (NO_3)

Nitrogen, (nitrate) determinations are made by the Cadmium Reduction Method and expressed in mg/l. "Nitrogen, (nitrate) usually occurs in relatively small concentrations in unpolluted freshwater, the world average being 0.30 ppm."8/ Under normal conditions, the amount of nitrate in solution at a given time is determined by metabolic processes in the body of water, i.e., production and decomposition of organic matter. High nitrate concentrations in effluents and water stimulate the growth of plankton and aquatic weeds. By increasing plankton growth and the development of fish food organisms, nitrates indirectly foster increased fish production.

"Hart, *et al.*, report references to the effect that among United States' waters supporting a good fish life, ordinarily 5 percent have less than 0.2 mg/l of nitrates; 50 percent have less than 0.9 mg/l; and 95 percent have less than 4.2 mg/l."9/

OXYGEN (DISSOLVED) (O_2)

The dissolved oxygen content can be determined with a Hach Dissolved Oxygen test kit and expressed in mg/l. The content of dissolved oxygen in the water depends on several factors such as the temperature and salinity of the water, amount of organic material present, light present, and the abundance of phytoplankton. "For a diversified warm-water biota, including game fish, dissolved oxygen concentrations should be above 5 mg/l, assuming normal seasonal and daily variations are above this concentration. Under extreme conditions, however, they may range between 5 and 4 mg/l for short periods during any 24-hour period, provided that the water quality is favorable in all other respects."10/

OXYGEN SATURATION (Percent)

Water is said to be saturated with oxygen when it contains all the dissolved oxygen it can hold at a given atmospheric pressure, temperature, and dissolved solids concentration. The difference between the actual oxygen content and the amount that could be

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8/ Reid, *op. cit.*, p. 187.

9/ McKee and Wolf, *op. cit.*, p. 225.

10/ U.S. Department of the Interior, Federal Water Pollution Control Administration, *Water Quality Criteria*, *op. cit.*, p. 44.

present is called the saturation deficit. If the water contains more oxygen than should normally be present, it is said to be supersaturated. The ability of water to hold oxygen decreases with increases in temperature, dissolved solids, and reduction of atmospheric pressure. 11/ Natural waters are seldom at equilibrium or exactly saturated with dissolved oxygen. The reason for this is that temperatures and atmospheric pressure are always changing; and physical, chemical, bio-chemical, and biological activities are continually utilizing or producing dissolved oxygen.

Oxygen saturation, like pH and alkalinity, is only a measurement, but it indicates the amount of potential oxygen actually present. High or low oxygen saturation values usually indicate high or low concentrations of dissolved oxygen, but this is not always the case. For instance, seawater at 15 degrees centigrade and 100 percent saturation will contain only 6 ppm dissolved oxygen, and freshwater at 15 degrees centigrade and 100 percent saturation will contain 11 ppm dissolved oxygen.12/

In natural waters, oxygen saturation is usually between 70 and 120. Readings below this range usually indicate pollution which is utilizing the available oxygen inhibiting the biological production of additional oxygen. Readings above this range usually come in mid to late afternoon on warm, sunny days, and indicate excessive photosynthetic activity by green plants in the water.

pH

The pH can be determined with a Hach test kit. The symbol "pH" is used to designate the logarithm (base 10) of the reciprocal of the hydrogen-ion concentration. If the pH value is less than 7, then the solution is considered acid and the lower the number the more acid the solution. Values above 7 indicate a basic solution and the larger the number the more basic the solution. "In most productive, fresh, natural water, the pH falls between 6.5 and 8.5 (except when increased by photosynthesis activity).13/ "Bass

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11/ Charles W. Keenan and Jesse H. Wood, General College Chemistry (2nd ed.; New York, Evanston, London: Harper and Row, Publishers, 1957).

12/ Reid, op. cit. 101.

13/ U.S. Department of the Interior, Federal Water Pollution Control Administration, Water Quality Criteria, op cit., p. 40.

and bluegill can live from 4.6 to 11; growth and reproduction at either extreme is poor. The optimum level for growth for these fish is 6.5 to 8.5."14/

PHOSPHATE, ORTHO (PO_4)

The Orthophosphate determinations were made by the Ascorbic Acid Method which gives a reading in mg/l. This is a test for just orthophosphates and does not indicate total phosphate content. The major sources of phosphorus entering freshwaters are domestic sewage effluents (including detergents), animal and plant processing wastes, fertilizer and chemical manufacturing spillage, various industrial effluents, and to a limited extent, sediment materials in agricultural runoff. "Phosphorus is stored in plankton and bottom sediments. Very little of this stored phosphorus reenters the water. Evidence from the addition of fertilizers to fish ponds and from what is known about the eutrophication of lakes by sewage supports the view that phosphorus plays a major role in production."15/ "Most natural waters contain relatively low levels of phosphorus (0.01 to 0.05 mg/l) in the soluble state during periods of significant productivity."16/ "Optimum growth of all organisms studied in cultures can be obtained on concentrations from 0.09 to 1.8 mg/l of phosphorus while a limiting effect on all organisms will occur in phosphorus concentrations from 0.009 mg/l downward. The lower limit of optimum range of phosphorus concentration varies from about 0.018 to about 0.09 mg/l; and the upper limit from 8.9 to 17.8 mg/l."17/

SODIUM (Na)

Sodium is a very active metal which does not occur free in nature. Nevertheless, sodium compounds make up 2.8 percent of

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14/ U.S. Department of Agriculture, Soil Conservation Service, "Water Quality and Fish Culture," Biology Technical Note XII, 1968.

15/ U.S. Department of the Interior, Federal Water Pollution Control Administration, The Practice of Water Pollution Biology, Division of Technical Support, 1969, p. 40.

16/ U.S. Department of the Interior, Federal Water Pollution Control Administration, Chemical Analysis for Water Quality, op cit., p. 15-1.

17/ S. P. Chu, "The Influence of the Mineral Composition of the Medium on the Growth of Planktonic Algae," Journal of Ecology, 31(2), 1943, pp. 109-148.

the earth's crust. Most sodium salts are extremely soluble in water. Because of this, any sodium that is leached from soil or discharged into streams by industries will normally remain in solution. Sodium is the cation of many salts used in industry and is one of the most common ions in process wastes.

Sodium in drinking water may be harmful to people suffering from cardiac, renal, and circulatory diseases. Drinking water of good quality may contain up to 115 mg/l of sodium, but it is recommended that a limit of 10 mg/l be established for drinking water and 50 mg/l for industrial water. Water used by livestock and wildlife should not have sodium concentrations greater than 2,000 mg/l.

"Of the United States' waters supporting a good fish fauna, originally the concentration of sodium plus potassium is less than 6 mg/l in about 5 percent, less than 10 mg/l in about 50 percent, and less than 85 mg/l in about 95 percent."18/

SPECIFIC CONDUCTANCE

Specific conductance is an indication of the ion concentration in water. Natural freshwater usually contains relatively small amounts of ions in solution, but in water polluted by brines and various chemical wastes the ion concentration may rise to levels that are harmful to living organisms because of the increase in osmotic pressure.

All substances in a solution collectively exert osmotic pressure on the organisms living in the solution. Most aquatic species can tolerate some changes in the amount of ions naturally present if the total maximum concentration is not exceeded. Wide variations in total salinity (specific conductance) or in the concentration of individual salts can have profound effects upon the aquatic fauna, resulting in the elimination of some or all aquatic species. When the osmotic pressure is sufficiently high because of ions in solution (high specific conductance), water will be drawn from the gills and other delicate external tissues causing considerable damage or even death. High concentrations of many types of pollutants of freshwater present this danger apart from any other toxic or corrosive effects they may have.19/

"Ellis has concluded that conductances in excess of 1,000 x 10^{-6} mhos at 25 degrees centigrade in most types of streams are probably

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18/ McKee and Wolf, op. cit., p. 259.

19/ Ibid., p. 94.

indicative of the presence of acid or salt pollution of various kinds. Ellis has also found that a specific conductance of 4,000 4,000 x 10^{-6} mhos at 25 degrees centigrade is approximately the upper limit of ionizable salts tolerated by fish.

Using Ellis' data, Hart, et al., have reported that among United States' water supporting a good fish fauna, about 5 percent have a specific conductance under 50 x 10^{-6} mhos at 25 degrees centigrade, about 50 percent under 270 x 10^{-6} mhos, and about 95 percent under 1,100 x 10^{-6} mhos."20/

SULFATE (SO_4)

Sulfate content can be analyzed by the Turbidimetric Method and expressed in mg/l. Sulfates occur naturally in waters as a result of leachings from gypsum and other common minerals. "Sulfate is ecologically important in natural waters in several ways. It is apparently necessary for plant growth; short supply of the material can inhibit the development of phytoplankton populations and, therefore, production. Sulfur is important in protein metabolism and is supplied to the organism originally as sulfate."21/ "In United States waters that support good game fish populations, 5 percent of the waters contain less than 11 mg/l of sulfates, 50 percent less than 32 mg/l, and 95 percent less than 90 mg/l. Experiments indicate that water containing less than 0.5 mg/l of sulfate will not support growth of algae."22/

SULFIDE (S)

Sulfides are determined by the Methylene Blue Method and expressed in mg/l. Sulfides in water are a result of the natural processes of decomposition, sewage, and industrial wastes such as those from oil refineries, tanneries, pulpmills, papermills, textile mills, chemical plants, and gas manufacturing facilities.

"The toxicity of solutions of sulfides toward fish increase as the pH value is lowered, i.e., the H_2S or HS, rather than the sulfide ion, appears to be the toxicity principle."23/ "Concentrations

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20/ Ibid., p. 274.

21/ George K. Reid, op. cit., p. 195.

22/ McKee and Wolf, op. cit., p. 276.

23/ Ibid., p. 277.

in the range of less than 1.0 mg/l to 25.0 mg/l are lethal in 1 to 3 days to freshwater fish."24/

SUSPENDED SOLIDS

In natural waters, suspended solids consist normally of sediment, organic detritus, bacteria, and plankton. The standard method of determining the suspended solids content of a water source is the Phytometric Method, which gives a direct reading of mg/l of suspended solids. The test does not measure the concentrations of specific chemical substances in water, but rather gives an empirical estimate of water quality by measuring the amount of suspended foreign materials. Prolonged exposure to concentratios of 100-200 mg/l may kill some species of fish and shellfish.25/

TEMPERATURE

Temperature is an important, and sometimes critical water quality parameter. Water temperature changes can result from natural climatic phenomena or from man's activities. For instance, "stream temperatures may be increased by irrigation practices and the return of agricultural drainage."26/

Water temperature changes resulting from man's activities are usually upward. Changes in temperature cause some or all of the following: (1) increases the solubility of dissolved oxygen, thereby reducing the availability of this essential gas, (2) higher temperatures increase the rate of metabolism and respiration and thus the oxygen demand of fish and other aquatic life; therefore, the oxygen demand is increased while the oxygen supply is decreased, (3) intensifies the toxicity of many substances, (4) increases favor the growth of sewage fungus and the putrefaction of sludge deposits which is detrimental to desirable fishes, (5) because changes in temperature may cause a change in species composition, there is a maximum and minimum temperature that each species can tolerate. (fish tolerance to temperature extremes and changes vary with fish species, prior acclimatization, oxygen availability, and the synergistic effects of other pollutants) and (6) changes in

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24/ U.S. Department of the Interior, Federal Water Pollution Control Administration, Water Quality Criteria, op cit., p. 88.

25/ McKee and Wolf, op. cit., p. 280.

26/ Ibid., p. 283.

temperature affect lower aquatic life. Temperature is one of the environmental features that determines which organisms will thrive, diminish, or be eliminated.27/

To maintain a well-rounded warm-water fishery population, the following recommendations were made on temperature extremes and temperature increases.

1. "During any month of the year, heat should not be added to a stream in excess of the amount that will raise the temperature of the water (at the expected minimum daily flow for that month) more than 5 degrees Fahrenheit. In lakes and reservoirs, the temperature of the epilimnion should not be raised more than 3 degrees Fahrenheit above that which existed before the addition of heat of artificial origin. The increase should be based on the monthly average of the maximum daily temperature.

2. The normal daily and seasonal temperature variations that were present before the addition of heat, because of other than natural causes, should be maintained.

3. The recommended maximum allowable temperatures are not to exceed the maximum temperatures of the preferred fish species and their associated biota."28/

TOTAL ALKALINITY

Alkalinity is not a specific polluting substance, but rather a combined effect of several substances and conditions. It is actually a measurement of the power of a solution to neutralize hydrogen ions. It is usually expressed in terms of an equivalent amount of calcium carbonate, $CaCO_3$. Alkalinity is caused by the presence of carbonates, bicarbonates, hydroxides, and to a lesser extent by borates, silicates-phosphates, and organic substances. Total alkalinity is related to pH but high pH values do not necessarily mean high total alkalinity values. High total alkalinity values indicate a buffered water which would be resistant to rapid, wide changes in pH. For instance, water with a pH of 7.0 can have a low total alkalinity value, whereas a buffered water with a pH of 6.0 can have a higher total alkalinity value.

Alkalinity itself is not considered harmful to humans but it is usually associated with high pH, hardness, and excessive

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27/ Ibid., p. 285.

28/ U.S. Department of the Interior, Federal Water Pollution Control Administration, Water Quality Criteria, op cit., p. 42.

dissolved solids, all of which may be harmful. For industrial use, high total alkalinity can be either beneficial or detrimental depending upon the type of industry.

Water to be used by livestock and wildlife for drinking should have a total alkalinity below 170 mg/l. Animals drinking water with higher values develop diarrhea. For fish and other aquatic life, alkalinity is not lethal to fully developed fish if the concentration is not enough to raise the pH well above 9.0.

The best waters for supporting a productive, diversified fish population and other aquatic life are those with pH values between 7 and 8 and having a total alkalinity of 120 mg/l or more. This alkalinity acts as a buffer to help prevent sudden changes in pH which could be harmful to fish and other aquatic life.29/

For waterfowl, waters with relatively high bicarbonate alkalinity produce more high value food plants than those with low such values. "Few waters with less than 25 mg/l bicarbonate alkalinity can be classed among the better waterfowl habitat."30/ Bicarbonate increases the amount of CO_2 available for plant use in photosynthesis.

TURBIDITY

Turbidity is the term used to describe the degree of translucence produced in water by suspended particulate matter. Excessive turbidity reduces light penetration into the water and, therefore, reduces photosynthesis by phytoplankton organisms, attached algae, and submersed vegetation. Turbidity calibrations were originally based on the Jackson Candle Turbidimeter with results expressed in Jackson Turbidity Units (JTU). As the Jackson equipment lacks sensitivity below 25 JTU (most treated water ranges from 0 to 5 JTU), the meter scale calibrations have been based on a uniform milky polymer called formazin, which allows accurate calibrations over a wide range. The results are expressed as Formazin Turbidity Units (FTU) and are equivalent to the Jackson Units. According to Buck, "maximum production of 161.5 lbs/acre occurred in farm ponds where the average turbidity was less than 25 FTU. Between 25 and 100 FTU fish yield dropped 41.7 percent to 94 lbs/acre, and in muddy ponds where turbidity exceeded 100 FTU, the yield was only 29.3 lbs/acre, or 18.2 percent of clear ponds."31/

29/ McKee and Wolf, op. cit., p. 129.

30/ U.S. Department of the Interior, Federal Water Pollution Control Administration, Water Quality Criteria, op cit., p. 94.

31/ Ibid. 46.

APPENDIX H

General and Specific

Water Quality Criteria for the Walnut-Roundaway Watershed

A. <u>State Criteria.</u>

(1) <u>General Water Criteria (Louisiana Stream Control Commission, 1973).</u> The following general criteria are applicable to the surface waters of Louisiana and specifically apply to substances attributed to waste discharges or to the activities of man, as opposed to natural phenomena. When natural waters have characteristics outside of the limits established by these criteria, these criteria do not apply. Criteria adopted relate to the condition of the water as affected by waste discharges or man's activities. These general criteria do not supercede specific exceptions to any one or more of the following, if the exception is specifically stated in a specific water quality standard. All waters of the State shall be capable of supporting desirable diversified aquatic life. General criteria follow.

(a) <u>Aesthetics.</u> The waters of the State shall be maintained in an aesthetically attractive condition and shall meet the generally accepted aesthetic qualification.

(b) <u>Color.</u> True color shall not be increased to the extent that it will interfere with present usage and projected future use of the streams and water bodies.

(c) <u>Floating, Suspended and Settleable Solids.</u> Waters should be free from substances that produce distinctly visible turbidity, solids or scum, or any formation of slimes, bottom deposits or sludge banks attributable to waste discharges from municipal, industrial or other sources, including agricultural practices.

(d) <u>Taste and Odor.</u> Taste and odor producing substances shall be limited to concentrations that will not interfere with the production of potable water by reasonable water treatment methods, or impart unpalatable flavor to food fish, including shellfish, or result in offensive odors arising from the waters, or otherwise interfere with the reasonable use of the waters.

(e) <u>Toxic Substances.</u> Substances alone, or in combination, should not be toxic to animal or plant life. In all cases, the level of toxic substances shall not exceed the $TLM_{96/10}$. Where the stream is used as a public water supply, the level of toxic substances shall not exceed the levels established by the United States Public Health Service drinking water standards latest edition.

(f) <u>Oils and Greases.</u> There shall be no free or floating oil or grease present in sufficient quantities to interfere with the designated uses, nor shall emulsified oils be present in sufficient quantities to interfere with the designated uses.

(g) <u>Foaming or Frothing Materials.</u> There shall be no foaming or frothing materials of a persistent nature.

(h) <u>Nutrients.</u> The naturally occurring nitrogen-phosphorous ratio shall be maintained. The State has not yet established numerical limits on nutrients.

(i) <u>Turbidity.</u> There shall be no substantial increase in turbidity from ambient conditions due to waste discharges.

(j) Other Materials. Limits on substances not specified in these water quality standards shall be in accordance with recommendations set by the Louisiana Stream Control Commission and/or the Louisiana Health and Social Rehabilitation Services Administration for municipal raw water sources.

(2) Numerical Water Criteria. Specific numerical water criteria have been established for many streams in Louisiana, however, no specific numerical criteria have been established for streams in the Walnut-Roundaway Watershed. Only general State criteria apply as follow.

(a) pH. The pH range represents minimum and maximum conditions throughout the stream segment with reasonable gradients applying towards segment boundries. The pH shall fall within the range of 6.0 to 9.0, unless otherwise specified. No discharge of wastes shall cause the pH of the water body to vary by more than one unit within the specified pH range for that segment of the stream where the discharge occurs. This does not apply in the mixing zone.

(b) Chlorides, Sulfates and Dissolved Solids. Values for these parameters apply to the approximate midpoint of the stream segment with reasonable gradients applying towards segment boundries. Values listed, in general, represent the arithmetic mean of existing data, plus one standard deviation.

(c) Dissolved Oxygen. For a diversified warm water biota, including game fish, the daily dissolved oxygen concentration shall be above 5 mg/l, assuming normal seasonal and daily variations are above this concentration. However, they may range between 4 and 5 mg/l for short periods of time during a 24-hour period, provided the water quality is favorable in all other respects. No waste discharge or activity of man shall lower the dissolved oxygen concentration to the point where the diurnal variation falls below the specified minimum.

(d) Temperature. The temperature standard consists of two parts, a temperature differential and maximum temperature. The temperature differential represents the maximun permissable rise above ambient conditions. There shall be no addition of artificial heat once the ambient temperature reaches the maximum temperature specified: a minimum of 5°F (2.8°C) rise above ambient temperature for streams and rivers.

(e) Bacterial Standards.

1. Standard #1: Primary Contact Recreation. Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 200/100 ml, nor shall more that 10 per cent of the total samples during any 30-day period exceed 400/100 ml.

2. Standard #2: Secondary Contact Recreation. Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 1,000/100 ml, nor shall more than 10 per cent of the total samples during any 30-day period equal or exceed 2,000/100 ml.

3. Standard #3: Public Water Supply. The monthly arithmetic average of total coliform MPN (most probable number)

shall not exceed 10,000/100 ml, nor shall the monthly arithmetic average of fecal coliforms exceed 2,000/100 ml.

4. Standard #4: Shellfish Propagation. The monthly total coliform median MPN shall not exceed 70/100 ml, and not more than 10 per cent of the samples shall ordinarily exceed an MPN of 230/100 ml.

(3) Water Uses. Streams within the project area are used for both primary (Class A) and secondary contact recreation (Class B), as well as for the propagation of fish and wildlife. No project stream is used for a domestic raw water supply.

(a) Class A: Water Contact Recreation and Other Uses, Primary Contact. The human body may come in direct contact with the raw water to the point of complete body submergence. The raw water may be ingested accidentally, and certain sensitive body organs (eyes, ears, nose, etc.) may be exposed to the water. Although the water may be ingested accidentally, it is not intended to be used as a potable supply, unless acceptable treatment is applied. Water may be used for swimming, water skiing, skin diving and other similar activities, or as a raw water source for public water supply, support and propagation of fish and wildlife, and agricultural, industrial and navigational uses.

(b) Class B: Fish, Wildlife and Other Aquatic and Semi-Aquatic Life, Secondary Contact Recreation and Other Uses. The water should be suitable for the growth and propagation of fish and other aquatic and semi-aquatic life. The water may be used as a warm water fish habitat, wildlife habitat or for other similar uses. This water is also suitable for secondary water contact recreation such as fishing; wading; boating; activities where ingestion of the water is not probable; a raw water source; public water supply; or for agricultural, industrial or navigational uses.

B. Regional and National Criteria.

(1) General Water Quality Criteria. The above criteria are equal to, or are more stringent than, those applicable to public water supply use as stated in the report of the National Technical Advisory Committee to the Secretary of the Interior on Water Quality Criteria.

(2) Heavy Metals and Pesticides Criteria (U.S. Environmental Protection Agency, 1973a). The following proposed water quality criteria concerning heavy metals and pesticides defines the acceptable limits of those constituents in receiving waters based on an evaluation of the latest scientific information by the Environmental Protection Agency. The criteria follow.

(a) Heavy Metals.

1. Cadmium. Maximum acceptable cadmium concentrations are 0.03 mg/l in hard water (total hardness greater than 100 mg/l $CaCO_3$) and 0.004 mg/l in soft water (total hardness 100 mg/l $CaCO_3$ or less).

2. Chromium. Maximum acceptable total chromium concentrations in water are 0.05 mg/l.

3. Copper. Maximum acceptable concentrations of copper in water are 1/10 (0.10) of the 96-hour LC_{50} value determined using the receiving water in question and the most sensitive important species in the locality as the test organisms.

4. Lead. Maximum acceptable concentrations of lead in water are 0.03 mg/l.

5. Mercury (Inorganic). Maximum acceptable total mercury concentration in unfiltered water at any time or place is 0.2 ug/l. Maximum acceptable average mercury concentration in unfiltered water is 0.05 ug/l. Maximum acceptable concentration of total mercury in any aquatic organism is a total body burden of 0.5ug/g net weight.

6. Nickel. Maximum acceptable concentrations of nickel in water are 1/50 (0.02), the 96-hour LC_{50} value determined using the receiving water in question and the most sensitive important species in the locality as the test organisms.

7. Zinc. Maximum acceptable zinc concentrations in water are 5/1000 (0.005), the 96-hour LC_{50} value determined using the most sensitive important species in the locality as the test organisms.

(b) Pesticides.

1. General. For pesticides on which toxicity data are not available, maximum acceptable concentrations in water are 1/100 (0.01) of the 96-hour LC_{50} value determined using the receiving water in question and the most sensitive important species in the area as test organisms.

2. Organochlorines. The maximum acceptable concentrations of organochlorine pesticides in water are listed is Table H-1.

3. Other Pesticides. The maximum acceptable concentrations of pesticides, other than organochlorines, in fresh water are listed in Table H-2.

Table H-1
Recommended Maximum Concentrations of Organochlorine Pesticides in Whole (Unfiltered) Water Sampled at Any Time and Any Place

ORGANOCHLORINE PESTICIDES	PERMISSIBLE MAXIMUM* CONCENTRATION (ug/l)
Aldrin	0.01
DDT	0.002
TDE	0.006
Dieldrin	0.005
Chlordane	0.04
Endosulfan	0.003
Endrin	0.002
Heptachlor	0.01
Lindane	0.02
Methoxychlor	0.005
Toxaphene	0.01

*Concentrations were determined by multiplying the acute toxicity values for the more sensitive species by an application factor of 0.01.

SOURCE: U.S. Environmental Protection Agency, 1973a.

Table H-2

Recommended Maximum Concentrations of Other Pesticides in Whole (Unfiltered) Water Sampled at Any Time and Any Place

PESTICIDE	PERMISSIBLE MAXIMUM* CONCENTRATION (ug/l)	PESTICIDE	PERMISSIBLE MAXIMUM* CONCENTRATION (ug/l)
ORGANOPHOSPHATE INSECTICIDES		Dexon	-
Abate	-**	Dicamba	0.2
Azinphosmethyl	0.001	Dichlobenil	37.0
Azinphosethyl	-	Dichlone	0.7
Garbophenothion	-	Diquat	0.5
Chlorothion	-	Diuron	1.6
Ciodrin	0.1	Difolitan	-
Coumaphos	0.001	Dinitrobutyl Phenol	-
Demeton	-	Diphenamid	-
Diazinon	0.009	2-4,D (PGBE)	-
Dichlorvos	0.001	2-4,D (BEE)	4.0
Dioxathion	0.09	2-4,D (IOE)	-
Disulfonton	0.05	2-4,D (Diethylamine Salts)	-
Dursban	0.001	Endothal (Disodium Salt)	-
Ethion	0.02	Endothal (Dipotassium Salt)	-
EPN	0.06	Eptam	-
Fenthion	0.006	Fenac (Sodium Salt)	45.0
Malathion	0.008	Hyamine-1622	-
Methyl Parathion	-	Hyamine-2389	-
Mevinphos	0.002	Hydrothal-47	-
Naled	0.004	Hydrothal-191	-
Oxydemeton Methyl	0.4	Hydrothal plus	-
Parathion	0.001	IPC	-
Phorate	-	MCPA	-
Phosphamidon	0.03	Molinate	-
Ronnel	-	Monuron	-
TEPP	0.3	Paraquat	-
Trichlorophon	0.002	Pebulate	-
CARBAMATE INSECTICIDES		Picloram	-
Aminocarb	-	Propanil	-
Bayer	-	Silvex (BEE)	2.5
Baygon	-	Silvex (PGBE)	2.0
Carbaryl	0.02	Silvex (IOE)	-
Zectran	0.1	Silvex (Potassium Salt)	-
HERBICIDES, FUNGICIDES AND DEFOLIANTS		Simazine	10.0
Acrolein	-	Trifluaralin	-
Aminotriazole	300.0	Vernolate	-
Balan	-	BOTANICALS	
Bensulfide	-	Allethrin	0.002
Choroxuron	-	Pyrethrum	0.01
CIPC	-	Rotenone	10.0
Dacthal	-		
Dalapon	110.0		
DEF	-		

* Concentrations were determined by multiplying the acute toxicity values for the more sensitive species by an application factor of 0.01.

**Insufficient data to determine safe concentrations indicated by "-".

SOURCE: U.S. Environmental Protection Agency, 1973c.

APPENDIX J

COMMON AND SCIENTIFIC NAMES OF PLANTS AND ANIMALS IN THE WATERSHED

The plants and animals are listed alphabetically by the common name followed by the scientific name.

HERBACEOUS PLANTS AND WOODY VINES

Alligatorweed
Alternanthera philoxeroides

Aster
Aster spp.

Barnyard Grass
Echinochloa crusgalli

Bedstraw
Galium aparine

Bermuda Grass
Cynodon dactylon

Beggar Ticks
Bidens spp.

Blackberry, Dewberry
Rubus spp.

Bladderwort
Utricularia spp.

Blue-Eyed Grass
Sisyrinchium spp.

Blue Grass
Poa autumnalis

Blue Grass
Poa annua

Blue Toadflax
Linaria canadensis

Broad-Leaved Cat-Tail
Typha latifolia

Broomsedge
Andropogon virginicus

Bur-Reed
Sparganium americanum

Buttercup, Crowfoot
Ranunculus spp.

Butterweed
Senecio glabellus

Button Snakeroot
Eryngium yuccifolium

Camphorweed
Pluchea spp.

Cane
Arundinaria gigantea

Carolina Mallow
Modiola caroliniana

Climbing Hempweed
Mikania scandens

Cockle Bur
Xanthium strumarium

Coffeeweed
Sesbania exaltata

Common Chickweed
Stellaria media

Common Frog Fruit
Lippia nodiflora

Common Ragweed
Ambrosia artemisiifolia

Coneflower
Rudbeckia amplexicauli

Creeping Cucumber
Melothira pendula

Creeping Spilanthes
Spilanthes americana

Curley Dock
Rumex crispus

Rice Cut Grass
Leersia virginica

Dallis Grass
Paspalum dilatatum

Dayflower
Commelina virginiana

Delta Duck Potato
Sagittaria platyphylla

Dichondra
Dichondra carolinensis

Duckweed
Lemna minor

Duckweed
Spirodela polyrhiza

Duckweed
Wolffiella floridana

Dutch Stonecrop
Penthorum sedoides

Dodder, Lovevine
Cuscuta compacta

Echinochloa
Echinochloa colonum

Eclipta
Eclipta alba

Euphorb
Euphorbia presleya

Evening Primrose
Oenothera speciosa

False Dandelion
Pyrrhopappus carolinianus

False Nettle
Boehmeria cylindrica

Fimbristylis
Fimbristylis spp.

Foxtail
Setaria spp.

Frogbit
Limnobium spongia

Frog Fruit
Diodia virginiana

Giant Cutgrass
Zizaniopsis miliacea

Giant Ragweed
Ambrosia trifida

Giant Reed
Arundo donax

Goldenrod
Solidago altissima

Paspalum
Paspalum fluitans

Greenbriar
Smilax spp.

Hawk's Beard
Crepis capillaris

Henbit
Lamium amplexicaule

Horned Rush
Rhynchospora corniculata

Horseweed
Erigeron canadensis

Hygrophila
Hygrophila lacustris

Ironweed
Sida rhombifolia

Ironweed
Vernonia glauca

Japanese Honeysuckle
Lonicera japonica

Johnson Grass
Sorghum halepense

Kudzu
Pueraria lobata

Ladies' Eardrops
Brunnichia cirrhosa

Lizard's Tail
Saururus cernuus

Loosestrife
Lythrum lineare

Lotus
Nelumbo lutea

Ludwigia
Ludwigia glandulosa

Ludwigia
Ludwigia leptocarpa

Mazus
Mazus japonicus

Mimulus
Mimulus stellata

Mist Flower
Eupatorium coelestinum

Morning Glory
Ipomoea sp.

Nightshade
Solanum carolinense

Northern Frog Fruit
Lippia lanceolata

Panicum
Panicum spp.

Partridge Pea
Cassia fasciculata

Pennywort
Hydrocotyle spp.

Pickerelweed
Pontederia cordata

Plantain
Plantago major

Pigweed
Amaranthus viridis

Poison Ivy
Rhus radicans

Pokeberry
Phytolacca americana

Pondweed
Potamogeton spp.

Poor Man's Peppergrass
Lepidium virginicum

Portulaca
Portulaca oleracea

Primrose-Willow
Ludwigia peploides

Purple Passion Flower
Passiflora incarnata

Rabbit Tobacco
Gnaphalium purpureum

Rattan Vine
Berchemia scandens

Redberried Moonseed
Cocculus carolinus

Rush
Juncus spp.

Santa Maria
Parthenium hysterophorus

Sedge
Carex spp.

Sedge
Carex crus-corvi

Sedge
Cyperus spp.

Sensitive Briar
Schrenkia microphylla

Sow Thistle
Sonchus sp.

Smartweed
Polygonum hydropiperoides

Smartweed
Polygonum pensylvanicum

Smartweed
Polygonum punctatum

Smutgrass
Sporobolus poirettii

Spanish Moss
Tillandsia usneoides

Speedwell
Veronica peregrine

Spider Lily
Hymenocallis occidentalis

Spikerush
Eleocharis spp.

Spiderwort
Tradescantia ohiensis

Sprangletop
Leptochloa panicoides

St. Augustine Grass
Stenotraphrum secundatum

St. John's Wort
Hypericum walteri

Thistle
Circium spp.

Touch-Me-Not
Mimosa strigillosa

Vasey Grass
Paspalum urvillei

Vervain
Verbena brasiliense

Vetch
Vicia spp.

Violet
Viola spp.

Virginia Creeper
Parthenocissus quinquefolia

Water Hoarhound
Lycopus rubellus

Watermeal
Wolffia columbinana

Water Primrose
Jussiaea spp.

White Clover
Trifolium repens

Wild Geranium
Geranium carolinianum

Wild Lettuce
Lactuca floridana

Wild Onion
Allium canadense

Yellow Jasmine
Gelsemium _sempervirens_

Yellow Passion Flower
Passiflora _lutea_

Wood Sorrel
Oxalis _corniculata_

Yankeeweed
Eupatorium _capilliforium_

TREES AND SHRUBS

American Elm
Ulmus _americana_

Baldcypress
Taxodium _distichum_

Bitter Pecan
Carya _aquatica_

Blackgum
Nyssa _sylvatica_

Black Locust
Robinia _pseudoacacia_

Black Willow
Salix _nigra_

Boxelder
Acer _negundo_

Buttonbush
Cephalanthus _occidentalis_

Cedar Elm
Ulmus _crassifolia_

Chinaberry
Melia _azedarach_

Common Privet
Ligustrum _vulgare_

Cottonwood
Populus _deltoides_

Deciduous Holly
Ilex _decidua_

Drummond Red Maple
Acer _drummondii_

Elderberry
Sambucus _canadensis_

Green Ash
Fraxinus _pennsylvanica_

Hackberry
Celtis _laevigata_

Hawthorn
Crataegus spp.

Honey locust
Gleditsia _triacanthos_

Lead Plant
Amorpha _fruticosa_

Live Oak
Quercus _virginiana_

Mimosa
Albizia _julibrissin_

Osage-Orange
Maclura _pomifera_

Overcup Oak
Quercus _lyrata_

ıs

Palmetto
Sabal minor

Pecan
Carya illinoensis

Persimmon
Diospyros virginiana

Red Mulberry
Morus rubra

Roughleaf Dogwood
Cornus drummondii

Sassafras
Sassafras albidum

Shumard Red Oak
Quercus shumardii

Slash Pine
Pinus elliottii

Southern Magnolia
Maglolia grandiflora

Swampprivet
Forestiera acuminata

Sweetgum
Liquidambar styraciflua

Sycamore
Palatanus occidentalis

Tupelogum
Nyssa aquatica

Water Locust
Gleditsia aquatic

Water Oak
Quercus nigra

White Mulberry
Morus alba

Willow Oak
Quercus phellos

Winged Elm
Ulmus alata

CULTIVATED CROPS

Corn
Zea mays

Cotton
Gossypium hirsutum

Rice
Oryza sativa

Soybeans
Glycine max

Wheat
Triticum aestivum

MAMMALS

American Black Bear
Euarctos americanus

American Beaver
Castor canadensis

Bobcat
Lynx rufus

Common muskrat
Ondatra zibethicus

Cotton Mouse
Peromyscus gossypinus

Coyote
Canis latrans

Eastern Cottontail
Sylvilagus floridanus

Cougar
Felis concolor

Fox Squirrel
Sciurus niger

Fulvous Harvest Mouse
Reithrodontomys fulvescens

Gray Fox
Urocyon cinereoargenteus

Gray Squirrel
Sciurusi carolinensis

Hispid Cotton Rat
Sigmodon hispidus

Nearctic River Otter
Lutra canadensis

Nine-Banded Armadillo
Dasypus novemcinctus

North American Mink
Mustela vison

Northern Raccoon
Procyon lotor

Nutria
Myocastor coypus

Red Bat
Lasiurus borealis

Red Fox
Vulpes fulva

Short-tailed Shrew
Blarina brevicauda

Striped Skunk
Mephitis mephitis

Swamp Rabbit
Sylvilagus aquaticus

Virginia Opossum
Didelphis virginiana

White-Footed Mouse
Peromyscus leucopus

White-Tailed Deer
Odocoileus virginianus

BIRDS

American Robin
Turbus migratorius

American Woodcock
Philohela minor

American wigeon
Anas americana

Barred Owl
Strix varia

Belted Kingfisher
Megaceryle alcyon

Blue Jay
Cyanocitta cristata

Blue-Winged Teal
Anas discors

Bobwhite
Colinus virginianus

Brown Thrasher
Toxostoma rufum

Cardinal
Cardinalis cardinalis

Carolina Wren
Thryothorus ludovicianus

Common Crow
Corvus brachyrhynchos

Common Gallinule
Gallinula chloropus

Common Grackle
Quiscalus quiscala

Common Snipe
Capella gallinago

Downy Woodpecker
Dendrocopos pubescens

Eastern Meadowlark
Sturnella magna

Eastern Mockingbird
Mimus polglottos

Gadwall
Anas strepera

Great Blue Heron
Ardea herodias

Great Egret
Casmerodius albus

Green Heron
Butorides virescens

Green-Winged Teal
Anas carolinensis

Hooded Merganser
Lophodytes cucullatus

House Sparrow
Passer domesticus

Ivory-Billed Woodpecker
Campephilus principalis

Killdeer
Charadrius vociferus

Little Blue Heron
Florida caerulea

Louisiana Heron
Hydranassa tricolor

Mallard
Anas platyrhynchos

Marsh Hawk
Circus cyaneus

Mourning Dove
Zenaida macroura

Osprey
Pandion haliaetus

Peregrine Falcon
Falco peregrinus

Pileated Woodpecker
Dryocopus pileatus

Red-Bellied Woodpecker
Centurus carolinus

Red-Headed Woodpecker
Melanerpes erythrocephalus

Red-Shouldered Hawk
Buteo lineatus

Red-Tailed Hawk
Buteo jamaicensis

Red-Winged Blackbird
Agelaius pheoniceus

Screech Owl
Otus asio

Snowy Egret
Egretta thula

Southern Bald Eagle
Haliaeetus leucocephalus

White-Throated Sparrow
Zonotrichia albicollis

Wild Turkey
Meleagris gallopavo

Wood Duck
Aix sponsa

Wood Stork
Mycteria americana

Yellow-Billed Cuckoo
Coccyzus americanus

REPTILES

American Alligator
Alligator mississipiensis

Broad-Banded Water Snake
Natrix sipedon confluens

Canebrake Rattlesnake
Crotalus horridus atricaudatus

Common Snapping Turtle
Chelydra serepentina

Gray Rat Snake
Elaphei obsoleta spiloides

Green Anole
Anolis carolinensis

Ground Skink
Lygosoma laterale

Gulf Coast Box Turtle
Terrapene carolina major

Gulf Coast Smooth Softshell
Trionyx muticus calvatus

Red-Eared Turtle
Pseudemys scriptai elegans

Diamond-Backed Water Snake
Natrix rhombifera

Eastern Garter Snake
Thamnophis sirtalis sirtalis

Eastern Hognose Snake
Heterodon playrhinos

Five-lined Skink
Eumeces fasciatus

Speckled Kingsnake
Lampropeltis getulus holbrooki

Southern Copperhead
Agkistrodon contortrix contortrix

Stinkpot Turtle
Sternothaerus odoratus

Western Cottonmouth
Agkistrodon piscivorus leucostoma

AMPHIBIANS

Bronze Frog
Rana clamitans

Bullfrog
Rana catesbeiana

Dwarf Salamander
Manculus quadridigitatus

False Map Turtle
Graptemys pseudogeographica

Fowler's Toad
Bufo woodhousei fowleri

Green Treefrog
Hyla cinerea

Marbled Salamander
Ambystoma opacum

Mississippi Map Turtle
Graptemys kohni

Southern Cricket Frog
Acris gryllus gryllus

Southern Gray Treefrog
Hyla versicolor chrysoscelis

Southern Leopard Frog
Rana pipiens sphenocephala

Northern Spring Peeper
Hyla crucifer crucifer

Three-Toed Amphiuma
Amphiuma means tridactylum

FISHES

Blue Catfish
Ictalurus furcatus

Black Bullhead
Ictalurus melas

Bowfin
Amia calva

Bluegill
Lepomis macrochirus

Carp
Cyprinus carpio

Channel Catfish
Ictalurus punctatus

Flathead Catfish
Pylodictis olivaris

Freshwater Drum
Aplodinotus grunniens

Gizzard Shad
Dorosoma cepedianum

Green Sunfish
Lepomis cyanellus

Largemouth Bass
Micropterus salmoides

Longear Sunfish
Lepomis megalotis

Madtom
Notorus spp.

Mosquitofish
Gambusia affinis

Pirate Perch
Aphredoderus sayanus

Shiner
Notropis spp.

Smallmouth Buffalo
Ictiobus bubalus

Spotted Gar
Lepisosteus oculatus

Sunfish
Lepomis spp. (juveniles)

Warmouth
Lepomis gulosus

Yellow Bullhead
Ictalurus natalis

APPENDIX J

Channel Work By Reaches*

		INVENTORY OF CHANNEL WORK		
CHANNEL	STATION	TYPE OF WORK	TYPE OF CHANNEL BEFORE PROJECT	FLOW CONDITION OF CHANNEL BEFORE PROJECT
M-1	115+00	III	M	PrS
	180+00	II	M	PrS
	235+00	II	M	IS
	467+00	II	M	I
	700+75	III	M	E
	794+00	II	M	E
	900+00	II	M	E
L-1A	0+00	IV	M	E
	40+00	II	M	E
	63+00	III	M	E
	69+75	VI	M	E
	100+00	VI	M	E
L-1A1	0+00	I	O	E
	46+00	I	O	E
L-1A2	0+00	I	O	E
	10+00	I	O	E
L-1B	0+00	II	M	I
	135+00	II	M	E
	302+19	II	M	E
L-1B1	0+00	II	M	E
	45+00	I	O	E
	74+00	I	O	E
L-1B2	0+00	II	M	E
	71+00	II	M	E
L-1B2A	0+00	II	M	E
	51+00	II	M	E
L-1B3	0+00	II	M	E
	41+50	II	M	E
L-1B4	0+00	I	O	E
	32+00	I	O	E
L-1B5	0+00	II	M	E
	108+00	II	M	E
L-1B6	0+00	I	O	E
	46+00	I	O	E
L-1C	0+00	VI	M	I
	53+00	III	M	I
	83+00	III	M	IS
	109+00	II	M	IS
	111+00	II	M	I
	646+50	II	M	E
	835+00	II	M	E
L-1C1	0+00	II	M	E
	147+00	II	M	E
L-1C3	0+00	II	M	E
	33+00	II	M	S
	37+00	II	M	E
	90+00	II	M	E
L-1C3A	0+00	II	M	E
	186+00	II	M	E
L-1C4	0+00	II	M	E
	44+00	II	M	E
L-1C5	0+00	II	M	E
	65+00	II	M	E
L-1C6	0+00	II	M	E
	38+00	I	O	E
	101+00	I	O	E

* See attached "Coding System for Inventory of Channel Work."

		INVENTORY OF CHANNEL WORK		
CHANNEL	STATION	TYPE OF WORK	TYPE OF CHANNEL BEFORE PROJECT	FLOW CONDITION OF CHANNEL BEFORE PROJECT
L-1D	0+00	II	M	E
	88+00	II	M	E
L-1E	0+00	II	M	E
	115+00	II	M	E
L-1F	0+00	II	M	E
	88+00	II	M	E
L-1G	0+00	II	M	E
	51+00	II	M	E
L-1H	0+00	II	N	E
	47+00	II	N	E
M-6	0+00	IV	M	PrS
	215+00	VI	M	PrS
	330+00	II	M	PrS
	470+00	VI	M	PrS
	513+00	VI	M	IS
	530+00	II	M	IS
	637+00	VI	M	IS
	657+00	II	M	IS
	669+00	II	M	I
	734+00	VI	M	IS
	830+00	II	M	I
	860+00	VI	M	E
	887+00	VI	M	E
	1000+60 = 887+00			
	1000+60	II	M	IS
	1138+20	VI	M	IS
	1148+20	II	M	IS
	1235+20	VI	M	IS
	1236+20	II	M	IS
	1245+20	VI	M	IS
	1248+20	II	M	IS
	1267+20	VI	M	IS
	1272+20	II	M	IS
	1296+20	VI	M	IS
	1300+20	II	M	E
	1312+40	II	M	E
M-6 Alt.	98+00	II	M	IS
	366+00	II	M	IS
M-6A	0+00	II	M	IS
	143+00	II	M	IS
L-6A	0+00	II	N	E
	142+00	II	N	E
L-6B	0+00	II	M	E
	45+85	I	O	E
	86+65	I	O	E
L-6D	96+00	III	M	E
	129+00	II	M	E
	171+00	II	M	E
L-6D1	0+00	II	M	E
	15+00	I	O	E
	29+00	II	M	E
	92+00	II	M	E
L-6D2	0+00	II	M	E
	112+00	II	M	E
L-6E	0+00	VI	N	S
	65+00	VI	M	E
	72+70	III	M	E
	82+70	III	M	E
L-6E1	0+00	VI	N	E
	14+00	II	M	E
	44+00	II	M	E
L-6E2	0+00	II	N	E
	68+00	II	N	E
L-6F	0+00	I	O	E
	2+00	II	M	E
	6+50	I	O	E
	24+00	I	O	E

INVENTORY OF CHANNEL WORK

CHANNEL	STATION	TYPE OF WORK	TYPE OF CHANNEL BEFORE PROJECT	FLOW CONDITION OF CHANNEL BEFORE PROJECT
L-6G	0+00	IV	M	E
	44+00	IV	M	E
L-6H	0+00	I	O	E
	35+00	I	O	E
L-6I	16+00	VI	N	E
	43+00	II	M	E
	135+00	VI	M	E
	155+00	VI	M	E
L-6I1	0+00	I	O	E
	68+51	II	M	E
	88+00	II	M	E
L-6I2	0+00	VI	N	S
	19+00	II	N	E
	107+56	I	O	E
	144+00	II	N	S
	191+75	II	N	S
L-6I2A	0+00	II	N	E
	42+00	II	N	E
L-6I3	0+00	II	M	E
	58+00	II	M	E
L-6L	0+00	IV	N	E
	27+00	II	N	E
	66+00	II	M	E
	185+00	II	M	E
L-6M	56+60	II	N	IS
	79+60	II	M	IS
	186+00	III	M	IS
	209+00	III	M	I
	268+50	III	M	S
	285+50	III	M	E
	294+50	III	M	S
	299+50	III	M	E
	369+00	III	M	E
L-6M1A	0+00	II	N	S
	23+00	II	M	E
	31+00	II	M	S
	43+00	II	M	E
	69+00	II	M	E
L-6M1A1	0+00	II	M	E
	5+00	II	M	E
L-6M1B	0+00	II	M	E
	76+00	II	M	E
L-6M1B1	0+00	II	M	E
	26+00	II	M	E
L-6M2	40+00	II	M	E
	90+00	II	M	E
L-6M2A	0+00	I	O	E
	36+00	I	O	E
L-6M3	0+00	II	M	E
	28+00	II	M	S
	44+00	II	M	E
	74+00	II	M	E
L-6M4	0+00	I	O	E
	48+00	I	O	E
L-6N	0+00	II	N	S
	5+00	II	N	E
	20+00	II	M	E
	142+00	II	M	E
M-7	77+00	VI	M	PrS
	274+50	II	M	PrS
	421+00	VI	M	PrS
	570+00	VI	M	IS
	605+00	VI	M	I
	819+29	II	M	I
	854+00	II	M	E
	1179+26	II	M	E

INVENTORY OF CHANNEL WORK

CHANNEL	STATION	TYPE OF WORK	TYPE OF CHANNEL BEFORE PROJECT	FLOW CONDITION OF CHANNEL
L-7A1	0+00	VI	M	E
	2+00	II	M	E
	100+00	II	M	E
L-7A2	0+00	VI	M	E
	66+00	II	M	E
	128+46	II	M	E
L-7A2B	0+00	VI	M	E
	2+00	II	M	E
	66+63	II	M	E
L-7A3	0+00	VI	M	E
	5+00	II	M	E
	65+59	II	M	E
L-7A3A	0+00	II	M	E
	17+90	II	M	E
L-7A3B	0+00	II	M	E
	30+10	II	M	E
L-7B	0+00	VI	M	E
	2+00	II	M	E
	180+00	II	M	E
L-7C	0+00	IV	M	PrS
	6+70	VI	M	PrS
	474+40	IV	M	IS
	490+50	IV	M	S
	528+67	IV	M	E
	626+00	IV	M	E
L-7C1	0+00	VI	M	E
	2+64	II	M	E
	121+35	II	M	E
L-7C1A	0+00	I	O	E
	53+23	I	O	E
L-7C2A	0+00	IV	M	E
	6+00	II	M	E
	24+22	II	M	E
L-7C2B	0+00	VI	M	E
	10+00	I	O	E
	22+35	I	O	E
L-7C3	0+00	VI	M	E
	10+00	II	M	E
	100+04	II	M	E
L-7C4	0+00	VI	M	E
	9+00	II	M	E
	115+00	I	O	E
	130+00	I	O	E
L-7C4A	0+00	I	O	E
	20+70	I	O	E
L-7C4B	0+00	II	M	E
	20+52	II	M	E
L-7C5	8+00	II	M	E
	79+37	II	M	E
L-7C6	0+00	VI	M	E
	16+00	II	M	E
	72+00	VI	M	E
	120+50	II	M	E
	156+88	II	M	E
L-7C6A	0+00	II	M	E
	38+43	II	M	E
L-7C6B	0+00	II	M	E
	29+88	II	M	E
L-7C8	0+00	VI	M	I
	34+72	IV	M	I
	86+80	II	M	E
	210+44	II	M	E

		INVENTORY OF CHANNEL WORK		
CHANNEL	STATION	TYPE OF WORK	TYPE OF CHANNEL BEFORE PROJECT	FLOW CONDITION OF CHANNEL BEFORE PROJECT
L-7C8C	0+00	VI	M	E
	43+24	II	M	E
	129+00	II	M	E
L-7C8D	0+00	VI	M	E
	3+00	II	M	E
	14+82	II	M	E
L-7C9	0+00	VI	M	E
	10+00	II	M	E
	29+00	II	M	E
L-7C10	0+00	VI	M	E
	75+00	VI	N	S
	148+25	I	O	E
	190+00	II	M	E
	203+85	II	M	E
L-7C10B	0+00	II	M	E
	34+43	II	M	E
L-7C11	0+00	VI	M	E
	55+60	II	M	E
	122+30	II	M	E
L-7C11A	0+00	II	M	E
	41+25	II	M	E
L-7C12	0+00	IV	M	I
	23+70	VI	M	I
	263+42	II	M	E
	310+18	I	O	E
	326+93	I	O	E
L-7C12A	0+00	II	M	E
	130+00	II	M	E
L-7C12B	0+00	II	M	E
	56+00	II	M	E
L-7C12C	0+00	II	M	E
	56+25	II	M	E
L-7C12D	0+00	II	M	E
	29+00	I	O	E
	42+92	I	O	E
L-7C12D1	0+00	II	M	E
	28+58	II	M	E
L-7C13	0+00	VI	M	E
	9+50	I	O	E
	32+78	I	O	E
L-7C14	0+00	II	N	E
	43+08	I	O	E
	74+77	II	M	E
	123+70	II	M	E
L-7C14A	6+38	II	M	E
	40+00	II	M	E
L-7C14B	0+00	II	M	E
	62+00	I	O	E
	79+00	I	O	E
L-7C15	0+00	VI	N	S
	80+00	VI	N	E
	165+00	VI	N	E
L-7C15A	0+00	II	M	E
	33+40	II	M	E
L-7C15A1	0+00	II	M	E
	13+20	II	M	E
L-7C15B	0+00	II	M	E
	11+42	II	M	E
L-7C15C	-10+58	II	M	E
	0+00	VI	M	E
	51+14	VI	M	E
L-7C15C1	0+00	IV	M	E
	16+08	IV	M	E

INVENTORY OF CHANNEL WORK

CHANNEL	STATION	TYPE OF WORK	TYPE OF CHANNEL BEFORE PROJECT	FLOW CONDITION OF CHANNEL BEFORE PROJECT
L-7C15C2	0+00	II	M	E
	205+00	VI	M	E
	255+00	II	M	E
	286+72	II	M	E
L-7C15C2B	0+00	IV	M	E
	39+74	II	M	E
	143+50	II	M	E
L-7C15C2C	0+00	II	M	E
	77+56	II	M	E
L-7C15C2D	0+00	II	M	E
	102+00	II	M	E
L-7C15C2E	0+00	II	M	E
	38+24	II	M	E
L-7C15C2F	0+00	II	M	E
	37+69	II	M	E
L-7C15C2G	0+00	II	M	E
	81+00	I	O	E
	105+10	I	O	E
L-7C15C2G1	0+00	II	M	E
	10+00	II	M	E
L-7C15C2G2	0+00	I	O	E
	30+20	I	O	E
L-7C15C2G2A	0+00	II	M	E
	12+46	II	M	E
L-7C15C2G3	0+00	I	O	E
	30+19	I	O	E
L-7C15C3	0+00	II	M	E
	36+00	II	M	E
L-7C16	0+00	II	M	E
	28+00	II	M	S
	121+09	II	M	S
L-7C16A	0+00	II	M	E
	26+15	II	M	E
L-7C17	0+00	II	M	E
	75+40	II	M	E
L-7C17A	0+00	II	M	E
	126+35	II	M	E
L-7C17A1	0+00	II	M	E
	31+00	II	M	E
L-7C17A2	0+00	II	M	E
	53+48	II	M	E
L-7C18	0+00	II	M	E
	37+30	II	M	E
L-7C19	0+00	II	M	E
	57+49	II	M	E
L-7C19A	0+00	II	M	E
	24+55	I	O	E
	41+17	I	O	E
L-7C20	0+00	II	M	E
	30+49	II	M	E
L-7CC	0+00	II	M	IS
	118+64	VI	M	IS
	142+00	II	M	IS
	170+00	VI	M	IS
	319+40	VI	M	S
	346+48	VI	M	S
L-7CC1	0+00	II	M	E
	50+00	II	M	E
L-7CC2	0+00	II	M	E
	56+00	VI	M	E
	88+00	VI	M	S
	103+25	VI	M	S

CHANNEL	STATION	INVENTORY OF CHANNEL WORK		
		TYPE OF WORK	TYPE OF CHANNEL BEFORE PROJECT	FLOW CONDITION OF CHANNEL BEFORE PROJECT
L-7CC2A	0+00	II	N	E
	24+00	I	O	E
	36+00	II	M	E
	45+00	II	M	E
L-7CC3	0+00	II	M	E
	7+55	I	O	E
	28+00	I	O	E
L-7D	0+00	VI	M	E
	6+00	II	M	E
	109+00	II	M	E
L-7D1	0+00	I	O	E
	66+20	I	O	E
L-7E	0+00	I	O	E
	47+82	I	O	E
L-7F	0+00	II	M	E
	23+00	II	M	S
	30+00	II	M	E
	36+00	II	M	E
L-7G	0+00	VI	M	E
	6+00	II	M	E
	26+00	II	M	E
L-7H	0+00	II	M	E
	54+00	II	M	E
L-7I	0+00	II	M	E
	57+00	II	M	E
M-8	0+00	VI	M	E
	3+00	II	M	E
	64+00	II	M	E
M-9	0+00	VI	M	E
	7+00	II	M	E
	18+00	II	M	S
	47+80	II	M	S
M-10	0+00	VI	M	E
	3+00	II	M	E
	20+00	II	M	S
	34+00	II	M	E
	58+60	II	M	E
M-11	0+00	VI	M	E
	4+00	II	M	E
	62+00	II	M	E
M-12	0+00	VI	M	E
	10+50	IV	M	E
	20+00	II	M	E
	30+00	I	O	E
	98+60	I	O	E
M-14	0+00	VI	M	E
	8+00	II	M	E
	80+00	II	M	S
	120+00	II	M	S
M-15	0+00	VI	M	E
	32+30	II	M	E
	74+92	II	M	E
M-16	1153+93	I	O	E
	1108+00	IV	M	IS
	1040+00	II	M	IS
	713+50	II	M	I
	647+80	II	M	I

Soil Conservation Service

Coding System for Inventory of Channel Work

Type of Work	I -	establishment of new channel including necessary stabilization measures
	II -	enlargement or realignment of existing channel or stream
	III -	cleaning out natural or manmade channel (includes bar removal and major clearing and snagging operation)
	IV -	clearing and removal of loose debris within channel section
	V -	stabilization as primary purpose (by continuous treatment or localized problem areas). (Present capacity adequate)
	VI -	adequate
Type of Channel Prior to Project	N -	an unmodified, well-defined natural channel or stream
	M -	manmade ditch or previously modified channel
	O -	none or practically no defined channel
Flow Condition Prior to Project	Pr -	perennial - flows at all times except during extreme drought
	I -	intermittent - continuous flow through some seasons of the year but little or no flow through other seasons
	E -	ephemeral - flows only during periods of surface runoff
	S -	ponded water with no noticeable flow, caused by lack of outlet or high ground water level.

SUPPLEMENT NO. 2 TO THE WATERSHED WORK PLAN AGREEMENT

between the following local organizations:

Madison Soil and Water Conservation District

East Carroll Soil and Water Conservation District

Madison Parish Police Jury

East Carroll Parish Police Jury

(Referred to herein as sponsors)

State of Louisiana

and the

Soil Conservation Service
United States Department of Agriculture
(Referred to herein as SCS)

Whereas, the Watershed Work Plan Agreement for the WALNUT ROUNDAWAY WATERSHED, State of Louisiana, executed by the sponsoring local organizations named therein and the Service, became effective on the 24th day of July, 1969; and

Whereas, in order to carry out the watershed work plan, it became necessary to modify the watershed work plan agreement to make provisions for administering the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970; and

Whereas, in order to carry out the watershed work plan for said watershed it has again become necessary to modify said watershed work plan to more clearly reflect the intent of the National Environmental Policy Act and the changed policies of the Service, and to supplement said Watershed Work Plan Agreement to reflect said modifications, and

Whereas a narrative attachment to Supplement No. 2 to the Watershed Work Plan agreement has been developed through the cooperative efforts of the sponsors and the Service to modify the Watershed Work Plan; which work plan and narrative attachment are annexed to and made a part of this agreement; and,

Whereas Supplement No. 2 to the Watershed Work Plan Agreement supersedes all numbered items in the original Watershed Work Plan agreement dated October 7, 1968 and the Supplemental Watershed Work Plan agreement dated December 16, 1971;

Now, therefore, the sponsoring local organizations and the Service hereby agree to carry out the Watershed Work Plan as supplemented by the attachment hereto in accordance with the following:

1. Except as hereinafter provided, the sponsors will acquire without cost to the Federal Government such land rights as will be needed in connection with the works of improvement. The percentages of this cost to be borne by the Parish Police Juries and the SCS are as follows:

Works of Improvement	Sponsors	SCS	Estimated Land Rights Cost
	(percent)	(percent)	(dollars)
Channel Work	100	0	2,964,100

2. The sponsors assure 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 cost of relocation payments will be shared by the sponsors and SCS as follows:

	Sponsors	SCS	Estimated Relocation Payment Costs
	(percent)	(percent)	(dollars)
Relocation Payments	64.0	36.0	-0-[1/]

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

3. The percentages of construction costs of structural measures to be paid by the sponsors and by the SCS are as follows:

Works of Improvement	Sponsors	SCS	Estimated Construction Costs
	(percent)	(percent)	(dollars)
Channel Work	25	75	8,914,900

4. The percentages of the cost for engineering services to be borne by the sponsors and the SCS are as follows:

Works of Improvement	Sponsors	SCS	Estimated Engineering Costs
	(percent)	(percent)	(dollars)
Channel Work	0	100	624,000

5. The sponsors and SCS will each bear the cost of Project Administration which it incurs, estimated to be $267,500 and $1,783,100, respectively.

6. The sponsors will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to state law as may be needed in the installation and operation of the works of improvement.

7. The sponsors will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed plan.

8. The sponsors will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

9. The sponsors will be responsible for the operation, maintenance and replacement of the works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

10. The costs shown in this plan represents preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

11. This agreement is not a fund-obligating document. Financial and other assistance to be furnished by SCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.

12. A separate agreement will be entered into between SCS and sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

13. This plan may be amended, revised, or terminated only by mutual agreement of the parties hereto except that the SCS may terminate financial and other assistance in whole or in part at any time it determines that the sponsors have failed to comply with the conditions of this agreement. In this case, the SCS shall promptly notify the sponsors in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the sponsors or recoveries by the SCS under projects terminated shall be in accord with the legal rights and liabilities of the parties. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between the SCS and the sponsors having specific responsibilities for the measure involved.

14. No member of, or delegate to, Congress, or resident commissioner, shall be admitted to any share or part of this plan, 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, as amended, and the regulations of the Secretary of Agriculture (7 CFR 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 otherwise subjected to discrimination under any activity receiving Federal financial assistance.

The sponsors and the SCS further agree to all other terms, conditions, and stipulations of said Watershed Work Plan Agreement not modified herein.

Madison Soil and Water Conservation District
Local Organization

By W.A. Windham

Title Chairman

Date Oct. 15 1980

The signing of this agreement was authorized by a resolution of the governing body of the Madison Soil and Water Conservation District
Local Organization
adopted at a meeting held on October 15, 1980

H. N. Pippen
Secretary, Madison Soil and Water Conservation District

Date 10/15/80

East Carroll Soil and Water Conservation District
Local Organization

By George L Lensing

Title Chairman

Date October 15, 1980

The signing of this agreement was authorized by a resolution of the governing body of the East Carroll Soil and Water Conservation District
Local Organization
adopted at a meeting held on ____________________.

[illegible]
Secretary, East Carroll Soil and Water Conservation District

Date October 15, 1980

Madison Parish Police Jury
Local Organization

By Joe M Thornton

Title President

Date 9-25-80

The signing of this agreement was authorized by a resolution of the governing body of the Madison Parish Police Jury adopted at a meeting
Local Organization
held on 9-25-80.

Joe M Clark
Secretary, Madison Parish Police Jury

Date 9-25-80

East Carroll Parish Police Jury
Local Organization

By [illegible]

Title President

Date [illegible]

The signing of this agreement was authorized by a resolution of the governing body of the East Carroll Parish Police Jury adopted at a
Local Organization
meeting held on [illegible].

[illegible]
Secretary, East Carroll Parish Police Jury

Date [illegible]

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

Soil Conservation Service

United States Department of Agriculture

Approved by:

Alton Mangum
State Conservationist

10/23/80
Date

NARRATIVE TO SUPPLEMENT NO. 2 OF THE WATERSHED WORK PLAN AGREEMENT

September 1980

Foreword

The Walnut-Roundaway Watershed Work Plan was approved for operations by Congress on July 24, 1969. The area encompassed by the watershed is in portions of Madison and East Carroll Parishes; about 96 percent of the watershed being in Madison Parish. Following discussion with the East Carroll Parish Police Jury, it was determined that they did not desire to carry out any needed structural measures in that parish. The Madison Parish Police Jury wished to carry out all needed structural measures in that parish. After a determination was made that failure to carry out needed measures in East Carroll Parish would have no adverse effects on the project in Madison Parish. The plan, as approved on July 24, 1969, was prepared.

The original watershed work plan agreement was modified once on December 16, 1971 to include the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646).

None of the channel work has been installed. The Police Jury of East Carroll Parish has now requested that they become sponsors and that the watershed work plan be revised to add about 19 miles of channel work in that parish. The increased P.L.-566 construction cost due to this additional channel work is $243,450.

Since the work plan was approved for operations, the East Carroll-Madison Soil and Water Conservation District was divided to form the East Carroll Soil and Water Conservation District and the Madison Soil and Water Conservation District and are both sponsors.

The watershed work plan was restudied to determine changes needed to provide a plan more compatible with the present land use and one that would minimize adverse effects on the environment. Since this watershed was planned, the policy of the SCS in relation to wetlands has changed. Previously, types 3, 4, and 5 were the wetlands that could not be converted to another land use as a purpose of a P.L.-566 project. Present policy prohibits providing technical and financial assistance for drainage or otherwise altering Wetland Types 1 through 20 for the purpose of converting them to other land uses. This restudy resulted in the elimination of about one mile of project channels in Types 1 and 6 Wetlands. Work on an additional 3 miles of project channel segments in Types 1, 5, 6, and 7 Wetlands, and 11 miles through bottomland hardwoods were also eliminated. Nineteen miles of project channels that traverse types 1, 5, 6, and 7 Wetlands are of adequate capacity and will not require any work or maintenance for the life of the project. Adequate drainage and flood prevention for existing cropland and pastureland will be provided in keeping with project objectives. Design features such as low level weirs, earthfill dams, water control structures (pipe drops), and grade stabilization structures are planned to be installed in channels to

prevent drainage of Types 5, 6, and 7 Wetlands, reduce the amount of sediment being delivered downstream and provide for stable channels.

Since numerous changes are required, the Sponsors and the SCS believe that the best way to avoid misunderstanding is to completely rewrite the Watershed Work Plan Agreement, incorporate the changes brought about by the present revision and the change as a result of the previous supplemental watershed work plan agreement. Therefore, Supplement No. 2 to the watershed work plan agreement supersedes the original agreement and the previous supplement. All pertinent information contained in the original agreement and the supplemental agreement is incorporated in this document.

It was agreed that the following revisions will be made to provide a plan that achieves the project objectives and minimizes adverse effects on the environment.

Changes in major features of the Watershed Work Plan are as follows:

1. Eliminate Channels L-6C, L-6J, L-6M1A, L-6M1A1, L-6P, L-7A2A, L-7C10A, L-7C7, L-7C8A, L-7C8B, L-7A4 and L-11A. Delete from project map.

2. Eliminate construction and appurtenant structures on Channels L-7A and L-7C2. No maintenance required. Shown as adequate channels on project map.

3. Eliminate portions of Channels M-6, L-6D, L-6E, L-6M2A, L-7CC, L-7CC2, L-1C6, M-7, L-7B, L-6I2, and L-7C2. Delete from project map.

4. Eliminate work on portions of Channels L-7C, L-6M2, L-6I, L-7C5, and L-7C10. Show as adequate, portions of Channels M-6, L-6E, L-6D, L-6D-1, and M-6 alt. on project map. No maintenance required.

5. Eliminate work on portions of Channels M-7, L7A2, L-7A2B, L-7A3, L-7C1, L-7C2B, L-7C3, L-7C4, L-7C6, L-7C8C, L-7C8D, L-7C9, L-7C11, L-7C12, L-7C13, L-7CC, L-7CC2, L-7D, L-7G, M-8, M-9, M-10, M-11, M-12, M-14, and M-15. Maintenance will be required.

6. Add Channels L-7C15C, L-7C15C1, L-7C15C2, L-7C15C2B, L-7C15C2C, L-7C15C2D, L-7C15C2E, L-7C15C2F, L-7C15C2G, L-7C15C2G1, L-7C15C2G2, L-7C15C2G3, and L-7C15C3 which are in the East Carroll Parish portion of the watershed.

7. Due to changes in design of Channel M-6, Dams No. 2 and No. 3 in the original work plan are eliminated. Dam No. 2 in the supplemented plan is now used to refer to the earthfill dam just east of the junctions of L-7C15 and M-16. Dam No. 4 in the original work plan has been eliminated. Dam No. 5 is now No. 4. Dam Nos. 4, 5, and 6 are cast-spoil dams which will involve no extra costs.

8. Weirs No. 3 and No. 5 are being installed to prevent the alteration of (drainage) Types 6 and 7 Wetlands.

9. Weir No. 1, has been changed from a fixed crest to a stop log weir. The minimum crest elevation has tentatively* been changed from 61.5 to 63.0 mean sea level (m.s.l.). This structure will have a maximum seasonal flooding capability of 65.0 m.s.l. (see project map for location).

   Weir No. 2 has been moved from its originally planned location, station 1237+00, channel M-6, to station 1130+00 of the same channel about 400 feet south of the U.S. Interstate Highway 20. The minimum crest elevation has tentatively *changed from 73.0 to 74.0 m.s.l. The structure will have a maximum seasonal flooding capability of 78.0 m.s.l. (see errata map for location).

   Weir No. 4 has been moved from its planned location station 1040+00 channel M-6 to station 17+00 of channel M6-A (Patterson Ditch). The structure will have a tentative *minimum crest elevation of 72.5 m.s.l. and a maximum seasonal flooding capability of 75.0 m.s.l. (see errata map for location).

   These three structures (Weir nos. 1, 2, and 4) will be operated and maintained by the Madison Soil and Water Conservation District. The stop log(s) will be installed in the structure(s) by November 1 of each year. The installation of stop log(s) could be delayed by the SWCD if an unusual situation exists such as high rainfall amounts occurring causing delays in harvesting of crops. This in no way means that this delay in closure of structure(s) would be the norm. It is anticipated that this would occur on an occasion such as one in ten years. The stop log(s) will be removed on March 1 of each year.

10. Combine Channel L-6M1 and the lower end of Channel L-6M and name it Channel M-6A.

11. Water from the drainage area of Channel M-6 above Walnut Bayou will not be routed through the portion of Channel M-6 below Walnut Bayou. The new section of Channel M-6 between Walnut Bayou and Coon Bayou has been eliminated from the plan. Water from the upper end of Channel M-6 above Walnut Bayou will continue to flow as it now does through Brushy Bayou which runs through the town of Tallulah. Brushy Bayou will be named Channel M-6 Alternate.

12. Modifications to the water control structure No. 2 (Englewood structure) are necessary to increase the capacity of the existing structure.

*SCS and USFWS agreed that the two agencies would look at actual elevations during the design stage and base final weir designs on field observations.

13. Add a new channel plus a portion of Bull Bayou and number this Channel M-16. This will divert the drainage areas of L-7C15 and Bull Bayou into Tensas River. The new channel will be excavated from Tensas River east to Bull Bayou. Bull Bayou will be cleared for about one mile, then enlarged for the remainder of its length which ends at its junction with Channel L-7C15 (Little Tensas Bayou). A grade stabilization structure will be installed near the outlet of Channel M-16. Dam No. 2 will be installed on the upper end of L-7C just below its junction with L-7C15 in order to divert all the flow from L-7C15 into Bull Bayou (M-16). Dam No. 4 will be installed to prevent Bull Bayou from draining into Bear Lake.

14. Add Dam No. 5 on Channel L-7C10. This small dam will prevent the flow from Channel L-7C10B from entering Bear Lake.

15. Add grade stabilization structures near the outlets of Channels M-11 and M-12.

16. An abbreviated habitat evaluation and mitigation alternatives (menus) was completed by SCS and USFWS on December 28, 1979. Losses that would result by installation of watershed as planned (1978) amounted to 7,999 habitat units.

    The sponsors, SCS and USFWS agreed that these losses will be mitigated. It was also agreed that at no time during installation of the structural measures will the losses exceed the mitigation. The mitigation will be accomplished within the frame work of alternative methods which are:

    A. Wetland Improvement

       (1) Texas Lake Complex

       (2) Horseshoe Lake Complex

       (3) Alligator Brake

    B. Conservation easements to preserve bottomland hardwoods.

    C. Vegetative plantings along maintenenace-free openland channels.

    D. Elimination of project channels that would cause habitat losses if installed.

    E. Creation of an 80-acre wetland area described as follows:

       An 80-acre wetland area will be created to mitigate the loss of 40 acres of Type 6 and 7 Wetlands due to the construction of project channels. This area will be located in Madison Parish in the southwestern corner of the watershed about 2 miles northwest of Quimby, La. The area is now composed of about 65 acres of over-mature bottomland hardwoods and about

15 acres of open land. These areas will be seasonally flooded and managed as wetlands for the life of the project (50 years). The management plan for this area is as follows: (1) Plant open field with browntop millet or other suitable species so seed crop will mature about three weeks prior to opening of waterfowl season. A soil test is needed to determine fertilizer needs; (2) annually flood the area between October 1 and November 1 to an average depth of 12 to 15 inches. Maximum water level is 73.0 feet mean sea level; (3) remove the water from the wetland by April 1; (4) a selective cutting of merchantable sweetgum trees would be beneficial to the oaks and increase their acorn production. Maintain mast-producing hardwoods. This development will be in the first construction contract and cost-shared at the same percentage as other structural measures.

17. The land treatment program has been revised from 68,000 acres to receive adequate treatment to 127,000 acres. The installation period has been extended from 10 years to 14.

The watershed work plan, as revised, consists of 282 miles of project channels, with appurtenances, and land treatment. Forty miles of the project channels are adequate, but will need to be maintained for the life of the project, and 242 miles require work. Two grade stabilization structures, five low-level weirs, and four earthfill dams will be installed. One water control structure will be modified and another one installed. The revised land treatment program will adequately treat 127,000 acres.

Also included in the revised work plan are items resulting from environmental concerns or policies. These items are:

1. All disturbed areas, except spread spoil in cropland, will be vegetated with a perennial grass species designed to establish permanent vegetation. Spoil that will not be spread will be vegetated with perennial species immediately after it has been placed and shaped. When it is determined that spoil will be stacked and then later spread, the stacked spoil will be vegetated with an annual species for temporary protection. After the spoil is spread, perennial vegetation will be established on the spread spoil in all areas other than cropland.

2. Efforts will be made to maintain trees along channels for aesthetic and wildlife purposes giving consideration to requirements for construction and operations and maintenance. Spoil will be placed in a manner that will not kill the trees. Spoil will be spread in open areas unless otherwise requested by landowner.

3. Wastes and construction debris will be buried, burned, or removed from the construction sites.

4. Noise levels will be monitored by the SCS and standards set by the Occupational Safety and Health Act will be followed.

5. An archaeological survey was conducted by personnel of Northeast State University. Five sites were located that could possibly be affected by project installation. These 5 sites are 16 MA-1, MA-82, MA-132, MA-147, and MA-149. As recommended by the staff archaeologist of the State Historic Preservation Office, no project channel work will be installed within approximately one-half mile of site 16 MA-1. Site 16 MA-82 is located on a ridge that is bisected by an existing channel. This channel requires clearing of vegetation, mostly willow trees and debris, and removal of silt bars in the low slough areas. No construction activity except the travelling of equipment will take place in the vicinity of this ridge. No debris or spoil will be disposed of on this ridge. As a result of a detail study of sites 16 MA-132, 16 MA-147, and 16 MA-149, by archaeological personnel of Northeast Louisiana University, it was determined that they would not be effected by the project. A careful watch for buried cultural remains will be maintained of all areas disturbed by project construction as work proceeds along channels. If prehistoric or historic artifacts or features are encountered, construction will be stopped. The Secretary of the Interior (National Park Service) and Office of the State Historical Preservation Officer will be notified, and will be given an opportunity to evaluate and make recommendations for salvage, mitigation, or alternate routes before construction continues. Also, the Advisory Council on Historic Preservation will be afforded an opportunity to comment in accordance with the "Procedures for the Protection of Historic and Cultural Properties."

6. Construction permits are required by the U.S. Army Corps of Engineers (Engineering Regulation No. 1165-2-302) for channel work to be done. These permits, and any others that may become necessary for installation of structural measures, will be obtained by the sponsors prior to the installation of any structural measures.

7. Project channels located in forest land and those having wooded channel banks will be dug primarily from one side. In some instances such as at bridge crossings, utility lines, pipelines, and along property lines the channel may have to be dug from both sides. In selecting which side to dig from, consideration will be given to maintaining the better quality habitat and providing the most effective shade for the channels containing ponded water.

Provisions for Operation and Maintenance

Planned channel maintenance includes periodic cleanouts, repair of eroded or washed-out areas, control of aquatic weeds, and repair or replacement of side inlets and other structures. The channels and earthfill dams will be kept clear of excessive vegetation by mowing,

hand labor, and use of approved herbicides. Maintenance of structures for water control, weirs and pipe drops, and grade stabilization structures includes repairing erosion damage, maintaining or replacing vegetation on fills, repairing or replacing worn or broken parts, replacing short-lived parts, and other activities essential to the safety and functioning of the structures. The general aesthetics of the channel rights-of-way and structure sites are an important feature of the maintenance program.

As channel work is being performed, berms will be constructed and spoil will be placed in a manner to allow maintenance equipment access to the channels as the need arises. Existing public roads, farm roads, turnrows, trails, open areas, and other existing facilities will be used for maintenance equipment to reach the channels. If none are existing, travel ways will be provided. The sponsors have given assurances that there will be access for maintenance to these channels.

Herbicides such as ammonium sulfamate, bromacil, and others registered with the Environmental Protection Agency (EPA) and approved by the United States Department of Agriculture (USDA) will be applied in a manner consistent with their labeling. Herbicides presently approved will not preclude the use of other EPA registered and USDA approved herbicides developed during the life of the project. Vegetation will be controlled in the summer months when the channels are most likely to have the least flow. Application during these months will also lower the possibility of runoff carrying herbicides into other areas.

Trees left in channel rights-of-way for landscape purposes will not be destroyed by maintenance methods. Two mechanical cleanouts are anticipated during the life of the project.

Operation and maintenance of the 80-acre wetland development includes the following:

1. Repair or replacement of the water supply system, and structures for water control.

2. Maintenance of vegetation cover and control of undesirable vegetation on the levees, and

3. Operating the area according to the agreed-to management plan.

The estimated annual maintenance cost of structural measures is about $223,200, based on 1976 prices. This estimated cost by parishes is: Madison $215,100, East Carroll $8,100.

Installation Cost

The total estimated cost of installing structural measures on the 248 miles of channels is $14,553,600; of which $9,093,275 will be borne by Public Law 566 and $5,460,325 will be borne by the sponsors. Of the amount borne by Public Law 566 $6,686,175 is for construction, $624,000 for engineering services, and $1,783,100 for project administration. Of the amount borne by the sponsors $2,228,725 is for construction, $2,964,100 is for land rights, and $267,500 is for project administration. Engineering

services consist of surveys, investigations, designs, and preparation of plans and specifications. Project administration includes administration of contracts and construction inspection.

The cost of installing the land treatment program is estimated to be $3,867,300. Since the watershed was approved for operations, $1,010,900 has been used to install parts of the program. Of the $2,856,400 remaining, $624,100 is for technical assistance, of which $411,300 will be borne by Public Law 566 funds and $212,800 will be borne by other funds. The remaining $2,232,300 will be the landusers cost for installing the individual land treatment measures.

Project Benefits

The installation of the combined program of land treatment and structural measures will afford benefits on about 157,000 acres of poorly drained agricultural land. The area benefitted does not include forest land and Class I land.

The PRESENT land use and the anticipated FUTURE land use of the watershed on which benefits were computed, both WITHOUT and WITH the project installed is as follows:

Land Use	Present	Future Without Project	Future With Project
Cropland	154,600	163,200	163,569
Pastureland	3,600	3,600	3,600
Forest land	52,200	42,800	41,109
Other land	17,300	18,100	19,422
Total	227,700	227,700	227,700

Direct primary benefits expected to accrue to agriculture are estimated to be $1,799,500 annually. This includes $852,400 which will accrue from flood prevention, $774,900 due to drainage, and $172,200 from more intensive use. The average annual benefits expected to accrue from redevelopment are $112,000.

Secondary benefits induced by or stemming from the project, accruing to the local economy, in the form of increased economic values over and above the monetary effects of the project are estimated to be $342,200. Secondary benefits from a national viewpoint will accrue to this project, but these were not evaluated.

Comparison of Benefits and Costs

Average annual primary benefits from structural measures are estimated to be $1,911,500. The average annual cost of structural measures (amortized installation cost plus operation and maintenance) is estimated to be $1,011,800, providing a benefit-cost ratio of 1.9 to 1. Total average annual benefits (including secondary benefits) from structural measures are estimated to be $2,253,700, providing a benefit-cost ratio of 2.2 to 1.

SCHEDULE OF OBLIGATIONS
(Dollars)[1/]

Year	Measures	PL-566 Funds	Other Funds	Total Funds
1st	Land Treatment	-	61,000	61,000
	Soil Surveys	2,900	800	3,700
	Technical Assistance	8,700	18,600	27,300
2nd	Land Treatment	-	68,100	68,100
	Soil Surveys	11,100	1,300	12,400
	Technical Assistance	23,100	11,100	34,200
3rd	Land Treatment	-	86,100	86,100
	Soil Surveys	19,900	600	20,500
	Technical Assistance	18,600	29,800	48,400
4th	Land Treatment	-	100,400	100,400
	Soil Surveys	3,100	200	3,300
	Technical Assistance	17,600	21,100	38,700
5th	Land Treatment	-	106,700	106,700
	Soil Surveys	300	-	300
	Technical Assistance	17,700	17,100	34,800
6th	Land Treatment	-	101,900	101,900
	Technical Assistance	18,700	18,500	37,200
7th	Land Treatment	-	173,800	173,800
	Technical Assistance	8,200	43,900	52,100
8th	Engineering Services	186,100	-	186,100
	Land Rights	-	612,000	612,000
	Project Administration	265,900	44,400	310,300
	Land Treatment	-	282,000	282,000
	Technical Assistance	49,800	30,400	80,200
9th	Construction	2,019,675	673,225	2,692,900
	Engineering Services	147,700	-	147,700
	Land Rights	-	691,100	691,100
	Project Administration	305,700	45,100	350,800
	Land Treatment	-	286,600	286,600
	Technical Assistance	51,300	30,400	81,700

Continued

Year	Measures	PL-566 Funds	Other Funds	Total Funds
10th	Construction	1,555,500	518,500	2,074,000
	Engineering Services	145,200	-	145,200
	Land Rights	-	628,000	628,000
	Project Administration	305,500	44,800	350,300
	Land Treatment	-	304,500	304,500
	Technical Assistance	55,500	30,400	85,900
11th	Construction	1,555,500	518,500	2,074,000
	Engineering Services	145,000	-	145,000
	Land Rights	-	642,500	642,500
	Project Administration	302,000	44,400	346,400
	Land Treatment	-	328,200	328,200
	Technical Assistance	53,200	30,400	93,600
12th	Construction	1,555,500	518,500	2,074,000
	Land Rights	-	390,500	390,500
	Project Administration	302,000	44,400	346,400
	Land Treatment	-	336,100	336,100
	Technical Assistance	62,400	30,400	92,800
13th	Project Administration	302,000	44,400	346,400
	Land Treatment	-	334,900	334,900
	Technical Assistance	62,200	30,400	92,600
14th	Land Treatment	-	360,000	360,000
	Technical Assistance	66,900	30,400	97,300
	Total	9,654,475	8,766,425	18,420,900

1/ Price base: 1976.

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TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Walnut-Roundaway Watershed, Louisiana

Installation Cost Item	Unit	Number Non-Federal Land	Estimated Cost (Dollars)[1/] P.L. 566 Funds[4/]	Other[4/]	TOTAL
LAND TREATMENT					
Land Areas[2/]					
Cropland	Acres to be treated	103,100	-	2,466,100	2,466,100
Pastureland		2,300	-	372,000	372,000
Wildlife Land[3/]		21,600	-	92,300	92,300
Technical Assistance			561,200	375,700	936,900
Total Land Treatment			561,200	3,306,100	3,867,300
STRUCTURAL MEASURES CONSTRUCTION					
Channel Work[5/]					
N	Miles	16	276,900	92,300	369,200
M	Miles	250	5,576,550	1,858,850	7,735,400
O	Miles	22	599,025	199,675	798,700
Subtotal - Channel			6,452,475	2,150,825	8,603,300
Grade Stabilization Structures	Number	2	87,600	29,200	116,800
Water Control Structures	Number	2	48,300	16,100	64,400
Low-Level Weirs	Number	5	91,200	30,400	121,600
Earthfill Dams	Number	5	6,600	2,200	8,800
Subtotal - Construction			6,686,175	2,228,725	8,914,900
ENGINEERING SERVICES			624,000	-	624,000
RELOCATION PAYMENTS			-	-	-
PROJECT ADMINISTRATION					
Construction Inspection			891,500	-	891,500
Other			891,600	267,500	1,159,100
Relocation Assistance Advisory Services			-	-	-
Subtotal - Administration			1,783,100	267,500	2,050,600
OTHER COSTS					
Land Rights					
Subtotal - Other			-	2,964,100	2,964,100
Total Structural Measures			9,093,275	5,460,325	14,553,600
TOTAL PROJECT			9,654,475	8,766,425	18,420,900

1/ Price base: 1976.

2/ Includes only areas estimated to be adequately treated during the installation period. Treatment will be accelerated throughout the watershed, and dollar amounts apply to total land area, not just to be adequately treated areas.

3/ Land and water managed primarily for fish and wildlife on lands where wildlife is the secondary use.

4/ SCS - Federal agency responsible for assisting in installation of works of improvement.

5/ Type of channel before project: (N)-an unmodified, well-defined natural channel or stream; (M)-manmade ditch or previously modified channel; and (O)-none or practically no defined channel.

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TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Walnut-Roundaway Watershed, Louisiana

(Dollars)[1/]

Structural Measures	Installation Cost-P.L. 566 Law Funds: Construction	Engineering	Total Public Law 566	Installation Cost-Other Funds: Construction	Land Rights	Total Other	Total Installation Cost
MULTIPLE PURPOSE							
Channel Work With Appurtenances[2/]							
East Carroll Parish							
(M)	219,975	20,500	240,475	73,325	100,400	173,725	414,200
(O)	23,550	2,200	25,750	7,850	3,000	10,850	36,600
Subtotal - East Carroll	243,525	22,700	266,225	81,175	103,400	184,575	450,800
Madison Parish							
(N)	276,900	25,800	302,700	92,300	154,400	246,700	549,400
(M)	5,576,505	520,500	5,856,575	1,785,525	2,632,300	4,406,825	10,263,400
(O)	575,475	53,700	629,175	191,825	85,000	276,825	906,000
Subtotal - Madison	6,208,950	579,500	6,788,450	2,069,650	2,860,700	4,930,350	11,718,000
Subtotal - Channels	6,452,475	602,200	7,054,675	2,150,825	2,964,100[3/]	5,114,925	12,169,600
Grade Stabilization Structures	87,600	8,200	95,800	29,200	-	29,200	125,000
Water Control Structures	48,300	4,500	52,800	16,100	-	16,100	68,900
Low-Level Weirs	91,200	8,500	99,700	30,400	-	30,400	130,100
Earthfill Dams	6,600	600	7,200	2,200	-	2,200	9,400
Subtotal	6,686,175	624,000	7,310,175	2,228,725	2,964,100	5,192,825	12,503,000
Project Administration	XXX	XXX	1,783,100	XXX	XXX	267,500	2,050,600
GRAND TOTAL	6,686,175	624,000	9,093,275	2,228,725	2,964,100	5,460,325	14,553,600

[1/] Price base: 1976.

[2/] Includes cost of structures for water control (pipe drops), vegetation and access road crossings.

[3/] Includes $1,271,700 for value of land; $127,200 for legal fees; and $1,538,700 for replacement of bridges and culverts, and modification of miscellaneous facilities.

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TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Walnut-Roundaway Watershed, Louisiana

(Dollars)[1/]

Item	Cost Allocation			Cost Sharing					
	Purpose			Public Law 566			Other		
	Flood Prevention	Drainage	Total	Flood Prevention	Drainage	Total	Flood Prevention	Drainage	Total
MULTIPLE PURPOSE									
Channel Work With Appurtenances	6,084,800	6,084,800	12,169,600	4,602,469	2,452,206	7,054,675	1,478,981	3,635,944	5,114,925
Grade Stabilization Structures	62,500	62,500	125,000	62,500	33,300	95,800	-	29,200	29,200
Water Control Structures	34,450	34,450	68,900	34,450	18,350	52,800	-	16,100	16,100
Low-Level Weirs	65,050	65,050	130,100	65,050	34,650	99,700	-	30,400	30,400
Earthfill Dams	4,700	4,700	9,400	4,700	2,500	7,200	-	2,200	2,200
GRAND TOTAL	6,251,500	6,251,500	12,503,000	4,769,169	2,541,006	7,310,175	1,478,981	3,713,844	5,192,825

[1/] Price base: 1976.

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TABLE 3 - STRUCTURE DATA
CHANNELS

Channel	Station	Drainage Area Sq. Mi.	3 - Yr. Freq. Capacity cfs[1/] Req'd	Design	Water Surface Elev.	Hydraulic Gradient (ft./ft.)	Channel Dimensions Width (ft.)	Bottom Grade (%)	Elevation (ft. msl)	Side Slopes	"n" Value Aged	As Built	Velocities Aged	As Built	Excavation Cu. Yds	Inventory of Channel Work[2/] Type of Work	Type of Ch. Pr To Proj.	Flow Cond. Pr To Proj
M-1	900+00	1.08	48	50	86.2	.00035	8	.04	82.7	1.5:1	.045	.025	1.07	2.26		II	M	E
	794+00	1.41	60	61	82.1	.00035	8	.04	78.2	1.5:1	.045	.025	1.13	2.37		II	M	E
	700+75	3.16	118	121	78.8	.00035		A=94	P=37		.040	.040	1.29	1.29		III	M	E
	594+80	6.26	208	212	75.0	.00035	12	.05	69.0	1.5:1	.040	.025	1.68	3.04		II	M	E
	467+00	8.33	267	279	74.3	.00005	30	.01	67.5	1.5:1	.030	.022	1.02	1.42		II	M	I
	347+00	14.22		432	83.6	.0005	35	.01	65.6	1.5:1	.030	.022	1.15	1.56		II	M	IS
	235+00	20.40	560	582	73.2	.00005	40	.01	65.2	1.5:1	.025	.020	1.40	2.00		II	M	IS
	180+00	69.81	1,550	1,590	72.9	.00005	60	.06	61.4	1.5:1	.025	.020	1.79	2.52	439,286	II	M	PrS
	115+00	70.56	1,560	2,067	72.6	.00005		A=1,323	P=186		.025	.025	1.56	1.56		III	M	PrS
L-1A	100+00	.02	2	34	74.2	.0001		A=61	P=23		.050	.050	0.56	0.56		VI	M	E
	69+75	.67	32	34	73.8	.0001		A=61	P=23		.050	.050	0.56	0.56		VI	M	E
	63+00	.89	41	38	73.6	.0001		A=61	P=23		.045	.045	0.62	0.62		III	M	E
	40+00	1.98	80	80	73.4	.0001	12	.02	68.4	1.5:1	.040	.024	0.82	1.87	8,842	II	M	E
	0+00	3.89	140	165	72.6	.0001		A=146	P=33		.035	.035	1.13	1.13		IV	M	E
L-1A-1	46+00																	
	0+00	.70				Estimated									11,105	I	O	E
L-1A-2	10+00																	
	0+00	.25				Estimated									2,130	I	O	E
L-1B	302+19	.68	32	32	75.4	.00005	10	.04	71.4	1.5:1	.040	.025	0.50	0.94		II	M	E
	236+00	2.21	87	112	74.6	.00005	14	.04	68.3	1.5:1	.035	.022	0.76	1.37		II	M	E
	143+00	5.83	219	225	73.7	.00005	26	.01	66.7	1.5:1	.035	.022	0.88	1.59		II	M	E
	135+00	5.83	219	225	73.7	.00005	26	.01	66.7	1.5:1	.035	.022	0.88	1.59		II	M	E
	127+00	7.67	262	278	73.6	.00005	28	.02	66.6	1.5:1	.030	.022	1.03	1.61		II	M	I
	113+50	9.06	285	295	73.6	.00005	30	.01	66.6	1.5:1	.030	.022	1.04	1.63		II	M	I
	0+00	11.22	342	334	73.1	.00005	30	.01	65.6	1.5:1	.030	.022	1.08	1.68	249,896	II	M	I
L-1B-1	74+00															I	O	E
	45+00															I	O	E
	0+00	1.13				Estimated									20,651	II	M	E
L-1B-2	71+00	0.80	41	70	77.6	.0013	3	.29	73.6	1.5:1	.045	.025	2.07	3.66		II	M	E
	44+00	1.11	49	48	74.1	.0001	8	.03	69.6	.15:1	.040	.025	0.73	1.34		II	M	E
	0+00	1.83	75	75	73.7	.0001	8	.03	68.1	1.5:1	.040	.025	0.82	1.47	27,702	II	M	E
L-1B-2A	51+00	0.03	3	21	80.5	.0009	3	.11	78.0	1.5:1	.045	.025	1.25	2.89		II	M	E
	23+00	0.15	10	10	78.0	.0001	3	.11	75.0	1.5:1	.045	.025	0.46	1.04		II	M	E
	0+00	0.36	19	19	77.8	.0001	3	.05	73.8	1.5:1	.045	.026	0.54	1.19	9,709	II	M	E
L-1B-3	39+00															II	M	E
	0+00	2.33				Estimated									22,800	II	M	E
L-1B-4	32+00															I	O	E
	0+00	.34				Estimated									4,932	I	O	E
L-1B-5	108+00															II	O	E
	0+00	1.02				Estimated									22,880	II	M	E
L-1B-6	46+00															I	O	E
	0+00	0.31				Estimated									6,155	I	O	E
L-1C	835+00	7.59	246	239	81.6	.0001	26	.01	75.6	1.5:1	.035	.022	1.14	2.12		II	M	E
	646+50	12.02	363	370	79.6	.0001	26	.01	72.6	1.5:1	.030	.022	1.45	2.25		II	M	E
	111+00	32.19	825	804	74.2	.0001	35	.01	65.7	1.5:1	.025	.020	1.98	2.85		II	M	I
	109+00	32.19	825	804	74.2	.0001	35	.01	65.7	1.5:1	.025	.020	1.98	2.85	834,658	II	M	S
	83+00	32.19	825	804	74.0	.0001		A=406	P=66		.025	.025	1.98	1.98		III	M	S
	53+00	32.19	825	804	73.7	.0001		A=406	P=66		.025	.025	1.98	1.98		III	M	I
	0+00	35.48	905	1,908	73.2	.0001		A=852	P=116		.025	.025	2.24	2.24		VI	M	I

1/ This frequency is a removal rate and not a peak discharge, unless otherwise indicated.
2/ See Attached Coding System for Inventory of Channel Work.

Channel	Station	Drainage Area Sq. Mi.	3 - Yr. Freq. Capacity cfs[1] Req'd	Design	Water Surface Elev.	Hydraulic Gradient (ft./ft.)	Channel Dimensions Width (ft.)	Bottom Grade (%)	Elevation (ft. msl)	Side Slopes	"n" Value Aged	As Built	Velocities Aged	As Built	Excavation Cu. Yds.	Inventory of Channel Work[2] Type of Work	Type of Ch Pr. To Proj	Flow Cond. Pr. To Proj
L-1C1	147+00															II	M	E
	0+00	2.67				Estimated									35,389	II	M	E
L-1C-3	90+00															II	M	E
	37+00															II	M	E
	33+00															II	M	S
	0+00	3.86				Estimated									22,333	II	M	E
L-1C3A	186+00															II	M	E
	0+00	1.55				Estimated									47,354	II	M	E
L-1C4	44+00															II	M	E
	0+00	0.28				Estimated									11,316	II	M	E
L-1C5	65+00															II	M	E
	0+00	0.78				Estimated									10,713	II	M	E
L-1C6	101+00															I	O	E
	38+00															I	O	E
	0+00	4.16				Estimated									98,963	II	M	E
L-1D	88+00															II	M	E
	0+00	1.97				Estimated									25,859	II	M	E
L-1E	115+00															II	M	E
	0+00	2.05				Estimated									32,430	II	M	E
L-1F	88+00															II	M	E
	0+00	1.30				Estimated									15,423	II	M	E
L-1G	51+00															II	M	E
	0+00	0.52				Estimated									7,319	II	M	E
L-1H	47+00															II	M	E
	0+00	1.97				Estimated									10,796	II	N	E
M-6	1,138+20	4.85	168	170	79.4	.0001	16	.01	73.2	1.5:1	.035	.022	1.08	1.94		II	M	IS
	1,000+60	12.07	310	311	77.9	.0001	24	.01	70.7	1.5:1	.035	.022	1.24	2.24		II	M	IS
	1,000+60=887+00																	
	887+00	0.56	28	240	74.5	.00015		A=287	P=82		.050	.050	0.83	0.83		VI	M	E
	860+00	3.86	139	240	74.3	.00015		A=287	P=82		.050	.050	0.83	0.83		VI	M	E
	830+00	4.32	152	156	73.8	.00015	10	.02	67.0	1.5:1	.040	.025	1.14	2.03		II	M	I
	734+00	5.92	198	283	72.9	.00015		A=414	P=161		.050	.050	0.68	0.68		VI	M	IS
	669+00	10.56	318	319	71.4	.00015	20	.02	64.3	1.5:1	.035	.022	1.47	2.62		II	M	I
	657+00	11.26	338	347	71.0	.00015	25	.02	64.3	1.5:1	.035	.022	1.48	2.65		II	M	IS
	637+00	20.84	565	680	70.6	.00015		A=636	P=126		.040	.040	1.06	1.06		VI	M	IS
	530+00	23.41	623	630	69.3	.00015	35	.0i	62.0	1.5:1	.030	.022	1.88	2.92		II	M	IS
	513+00	25.01	658	1,454	68.8	.00015		A=1,245	P=216		.050	.050	1.16	1.16		VI	M	IS
	470+00	39.57	964	1,153	68.8	.0001		A=1,343	P=273		.050	.050	0.85	0.85		VI	M	PrS
	330+00	46.90	1,111	1,113	67.2	.0001	40	.01	57.7	1.5:1	.025	.020	2.16	2.76	490,897	II	M	PrS
	215+00	48.50	1,149	1,292	66.0	.0001		A=1,060	P=178		.040	.040	1.21	1.21		VI	M	PrS
	0+00	55.66	1,282	1,288	63.8	.0001		A=869	P=163		.030	.030	1.48	1.48		IV	M	PrS
M-6 Alt.	366+00	29.24	750	761	77.0	.00004	60	.01	68.5	1.5:1	.027	.020	1.23	1.95		II	M	IS
	98+00	30.63	779	794	75.9	.00004	60	.01	67.2	1.5:1	.027	.020	1.25	1.96	182,000	II	M	IS
M-6A	143+00	10.16	310	315	77.9	.00012	24	.02	71.0	1.5:1	.035	.022	1.33	2.42		II	M	IS
	0+00	26.92	700	710	77.0	.00004	45	.02	68.0	1.5:1	.025	1.020	1.35	1.92	172,400	II	M	IS
L-6A	142+00															II	N	E
	0+00	3.92				Estimated									72,400			
L-6B	86+65															I	O	E
	45+85															I	O	E
	0+00	2.33				Estimated									18,156	II	M	E

Channel	Station	Drainage Area Sq. Mi.	3 - Yr. Freq Capacity cfs[1/] Req'd	Design	Water Surface Elev.	Hydraulic Gradient (ft./ft.)	Channel Dimensions Bottom Width (ft.)	Grade (%)	Elevation (ft. msl)	Side Slopes	"n" Value Aged	As Built	Velocities Aged	As Built	Excavation Cu. Yds	Inventory of Channel Work[2/] Type of Work	Type of Ch Pr. To Proj	Flow Cond. Pr. To Proj
L-6D	171+00	2.91	121	126	70.7	.0001	14	.01	64.7	1.5:1	.040	.025	0.91	1.65		II	M	E
	129+00	3.05	115	126	70.2	.0001	14	.01	64.2	1.5:1	.040	.025	0.91	1.65	16,057	II	M	E
	96+00	4.53	159	214	69.9	.0001		A=301	P=61		.060	.060	0.71	0.71		III	M	E
L-6D1	92+00															II	M	E
	29+00															II	M	E
	15+00															VI	N	E
	0+00	1.19				Estimated									26,422	II	M	E
L-6D2	112+00															II	M	E
	0+00	1.84				Estimated									17,920			
L-6E	82+70	4.61	180	306	69.6	.0001		A=207	P=40		.030	.030	1.48	1.48		III	M	E
	72+70	4.59	162	306	69.5	.0001		A=207	P=40		.030	.030	1.48	1.48		III	M	E
	65+00					LAKE										VI	M	E
	0+00					LAKE										VI	N	S
L-6E1	44+00															II	M	E
	14+00														7,336	II	M	E
	0+00	1.06				Estimated										VI	N	E
L-6E2	68+00															II	N	E
	0+00	1.78				Estimated									14,537	II	N	E
L-6F	24+00															I	O	E
	6+50															I	O	E
	2+00															II	M	E
	0+00	.78				Estimated									6,740	I	O	E
L-6G	44+00	0.52	26	39	74.0	.0004		A=40	P=25		.040	.040	0.97	0.97		IV	M	E
	0+00	1.11	49	44	72.4	.0004		A=39	P=19		.040	.040	1.13	1.13		IV	M	E
L-6H	35+00															I	O	E
	0+00	.91				Estimated									7,974	I	O	E
L-6I	155+00	1.21	59	54	74.0	.0001		A=91	P=31		.050	.050	0.60	0.60		VI	M	E
	135+00	1.21	53	54	73.3	.0001		A=91	P=31		.050	.050	0.60	0.60		VI	M	E
	43+00	8.98	294	330	72.4	.0001	16	.01	65.4	1.5:1	.040	.025	0.80	1.82	20,998	II	M	E
	16+00	8.98	283	330	71.9	.0001		A=413	P=131		.040	.040	0.80	0.80		VI	N	E
L-6I1	88+00															II	M	E
	68+51															II	M	E
	0+00	2.50				Estimated									35,829	I	O	E
L-6I2	128+00	1.17	51	53	72.5	.0001	8	.04	67.5	1.5:1	.045	.025	0.68	1.39		II	N	E
	107+56	1.67	69	69	72.1	.00005	10	.04	65.8	1.5:1	.045	.025	0.56	1.13		I	O	E
	19+00	3.34	123	123	71.5	.00005	18	.01	65.1	1.5:1	.040	.025	0.69	1.26	93,259	II	N	E
	0+00	4.00	143	142	71.4	.00005		A=323	P=81		.060	.060	0.44	0.44		VI	N	S
L-6I2A	42+00															II	N	E
	0+00	0.41				Estimated									7,800	II	N	E
L-6I3	58+00															II	M	E
	0+00	0.62				Estimated									7,948	II	M	E
L-6L	185+00	.06	5	23	81.7	.00035	4	.04	78.7	1.5:1	.045	.025	0.89	1.86		II	M	E
	66+00	.85	40	50	77.2	.00035	8	.04	73.7	1.5:1	.045	.025	1.07	2.28		II	M	E
	27+00	3.08	115	116	75.8	.00035	8	.07	70.7	1.5:1	.040	.025	1.45	2.63	21,184	II	N	E
	0+00	3.30	123	266	74.6	.00035		A=216	P=49		.060	.060	1.23	1.23		IV	N	E

Channel	Station	Drainage Area Sq Mi	3 - Yr Freq Capacity cfs Req'd	3 - Yr Freq Capacity cfs Design	Water Surface Elev	Hydraulic Gradient (ft /ft.)	Channel Dimensions Width (ft.)	Channel Dimensions Bottom Grade (%)	Channel Dimensions Bottom Elevation (ft msl)	Channel Dimensions Side Slopes	"n" Value Aged	"n" Value As Built	Velocities Aged	Velocities As Built	Excavation Cu. Yds.	Inventory of Channel Work 2/ Type of Work	Inventory of Channel Work 2/ Type of Ch. Pr. To Proj	Inventory of Channel Work 2/ Flow Cond. Pr To Proj.
L-6M	369+00	0.46	24	24	83.0	.00025		A=32	P=18		.045	.045	0.75	0.75		III	M	E
	299+50	1.80	79	100	81.2	.00025		A=122	P=40		.060	.060	0.82	0.82		III	M	E
	294+50	1.80	79	100	81.0	.00025		A=122	P=40		.060	.060	0.82	0.82		III	M	S
	285+50	4.74	165	234	80.8	.00025		A=170	P=47		.040	.040	1.38	1.38		III	M	E
	268+50	5.80	196	234	80.3	.00025		A=170	P=47		.040	.040	1.38	1.38		III	M	S
	209+00	8.38	265	284	78.8	.00025		A=315	P=139		.045	.045	0.90	0.90		III	M	I
	186+00	8.63	274	284	78.2	.00025		A=315	P=139		.045	.045	0.90	0.90		III	M	I
	79+60	11.82	358	377	77.8	.00006	45	.01	71.6	1.5:1	.030	.022	1.12	1.79		II	M	IS
	56+60	13.21	393	387	77.4	.00006	45	.01	7.14	1.5:1	.035	.022	1.13	1.77	108,253	II	N	IS
L-6M1B	76+00															II	M	E
	0+00	1.72				Estimated									17,044	II	M	E
L-6M1B1	26+00															II	M	E
	0+00	0.23				Estimated									4,815	II	M	E
L-6M2	90+00	0.20	12	12	80.6	.0001	4	.03	77.6	1.5:1	.045	.025	0.47	1.08		II	M	E
	40+00	0.88	44	45	79.8	.0001	12	.03	76.1	1.5:1	.040	.025	0.69	1.21	7,611	II	M	E
L-6M2A	28+00															I	O	E
	0+00	1.16				Estimated									10,400	I	O	E
L-6M3	74+00															II	M	E
	44+00															II	M	E
	28+00															II	M	S
	0+00	2.03				Estimated									33,437	II	M	E
L-6M4	48+00															II	M	E
	30+00															II	M	E
	0+00	4.75				Estimated									36,267	I	O	E
L-6N	142+00															II	M	E
	20+00															II	M	E
	5+00															II	N	E
	0+00	1.62				Estimated									47,333	II	N	S
M-7	1,179+26	0.13	8	8	80.4	.0001	5	.02	78.1	1.5:1	.045	.025	0.43	0.96		II	M	E
	854+00	7.03	229	232	75.4	.0002	12	.02	68.6	1.5:1	.035	.025	1.54	2.38		II	M	E
	819+29	9.98	305	313	74.1	.0002	15	.05	66.8	1.5:1	.035	.025	1.65	2.51		II	M	I
	605+00	21.93	590	869	69.4	.0002		A=460	P=82		.035	.035	1.89	1.89		VI	M	I
	570+00	71.79	1,584	2,861	69.0	.0002		A=1,333	P=117		.035	.035	2.14	2.14		VI	M	IS
	421+00	118.27	2,402	3,200	67.5	.0001		A=1,497	P=132		.035	.035	2.13	2.13		VI	M	PrS
	274+50	119.53	2,420	2,480	65.9	.0001	45	.01	52.6	2:1	.025	.020	2.60	3.58	51,799	II	M	PrS
	77+00	129.82	2,592	2,630	63.9	.0001		A=1,305	P=103		.040	.040	2.02	2.02		VI	M	PrS
L-7A1	100+00	0.11	7	12	74.4	.0005	4	.05	72.4	1.5:1	.045	.025	0.86	1.98		II	M	E
	2+00	1.04	52	54	72.1	.0001	10	.05	67.7	1.5:1	.040	.025	0.74	1.37	16,210	II	M	E
	0+00	1.37	59	59	71.7	.0001		A=78	P=27		.040	.040	0.76	0.76		VI	M	E
L-7A2	128+46	0.12	8	8	73.0	.00025	4	.08	71.0	1.5:1	.045	.025	0.61	1.40		II	M	E
	66+00	1.58	66	77	71.6	.0002	8	.08	66.3	1.5:1	.040	.025	1.06	1.93	4,379	II	M	E
	0+00	2.36	92	95	69.9	.0002		A=85	P=27		.040	.040	1.12	1.12		VI	M	E
L-7A2B	66+63	0.04	3	29	78.1	.003	4	.29	76.1	1.5:1	.045	.025	2.10	3.77		II	M	E
	2+00	0.65	32	34	73.4	.00035	5	.05	70.0	1.5:1	.045	.025	0.98	2.06	12,580	II	M	E
	0+00	0.69	33	34	73.0	.00035		A=34	P=17		.045	.045	0.98	0.98		VI	M	E
L-7A3	65+59	0.14	9	10	73.9	.0001	5	.03	71.4	1.5:1	.045	.025	0.44	0.98		II	M	E
	5+00	0.78	38	46	73.2	.0001	8	.03	68.8	1.5:1	.040	.025	0.72	1.32	15,259	II	M	E
	0+00	1.02	46	46	73.1	.0001		A=64	P=24		.040	.040	0.72	0.72		VI	M	E
L-7A3A	17+90	0.05	4	9	74.7	.0003	4	.04	72.7	1.5:1	.045	.025	0.66	1.53		II	M	E
	0+00	0.09	6	9	73.9	.0003	4	.04	71.9	1.5:1	.045	0.25	0.66	1.53	3,911	II	M	E
L-7A3B	30+10	0.11	7	17	77.0	.001	4	.15	75.0	1.5:1	.045	.025	1.21	2.79		II	M	E
	0+00	0.19	12	17	73.8	.001	4	.15	71.8	1.5:1	.045	.025	1.21	2.79	7,246	II	M	E

Channel	Station	Drainage Area Sq. Mi.	3 - Yr. Freq. Capacity cfs[1] Req'd	Design	Water Surface Elev.	Hydraulic Gradient (ft./ft.)	Channel Dimensions Bottom Width (ft.)	Grade (%)	Elevation (ft. msl)	Side Slopes	"n" Value Aged	As Built	Velocities Aged	As Built	Excavation Cu. Yds.	Inventory of Channel Work[2] Type of Work	Type of Ch. Pr. To Proj.	Flow Cond. Pr. To Proj.
L-7B	180+00	1.02	46	48	75.3	.00025	9	.05	71.7	1.5:1	.045	.025	0.93	1.94		II	M	E
	2+00	4.74	164	167	67.7	.00025	12	.05	61.9	1.5:1	.040	.025	1.29	2.49	52,397	II	M	E
	0+00	4.74	164	167	69.7	.00025		A=120	P=33		.040	.040	1.29	1.29		VI	M	E
L-7C	626+00	3.33	123	115	72.6	.00005		A=139	P=50		.025	.025	0.82	0.82		IV	M	E
	528+67	18.07	502	535	72.0	.00005		A=427	P=68		.028	.028	1.25	1.25		IV	M	E
	490+50	18.31	508	535	71.8	.00005		A=427	P=68		.028	.028	1.25	1.25		IV	M	S
	474+40	27.70	765	806	71.8	.00005		A=540	P=73		.027	.027	1.49	1.49		IV	M	IS
	6+70					In Lake										VI	M	PrS
	0+00	41.2	995	1,009	69.0	.0001		A=716	P=149		.030	.030	1.41	1.41		IV	M	PrS
L-7C1	121+35	.04	4	5	76.0	.00005	5	.04	74.0	1.5:1	.045	.025	0.28	0.64		II	M	E
	2+64	1.42	61	63	75.0	.00005	10	.04	69.3	1.5:1	.040	.025	0.60	1.07	25,168	II	M	E
	0+00	1.42	61	63	75.0	.00005		A=106	P=31		.040	.040	0.60	0.60		VI	M	E
L-7C1A	53+23	0.03	3	14	79.5	.0007	4	.07	77.5	1.5:1	.045	.025	1.01	2.34		I	O	E
	0+00	0.33	18	19	75.8	.0007	4	.07	73.5	1.5:1	.045	.025	1.09	2.45	12,367	I	O	E
L-7C2A	24+22	.02	2	12	74.7	.0005	4	.06	72.7	1.5:1	.045	.025	0.86	1.98		II	M	E
	6+00	0.13	8	12	73.5	.0005	4	.06	71.5	1.5:1	.045	.025	0.86	1.98	2,294	II	M	E
	0+00	0.14	9	12	73.1	.0005		A=14	P=11		.045	.045	0.86	0.86		IV	M	E
L-7C2B	22+35	0.16	10	13	77.6	.0006	4	.05	75.6	1.5:1	.045	.025	0.94	2.16		I	O	E
	10+00	0.23	14	14	77.0	.0006	4	.05	74.9	1.5:1	.045	.025	0.96	2.20	7,867	I	O	E
	0+00	0.33	18	19	76.3	.0006		A=18	P=13		.045	.045	1.03	1.03		VI	M	E
L-7C3	100+04	0.08	6	9	77.4	.0003	4	.05	75.4	1.5:1	.045	.025	0.66	1.53		II	M	E
	10+00	0.78	37	38	73.0	.0006	7	.05	70.2	1.5:1	.045	.025	1.21	2.57	11,245	II	M	E
	0+00	0.80	38	39	72.2	.002		A=20	P=14		.045	.045	1.91	1.91		VI	M	E
L-7C4	130+00	0.09	6	15	76.3	.0008	4	.10	74.3	1.5:1	.045	.025	1.08	2.50		I	O	E
	115+00	0.30	20	22	75.1	.0008	4	.10	72.7	1.5:1	.045	.025	1.19	2.66		I	O	E
	9+00	2.48	98	98	72.8	.00015	14	.04	68.1	1.5:1	.040	.025	0.99	1.82	39,182	II	M	E
	0+00	2.50	98	357	70.8	.002		A=99	P=31		.040	.040	3.61	3.61		VI	M	E
L-7C4A	20+70	0.05	5	21	77.4	.0015	4	.14	75.4	1.5:1	.045	.025	1.48	3.42		I	O	E
	0+00	0.13	8	21	74.4	.0015	4	.14	72.4	1.5:1	.045	.025	1.48	3.42	2,614	I	O	E
L-7C4B	20+52	0.12	8	9	74.3	.00015	4	.07	72.0	1.5:1	.045	.025	0.50	1.14		II	M	E
	0+00	0.33	18	18	73.8	.00015	5	.07	70.7	1.5:1	.045	.025	0.61	1.30	1,454	II	M	E
L-7C5	79+37	0.22	13	26	79.7	.0023	4	.14	77.7	1.5:1	.045	.025	1.84	3.64		II	M	E
	8+00	0.81	38	39	71.5	.00015	9	.14	67.8	1.5:1	.045	.025	0.74	1.52	12,743	II	M	E
L-7C6	156+88	0.03	3	15	81.5	.0008	4	.10	79.5	1.5:1	.045	.025	1.08	2.50		II	M	E
	120+50	0.57	28	32	78.4	.0008	5	.10	75.7	1.5:1	.045	.025	1.31	2.86		II	M	E
	72+00	1.13	50	53	75.2	.0006		A=41	P=20		.045	.045	1.30	1.30		VI	M	E
	16+00	2.84	108	110	74.0	.00015	14	.04	69.0	1.5:1	.040	.025	1.02	1.86	11,414	II	M	E
	0+00	2.90	110	110	73.8	.00015		A=108	P=32		.040	.040	1.02	1.02		VI	M	E
L-7C6A	38+43	0.22	13	13	78.0	.0003	4	.07	75.6	1.5:1	.045	.025	0.73	1.63		II	M	E
	0+00	0.85	40	42	76.6	.0003	7	.07	73.1	1.5:1	.045	.025	0.97	2.03	3,970	II	M	E
L-7C6B	29+88	0.03	3	15	80.8	.0008	4	.08	78.8	1.5:1	.045	.025	1.08	2.50		II	M	E
	0+00	0.16	10	15	78.2	.0008	4	.08	76.2	1.5:1	.045	.025	1.08	2.50	1,513	II	M	E
L-7C8	210+44	4.45	162	176	78.2	.00015	20	.01	72.7	1.5:1	.040	.025	1.13	2.05		II	M	E
	86+80	6.80	222	226	76.2	.00015	20	.01	70.3	1.5:1	.035	.025	1.33	2.11	38,330	II	M	E
	34+72	8.02	255	298	75.4	.00015		A=210	P=47		.035	.035	1.42	1.42		IV	M	I
	0+00	8.96	280	415	74.9	.00015		A=512	P=116		.060	.060	0.81	0.81		VI	M	I

Channel	Station	Drainage Area Sq. Mi.	3 - Yr. Freq. Capacity cfs[1] Req'd	Design	Water Surface Elev.	Hydraulic Gradient (ft./ft.)	Channel Dimensions Width (ft.)	Bottom Grade (%)	Bottom Elevation (ft. msl)	Side Slopes	"n" Value Aged	"n" Value As Built	Velocities Aged	Velocities As Built	Excavation Cu. Yds.	Inventory of Channel Work[2] Type of Work	Type of Ch. Pr. To Proj.	Flow Cond. Pr. To Proj.
L-7C8C	129+00	0.07	5	12	85.5	.00025	6	.06	83.5	1.5:1	.045	.025	0.64	1.48		II	M	E
	43+24	1.29	56	57	81.2	.0007	9	.06	78.2	1.5:1	.045	.025	1.41	3.15	10,548	II	M	E
	0+00	1.86	76	76	78.2	.0007		A=50	P=35		.045	.045	1.53	1.53		VI	M	E
L-7C8D	14+82	1.02	46	50	79.8	.001	7	.11	77.0	1.5:1	.045	.025	1.56	3.41		II	M	E
	3+00	1.03	46	50	78.2	.001	7	.11	75.3	1.5:1	.045	.025	1.56	3.41	233	II	M	E
	0+00	1.19	52	53	78.2	.001		A=33	P=17		.045	.045	1.60	1.60		VI	M	E
L-7C9	29+00	0.02	2	15	80.4	.0008	4	.06	78.4	1.5:1	.045	.025	1.08	2.50		II	M	E
	10+00	0.25	15	15	79.2	.0008	4	.06	77.2	1.5:1	.045	.025	1.08	2.50	1,161	II	M	E
	0+00	0.41	22	24	78.0	.0008		A=19	P=12.75		.045	.045	1.22	1.22		VI	M	E
L-7C10	203+85	0.57	28	30	73.5	.00005	8	.01	69.5	1.5:1	.040	.025	0.48	0.91		II	M	E
	190+00	0.57	28	30	73.4	.00005	12	.01	69.2	1.5:1	.040	.025	0.50	0.97		II	M	E
	148+25	1.26	55	57	73.1	.00005	12	.04	68.1	1.5:1	.040	.025	0.58	1.06		I	O	E
	75+00	2.34	92	660	72.5	.00005		A=1,620	P=248		.090	.090	0.41	0.41		VI	N	S
	30+00	2.96	111	108	72.3	.00005		A=242	P=78		.050	.050	0.44	0.44		VI	M	E
	0+00	3.80	136	132	72.1	.00005		A=163	P=41		.035	.035	0.81	0.81	33,200	VI	M	E
L-7C10B	34+43	0.36	19	19	73.8	.00005	8	.02	70.2	1.5:1	.040	.025	0.40	0.86		II	M	E
	0+00	0.57	28	28	73.5	.00005	8	.02	69.4	1.5:1	.040	.025	0.49	0.92	2,400	II	M	E
L-7C11	122+30	0.42	22	23	77.0	.00015	8	.02	74.3	1.5:1	.045	.025	0.70	1.32		II	M	E
	55+60	1.56	59	61	76.5	.00015	10	.02	72.6	1.5:1	.040	.025	0.98	1.61	31,259	II	M	E
	0+00	1.19	52	50	75.4	.00015		A=57	P=23		.040	.040	0.85	0.85		VI	M	E
L-7C11A	41+25	0.06	5	7	79.3	.00015	4	.05	77.3	1.5:1	.045	.025	0.47	1.08		II	M	E
	0+00	0.34	19	19	78.5	.00015	5	.05	75.3	1.5:1	.045	.025	0.62	1.32	3,486	II	M	E
L-7C12	326+93	0.06	5	9	86.2	.0003	4	.05	84.2	1.5:1	.045	.025	0.66	1.53		I	O	E
	310+18	0.18	13	13	85.7	.0003	4	.05	83.3	1.5:1	.045	.025	0.73	1.63		I	O	E
	263+42	0.48	25	26	84.9	.00015	7	.04	81.6	1.5:1	.045	.025	0.66	1.40	7,456	II	M	E
	23+70	7.99	255	386	74.5	.00085		A=237	P=70		.060	.060	1.63	1.63		VI	M	I
	0+00	8.31	263	364		.00085		A=153	P=47		.040	.040	2.38	2.38		IV	M	I
L-7C12A	130+00															II	M	E
	0+00	1.69				Estimated									19,741	II	M	E
L-7C12B	56+00	0.14	9	13	85.7	.0006	4	.08	83.7	1.5:1	.045	.025	0.94	2.16		II	M	E
	0+00	0.98	45	45	82.4	.0004	7	.08	79.0	1.5:1	.045	.025	1.10	2.32	4,816	II	M	E
L-7C12C	56+25	0.17	11	15	87.2	.0015	4	.09	85.2	1.5:1	.045	.025	1.48	3.42		II	M	E
	0+00	0.64	31	32	83.1	.0006	5	.09	80.2	1.5:1	.045	.025	1.18	2.54		II	M	E
L-7C12D	42+92	0.37	20	21	84.4	.00005	7	.09	80.5	1.5:1	.045	.025	0.42	0.86		I	O	E
	29+00	0.92	47	49	84.3	.00005	10	.09	79.3	1.5:1	.040	.025	0.56	1.02		I	O	E
	0+00	1.58	66	70	84.2	.00005	12	.02	78.6	1.5:1	.040	.025	0.61	1.10	14,306	II	M	E
L-7C12D1	28+58	0.16	10	10	84.5	.0001	7	.05	82.3	1.5:1	.045	.025	0.44	0.99		II	M	E
	0+00	0.42	22	23	84.2	.0001	7	.05	80.8	1.5:1	.045	.025	0.55	1.16	3,799	II	M	E
L-7C13	32+78	0.12	8	21	80.3	.0015	4	.15	78.3	1.5:1	.045	.025	1.48	3.42		I	O	E
	9+50	0.31	17	21	76.8	.0015	4	.15	74.8	1.5:1	.045	.025	1.48	3.42	7,124	I	O	E
	0+00	0.82	39	44	75.5	.0015		A=24	P=15	1.5:1	.045	.045	1.79	1.79		VI	M	E
L-7C14	123+70	0.04	4	21	83.2	.0015	4	.14	81.2	5:1	.045	.025	1.48	3.42		II	M	E
	74+77	0.36	19	20	77.7	.0001	7	.14	74.5	1.5:1	.045	.025	0.53	1.13		II	M	E
	43+08	2.81	107	108	77.5	.0001	12	.10	71.6	1.5:1	.040	.025	0.88	1.58		I	O	E
	0+00	3.30	121	124	76.8	.0001	12	.02	70.5	1.5:1	.040	.025	0.92	1.63	48,319	II	N	E
L-7C14A	40+00	0.28	16	17	79.4	.0003	7	.04	77.2	1.5:1	.045	.025	0.76	1.72		II	M	E
	6+38	0.60	30	31	78.4	.0003	7	.04	75.4	1.5:1	.045	.025	0.89	1.91	3,900	II	M	E

Channel	Station	Drainage Area Sq. Mi.	3 - Yr. Freq. Capacity cfs[1/] Req'd	3 - Yr. Freq. Capacity cfs[1/] Design	Water Surface Elev.	Hydraulic Gradient (ft./ft.)	Channel Dimensions Bottom Width (ft.)	Channel Dimensions Bottom Grade (%)	Channel Dimensions Bottom Elevation (ft. msl)	Side Slopes	"n" Value Aged	"n" Value As Built	Velocities Aged	Velocities As Built	Excavation Cu. Yds.	Inventory of Channel Work[2/] Type of Work	Inventory of Channel Work[2/] Type of Ch. Pr. To Proj.	Inventory of Channel Work[2/] Flow Cond. Pr To Proj
L-7C148	79+00	0.13	8	24	82.4	.002	4	.31	80.4	1.5:1	.045	.025	1.71	3.95		I	O	E
	62+00	0.28	39	39	78.9	.00015	9	.31	75.2	1.5:1	.045	.025	0.73	1.52		I	O	E
	0+00	1.70	70	71	77.7	.00015	11	.03	73.3	1.5:1	.040	.025	0.92	1.68	34,519	II	M	E
L-7C15	165+00	9.47	348	381		.00015	A=353		P=69		.050	.050	1.08	1.08		VI	N	E
	80+00	10.54	375	475		.00015	A=413		P=74		.050	.050	1.15	1.15		VI	N	E
	0+00	11.19	390	631		.00015	A=679		P=169		.050	.050	0.93	0.93		VI	N	S
L-7C15A	33+40	0.05	4	5	80.0	.0001	4	.08	78.0	1.5:1	.045	.025	0.38	0.88		II	M	E
	0+00	0.71	35	38	79.7	.0001	7	.08	75.5	1.5:1	.045	.025	0.69	1.26	1,197	II	M	E
L-7C15A1	13+20	0.10	6	17	81.2	.001	4	.10	79.2	1.5:1	.045	.025	1.21	2.79		II	M	E
	0+00	0.25	15	17	79.9	.001	4	.10	77.9	1.5:1	.045	.025	1.21	2.79	1,273	II	M	E
L-7C15B	11+42	.09	6	12	84.1	.0005	4	.05	82.1	1.5:1	.045	.025	0.86	1.98		II	M	E
	0+00	.10	6	12	83.5	.0005	4	.05	81.5	1.5:1	.045	.025	0.86	1.98	574	II	M	E
L-7C15C	51+14	1.10	59	282	81.6	.0007	A=206		P=55		.070	.070	1.35	1.35		VI	M	E
	0+00	1.42	76	147	80.0	.00015	A=207		P=45		.070	.070	0.71	0.71		VI	M	E
	-10+58	9.47	348	356	79.8	.00015	20	.01	72.3	1.5:1	.035	.022	1.52	2.41	1,000	II	M	E
L-7C15C1	16+08	0.29	19	33	81.2	.00025	A=30		P=12		.040	.040	1.08	1.08		IV	M	E
	0+00	0.66	37	80	80.8	.00025	A=68		P=24		.040	.040	1.17	1.17		IV	M	E
L-7C15C2	286+72	0.02	1	42	90.2	.0007	6	.09	87.2	1.5:1	.045	.025	1.32	2.39		II	M	E
	255+00	0.02	1	42	87.9	.0007	6	.09	84.9	1.5:1	.045	.025	1.32	2.39		II	M	E
	205+00	0.59	34	40	84.7	.0007	A=39		P=20		.060	.060	1.95	1.95		VI	M	E
	0+00	7.34	278	291	79.9	.0001	20	.03	72.7	1.5:1	.035	.025	1.24	1.73	92,300	II	M	E
L-7C15C2B	143+50	0.02	1	25	86.7	.00025	6	.02	83.7	1.5:1	.045	.025	0.79	1.66		II	M	E
	39+74	0.73	40	47	83.6	.0004	8	.04	80.3	1.5:1	.045	.025	1.10	2.27	17,100	II	M	E
	0+00	0.89	48	47	82.0	.0004	A=46		P=24		.045	.045	1.02	1.02		IV	M	E
L-7C15C2C	77+56	0.06	5	32	85.0	.0004	6	.04	82.0	1.5:1	.045	.025	1.00	2.10		II	M	E
	0+00	0.63	36	38	81.9	.0004	6	.04	78.6	1.5:1	.045	.025	1.05	2.18	6,600	II	M	E
L-7C15C2D	102+00	0.03	3	68	87.0	.0018	6	.04	84.0	1.5:1	.045	.025	2.13	3.83	*	II	M	E
	0+00	0.78	43	45	82.5	.0007	6	.04	79.4	1.5:1	.045	.025	1.35	2.82	13,133	II	M	E
L-7C15C2E	38+24	0.02	1	33	86.0	.00045	6	.04	83.0	1.5:1	.045	.025	1.06	2.23		II	M	E
	0+00	0.26	17	33	84.3	.00045	6	.04	81.3	1.5:1	.045	.025	1.06	2.23	3,600	II	M	E
L-7C15C2F	37+69	0.02	1	25	87.0	.00025	6	.03	84.0	1.5:1	.045	.025	0.79	1.66		II	M	E
	0+00	0.45	27	30	86.1	.00025	6	.03	82.8	1.5:1	.045	.025	2.01	1.73	3,200	II	M	E
L-7C15C2G	105+10	0.02	1	19	86.6	.00015	6	.01	83.6	1.5:1	.045	.025	0.61	1.29		I	O	E
	81+00	0.02	1	19	86.2	.00015	6	.01	83.2	1.5:1	.045	.025	0.61	1.29		I	O	E
	0+00	1.52	75	76	84.9	.00015	8	.01	79.8	1.5:1	.040	.025	0.95	1.69	12,200	II	M	E
L-7C15C2G1	10+00	0.11	8	32	87.0	.0007	4	.07	84.0	1.5:1	.045	.025	1.25	2.64		II	M	E
	0+00	0.12	9	32	86.3	.0007	4	.07	83.3	1.5:1	.045	.025	1.25	2.64	1,400	II	M	E
L-7C15C2G2	30+20	0.03	3	17	86.1	.0002	4	.03	83.1	1.5:1	.045	.025	0.67	1.21		I	O	E
	0+00	0.24	16	17	85.5	.0002	4	.03	81.9	1.5:1	.045	.025	0.67	1.52	6,500	I	O	E
L-7C15C2-G2A	12+46	0.02	2	17	86.0	.0002	4	.02	83.0	1.5:1	.045	.025	0.67	1.41		II	M	E
	0+00	0.04	4	17	85.8	.0002	4	.02	82.8	1.5:1	.045	.025	0.67	1.41	1,500	II	M	E
L-7C15C2-G3	30+19	0.03	3	17	87.0	.0002	4	.02	84.0	1.5:1	.045	.025	0.67	1.41		I	O	E
	0+00	0.09	7	17	86.4	.0002	4	.02	83.4	1.5:1	.045	.025	0.67	1.41	5,400	I	O	E
L-7C15C3	36+00	0.04	4	19	85.8	.00025	4	.03	82.8	1.5:1	.045	.025	0.75	1.58		II	M	E
	0+00	0.34	22	25	85.0	.00025	4	.03	81.4	1.5:1	.045	.025	0.79	1.70	1,700	II	M	E

Channel	Station	Drainage Area Sq. Mi.	3 - Yr. Freq. Capacity cfs[1/] Req'd	Design	Water Surface Elev.	Hydraulic Gradient (ft./ft.)	Channel Dimensions Width (ft.)	Bottom Grade (%)	Elevation (ft. msl)	Side Slopes	"n" Value Aged	As Built	Velocities Aged	As Built	Excavation Cu. Yds.	Inventory of Channel Work[2/] Type of Work	Type of Ch. Pr. To Proj.	Flow Cond. Pr To Proj
L-7C16	121+09	0.13	8	24	79.0	.002	4	.05	77.0	1.5:1	.045	.025	1.71	3.95		II	M	S
	28+00	1.10	48	77	76.8	.0001	10	.05	72.6	1.5:1	.040	.025	0.72	1.34		II	M	S
	0+00	2.34	72	92	76.2	.0001	12	.06	70.8	1.5:1	.040	.025	0.85	1.53	44,015	II	M	E
L-7C16A	26+15	0.15	10	10	79.3	.00025	4	.04	77.3	1.5:1	.045	.025	0.62	1.44		II	M	E
	0+00	0.28	16	17	78.6	.00025	4	.04	76.0	1.5:1	.045	.025	0.72	1.58	818	II	M	E
L-7C17	75+40	0.06	5	5	76.6	.0001	4	.07	74.6	1.5:1	.045	.025	0.38	0.88		II	M	E
	0+00	4.98	171	174	75.4	.0001	20	.07	69.7	1.5:1	.035	.025	1.07	1.70	54,148	II	M	E
L-7C17A	126+35	0.10	6	12	78.9	.0005	4	.06	76.9	1.5:1	.045	.025	0.86	1.98		II	M	E
	0+00	4.32	153	158	75.6	.0001	14	.06	69.3	1.5:1	.035	.025	1.07	1.67	47,675	II	M	E
L-7C17A1	31+00	0.22	13	14	76.7	.0001	4	.07	74.7	1.5:1	.045	.025	0.92	0.88		II	M	E
	0+00	0.66	32	32	76.4	.0001	7	.07	72.3	1.5:1	.045	.025	0.60	1.24	4,386	II	M	E
L-7C17A2	53+48	0.37	20	21	77.5	.00025	7	.06	74.9	1.5:1	.045	.025	0.75	1.66		II	M	E
	0+00	2.07	82	82	76.4	.0001	12	.06	71.3	1.5:1	.040	.025	0.82	1.49	11,156	II	M	E
L-7C18	37+30	0.01	2	9	79.2	.0003	4	.08	77.2	1.5:1	.045	.025	0.66	1.53		II	M	E
	0+00	0.24	15	16	78.0	.0003	5	.08	75.6	1.5:1	.045	.025	0.75	1.68	5,648	II	M	E
L-7C19	57+49	0.92	48	48	77.9	.0002	9	.02	74.1	1.5:1	.045	.025	0.85	1.78		II	M	E
	0+00	1.46	62	62	76.8	.0002	9	.02	72.7	1.5:1	.040	.025	1.00	1.83	2,053	II	M	E
L-7C19A	41+17	0.11	7	10	78.8	.0002	6	.05	76.8	1.5:1	.045	.025	0.57	1.32		I	O	E
	24+55	0.27	15	16	78.4	.0002	6	.05	75.9	1.5:1	.045	.025	0.64	1.43		I	O	E
	0+00	0.39	21	21	78.0	.0002	7	.02	75.3	1.5:1	.045	.025	0.69	1.51	8,270	II	M	E
L-7C20	30+49	0.08	6	8	77.2	.0002	4	.05	75.2	1.5:1	.045	.025	0.54	1.25		II	M	E
	0+00	0.42	22	24	76.6	.0002	7	.05	73.7	1.5:1	.045	.025	0.71	1.54	2,682	II	M	E
L-7CC	346+48	2.07	83	117	73.2	.0001	A=134		P=37		.040	.040	0.87	0.87		VI	M	S
	319+40	3.12	116	117	72.8	.0001	A=134		P=37		.040	.040	0.87	0.87		VI	M	S
	170+00	13.47	404	431	71.0	.0001	A=297		P=59		.030	.030	1.45	1.45		VI	M	IS
	142+00	13.75	400	431	70.8	.0001	36	.01	64.3	1.5:1	.030	.022	1.45	2.22		II	M	IS
	118+64	13.81	402	431	70.5	.0001	A=297		P=59		.030	.030	1.45	1.45		VI	M	IS
	0+00	46.18	1,097	1,113	69.4	.0001	40	.04	59.9	1.5:1	.025	.020	2.16	3.04	116,200	II	M	IS
L-7CC1	50+00	2.78	105	110	71.4	.00005	12	.02	64.8	1.5:1	.035	.022	0.76	1.33		II	M	E
	0+00	3.50	128	131	71.0	.00005	12	.02	63.8	1.5:1	.035	.022	0.80	1.38	14,242	II	M	E
L-7CC2	103+25	1.76	73	92	75.9	.00075	A=57		P=24		.045	.045	1.62	1.62		VI	M	S
	88+00	1.76	73	92	75.8	.00075	A=57		P=24		.045	.045	1.62	1.62		VI	M	S
	56+00	2.75	104	106	71.9	.0001	A=122		P=34		.040	.040	0.87	0.87		VI	M	E
	0+00	3.10	115	121	71.2	.0001	14	.01	65.3	1.5:1	.040	.025	0.90	1.62	7,246	II	M	E
L-7CC2A	45+00	0.17	11	20	82.7	.0014	4	.01	80.7	1.5:1	.045	.025	1.43	3.31		II	M	E
	36+00	0.17	11	20	82.6	.0014	4	.01	80.6	1.5:1	.045	.025	1.43	3.31		II	M	E
	24+00	0.34	19	20	79.8	.0014	4	.23	77.8	1.5:1	.045	.025	1.43	3.31		I	O	E
	0+00	0.49	26	29	76.5	.0014	4	.15	74.1	1.5:1	.045	.025	1.58	3.52	5,613	II	N	E
L-7CC3	28+00	1.65	68	69	73.5	.0001	10	.01	68.5	1.5:1	.040	.025	0.79	1.44		I	O	E
	7+55	1.65	68	69	73.4	.0001	10	.01	68.4	1.5:1	.040	.025	0.79	1.44		I	O	E
	0+00	1.80	74	75	73.3	.0001	10	.01	68.1	1.5:1	.040	.025	0.81	1.46	6,689	II	M	E
L-7D	109+00	1.30	56	58	77.9	.00075	7	.08	74.6	1.5:1	.045	.025	1.48	3.14		II	M	E
	6+00	2.85	108	110	69.5	.0007	9	.08	65.6	1.5:1	.040	.025	1.84	3.39	6,000	II	M	E
	0+00	3.50	127	133	69.6	.0007	A=69		P=25		.040	.040	1.93	1.93		VI	M	E
L-7D1	66+20	0.14	9	29	82.8	.003	4	.10	80.8	1.5:1	.045	.025	2.09	3.77		I	O	E
	0+00	0.87	41	42	77.0	.00045	4	.10	73.2	1.5:1	.045	.025	1.14	2.44	12,585	I	O	E
L-7E	47+82	0.30	17	17	77.3	.0006	4	.08	75.0	1.5:1	.045	.025	1.01	2.27		I	O	E
	0+00	0.92	43	43	74.4	.0006	7	.08	71.4	1.5:1	.045	.025	1.26	2.71	8,769	I	O	E

Channel	Station	Drainage Area Sq. Mi.	3 - Yr. Freq. Capacity cfs[1/] Req'd	3 - Yr. Freq. Capacity cfs[1/] Design	Water Surface Elev.	Hydraulic Gradient (ft./ft.)	Channel Dimensions Width (ft.)	Channel Dimensions Bottom Grade (%)	Channel Dimensions Bottom Elevation (ft. msl)	Channel Dimensions Side Slopes	"n" Value Aged	"n" Value As Built	Velocities Aged	Velocities As Built	Excavation Cu. Yds.	Inventory of Channel Work[2/] Type of Work	Inventory of Channel Work[2/] Type of Ch. Pr. To Proj	Inventory of Channel Work[2/] Flow Cond. Pr. To Proj.
L-7F	36+00	0.10	6	15	76.8	.0008	4	.01	74.8	1.5:1	.045	.025	1.08	2.50		II	M	E
	30+00	0.10	6	15	76.7	.0008	4	.01	74.7	1.5:1	.045	.025	1.08	2.50		II	M	E
	23+00	0.21	12	15	75.9	.0008	4	.11	73.9	1.5:1	.045	.025	1.08	2.50		II	M	S
	0+00	0.34	19	20	73.3	.0011	4	.11	71.2	1.5:1	.045	.025	1.30	2.54	2,182	II	M	E
L-7G	26+00	2.27	90	92	75.0	.0004	9	.07	70.8	1.5:1	.040	.025	1.43	2.61		II	M	E
	6+00	2.92	111	113	74.2	.0004	10	.07	69.7	1.5:1	.040	.025	1.50	2.76	2,663	II	M	E
	0+00	2.98	112	113	73.9	.0004		A=75	P=26		.040	.040	1.50	1.50		VI	M	E
L-7H	54+00	0.52	26	26	79.0	.00085	5	.09	76.6	1.5:1	.045	.025	1.27	2.82		II	M	E
	0+00	1.57	66	77	75.5	.0004	7	.09	71.3	1.5:1	.040	.025	1.38	2.52	5,491	II	M	E
L-7I	57+00	0.11	7	13	78.2	.00055	4	.08	76.2	1.5:1	.045	.025	0.90	2.07		II	M	E
	0+00	0.94	43	44	75.8	.0002	7	.08	71.8	1.5:1	.045	.025	0.84	1.74	8,283	II	M	E
M-8	64+00	0.28	16	17	76.3	.001	4	.09	74.3	1.5:1	.045	.025	1.21	2.79		II	M	E
	3+00	1.54	65	75	74.3	.0001	8	.09	68.7	1.5:1	.040	.025	0.82	1.49	11,433	II	M	E
	0+00	1.54	65	75	74.3	.0001		A=92	P=28		.040	.040	0.82	0.82		VI	M	E
M-9	47+80	0.28	16	17	72.6	.00025	5	.05	70.0	1.5:1	.045	.025	0.72	1.58		II	M	S
	18+00	0.70	33	36	71.5	.00025	7	.05	68.1	1.5:1	.045	.025	0.87	1.83		II	M	S
	7+00	0.75	36	38	71.2	.00025	7	.05	67.7	1.5:1	.045	.025	0.88	1.85	7,007	II	M	E
	0+00	0.81	38	40	71.0	.00025		A=45	P=20		.045	.045	0.89	0.89		VI	M	E
M-10	58+60	0.50	26	32	71.3	.0008	4	.10	68.9	1.5:1	.045	.025	1.17	2.66		II	M	E
	34+00	0.94	43	50	66.2	.0008	6	.10	63.5	1.5:1	.045	.025	1.31	2.82		II	M	E
	20+00	1.13	50	52	68.3	.0004	8	.08	65.3	1.5:1	.045	.025	1.01	2.18		II	M	S
	3+00	1.25	54	56	67.7	.0004	7	.09	63.8	1.5:1	.045	.025	1.16	2.44	10,800	II	M	E
	0+00	1.36	58	59	67.4	.0004		A=50	P=21		.045	.045	1.17	1.17		VI	M	E
M-11	62+00	0.10	7	17	80.3	.001	4	.08	78.3	1.5:1	.045	.025	1.21	2.79		II	M	E
	4+00	1.45	70	71	77.5	.0002	8	.08	72.9	1.5:1	.040	.025	1.04	1.90	11,822	II	M	E
	0+00	1.62	70	71	77.4	.0002		A=69	P=25		.040	.040	1.04	1.04		VI	M	E
M-12	98+60	0.17	10	17	79.2	.001	4	.08	77.2	1.5:1	.045	.025	1.21	2.89		I	O	E
	30+00	0.60	29	29	73.0	.0002	8	.08	69.9	1.5:1	.045	.025	0.75	1.62		I	O	E
	20+00	0.60	29	29	72.8	.0002	8	.02	69.7	1.5:1	.045	.025	0.75	1.62	24,400	II	M	E
	10+50	1.15	50	54	72.2	.0002		A=56	P=22		.040	.040	0.97	0.97		IV	M	E
	0+00	1.95	78	77	71.6	.0004		A=56	P=22		.040	.040	0.97	0.97		VI	M	E
M-14	120+00	0.18	12	14	75.0	.0001	7	.05	72.4	1.5:1	.045	.025	0.48	1.05		II	M	S
	80+00	0.93	49	50	74.6	.0001	9	.05	70.2	1.5:1	.040	.025	0.73	1.33		II	M	S
	8+00	2.81	106	106	73.1	.0001	10	.05	66.9	1.5:1	.040	.025	0.89	1.57	36,000	II	M	E
	0+00	3.18	117	121	73.0	.0001		A=131	P=34		.040	.040	0.92	0.92		VI	M	E
M-15	74+92	0.15	9	15	76.2	.0008	4	.12	74.2	1.5:1	.045	.025	1.08	2.50		II	M	E
	32+30	1.01	48	51	72.8	.0008	5	.12	69.4	1.5:1	.045	.025	1.48	3.12	8,400	II	M	E
	0+00	1.14	50	51	71.0	.0008		A=34	P=17		.045	.045	1.48	1.48		VI	M	E
M-16	647+80	13.36	390	415	77.1	.00011	30	.01	70.3	1.5:1	.030	.022	1.52	2.39		II	M	I
	713+50	13.36	390	415	76.4	.00011	30	.01	69.6	1.5:1	.030	.022	1.52	2.39		II	M	I
	1,040+00	25.39	672	672	72.8	.00011	35	.01	64.7	1.5;1	.029	.022	1.76	2.64		II	M	IS
	1,108+00	26.33	687	738	72.0	.00011		A=644	P=174		.035	.035	1.06	1.06		IV	M	IS
	1,153+93	26.83	697	698	71.5	.00011	32	.01	63.4	2.5:1	.030	.022	1.65	2.58	338,600	I	O	E

Coding System for

Inventory of Channel Work

Status	C -	constructed or under contract
	Pl -	planned and in an approved project but not constructed or under contract
Type of Work	I -	establishment of new channel including necessary stabilization measures
	II -	enlargement of realignment of existing channel or stream
	III -	cleaning out natural or manmade channel (includes bar removal and major clearing and snagging operation)
	IV -	clearing and removal of loose debris within channel section
	V -	stabilization, by continuous treatment or localized problem areas, as primary purpose (present capacity adequate)
	VI -	present capacity adequate, no work proposed
Type of Channel Prior to Project	N -	an unmodified, well-defined natural channel or stream
	M -	manmade ditch or previously modified channel
	O -	no or practically no defined channel
Flow Condition	Pr -	perennial: flow at all times except during extreme drought
	I -	intermittent: continuous flow during some seasons of the year but little or no flow during other seasons
	E -	ephemeral: flow only during periods of surface runoff, otherwise dry
	S -	ponded water: no noticeable flow, caused by lack of outlet or high ground-water table

TABLE 3A - STRUCTURAL DATA
STRUCTURES FOR WATER CONTROL (WEIRS)
WALNUT-ROUNDAWAY WATERSHED, LOUISIANA

Weir No.	Channel	Station 1/	Elevation of HG (ft. msl)	Height (ft.)	Crest Elevation (ft. msl)	Depth (ft.) 2/	Crest Width (ft.)	Side Slope	Length (ft.)
3	M-6	620+00	70.6	2.3	66.0	4.6	44	2:1	78
5	L-6M	140+00	78.0	2.1	73.9	4.1	69	2:1	101

1/ Location of weirs are approximate. Final locations will be determined during construction stage.

2/ Difference between hydraulic gradient and crest elevations.

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TABLE 3B - STRUCTURAL DATA
STRUCTURES FOR WATER CONTROL
(STOP LOG WEIRS)
Walnut-Roundaway Watershed, Louisiana

Weir No.	Channel	Station 1/	Elevation of HG (ft. msl)	Drainage Area (acre)	Design Flow (cfs)	Stop Log Crest Elevation (ft. msl)	Stop Log Length (ft.)	Weir Crest Elevation (ft. msl)	Weir Crest Length (ft.)	Side Slope	Length (ft.)
1	M-6	456+00	68.4	25,600	973	63.0	20	65.0	61	2:1	95
2	M-6	1130+00	79.3	6,190	251	74.0	10	78.0	36	2:1	53
4	M-6A	17+00	77.1	17,200	700	72.5	20	75.0	80	2:1	110

1/ Locations of stop log weirs are approximate. Final locations will be determined during construction stage.

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TABLE 3C - STRUCTURAL DATA
WATER CONTROL STRUCTURES
Walnut-Roundaway Watershed, Louisiana

Structure Number	Drainage Area	Design Capacity	Conduit I.D.	Inlet Elevation
1	300	30	36 in.	73.0
2[1/]	20,467	808	8 ft.	71.7

[1/] Existing structure to be modified by increasing weir length.

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TABLE 3D - STRUCTURAL DATA
EARTHFILL DAMS
Walnut-Roundaway Watershed, Louisiana

Structure Number	Top Width (ft.)	Side Slopes (ft./ft.)	Material Fill Height (ft.)	Quantity (cu. yds.)
1	20	3:1	22	9,720
2	12	3:1	9	800
4	12	3:1	15	3,050
5	10	3:1	12	860

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TABLE 3E - STRUCTURAL DATA
GRADE STABILIZATION STRUCTURES
Walnut-Roundaway Watershed, Louisiana

Site No.	Drainage Area (sq. mi.)	Design Capability Principal Spill (cfs)	Association, Frequency and Duration of Storm (% chance & hours)	Drop (ft.)	Volume of Concrete (cu. yds.)	Type of Structure
1	1.7	103	25 - 48	7.4	-	Inlet on culvert
2	27	1,935	10 - 48	11.7	180	Chute

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TABLE 4 - ANNUAL COST

Walnut-Roundaway Watershed, Louisiana

(Dollars)[1/]

Evaluation Unit	Amortization Installation Cost[3/]	Operation and Maintenance Cost	Total
MULTIPLE PURPOSE			
Channel Work With Appurtenances			
East Carroll Parish	30,100	8,100	38,200
Madison Parish	629,500	208,600	838,100
Subtotal - Channels	659,600	216,700	876,300
Grade Stablization Structures	6,700	2,300	9,000
Water Control Structures	3,700	1,200	4,900
Low-Level Weirs	7,000	2,400	9,400
Earthfill Dams	500	600	1,100
Subtotal - Structures[2/]	17,900	6,500	24,400
Subtotal - Structural Measures	677,500	223,200	900,700
Project Administration	111,100	xxx	111,100
Total	788,600[3/]	223,200	1,011,800

[1/] Price base: 1976

[2/] All structures to be installed in Madison Parish.

[3/] 50 years @ 4 7/8 percent interest (.05372) for Madison Parish portion and 6 3/8 percent interest (.06679) for East Carroll Parish portion.

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TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Walnut-Roundaway Watershed, Louisiana

(Dollars)[1/]

Item	Estimated Average Annual Damage: Without Project	Estimated Average Annual Damage: With Project	Damage Reduction Benefits
Floodwater			
Agricultural Crop and Pasture	998,600	223,700	774,900
Indirect	99,900	22,400	77,500
TOTAL	1,098,500	246,100	852,400

[1/] Current normalized prices - 1976.

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TABLE 6

COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Walnut-Roundaway Watershed, Louisiana

(Dollars)

Evaluation Unit	Flood Prevention[1/]: Damage Reduction	Flood Prevention[1/]: Intensive Use	Drainage[1/]	Redevelopment[2/]	Secondary[1/]	Total	Average Annual Cost[3/]	Benefit-Cost Ratio
MULTIPLE PURPOSE								
East Carroll Parish								
Channel Work With Appurtenances	56,000	11,300	50,900	7,400	22,500	148,100	38,200	3.9:1
Madison Parish								
Channel Work With Appurtenances, Grade Stabilization Structures, Water Control Structures, Low-Level Weirs, and Earthfill Dams	796,400	160,900	724,000	104,600	319,700	2,105,600	862,500	2.4:1
Subtotal	852,400	172,200	774,900	112,000	342,200	2,253,700	900,700	2.5:1
Project Administration	XXX	XXX	XXX	XXX	XXX	XXX	111,100	XXX
GRAND TOTAL	852,400	172,200	774,900	112,000	342,200	2,253,700	1,011,800	2.2:1

1/ Price base: Current normalized prices - 1976.

2/ Price base: 1976.

3/ Price base: from Table 4.

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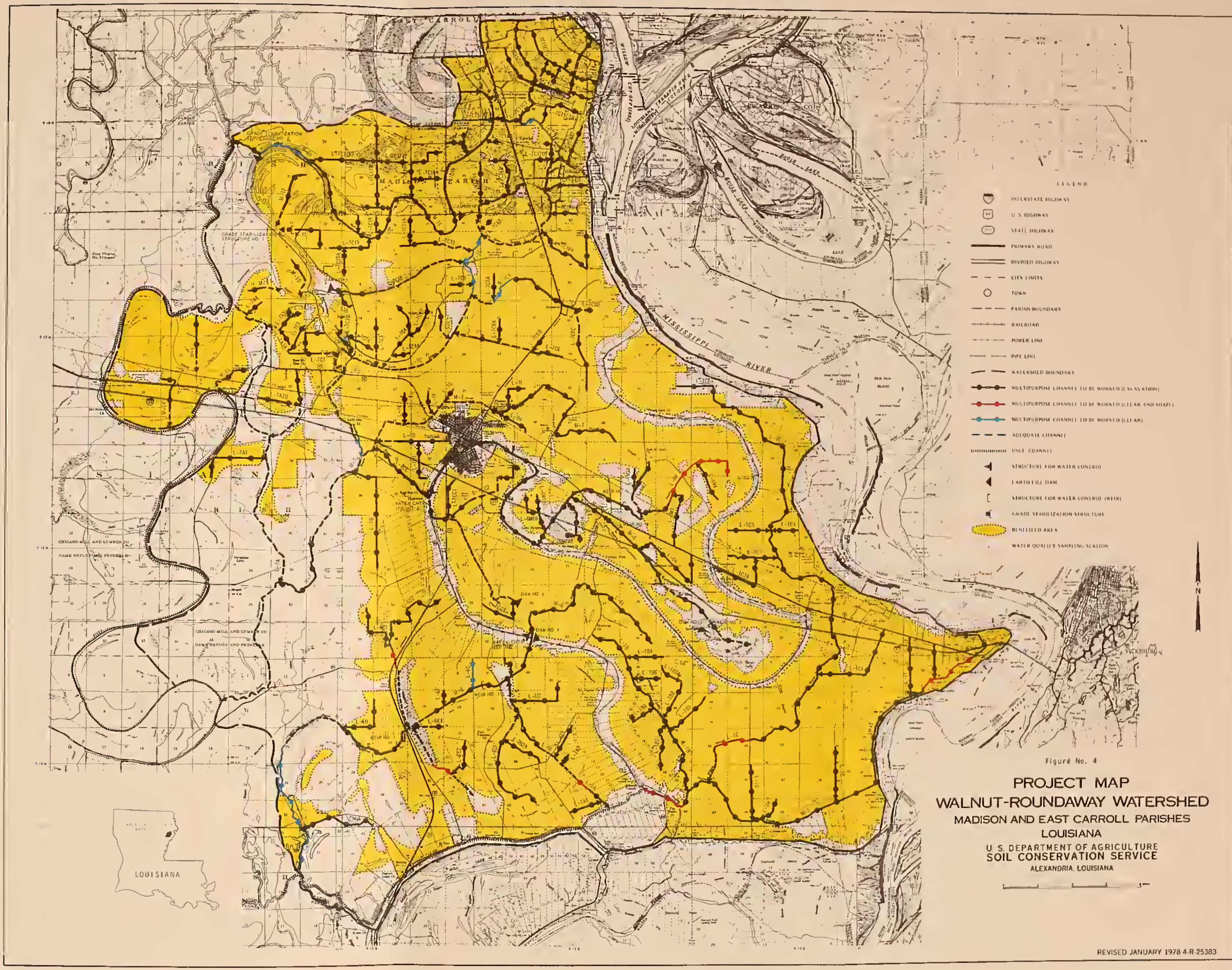

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