Y 4. P96/10 92-13

GOVERNMENT Storage

DOCUMENTS

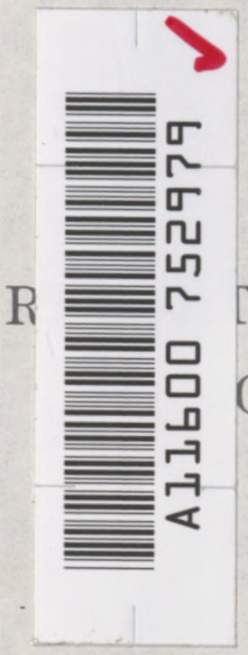
JUN 14 1971

THE LIBRARY
KANSAS STATE UNIVERSITY

92d 1st SESSION

COMMITTEE PRINT

WATERSHED WORK PLAN FOR WEST SECTOR WHITEWATER RIVER WATERSHED, BUTLER, SEDGWICK, AND HARVEY COUNTIES, KANSAS


A11671600 752979

REPORT OF THE SOIL CONSERVATION SERVICE, DEPARTMENT OF AGRICULTURE, IN ACCORDANCE WITH THE PROVISIONS OF PUBLIC LAW 83-566

COMMITTEE ON PUBLIC WORKS
UNITED STATES SENATE

APRIL 1971

SERIAL NO. 92-13



Printed for the use of the Committee on Public Works

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1971

59-848 O

AUTHENTICATED U.S. GOVERNMENT INFORMATION GPO

COMMITTEE ON PUBLIC WORKS

JENNINGS RANDOLPH, West Virginia, *Chairman*

EDMUND S. MUSKIE, Maine
B. EVERETT JORDAN, North Carolina
BIRCH BAYH, Indiana
JOSEPH M. MONTOYA, New Mexico
THOMAS F. EAGLETON, Missouri
MIKE GRAVEL, Alaska
JOHN V. TUNNEY, California
LLOYD BENTSEN, Texas

JOHN SHERMAN COOPER, Kentucky
J. CALEB BOGGS, Delaware
HOWARD H. BAKER, JR., Tennessee
ROBERT J. DOLE, Kansas
J. GLENN BEALL, JR., Maryland
JAMES BUCKLEY, New York
LOWELL P. WEICKER, JR., Connecticut

RICHARD B. ROYCE, *Chief Clerk and Staff Director*
J. B. HUYETT, JR., *Assistant Chief Clerk and Assistant Staff Director*
BARRY MEYER, *Counsel*
BAILEY GUARD, *Minority Staff Director*
TOM C. JORLING, *Minority Counsel*

Professional Staff Members: JOSEPH F. VAN VLADRICKEN, LEON G. BILLINGS, RICHARD D. GRUNDY, JOHN YAGO, HAROLD H. BRAYMAN, RICHARD W. WILSON, PHILIP T. CUMMINGS, JUDY PARENTE, AND RICHARD HEROD

PRELIMINARY CONTENTS

Page

Letter of submittal..... v
Environmental statement..... vii
Comments:
Kansas, State of..... xiii
Army, Department of..... xix
Interior, Department of..... xx
Bureau of Sport Fisheries, report of..... xxii
Health, Education, and Welfare, Department of..... xxxiii
General table of contents..... xxxvii

LETTER OF SUBMITTAL

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

April 15, 1971

Honorable Spiro T. Agnew
President of the Senate
Washington, D. C. 20510

Dear Mr. President:

Pursuant to the authority vested in the President by section 5 of the Watershed Protection and Flood Prevention Act, as amended (16 U.S.C. 1005), and delegated to the Director of the Office of Management and Budget by Executive Order No. 10654 of January 20, 1956, there are transmitted herewith the following plans for works of improvement which have been prepared under the provisions of that Act:

State	Watershed
Georgia	Cedar Creek*
Illinois	Lower McKee Creek*
Illinois	Upper McKee Creek*
Kansas	West Sector Whitewater River
North Dakota	Middle South Branch Forest River (Supplemental)*
Oklahoma	Deep Red Run-Coffin Creek*
Tennessee	Little Bigby Creek*
West Virginia	Mill Creek*

Each of the above listed plans involves at least one structure which provides more than 4,000 acre-feet of total capacity.

Sincerely,

Caspar W. Weinberger
Acting Director

Note: Referred to the Committee on Public Works by the Secretary of the Senate on April 19, 1971, Executive Communication No. 32.
*Printed separately.

ENVIRONMENTAL STATEMENT

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Prepared in Accordance with Section 102(2) (C) of P.L. 91-190

Date: January 1971

Title of Statement: The Effect of the Upstream Watershed Projects for East and West Sector Whitewater River Watersheds, Kansas, Upon Environmental Quality

Authority for Project: Public Law 566, 83rd Congress, 68 Stat. 666, as amended.

Sponsoring Local Organizations: Butler, Marion Sedgwick and Harvey County Soil Conservation Districts; Harvey County; and the Whitewater River Watershed Joint District No. 22

Nature of Action:

The following statement presents the combined information for two interrelated watershed projects on the Whitewater River. Plans for solving water and natural resource problems have been prepared by the above listed sponsors with Federal assistance under the provisions of Public Law 83-566, as amended. The sponsors assume all local responsibilities for the installation, operation and maintenance of planned structural works.

The combined project area for the two watershed plans consists of about 328,000 acres and is located in Butler, Marion, Sedgwick and Harvey Counties, Kansas. Farms in the watershed are diversified, raising wheat, grain sorghums, soybeans and alfalfa. Wheat and soybeans are the principal cash crops with the other crops and hay marketed through livestock. Sixty percent of the land is used for crop production, 30 percent is in grassland, about 3 percent is ir woodland and the remainder is in miscellaneous uses. Even though the area is agriculturally oriented, there is a dense population around the watershed. The largest city nearby is Wichita, about 15 miles to the southwest. There are 1,487 family farming units wholly or partly within the watershed. More than 1,000 of these farms are under agreement with their local soil conservation district to practice soil conservation.

Whitewater River and its tributaries receive moderate fishing usage. Farm ponds furnish poor to excellent quality fishing. Bass, catfish and bluegill are among the more important fish species. Habitat for upland game, fur animals and deer is good to excellent. Bobwhite, pheasant, squirrel, rabbit and dove are the principal upland game species.

There is some waterfowl hunting on farm ponds and on nearby lakes outside the watershed.

There is a need for water-based recreation since the facilities available in and near the watershed are not adequate to serve the 525,000 people who live within a 50-mile radius of the project area. It is estimated that this population will grow to nearly 800,000 by 1980.

Erosion and sediment production is moderate to severe on untreated upland cropland with annual rates averaging 0.4 acre foot per square mile. Several tributaries in the upper reaches of the watershed have relatively high concentrations of calcium sulfate that may effect water quality during periods of low stream flow.

Flooding of bottomland causes widespread damage to crops and fixed improvements. The frequency of damaging floods ranges from about three times a year on the mainstem to once every two years on some of the tributaries. The flood plain area subject to damage is more than 12,600 acres.

The scouring action of floodwaters has reduced the productive capacity on about 2,500 acres of bottomland by almost 20 percent.

Conservation land treatment on much of the land area still needing treatment will be intensified and accelerated during the seven-year project installation period. To supplement this conservation land treatment the projects include 23 floodwater retarding structures and one multiple-purpose floodwater retarding and recreational reservoir with associated recreational facilities.

All construction areas will be revegetated with appropriate grasses and shrubs suitable to control erosion immediately after construction. Contractors will be required to adhere to strict guidelines for minimizing soil erosion, and water and air pollution during construction. Mosquito control precautions will be observed in compliance with State and local health regulations. The plan does not provide for recreational use of floodwater retarding structures. Sponsors will advise the concerned landowners of the need for sanitary facilities in accordance with State and local health regulations if any reservoirs are used for recreation.

Inquiries during planning indicate there will be no places of archeological or historical value that will be affected by installation of the project. The National Park Service will be kept current on construction progress at each site.

Statement:

(i.) Environmental Impact

Conservation land treatment will retard runoff and reduce erosion and soil losses. The reduction in erosion rates will slow down the sedimentation of road ditches, farm ponds and reduce sediment delivery to the downstream Towanda Reservoir, a Corps of Engineers' project.

The combination of land treatment and structural measures will reduce flood damages by about 70 percent. Land in 495 farms, one third of the total number of farm units, will receive direct flood protection benefits by the projects. Flood frequency, depth and duration will be reduced. More dependable use can be made of the flood plain areas which will encourage some needed land use adjustments. Because of the reduced flood hazard, farmers will use improved seed varieties and establish soil building rotations. Farmers will be able to perform tillage, planting and harvesting operations on a timely basis for improved production. Through the technical assistance to be furnished in installing land treatment, farmers will be encouraged to practice improved management techniques in the use of fertilizers and pesticides in order to minimize any possible downstream effects on water quality.

The works of improvement in these projects will provide benefits to Towanda Reservoir. These benefits represent the value of reallocation of storage capacity from floodwater and sediment to water supply purposes made possible by capacity included in the upstream reservoirs.

Multiple-purpose reservoir No. 14 (West Sector Whitewater River Watershed project) will provide 230 surface acres of lake fishery. The development will provide facilities for boating, fishing, swimming, picnicking, camping, etc. for an estimated 50,000 people each year.

The sediment pools of each of the floodwater retarding reservoirs will have potential for recreational use. If this potential is utilized, basic sanitary facilities will need to be provided to reduce adverse effects on water quality and health. These sediment pools can provide about 850 acres of lake fishery until they become too shallow from sediment deposition.

The project is expected to have little effect on water quality downstream from the planned reservoirs, except for slight increases in water temperature and some evaporation as a result of impoundments. Regulations of the Kansas Division of Water Resources require that the design of all dams shall provide for a minimum of a four-inch outlet pipe to pass streamflow through the dam at or near the original streambed elevation to compensate for evaporation losses during critical low streamflow periods. The dams in this project will be provided with this feature. The Kansas Division of Water Resources has jurisdiction over whether water shall be withheld or released through the pipes provided for this purpose.

The increased water area and wide distribution of project reservoirs will provide additional resting and feeding areas for migratory waterfowl.

Erosion reductions by land treatment will provide clearer streamflows. Hunting opportunities will increase because the reduced flood hazard will allow hunters access to formerly flood prone areas. Maintenance of desirable land cover will be possible with the reduction of spread of weed seeds by floods.

(ii.) Favorable Environmental Impact

1. Reduce erosion and water losses.

2. Slow sedimentation of road ditches, farm ponds and the downstream Towanda Reservoir.

3. Reduce flood damages by about 70 percent.

4. Allow farmers to have greater security in production of crops and other agricultural enterprises.

5. Provide recreation facilities and about 230 surface acres of lake fishery for an estimated 50,000 people each year at reservoir number 14.

6. Provide opportunity for incidental recreational use of the sediment pools of proposed reservoirs.

7. Increase the water area and distribution of waterfowl resting and feeding areas.

8. Prolonged flows and decreased volumes of sediment downstream from proposed reservoirs will make the streams flow clearer.

9. Planned increase and improvement of vegetative cover in the watershed will provide more and better wildlife habitat.

(iii.) Adverse Effects on the Environment

1. A low to moderate fishery resource along the approximately 18 miles of stream channels to be inundated by the planned reservoirs will be lost.

2. Wildlife cover will be lost in the construction areas, until vegetative cover is replaced after construction.

3. There will be project induced evaporation losses from reservoir areas. This could reduce low flows in stream reaches below the reservoirs and could lower water quality by increasing the concentration of calcium sulfate in these reaches unless reservoir releases are made during periods of low flow. Releases will be made as required by the Kansas Division of Water Resources.

(iv.) Alternatives to the Proposed Action

One possible alternative to the planned action is one of inaction. This alternative would alleviate the minor fishery and wildlife losses to be incurred by the project but it would permit continued degradation of these resources by erosion, sedimentation and frequent flooding. In addition, the agricultural flood plains would continue to be subjected to floodwater and sediment damages on an increasing scale; a third of the farm units in the watershed would continue to suffer damages and would not be able to make needed land use adjustment and desirable improvements in management; road and bridge damages would continue, and residents of the watersheds would continue to be subjected to interruption of traffic flow. The benefits foregone by not implementing the project are estimated to be about $130,000 each year.

Initial formulation included a system of floodwater retarding structures and channel improvement. This alternative system would have provided a higher level of protection but would have incurred additional environmental costs. Channel improvement was dropped from the proposed plan in the interest of a reduction in adverse environmental impacts and monetary costs.

(v.) Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Lands in the watershed are largely devoted to agricultural production and are expected to remain essentially in these uses. The project will reduce erosion, flooding and sedimentation, thus preserving the total area for use by future generations while maintaining and improving current productivity. Even after the designed life of the projects of 100 years, the projects will still be effective in conserving the land and water resources in the watershed.

(vi.) Irreversible and Irretrievable Commitments of Resources

An estimated 785 acres of cropland and grassland also used for wildlife habitat, will be committed to dams, spillways, pool areas and recreation facilities. No other permanent commitment of resources is known to be required for this project.

Consultation-General:

The application for assistance for these projects was submitted to and approved by the Kansas Water Resources Board representing the Governor of Kansas. The plans for solving water and related land resource problems were developed in full consultation with Federal, State and local agencies and groups expressing interest. Numerous coordination meetings were held and contacts made during the plan development stage. Prior to preparation of the final plans, an informal field review was

held in the watershed at which time interests were invited to present their views and recommendations either orally or in writing. The plans and environmental statement have been prepared in consideration of such comments and recommendations as were provided by reviewing Federal agencies and the Governor of Kansas.

Consultation with Appropriate Federal Agencies:

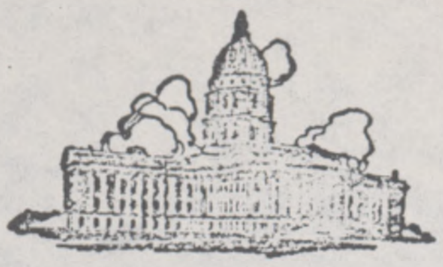
The Department of the Interior expressed concern that adverse effects may result from possible reduction of flows in the Walnut River after project installation, and that this may result in deterioration of downstream water quality.

The environmental statement has been revised to more clearly show the possible effects the planned projects may have on water quality, and to outline the steps to be taken to avoid deterioration.

Review by State and Local Agencies Developing and Enforcing Environmental Standards:

No problems or objections were presented.

APPROVED BY Norman A. Berg, Acting Administrator DATE JAN 20 1971



STATE OF KANSAS

Office of the Governor

STATE CAPITOL BUILDING
TOPEKA, KANSAS 66612



ROBERT B. DOCKING
GOVERNOR

September 2, 1970

Mr. Kenneth Grant
U. S. Soil Conservation Service
Washington, D. C.

Dear Mr. Grant:

The following comments relative to your reports on the Whitewater River Watershed work plans sponsored by the Whitewater River Watershed Joint District No. 22 and the Butler, Harvey, Marion, and Sedgwick County Soil Conservation Districts, Kansas, are submitted for your consideration on behalf of the State of Kansas. The development of the work plans were prepared for the east and west sectors of the district. Since the engineering and economic appraisals of the two plans are related, they are considered herein as one unit.

The State Water Resources Board advises that the proposed program of land treatment measures, the flood retarding structures, and the multiple-purpose structure will provide a relatively good degree of protection to the watershed and to downstream floodplain and desirable sedimentation benefits to the Corps of Engineers authorized Towanda Reservoir.

The Board of Directors of the watershed district has signified approval of the plans as proposed in your reports. The Chief Engineer, Division of Water Resources, State Board of Agriculture, acting under the provisions of the Kansas Watershed District Act, has approved the general structural work plan as submitted by the district. It should be noted that under the provisions of the same Act, a similar approval must be secured prior to initiation of construction for the detailed engineering plans. Also, the completed projects will have to be operated in accordance with the provisions of the state water laws.

The improvements, as set forth in the work plans, are compatible with the goals and objectives of the State Water Plan.

In view of the foregoing, I am pleased to indicate herewith my approval of the work as provided in your reports.

With every good wish.

Yours sincerely,

Robert Docking
Governor of Kansas

Kansas Water Resources Board
Staff Report
Review of the Watershed Work Plans
Whitewater River Watershed Joint District No. 22

Introduction

The Soil Conservation Service in cooperation with the Whitewater River Watershed Joint District No. 22 and the Butler, Harvey, Marion, and Sedgwick county Soil Conservation Districts as local sponsors, has completed watershed work plans covering the east and west sector of the district. The watershed work plans are the result of the district's request for planning assistance under the provisions of Public Law 566 as amended. The Whitewater District was divided into two parts for planning purposes. Since the engineering and economic appraisals are related for the two sectors, the work plans are considered herein as one unit.

Description of the Area

The watershed is located in south-central Kansas and includes the drainage area of the Whitewater River, a right-bank tributary of the Walnut River, joining that river at Augusta, Kansas. The watershed District includes 512 square miles or 327,960 acres of which 212,320 acres are in Butler County, 55,840 acres are in Harvey County, 23,360 are in Marion County, and 36,440 are in Sedgwick County. Land use in the watershed includes cropland 204,439 acres or 62 percent of the watershed, grassland 101,983 acres or 31 percent, woodland 9,482 acres or 3 percent, and miscellaneous 12,056 acres or 4 percent.

The economy of the watershed is primarily based on agriculture with wheat and soybeans as the major cash crops and grassland, grain sorghum and alfalfa used for livestock production, and feeding programs.

Incorporated towns within the watershed and their population include Towanda, 1,048; Potwin, 531; Whitewater, 544; Benton, 441; Burns, 308; and Elbing, 99. The metropolitan area of Wichita, Kansas is located immediately west of the watershed district, and suburban development is encroaching upon the rural area.

Towanda Reservoir is a multiple-purpose structure authorized as part of the overall Walnut River Basin program. The damsite would be located on the Whitewater River immediately upstream from the town of Towanda, and the reservoir would be within the boundaries of the watershed district. The district is one of several organized watershed districts in the Walnut River Basin which collectively encompasses 1,853 square miles of the total drainage area.

Watershed Flood Problems

Flood problems within the watershed accrue to crops, land, and other agricultural property, and roads and bridges. Recent major floods include those of July 1951, 1957, 1962, and June 1965. Mainstem overbank flows average 3 times a year. The floodplain consists of 16,715 acres of which 14,375 acres are productive land. The June 1965 flood caused extensive damage to the watershed area and inundated a major portion of Augusta.

The floodplain of the Whitewater River covers 16,715 acres of which over 90 percent is cropland. Total average annual flood damage in the watershed is estimated to be $270,700. Of this total, 68 percent or $185,400 is crop damage; $11,000 is other agriculture damage; $32,300 is road, railroads, and bridges; and $42,000 for scour and indirect damage.

Other Water Management Problems

Drainage and irrigation practices are generally associated with the individual landowners and would continue largely on an individual basis rather than considered as part of the development of the watershed work plans. Municipal and industrial water supplies will be available when the authorized Towanda Reservoir is completed, and this source will meet the major needs of the watershed. Because of the high population density within and adjacent to the watershed, recreation, fishing, and hunting activities will increase. The demand for this activity already exceeds the supply. Rural and livestock needs are serviced from ground-water sources and ponds. During critical drought periods, these sources are not reliable. With the expanding suburban population into the area, rural water districts are being formed. Presently, these districts obtain their supply through municipal sources. With the expansion of the rural water districts, alternate supply sources may be necessary.

Surface water supplies of the Whitewater watershed, in some instances are adversely affected by natural and man-made sources. An active program for control of these pollution sources is being carried out by the state. Natural sources are wide-spread throughout the area and a satisfactory solution for their control does not appear feasible at the present time.

Cattle feedlot operations are an expanding industry within the district. These operations currently utilize ground water as a source of water supply for the cattle. Further expansion of this industry, coupled with a critical drought period, could encounter a water supply problem.

Land Treatment Measures

Each of the sponsoring soil conservation districts maintain an active land treatment program within the Whitewater Watershed District. Needed practices applied to date are well established although further effort on the part of district cooperators is needed to assure a satisfactory level of development for terraces and grassed waterways. The district is working closely with the individual landowners on this phase of the program particularly in those areas where structural control measures are contemplated.

Plan of Improvement

The watershed structural work plans prepared by the Soil Conservation Service provides for the construction of a system of 23 floodwater retarding structures and 1 multiple-purpose reservoir for flood prevention and recreation. The structures are planned to provide storage for 31,736 acre-feet of floodwater, 675 acre-feet of recreation water supply storage, and 5,903 acre-feet for sediment.

The multiple-purpose reservoir is planned for a water supply storage for recreation of 675 acre-feet, and floodwater retarding storage of 4,101 acre-feet. The surface area of the full recreation pool will be 231 acres.

The floodwater retarding structures have been planned for a floodwater storage ranging from 3.85 to 4.80 inches of runoff from their drainage areas. Storage will be provided for the expected 100-year accumulation of sediment and a storage volume equivalent ranging from 0.48 to 1.18 inches per acre from the drainage area above detention structures.

All structures will be earth filled with vegetated or rock emergency spillways planned so that their chance of operation in any one year is 4 percent or less. Principal spillways will have inlets with uncontrolled average release rates varying from 16.8 csm to 27.0 csm. The emergency spillway capacities are planned to handle storms ranging in volume from 8.5 to 14.5 inches of rainfall in a 6-hour period.

The works of improvement are proposed to be installed within a 7-year period following authorization of federal assistance for installation.

The estimated installation cost of the proposed structural works is $4,455,000 of which Public Law 566 share is $3,429,500 and local costs are $925,100.

Benefits

Average annual monetary benefits from the works of improvements are estimated to be $351,800. Average annual costs amount to $240,500 for a benefit-cost ratio of 1.5 to 1. Land treatment and structural measures will accomplish a 68 percent reduction in average annual flood damages. The watershed project will reduce the number of floods causing damage by about 50 percent. The watershed work plans, in conjunction with the authorized Towanda Reservoir, will provide for benefits on the main stem of the Whitewater as well as on the Walnut River below Augusta. Off-project benefits on the main stem Walnut River evaluated by the Corps of Engineers are estimated to be $24,600 annually. Additional annual benefits accruing to Towanda Reservoir are estimated to be $19,500.

Recreation benefits from the multiple-purpose structure are estimated to be $57,200 annually.

Local Attitude

The Board of Directors of Whitewater River Watershed Joint District No. 22 have indicated approval of the plan of improvement as proposed in the work plans. The watershed district will obtain all land, easements, and rights-of-way for the structural program and will comply with local requirements of relocation and modification of public utilities and communication lines. The district will also make arrangements with the county commissioners for abandonment, relocation, and modification of county roads. The respective County Soil Conservation Districts, as co-sponsors of the work plans, have indicated approval.

Harvey County, as a co-sponsor of the plan of improvement has indicated general approval of the proposed structural measures and particularly the multiple-purpose structure. The county commissioners of Harvey County have also indicated that they will provide the necessary local nonfederal cooperation for the recreation facilities.

59-848 O-71——2

State Action

On December 29, 1969, the watershed district transmitted the revised general work plan to the Chief Engineer, Division of Water Resources, State Board of Agriculture, for his consideration and approval in accordance with provisions of the state water law. In a report transmitted January 5, 1970, the Chief Engineer issued his approval. However, it should be noted that approval of detailed engineering plans of specified projects must be obtained prior to initiation of construction and that the project be operated in accordance with state water laws.

Summary and Conclusion

A review of the watershed work plans, which includes a structural program of 23 floodwater retarding structures and one multiple-purpose structure for recreation and flood control, indicates that it would provide a relatively good degree of flood protection to the watershed and downstream floodplain area and sedimentation benefits to the authorized Towanda Reservoir. The watershed district and other co-sponsors have indicated approval of the work plans and their willingness and ability to fulfill the necessary local obligations.

The multiple-purpose structure will provide 231 acres of water area for recreational opportunities. Additional facilities will be provided to assure full recreation development of the structure. Development of this structure for recreation purposes would be compatible with the general objectives of the State Water Plan Act and would fulfill a local recreation need.

Whitewater River Watershed Joint District No. 22 is included as part of the State Water Plan. The project as set forth in the work plan appears compatible with the general goals and objectives of the State Water Plan as set forth in K.S.A. 82a-901 et al. There appears to be adequate justification for favorable state action on this proposed work plan.

In view of the foregoing, it is recommended that the Whitewater River Watershed Joint District No. 22 work plans be approved as proposed subject to the following provisions.

1. Local interests will obtain necessary state approval of specific projects prior to construction in accordance with the Kansas Watershed District Act.

2. That the works of improvement be operated in accordance with state water laws.

KWRB-DAA
June 1970

DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 20310

September 24, 1970

Honorable Thomas K. Cowden
Assistant Secretary of Agriculture
Washington, D. C. 20250

Dear Dr. Cowden:

In compliance with the provisions of Section 5 of Public Law 566, 83d Congress, the Administrator of the Soil Conservation Service, by letter of 12 August 1970, requested the views of the Secretary of the Army on the work plan for West Sector, Whitewater River Watershed, Butler, Sedgwick, and Harvey Counties, Kansas.

We have reviewed this work plan and foresee no conflict with any projects or current proposals of this Department. The draft of the environmental statement satisfies the requirements of Public Law 91-190, 91st Congress, insofar as this Department is concerned.

Sincerely,

Robert E. Jordan, III
Special Assistant to the Secretary of the Army
(Civil Functions)

COMMENTS OF THE DEPARTMENT OF THE INTERIOR

United States Department of the Interior

SOIL CONS. SERVICE

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

Dear Mr. Secretary:

October 13, 1970

This is in reply to the letter of August 12, 1970, from the Administrator of Soil Conservation Service, submitting for our review and comment the work plan for West Sector Whitewater River Watershed, Kansas. In accordance with Section 2 of Executive Order 10913 and provisions of Section 5 of the Watershed Protection and Flood Prevention Act, as amended, this work plan has been reviewed by interested agencies of the Department of the Interior and the following comments are offered.

Our review indicates that the floodwater retarding structures will not cause a significant change in the water quality of the West Sector Whitewater River Watershed.

We are concerned, however, about adverse effects that may result from the possible reduction of flows in the Walnut River. We note that the report does not discuss the effect of the project on streamflow except during flood periods and wish to point out that any reduction of low flows may result in deterioration of downstream water quality. Therefore, during periods of critical low streamflow, at least as much water as enters the reservoirs should be released from the reservoirs to provide for downstream uses. We also recommend, if possible, that low flows be increased in the Walnut River below the project for the purpose of regulating dissolved oxygen levels.

We recommend that, to protect water quality during the construction period, the contract specifications require all contractors to adhere to guidelines for minimizing soil erosion and air pollution during construction as set forth in Soil Conservation Service "Engineering Memorandum-66".

Fishery resources of the watershed would be benefited by the project. Upland game habitat and hunting would be reduced, while waterfowl habitat and hunting opportunities for waterfowl would improve with the project. The Bureau of Sport Fisheries and Wildlife report contained recommendations which, if incorporated into project plans, would

mitigate the losses of upland game habitat and enhance the fish and wildlife resources of the watershed. The work plan does not indicate whether these recommendations will be followed. It is requested that the enclosed report accompany the work plan when it is forwarded to Congress.

We request that the Director, Midwest Region, National Park Service, U. S. Department of the Interior, 1709 Jackson Street, Omaha, Nebraska 68102, be kept advised of the progress of this proposal so that archeological surveys and any necessary salvage can be scheduled for completion prior to project construction.

We believe the Environmental Statement could be improved by including the effects of the proposed project on water quality. The immediate and long-term effects upon ground and surface waters of local and downstream environments resulting from the increased use of agricultural chemicals (fertilizers and pesticides) should be evaluated and included.

We appreciate the opportunity to review and comment on this watershed work plan, and provided that the above recommendations are considered, we have no objections to the proposed project.

Sincerely yours,

Deputy Assistant Secretary of the Interior

Honorable Clifford M. Hardin
Secretary of Agriculture
Washington, D. C. 20250

Enclosure

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
POST OFFICE BOX 1306
ALBUQUERQUE, NEW MEXICO 87103

August 29, 1968

Mr. Morrie A. Bolline, State Conservationist
Soil Conservation Service
Post Office Box 600
Salina, Kansas 67401

Dear Mr. Bolline:

This letter is our Bureau's revised report on the fish and wildlife aspects of the West Sector of the Whitewater River Watershed in Butler, Sedgwick, Harvey, and Marion Counties, Kansas. It was prepared in cooperation with the Kansas Forestry, Fish and Game Commission and in accordance with the provisions of Section 12 of the Watershed Protection and Flood Prevention Act (68 Stat. 666, as amended; 16 U.S.C. 1008).

The project is sponsored by the Soil Conservation Districts of Butler, Sedgwick, Harvey, and Marion Counties, Kansas, and the Whitewater River Watershed Joint District No. 22, in cooperation with your Service, under the authority of the above Act.

The Kansas Forestry, Fish and Game Commission has indicated their concurrence in the report by letter dated August 16, 1968, signed by Director George C. Moore. A copy of that letter is enclosed.

The Whitewater River Watershed comprises an area of 328,080 acres in northwest Butler County, northeast Sedgwick County, southeast Harvey County, and southwest Marion County. Since this total exceeds the 250,000-acre limitation set forth in the Watershed Protection and Flood Prevention Act, the Whitewater River Watershed has been subdivided into a West Sector containing 174,960 acres and an East Sector having 153;120 acres. This report deals with the West Sector.

Of the 174,960 acres in the West Sector of the Whitewater River Watershed, 82,800 acres are in Butler County, 36,440 acres are in Sedgwick County, and 55,720 acres are in Harvey County. Augusta, with a population of 6,346, Towanda, with a population of 1,048, and Benton, with a population of 441, are incorporated towns in the watershed.

Land use in the watershed is as follows: 109,503 acres or 63 percent cropland; 52,577 acres or 30 percent native grassland; 7,547 acres or 4 percent woodland; and 5,333 acres or 3 percent miscellaneous. The West Sector is located on the eastern fringe of the Central Kansas Prairies. The topography ranges from flat to gently rolling to rolling. Soils are generally silty clay to sandy clay. Rainfall at El Dorado, 10 miles east of the watershed, averages 31.75 inches, with about 60 percent falling from May through September. January temperatures at El Dorado average 32.2° F. while July temperatures average 80.3° F. The growing season averages 184 days from about April 19 through October 20.

The West Sector has a dual economy based on agriculture and oil production and refining. Farming generally is on a full-time basis in the north half of the watershed while in the south half there are many part-time farmers operating smaller units. Production of beef cattle is the major agricultural pursuit. Corn and sorghum for grain and silage and alfalfa are grown mostly in bottomland areas, and are used locally to produce finished beef. Wheat and milo are grown throughout the watershed as a cash and grain crop. Legumes and tame pasture are used in livestock production as are native grass pasture units which generally are small and overgrazed. Commercial feedlots, which contribute substantial amounts of pollution to the Whitewater River, have been established and are being expanded in number and size.

Oil wells are common in the watershed, particularly near Towanda and Augusta. Oil production and refining activities have been major sources of pollution of the Whitewater River.

The northern two-thirds of the West Sector of the Whitewater River Watershed is drained by the West Branch of the Whitewater River. The West Branch rises in Harvey County. It flows generally southeast to its junction with the East Branch of the Whitewater River one mile northwest of Towanda to form the Whitewater River. The Whitewater River then flows generally south to its junction with the Walnut River at Augusta. With its principal tributary, Indianola Creek, the Whitewater River drains the southern one-third of the West Sector. Whitewater, Prairie, Wildcat, Gypsum, East Whitewater, and West Whitewater Creeks are the principal tributaries of the West Branch of the Whitewater River.

Planned project features include construction of 14 floodwater retarding structures and one multiple-purpose reservoir. There are no channel improvements planned with the project.

Land treatment measures are designed to reduce the rate of runoff throughout the West Sector. Included are vegetative practices such as conservation cropping systems, pasture planting, range seeding, proper range use, and contour farming. Structural land treatment practices include construction of terraces, diversions, grade stabilization structures, grassed waterways, and farmponds. Proposed forestry measures include woodland planting, structure planting, windbreak planting, timber stand improvement, woodland protection, and marketing assistance.

The County Commissioners of Harvey County would participate in the development of the multiple-purpose reservoir for flood control, fish and wildlife and recreation. The fish and wildlife and recreation development would be carried out under the provisions of the Watershed Protection and Flood Prevention Act.

Total storage capacity of the multiple-purpose reservoir would be about 5,976 acre-feet. Of this total, 595 acre-feet would be for sediment deposition, 1,280 acre-feet would be for fish and wildlife and recreation, and 4,101 acre-feet would be for floodwater storage.

As currently planned, the dam for the multiple-purpose reservoir would be located in Section 15, Range 2 East, Township 23 South, Harvey County. The proposed reservoir would inundate portions of Sections 15 and 16. The dam would have a maximum height of 41 feet. Surface area of the permanent pool would be about 200 acres and it would have an initial average depth of about 9 feet. After 50 years of sediment deposition, the average depth would be about 6 feet.

Fishing in the West Sector is available in the West Branch of the Whitewater River, the Whitewater River, the lower portions of the major tributaries, and the watershed farmponds. Principal species taken by fishermen in project streams and lakes include channel catfish, flathead catfish, bullheads, sunfishes, crappies, carp, buffalofishes, drum, and largemouth bass. Minnows and other small nongame fishes are abundant in project streams and are seined for bait by fishermen. Commercial harvest of bait minnows is restricted by landowners along project streams. Many watershed farmponds have been stocked with combinations of largemouth bass, bluegills, channel catfish, and occasionally other species.

Even though they are not in the watershed, Butler, McPherson, and Chase Counties State Lakes, Augusta City Lake, El Dorado and Bluestem Lakes, and Fall River, Toronto, and Cheney Reservoirs are close

enough to provide public fishing waters for people living in and adjacent to the watershed.

Although the quality of stream fishing in the project area ranges only from fair to good, fishing of project streams is extremely heavy. Portions of the West Branch of the Whitewater River receive in excess of 1,000 man-days of fishing per mile annually. This heavy fishing results from the proximity to the city of Wichita, with a population of 254,698, coupled with the willingness of many riparian landowners to permit free public access to streams from county road crossings. Fishing in watershed farmponds ranges from poor to excellent depending upon water quality and permanence and degree of individual pond management. Most farmpond fishing is restricted to families and close friends of pond owners.

With the project, the sediment pools of the proposed floodwater retarding structures would provide about 366 acres of potential fishing water. These pools would range in size from 12 to 60 acres and average about 26 acres in surface area. Initially, the average depth of the pools would be sufficient to provide fishing which would range in quality from poor to excellent, depending upon the degree and type of management applied. However, as the ponds fill in with silt their value as a fishery will decrease. Stream fishing in the watershed would be benefited by stabilized streamflows and lowered turbidities downstream of the floodwater retarding structures.

The multiple-purpose reservoir would have a surface area of about 200 acres. The average depth of about 9 feet would be adequate to support fish. Parking areas, boat-launching ramps, and sanitary and picnic facilities would be provided by the Harvey County Commissioners. Suitable game fish would be stocked in the reservoir. With proper management and development of facilities, the reservoir could be expected to support about 20,000 man-days of fishing annually.

In general, wildlife habitat is good over the West Sector of the Whitewater River Watershed although upland areas, particularly on the west side of the watershed, are in need of additional food and cover development for optimum wildlife production. Portions of the broad floodplain of the West Branch of the Whitewater River contain outstanding examples of upland-game habitat.

White-tailed deer populations are increasing in the watershed. Deer have been legally hunted in Kansas for the past few years and,

barring major habitat changes, deer hunting will become increasingly important in the watershed.

Hunting in the West Sector is good for bobwhites, pheasants, doves, fox squirrels, and cottontails. Prairie chickens are present in the watershed but in numbers too low to attract more than nominal hunting pressure. Waterfowl hunting is available on farmponds and streams but is classed as poor over the watershed as a whole. Cheney Reservoir, located about 50 miles to the southwest, provides excellent waterfowl hunting. Bluestem Lake, Toronto and Fall River Reservoirs also provide some waterfowl hunting for people of the watershed.

Fur animals, including minks, muskrats, foxes, raccoons, beavers, and skunks are common, but low fur prices have resulted in an insignificant take. Raccoon and coyote hunting with dogs is popular in parts of the watershed.

With the project, the sediment pools and the recreation pool would permanently inundate about 566 acres of floodplain. An additional 2,333 acres in the flood pools of the floodwater retarding reservoirs would be flooded occasionally. About 200 acres of the land in the sediment pools are good to excellent wildlife habitat. The remaining land which will be permanently inundated provides poor to good habitat for wildlife. There would be losses of wildlife as a result of inundation by the sediment pools.

A complicating factor in small watershed project development is that many losses of wildlife habitat are unsuspected or passed off as insignificant. The losses may involve the removal of only small acreages of habitat at different times and places in the watershed, or the subtle lowering of habitat quality through alterations in plant species composition following spraying for brush and weed control, or the removal of hedgerows. The cumulative effect of this continuing attrition of wildlife habitat is a reduction of wildlife and a consequent loss of hunting.

Some wildlife benefits, particularly to ground-nesting species, would be realized as a result of reduced flooding downstream from the proposed floodwater retarding structures. On the other hand, protection of the downstream floodplain would result in more intensive agriculture and consequent losses in wildlife habitat. As the sediment pools gradually fill in with silt, emergent and woody vegetation will increase around the water's edge. Thus, the value of the sediment pools as wildlife habitat would increase.

The increased water area and wide distribution of the project structures would benefit waterfowl by providing additional resting and feeding areas. There would be increased opportunities for waterfowl hunting with the project, especially on the multiple-purpose reservoir.

Development of fish and wildlife resources is listed as among the primary project objectives. The sponsors have fulfilled part of that objective by developing a multiple-purpose reservoir in the watershed. However, development of fish and wildlife should include measures designed to replace unavoidable habitat losses as well as those designed to enhance fish and wildlife resources. Because of the high regional population, over 500,000 within a 50-mile radius, the demand for hunting and fishing in the watershed exceeds the supply; hence the need for fish and wildlife development measures is great.

Present and future watershed planning and practices, whether on a watershed-wide or individual farm basis, should recognize the need for fish and wildlife developments. With a minimum of planning and expense, many water retarding, erosion prevention, and soil building practices can provide fish and wildlife benefits.

Creation of new water areas will not result automatically in additional good fishing. Each new water area poses complex problems with respect to its habitat, species and numbers of fish best suited for stocking, and long-range management. Owners of new water areas, or those persons responsible for managing such areas, should seek advice from the Kansas Forestry, Fish and Game Commission to insure the establishment and continuance of good fishing. The same principle applies with respect to development of wildlife resources and hunting.

Conflicts in the use of reservoirs sometimes arise concerning uses for fishing, hunting, speedboating, waterskiing, and swimming. As a result, life and property often are endangered and optimum use of the reservoirs is not achieved. To assure optimum fishing use on the multiple-purpose reservoir, a zoning plan that will include areas for undisturbed fishing should be developed. In conjunction with the zoning plan, selected areas of timber should be left standing in bays to serve as fish attractors.

Public access should be provided at the multiple-purpose reservoir in accordance with the policies set forth in the Department of Agriculture's Watersheds Memorandum SCS-64, dated August 9, 1963.

Portions of the lands acquired by the sponsors around the multiple-purpose reservoir should be designated as wildlife management area. Intensive management for upland-game species in conjunction with public hunting would compensate partially for the loss of wildlife habitat caused by construction and operation of the reservoir.

Greatly increased benefits could be derived from the project by allowing public access to the sediment pools of all the floodwater retarding reservoirs for fishing and hunting.

Special emphasis should be given to obtaining public access to several of the larger reservoirs proposed in this watershed. The sediment pools, sites No. 3-31 with 60 acres, No. 15-28 with 52 acres, No. 19-9 with 39 acres, and No. 22-21 with 39 acres, are all large enough and contain sufficient water to provide excellent public recreation areas at very little additional expense.

Upon completion of each structure and prior to impoundment, all barren ground and borrow areas in the reservoir basins should be smoothed out to a gradual sloping shoreline and planted to grasses or small grains adaptable to the area. This would improve fish habitat by increasing initial fertility, reducing erosion, and decreasing turbidity. Land adjacent to the sediment pools should be planted to grass to reduce soil erosion and the amount of sediment deposition in the pools.

Wildlife losses could be minimized if care were taken to retain brush and timber wherever possible when applying land treatment measures.

Unavoidable habitat losses, as in clearing for construction, should be replaced following construction by replanting or by habitat development on other lands. Selection of trees and shrubs for windbreaks should include species valuable as wildlife food and cover in addition to windbreak utility. Fencerows, fence corners, nonpasture areas too rough or rocky for plowing, and borders of gullies or draws are examples of areas suitable for wildlife planting.

Planting a mixture of native grasses and legumes on odd areas between the terraces and on the terraces, and leaving such areas unmowed, would provide additional wildlife habitat in the watershed. Further improvement of wildlife habitat could be realized if farm operators would leave a few rows of cultivated crops, such as small grains, unharvested at the edges of their fields.

Habitat lost through inundation and clearing in construction of farmponds and floodwater retarding structures could be replaced and even enhanced in value through proper management. Farmponds, dams, and portions of the reservoirs should be fenced to exclude livestock. Provision should be made for watering livestock outside the fenced enclosures. Wildlife food and cover plants should be planted on pond and reservoir flood pool and perimeter lands. Exclusion of livestock from ponds and reservoirs would improve fishing and hunting and prolong the useful life of the structure by eliminating a major source of turbidity and sedimentation.

Many floodwater retarding, erosion prevention, and soil building practices can be used to improve fish and wildlife habitat in addition to fulfilling their primary functions. For example, hedgerow plantings provide excellent food and cover for various species of wildlife. They also delineate field boundaries, reduce wind erosion, establish contour guidelines, and serve as living fences or screens. Likewise, field border plantings help control erosion, protect edges of fields that are used for turnrows or travel lanes for farm machinery, and provide food and cover for wildlife. Such plantings also serve to beautify the landscape.

In view of the foregoing, it is recommended that:

1. The development of fish and wildlife be included as a project purpose and that specific planning for fish and wildlife be included in the work plan.

2. To insure the availability of adequate areas for fishing and hunting, a reservoir zoning plan be developed cooperatively with the Harvey County Commissioners, the Kansas Forestry, Fish and Game Commission, and any other agency that may be expected to administer the multiple-purpose reservoir.

3. The project sponsors consult with the Kansas Forestry, Fish and Game Commission in developing clearing specifications for reservoir sites to allow for the retention of as much woody vegetation as possible.

4. Portions of the land acquired by the sponsors around the multiple-purpose reservoir be made available for upland-game management purposes.

5. The project sponsors provide public access to the floodwater retarding reservoirs as well as the multiple-purpose reservoir for fishing and hunting.

6. Prior to impoundment, a cover crop should be planted on all barren ground and borrow areas within the reservoir basins and adjacent to the reservoir areas.

7. Selected portions of the sediment pools and dams be fenced to exclude livestock.

8. Plants beneficial to wildlife be established on suitable sites within the fenced enclosures adjacent to the impoundments.

9. Landowners in the watershed be encouraged by the Soil Conservation Service and the project sponsors to establish hedgerows and living fences on field boundaries.

10. Landowners in the watershed be encouraged by the Soil Conservation Service and the project sponsors to plant 20- to 30-foot-wide strips along hedgerows and fences and leave them unmowed to provide food and cover for wildlife.

11. Landowners and farm operators in the project area be encouraged to leave unharvested a few rows of cultivated crops at the edges of their fields to provide food and cover for wildlife.

12. Odd areas between terraces and on the terraces throughout the watershed be planted to a mixture of native grasses and legumes, and left unmowed to provide food and cover for wildlife.

Our reconnaissance of the proposed West Sector Whitewater River Watershed indicates that the watershed would provide fishery benefits. The 14 floodwater retarding structures would establish about 366 acres of potentially good fishing water. The multiple-purpose reservoir would provide about 200 acres of additional fishing water. Stream fishing would be improved with the project. Upland-game habitat and hunting would be reduced, while waterfowl habitat and hunting opportunities would improve under project conditions.

The recommendations contained herein are in conformance with the U.S.D.A. Soil Conservation Service Biology Memorandum-7 (Rev. 1), National Standards for Biology Practices. The recommendations outline some of the measures needed in the watershed for fish and wildlife. Incorporated into the West Sector of the Whitewater River Watershed work plan and subsequently implemented, the measures would aid materially in compensating for wildlife habitat losses and in providing fish and wildlife benefits.

This office, in cooperation with the Kansas Forestry, Fish and Game Commission, will be pleased to furnish advice on fish and wildlife management measures which might be incorporated into project plans and which would aid in developing and maintaining fish and wildlife in the watershed.

The cooperation of your staff and the watershed sponsors in providing us with pertinent information relative to this watershed is appreciated.

Sincerely yours,

William T. Krummes
Regional Director

Enclosure

STATE OF KANSAS

Forestry, Fish and Game Commission



BOX 1028
PRATT, KANSAS

August 16, 1968

Mr. W. O. Nelson, Jr.
Acting Regional Director
Bureau of Sport Fisheries and Wildlife
Post Office Box 1306
Albuquerque, New Mexico 87103

Dear Mr. Nelson:

This will acknowledge your letter and draft report dated August 8, 1968, relative to the Soil Conservation Services' proposed West Section, Whitewater River Watershed, Kansas.

We have made a review of the above mentioned report and we are in concurrence with the report.

Your cooperation in preparing this report is greatly appreciated.

Sincerely yours,

George C. Moore

GEORGE C. MOORE
Director

GCM:cth:dma

COMMENTS OF THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

Mr. Kenneth E. Grant
Administrator
Soil Conservation Service
Department of Agriculture
Washington, D.C. 20250

October 21, 1970

Dear Mr. Grant:

As requested in your letter of August 12, 1970, the work plan and draft environmental statement for West Sector Whitewater River Watershed, Kansas, have been reviewed by the appropriate agencies of the Department that have an environmental interest.

The work plan describes a proposed multiple-purpose water resource development for the West Sector Whitewater River Watershed in southeastern Kansas. The proposal includes the construction of 12 single-purpose reservoirs for flood control, one multiple-purpose reservoir for flood control and recreational development; and installation of various land conservation treatment measures.

With respect to our review of the draft environmental statement, we have concluded that the project as proposed will have no significant adverse effect on environmental factors of concern to the Department of Health, Education, and Welfare.

We recommend, however, that appropriate health guidelines outlined in the following publications be employed during the development of this project. The vector control measures in particular are justified as a safeguard for public health since production of culex tarsalis, the encephalitis mosquito, has been observed in poorly maintained floodwater detention reservoirs in several areas of the midwest.

1. For control of disease vector problems: Prevention and Control of Vector Problems Associated with Water Resources (Public Health Service monograph, January 1965).

59-848 O-71——3

2. For recreation developments: Environmental Health Practices in Recreational Areas (Public Health Service publication number 1195).

With proper attention to this health-related aspect of project development the Department of Health, Education, and Welfare has no objection to the authorization of this project insofar as Departmental interests and responsibilities are concerned.

Sincerely yours,

Roger O. Egeberg, M.D.
Assistant Secretary
for Health and Scientific Affairs

WATERSHED WORK PLAN

WEST SECTOR WHITEWATER RIVER WATERSHED
BUTLER, SEDGWICK, AND HARVEY COUNTIES
KANSAS

West Sector Whitewater River Watershed

Butler, Sedgwick, and Harvey Counties, Kansas

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

Prepared by

Butler County Soil Conservation District
Sedgwick County Soil Conservation District
Harvey County Soil Conservation District
Harvey County
Whitewater River Watershed Joint District No. 22

With Assistance by

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

State of Kansas
State Soil Conservation Committee
Office of the Kansas State and Extension Forester

August 1969

TABLE OF CONTENTS

	Page
SUMMARY OF PLAN	1
DESCRIPTION OF THE WATERSHED	3
Physical Data	3
Economic Data	6
Land Treatment Data	7
Fish and Wildlife Resource Data	9
Recreation Data	10
WATERSHED PROBLEMS	11
Problems Relating to the Misuse and Treatment of Land	11
Floodwater Damage	12
Sediment Damage	13
Erosion Damage	13
Problems Relating to Water Management	14
PROJECTS OF OTHER AGENCIES	15
PROJECT FORMULATION	16
WORKS OF IMPROVEMENT TO BE INSTALLED	20
Land Treatment Measures	20
Structural Measures	22
EXPLANATION OF INSTALLATION COSTS	24
EFFECTS OF WORKS OF IMPROVEMENT	28
PROJECT BENEFITS	33
COMPARISON OF BENEFITS AND COSTS	34
PROJECT INSTALLATION	35
Land Treatment Measures	35
Structural Measures	36
FINANCING PROJECT INSTALLATION	37
Land Treatment Measures	37
Structural Measures	38
PROVISIONS FOR OPERATION AND MAINTENANCE	39
Land Treatment Measures	39
Structural Measures	39

TABLE OF CONTENTS

	Page
TABLES	
Table 1 - Estimated Project Installation Cost	42
Table 1A - Status of Watershed Works of Improvement	43
Table 2 - Estimated Structural Cost Distribution	44
Table 2A - Cost Allocation and Cost Sharing Summary	45
Table 2B - Recreational Facilities Estimated Construction Costs	46
Table 3 - Structure Data - Multiple-Purpose and Floodwater Retarding Structures	47
Table 4 - Annual Cost	51
Table 5 - Estimated Average Annual Flood Damage Reduction Benefits	52
Table 6 - Comparison of Benefits and Costs for Structural Measures	53
INVESTIGATION AND ANALYSIS	54
COOPERATION IN PLANNING	54
General	54
Forestry	54
Fish and Wildlife	55
HYDROLOGY AND HYDRAULICS	55
ENGINEERING	57
Surveys	57
Structure Design and Cost Estimates	58
GEOLOGY	59
Dam Site Investigation	59
Sedimentation in Reservoirs	60
Flood Plain Scour	60
ECONOMIC INVESTIGATIONS	61
TYPICAL EARTH DAM WITH PIPE DROP INLET	66
RECREATION DEVELOPMENT MAP	
PROJECT MAP	

WATERSHED WORK PLAN

WEST SECTOR WHITEWATER RIVER WATERSHED
Butler, Sedgwick, and Harvey Counties, Kansas

August 1969

SUMMARY OF PLAN

West Sector Whitewater River Watershed has an area of 174,960 acres or 273 square miles. It lays to the east and north of Wichita, Kansas. The watershed includes the drainage area of the West Branch Whitewater River and the mainstem and its tributaries below the junction of West Branch and the Whitewater River (See Project Map). This watershed along with the East Sector makes up the total area of the Whitewater River Watershed Joint District No. 22. Work plans for West and East Sectors were developed concurrently as requested by the local sponsoring organizations.

Whitewater River junctions with the Walnut River at Augusta, Kansas, more than doubling its drainage area at that point. This watershed is one of nine which covers the total drainage area of the Walnut River above Winfield, Kansas. For location see the Project Map.

This work plan for watershed protection, flood prevention, and recreational development is sponsored by the Butler, Sedgwick, and Harvey Counties Soil Conservation Districts, Harvey County, and the Whitewater River Watershed Joint District No. 22. Technical assistance in preparing the watershed work plan was provided by the Soil Conservation Service, United States Department of Agriculture.

Whitewater River Watershed Joint District No. 22 retained consulting engineering firms to furnish aerial photography and a preliminary investigation report of the watershed. The State Soil Conservation Committee negotiated contracts for engineering services with Cook, Flatt, and Strobel, Topeka, Kansas, and Bucher and Willis, Salina, Kansas, using funds provided by the State of Kansas. The forestry part of this plan was prepared by the Kansas State Extension Forester in cooperation with

and through the Forest Service, United States Department of Agriculture. A letter report covering fish and wildlife conditions with recommendations for improvement was supplied by the Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, and was concurred in by the Kansas Forestry, Fish and Game Commission.

Watershed problems consist of upland erosion, floodwater damage to crops, land, other agricultural property, roads, railroads, and bridges, and a lack of water-based recreational opportunities for the people in and around the watershed. Evaluated average annual floodwater damages within the watershed are estimated to be $143,200.

Works of improvement are planned to solve major water and land resource problems of the watershed. These will include the establishment of conservation measures on 31,591 acres of cropland, 21,533 acres of rangeland, and 610 acres of woodland. Structural measures will consist of 12 floodwater retarding structures, 1 multiple-purpose structure, and basic recreation facilities. The structures will have an aggregate capacity of 21,810 acre feet of which 3,258 acre feet are for sediment storage, 675 acre feet for conservation storage, and 17,877 acre feet are for floodwater detention storage. These structures will regulate runoff from a drainage area of 74.6 square miles or 27.3 percent of the watershed area, and furnish 50,000 visitor days of annual recreation. Works of improvement will reduce flood damage by 65 percent.

A period of seven years is proposed for installing the needed works of improvement of this plan.

The estimated cost of installing the project is $4,528,600. Public Law 566 costs are $2,102,600 of which $124,400 are for technical assistance to speed up establishment of land treatment measures, and $1,978,200 are for installing structural measures. The share of structural measures provided by local interests is valued at $661,200. The value of land treatment applied to date is $2,486,500. Farmers will establish additional land treatment during the installation of the project at a cost of $1,764,800 bringing the total other contribution to $4,912,500.

Whitewater River Watershed Joint District No. 22 will provide land rights, will contract for construction, and will operate and maintain the 12 floodwater retarding structures. Harvey County will provide these items for the multiple-purpose site 14 and the recreational development. Annual operation, maintenance, and replacement costs of structural measures are estimated to be $17,600. Land treatment measures will be maintained by landowners and operators of the farms on which measures are installed. This will be accomplished by agreement with the Butler, Sedgwick, and Harvey Counties Soil Conservation Districts.

The total population of 3,003 rural and 2,216 urban will benefit by watershed protection and flood damage reduction afforded by this plan. Many additional people with interests both urban and rural in the Walnut River flood plain below the watershed will be directly benefited. Incidental recreation and secondary benefits will accrue to many others living in the surrounding areas.

An estimated 6,998 acres of agricultural flood plain within the watershed will be given flood protection. Corps of Engineers authorized reservoirs and local protection works and the nine organized watersheds in the basin afford flood protection to 31,880 acres of flood plain and seven towns on the Walnut River below this watershed.

Total evaluated average annual benefits to structural measures of the project are $230,900. The benefit-cost ratio of structural measures is 1.6:1. Individual benefit items are shown on tables 5 and 6.

DESCRIPTION OF THE WATERSHED

Physical Data

West Sector Whitewater River Watershed comprises the drainage area of the West Branch Whitewater River and the main stem of the Whitewater River lying downstream from the proposed Towanda Reservoir. The total watershed area is 174,960 acres or 273 square miles. Of this total acreage, 82,800 acres lie in Butler County, 36,440 acres are in Sedgwick County, and 55,720 acres are in Harvey County. All watershed lands are privately owned.

Whitewater River and the West Branch head in the southern part of Marion County and flow south into Butler County. These streams junction just above the town of Towanda, Kansas. The Whitewater River continues its southerly flow below Towanda and enters the Walnut River just below Augusta. Whitewater River at its junction with the Walnut River comprises a little over one-half of the total drainage at that point. The Walnut River enters the Arkansas River just below Arkansas City, Kansas.

Incorporated towns of the watershed are Whitewater, population 544; Towanda, population 1,048; and Benton, population 441. Unincorporated towns are Annelly, Furley, and Greenwich. The outlet of the watershed is located at Augusta, population 6,278, which is thirteen miles east of Wichita, Kansas.

Towanda Reservoir is a Corps of Engineers authorized multiple-purpose structure. It is proposed to be located across the Whitewater River just above the town of Towanda. West Branch and its tributaries plus all of the East Sector Whitewater River Watershed lie above the Towanda Reservoir.

West Sector Whitewater River Watershed is one of nine watersheds in the Walnut River basin covering 1,853 square miles of the 1,955 square miles of the Walnut River drainage area. Of these watersheds, one is constructed, three are in construction, four including this watershed have their plans completed or about complete, and planning is in progress on the remaining watershed. Locations of these watersheds and proposed water resource projects of other agencies are shown on the Walnut Basin Map.

The watershed is located in the western fringe of the Bluestem Hills. The terrain varies from gently rolling in the western part of the watershed to rolling in the eastern areas. Elevations range from 1,554 feet in the uplands to 1,190 feet at the outlet. Stream gradients average 2.0 feet drop per mile in the lower reaches to 12 feet per mile in the upstream valleys.

Stream laid gravels, sand, silt and clay up to fifty feet deep are found in the Whitewater River valley.

Thinner accumulations fill the valleys of the tributary streams. Terraces lie on either side of the stream below Towanda.

Wellington shale covers the drainage area of the West Branch and west tributaries of the Whitewater River. Thick limestones and shales of the Chase Group are exposed south and east of Towanda.

Upland soils include those developed from limestones, shales, and outwash from old alluvium. Most of these soils are deep, dark, tight clays with semi-claypans. Small areas of shallow, stony soils may be found on the ridges and stream breaks. Bottomland soils are deep, moderately friable, with silty to clayey subsoils.

Sixty-four percent of the watershed is in cultivation, 29 percent in native pasture, 3 percent woodland, and 4 percent miscellaneous. Sixty-seven percent of the farm units are under cooperative agreement with the soil conservation districts. Applied practices, their amounts, and costs are shown in table 1A.

This watershed lies in the western edge of the Bluestem (Tall Grass Prairie) region of Kansas. Principal native grasses are big and little bluestem, indiangrass, sideoats grama, switchgrass, and tall dropseed. Prairie cordgrass (sloughgrass) and eastern gamagrass are confined to the wet lowlands and sloughs. Kentucky bluegrass exists as under cover and increases with overgrazing under favorable moisture conditions. Smooth brome grass and Kentucky 31 fescue are used for tame pastures, but need intense fertilization to maintain productivity. Buckbrush and smooth sumac are invading brush plants. Honeylocust and osageorange may invade poorly managed pastures and range. Chemical treatment is used to control brush and undesirable trees. After treatment recovery of native grass is usually rapid and must be followed by careful management to maintain a good grassland composition.

The total woodland area of the watershed of 4,582 acres is in private ownership. An estimated 4,141 acres of this total area are on bottomland sites. The majority of this bottomland timber is located in narrow bands

immediately adjacent to Whitewater River and its tributaries. Most of the 441 acres of upland timber are located on the steeper slopes adjacent to these drainages.

Species most commonly found on bottomland sites include black walnut, bur oak, hackberry, green ash, elm, boxelder, osageorange, cottonwood, sycamore, and Kentucky coffee tree. On the upland sites bur oak, hackberry, elm, osageorange, honeylocust, green ash, and black walnut are found but are usually of poorer commercial quality than trees growing in the bottomland areas.

The watershed lies in the path of alternate masses of warm, moist air moving north from the Gulf of Mexico and currents of cold, comparatively dry air moving south from the polar regions. Consequently this area is subject to frequent and abrupt weather changes. High intensity storms of short duration are common and often cause flash floods. The watershed is also subject to extended periods of below normal rainfall with resulting drought conditions. Annual precipitation at El Dorado, Kansas, averages 32.55 inches but has varied from 17.41 inches to 51.24 inches. The six month growing season, April through September, accounts for 73 percent of the normal annual total. Temperature extremes recorded at El Dorado are a high of 117 degrees and a low of 28 degrees below zero. The average length of growing season is 184 days.

Economic Data

The watershed lies within a dense population area of the state. Cities located around the watershed include: Wichita, population 281,110; Newton, population 16,018; El Dorado, population 12,533; and Augusta, population 6,278. Population of the watershed is about 5,219 people with 3,003 living in the rural area and the remainder living in the towns and communities of Towanda, Whitewater, Benton, Annelly, Furley, and Greenwich.

Nine hundred and seventy-seven family farming units or portions thereof averaging 180 acres in size are within the watershed. Approximately fifty-five percent of the farms are owner operated. The number of farms within the

watershed is not decreasing because the farms closest to the large urban centers are being divided and purchased by city dwellers who wish to live in the country.

The farms in the watershed are diversified raising primarily wheat, grain sorghums, soybeans, and alfalfa. Wheat and soybeans are the major cash crops with most of the other crops and hay marketed through livestock. The land use of the watershed is as follows:

Land Use	Watershed Total	Percent
Cropland	112,839	64
Grassland	50,983	29
Woodland	4,582	3
Miscellaneous	6,556	4
Total	174,960	100

Two composite flood plain acres were developed due to differences in land use. Gross values of the composite acres are $92 and $82. Current agricultural land values are about $275 per acre for upland cropland, $325 per acre for tributary bottomland, $400 per acre for mainstem bottomland, and $130 per acre for pastureland.

The watershed is girded by a system of secondary roads which lead to major U.S. Highways 50, 54, and 77 and Kansas Highways 196 and 254. Interstate 35 passes through the watershed. Three railroads, the Chicago, Rock Island, and Pacific; the Atchison, Topeka, and Santa Fe; and the Missouri Pacific service the watershed. These transportation facilities offer the people of the watershed excellent marketing opportunities.

Land Treatment Data

There are farms throughout the watershed where proper land use and treatment of the land are not being practiced. These landowners and operators are being encouraged by the soil conservation district supervisors and watershed directors to practice proper land use and establish land treatment.

Watershed directors and soil conservation district supervisors are furnishing some rodman assistance to the Soil Conservation Service staff to help speed up the installation of needed soil and water conservation treatment on the land. Watershed directors have authorized hiring of a full-time employee to work in the watershed to promote land treatment by personally contacting landowners and operators and to write news articles to keep the public informed of the progress of the watershed.

There are approximately 657 soil conservation district cooperators covering 69 percent of the watershed. Approximately 500 basic plans have been developed in the watershed with additional plans being continuously prepared.

Following is the percent of the needed land treatment that has been applied to the land: 57 percent of the range is being used properly; 70 percent of the pasture planting; 39 percent of the grassed waterways; 62 percent of the diversion terraces; 68 percent of the farm ponds; 28 percent of the terraces; 51 percent of the conservation cropping system; and 61 percent of the grade stabilization structures. More of the above practices are being applied so that the above percentages will be steadily increasing.

Watershed woodlands are in general moderately to fully stocked and occur mainly in small tracts of less than 40 acres. It is expected that some reduction in woodland acreage will result from the impoundment of water behind proposed structures. An increased effort will be made to replace these lost acres with new plantations.

Most of the woodlands of the watershed have a high percentage of poor quality and low value trees. This has resulted from a lack of management and consistently cutting only the best trees. Economic return of these woodlands has been low. Many of the bottomland sites and some of the better upland sites produce good growth rates on commercial species such as walnut, bur oak, and hackberry. Many of these areas have an adequate amount of desirable young trees but good management is needed to produce high quality commercial timber.

The proximity of the watershed to the city of Wichita and several other large towns increases the potential value of woodlands for such by-products as firewood, wildlife, and recreation.

The watershed area is now protected by rural fire districts. Equipment procurement, fire training, and fire prevention education will continue to be developed by the Kansas State Extension Forester, cooperating with the Forest Service, through the going Cooperative Fire Control Program. Adequate watershed fire protection can be achieved through this program without accelerated technical assistance.

Fish and Wildlife Resource Data

Fishing in the West Sector Whitewater River Watershed is available in the West Branch, the Whitewater River, the lower portions of the major tributaries, and in farm ponds. Principal species taken by fisherman in project streams and ponds include channel catfish, flathead catfish, bullheads, sunfish, crappie, carp, buffalo, drum, and largemouth bass. Minnows and other small nongame fishes are abundant in project streams and are seined for bait. Many farm ponds have been stocked with combinations of largemouth bass, bluegill, channel catfish, and occasionally other species.

Fishing in watershed farm ponds ranges in quality from poor to excellent.

Butler and Chase Counties State Lakes, El Dorado and Bluestem Lakes, and Fall River, Marion, Toronto, and Cheney Reservoirs are located outside of the watershed but are close enough to provide public fishing.

In general, wildlife habitat is good over the watershed although upland areas, particularly on the west side, are in need of additional food and cover development for optimum wildlife production. Portions of the broad flood plain of the West Branch contain outstanding examples of upland game habitat.

White-tailed deer populations are increasing in the watershed. Deer have been legally hunted in Kansas only

since 1965. Barring major habitat changes, deer hunting is expected to become more important in the watershed.

Hunting in the West Sector is good for bobwhite, pheasant, dove, fox squirrel, and cottontail. Prairie chicken are present in the watershed but in numbers too low to attract more than nominal hunting pressure. Waterfowl hunting is available on farm ponds and streams but is classed as poor over the watershed as a whole. Cheney Reservoir, located about fifty miles to the southwest, provides excellent waterfowl hunting. Bluestem Lake, Toronto, and Fall River Reservoirs also provide some waterfowl hunting for residents of the watershed.

Fur animals, including mink, muskrat, beaver, raccoon, skunk, opossum, and fox are common. Low fur prices have resulted in little interest in trapping for pelts. Sport hunting with dogs for raccoon and coyote is common.

Recreation Data

Recreation activities are enhanced by water developments in Kansas. The need for these activities is reflected in part by facilities already available within a reasonable distance. Within a fifty-mile radius of the center of the watershed there are three federal reservoirs totalling 18,312 surface acres. All have developed recreational facilities for boating, picnicking, camping, etc. In addition, the State Park and Resources Authority has developed recreational facilities at Cheney and Fall River Reservoirs. Cowley, Butler, and Chase County lakes are located within a fifty-mile radius. These are primarily maintained as fishing and hunting areas by the Forestry, Fish and Game Commission. City lakes and parks of El Dorado and Augusta add to the available recreation facilities.

The environment is generally suitable for recreational uses along streams and around reservoir sites.

The present population of people within the watershed is 5,219 and within a fifty-mile radius is 525,820. By 1980 it is estimated that populations will be 7,800 and 788,384 respectively.

WATERSHED PROBLEMS

Problems Relating to the Misuse and Treatment of Land

A major problem throughout the West Sector of the watershed is loss of soil on untreated upland cropland. Both sheet and gully erosion occur. This causes depletion of soil resources, reduction of farm yields and income, sedimentation of road ditches and ponds, and adds to the problems of the flood plain. Land treatment, including waterway development, terracing, pasture and range management, range seeding, pasture planting, crop residue use, crop rotation and contour farming is a must to control soil and water loss. Many of the landowners are economically able to install the needed land treatment by taking advantage of assistance offered by the Agricultural Conservation Program. More emphasis needs to be placed on contour farming. Some good conservation farmers are tending to get away from farming their terraced land on the contour. This trend needs to be reversed. More emphasis on the value and need for contour farming will be stressed by watershed directors, soil conservation district supervisors, and Soil Conservation Service personnel.

On many farms, grazing in the woodland is practiced. This grazing causes soil compaction, loss of humus and litter, and seriously impairs the capacity of these woodlands to retard erosion and reduce peak runoff. It also reduces the economic potential of the woodland by reducing the quantity of reproduction of desirable species.

Lack of good timber management and application of forest management practices has resulted in low income from most woodland acres.

Fires destroy grass and tree cover needed for watershed protection. They also lower the quality and growth rates of commercial timber stands. Fire control measures are needed in some areas to provide a higher level of fire protection for the watershed.

Some farms would benefit from windbreak, pond, or wildlife plantings. Properly planned and placed plantings of this nature would add materially to the value of these

59-848 O-71 —— 4

farms and ranches. Old established windbreaks and shelterbelts are in need of renovation to improve their effectiveness.

Floodwater Damage

Damage resulting from the flooding of flood plain lands and facilities is the principal problem. The entire Whitewater River bottom is flooded frequently. Major floods of recent years have been those of July 1951, 1957, 1962, and June 1965. Overbank flows range from three times a year on the mainstem to once every two years on some of the smaller tributaries.

The flood plain covers 6,998 acres and includes 5,948 acres of cropland valued at $325 to $400 per acre. Crop damage due to flooding averages $91,700 annually and accounts for 64 percent of the total flood damage. Flood durations are usually less than 24 hours with moderate to high velocity flows the major cause of flood damage.

Flooding also causes damage to buildings, fences, and machinery. Many miles of fences are destroyed or damaged even by minor floods. Most buildings have been moved out of the flood plain because of frequent flooding. Installations such as cattle and hog pens, feed bunks, and stock tanks are frequently damaged. Considerable expense is incurred for cleanup of debris after flooding. Agricultural damage of this type averages about $7,500 annually.

Floodwater damage to roads and bridges is extensive amounting to $21,200 on an average annual basis. Flood flows wash away road surfacing, scour road shoulders, silt in roadside ditches, and damage bridges. County and township road budgets are not usually sufficient to make immediate replacements and repairs following a flood. Such costs and needed work are spread over a number of years allowing these essential facilities to remain in a subnormal condition.

Small frequent floods, localized in character, cause considerable damage and inconvenience to farmers in the area of their occurrence. A major flood such as that experienced in 1965 affects everyone in the area due to

damage to roads, bridges, transportation, utilities, and loss of business to those serving the agricultural community. Such indirect losses under present conditions are estimated to average $14,000 annually.

Sediment Damage

Sedimentation has some effect on the water supplies of the area by causing an increase in hardness. Where stream water is used by municipalities, treatment costs are quite expensive.

Sediment reduces the capacity of large reservoirs at the rate of 0.3-0.5 acre foot per square mile per year from the drainage area. Stockwater ponds may be reduced an average of 0.4 acre foot per square mile annually from grassland up to 0.8 acre foot for a drainage area of cropland and grassland.

Local bank deposition has reduced channel capacities causing more frequent overflows. Sediment damage to flood plain soils is slight. The sediment yield at the mouth of the watershed each year is about 0.4 acre foot per square mile of drainage area.

Erosion Damage

Gently rolling cropland shows slight to moderate erosion. The more steep, poorly managed fields are severely eroded. Most of the damage is the result of sheet erosion.

The average annual rate of erosion from pastureland is generally less than one ton of soil per acre annually. The rate from cropland may range from one to four tons per acre per year.

Small critical sediment source areas near oil production and without vegetative cover has emanated from salt water brines.

About 1,250 acres on the flood plain has been eroded by floodwaters. The damage to the scoured areas has reduced crop production an average of 17 percent.

The main channel is more or less stable with some erosion and deposition and no land loss from bank erosion.

Problems Relating to Water Management

Drainage: Drainage problems in Whitewater River Watershed are generally minor and occur on the flood plain. These problems have been aggravated by flooding. It is felt that any drainage problem remaining after the flood plain has been protected from flooding can be handled by individual landowners.

Irrigation: About 87 percent of the area soils are shown as suitable for irrigation in the Kansas Water Resources Board's publication "Irrigation in Kansas." About 22,400 acres of this area overlays groundwater regions capable of producing yields of 100 to 500 gallons per minute.

Irrigation development has been hampered by an inadequacy in both quality and quantity of water. Developing irrigation in an area that has natural moisture conditions which will produce crops in most years requires careful economic consideration. This has had much to do with the slow irrigation development in Whitewater River.

Some interest has been shown by individuals to develop additional surface water supply for irrigation but not to the extent that they would cost share for this purpose.

Municipal and Industrial Water: Water supplies for towns, cities, and industry around Whitewater River Watershed are obtained primarily from streams and lakes. Additional water supply will be available from major reservoirs in the basin. West Sector Whitewater River Watershed's contribution to future municipal and industrial water supply will be to reduce sediment and floodwater flows.

Recreation: Augusta City Lake, scattered farm ponds, and streams constitute water areas for recreation within the watershed. Because of the high population in the

region, over a half million people within a fifty-mile radius, the demand for recreation in the watershed exceeds the supply.

Fish and Wildlife: Quality of stream fishing in the watershed ranges from fair to good. Fishing of project streams is extremely heavy. Portions of the West Branch of the Whitewater River receive in excess of 1,000 man-days of fishing per mile annually. This heavy fishing results from the proximity to the city of Wichita, with a population of 281,110, coupled with the willingness of many riparian landowners to permit free public access to streams from county road crossings. Fishing in watershed farm ponds ranges from poor to excellent depending upon water quality, permanence and pond management. Most farm pond fishing is restricted to families and close friends of pondowners.

All of the agricultural area of the watershed is privately owned. Habitat for upland game, fur animals, and deer is good to excellent. To maintain present levels of wildlife in the agricultural areas will require careful management of present wildlife cover and food resources. Greater abundance of wildlife to handle increased hunting would require increases in food and cover which would be in economic competition with agricultural production.

Other: Most water for farmstead use is obtained from wells. Farm ponds supply most of the water for livestock on pasture. Water supplies from both sources are short during prolonged drought periods.

Sedgwick County Rural Water District No. 1 furnishes water to an area of about 25 square miles along the southwest edge of the watershed. This district obtains its water from the city of Wichita, Kansas. Because of the comparatively high cost of purification of surface water, future supplies for expansion of this or for additional rural water districts will probably come from wells or existing municipal plants.

PROJECTS OF OTHER AGENCIES

Towanda Dam, a Corps of Engineers multiple-purpose structure, will be located across the mainstem of the

Whitewater River just below the junction with West Branch and at the lower boundary of East Sector Whitewater River Watershed. Towanda is one of three Corps reservoirs authorized for construction in the Walnut River Basin. See the Project Location Map on last page of this report.

Towanda Reservoir is authorized for flood control, municipal and industrial water supply, water quality control, and recreation. Its conservation pool is planned to cover 6,200 acres with an additional 6,000 surface acres occupied by the flood control pool. Much of this area is Whitewater River flood plain land of which about one-third lies in West Sector of Whitewater River Watershed.

The volume of floodwater and sediment storage in Towanda Reservoir will be determined giving full consideration to the effects of watershed works of improvement. Benefits from storage re-allocation were computed and agreed to by the Corps of Engineers and the Soil Conservation Service.

PROJECT FORMULATION

Whitewater River Watershed District was organized for the primary purpose of preventing floods and their resulting damages. The nucleus of the agricultural economy under present operations is dependent upon the highly productive flood plain. Many flood plain farm operators estimate their income would be doubled if flood damages could be avoided.

Local sponsoring organizations recognized in their application that land treatment would need to be accelerated to accomplish adequate watershed protection in a reasonable length of time. Land treatment measures will be achieved through cooperation with the soil conservation districts. A major objective is to obtain 100 percent cooperation with the districts programs among the landowners and operators. To speed up the land treatment application, the watershed district has provided technical and clerical assistance to the soil conservation districts. Community meetings, tours, demonstrations, and other activities have been sponsored to keep the people informed and to encourage

land treatment. The press, radio, and personal contacts have been used. The board intends to continue the above program and expand it as necessary.

The watershed district board of directors working with the soil conservation districts and Soil Conservation Service plan to have 75 percent of the needed land treatment on the drainage areas above the planned floodwater retarding structures as soon as possible so that construction will not be held up by lack of adequate land treatment.

Upland soils are generally claypan or limestone soils. These are generally heavy to moderately heavy and have a soil loss limit of from two to four tons per acre per year.

No radical changes in farm enterprises are expected. This area has always been a diversified farming area due to its balance of cropland and pastureland. Any changes in land use and farming practices will come about by basic changes in agricultural economics.

The watershed district board of directors intends to promote land treatment on the cropland to reduce soil loss to an acceptable level.

Agriculture production from the flood plain is an economic necessity for the watershed. Eighty-five percent of the flood plain area is now being farmed for crop production. The beginning desire of the watershed district, as stated in their application for assistance, was to have a flood prevention project that will provide 50 percent protection from flood damages.

The Watershed Review Committee's field examination report covers the total district which includes both East and West Sector Whitewater River Watersheds. This report listed the goals of the district were to install a program which would provide 50 percent protection from flood damages. This was to be accomplished principally by the construction of floodwater retarding structures. They estimated that it would require from 34 to 40 structures with drainage areas as great as 17 square

miles. Other measures such as levees and channel improvement would be considered if determined to be more desirable economically.

The watershed district secured the firm of Bucher and Willis, Consulting Engineers and Planners, to prepare a preliminary investigation report for the entire watershed district. This report considered that 48.4 percent of the district could be physically and economically controlled with 34 floodwater retarding structures. These structures would range in drainage area size of from 1 square mile to 24.4 square miles.

The application and preliminary investigation estimates were made before the Corps of Engineers Towanda Reservoir was authorized and without consideration of its effects. The Soil Conservation Service modified the preliminary investigation findings considering the effects of Towanda Reservoir. From this investigation it appeared a system of 10 floodwater retarding structures controlling the runoff from 23 percent of the watershed was economically and physically feasible. It was estimated that this system coupled with a sound land treatment program would produce an overall damage reduction of fifty percent. This information was presented to the board of directors. Their acceptance of this level of protection was requested and was received before planning authorization was granted by the Administrator of the Soil Conservation Service.

After receiving planning authorization, a detailed evaluation was made. From the evaluation the average annual benefits for controlling a drainage area of one square mile were determined for each subarea within the watershed. An estimated cost of controlling a square mile was also determined. This information was supplied to the board of directors. Using this information the directors with the technical help of the Soil Conservation Service selected a system of 13 floodwater retarding structures which are economically and physically feasible and socially acceptable. The 13 structure system will regulate runoff from a drainage area of 74.6 square miles or 27.3 percent of the watershed area. Works of improvement will reduce annual flood damages by 65 percent. The watershed directors agree that this is an acceptable level of protection.

The sponsors agreed to damage reduction varying from 37 percent in reach 23 to 96 percent in reach 15. These areas benefited and percent reduction in annual damages are shown by individual reaches in the Effects of Works of Improvement section.

Topography, roads, pipelines, utilities, railroads, farm buildings, etc., were factors which influenced selection of structure sites. All possible structure sites were considered and the thirteen selected were those the directors agreed would most meet the watershed's goal.

People of Harvey County have long recognized their need for additional recreation. Sites in the general area of recreation need were studied as to adaptability to multiple-purpose use. Site No. 14 was in a location that was very advantageous to Harvey County. It laid just above First Street seven miles east of Newton, Kansas. Topography of the site was very well adapted to the type of recreation development needed. Harvey County Commissioners decided to become a watershed sponsor to install this development.

Channel improvement was considered as a flood prevention measure to supplement the floodwater retarding structures. Channels were considered not feasible because the additional benefits would not offset additional costs of channel enlargement and they were not needed to reach the desired level of protection.

Structure surveys showed that minor adjustments were necessary in location of some sites. Evaluation of flood damages and the associated benefits of the twelve floodwater retarding structures and the one multiple-purpose structure system compared to estimated structure cost showed that all selected sites were economically justified.

This system coupled with the Corps of Engineers Towanda Reservoir will provide a high degree of flood protection to the Whitewater River flood plain below the Towanda Reservoir and will provide recreation to the people of the watershed and the surrounding area.

The Kansas Water Resources Board was instrumental in organizing the Walnut River Basin Citizens Advisory Committee. Each of the seven watershed districts as well as the major cities and leaders of the basin were represented. This committee met several times with representatives of state and federal agencies to formulate the basin plan of improvement. This plan included watershed protection and flood prevention in West Sector of Whitewater River Watershed.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

Application of land treatment measures is essential to a sound and continuing watershed protection and flood prevention program.

Soil surveys will be completed over all the watershed. Surveys are already completed on those portions of the watershed situated in Butler and Harvey Counties. Approximately 25,000 acres in Sedgwick County need soil surveys. It is estimated that 78 man days will be required for a soil scientist to map the remaining area.

Farmers and ranchers cooperating with the soil conservation districts will develop conservation plans that will achieve proper land use and meet the basic conservation needs of the land. The trend will be to continue rangeland in that land use with improvement being made in the condition of some ranges. A small amount of cropland will be converted to rangeland and pastureland plus some conversion to water storage in reservoirs.

Treatment on cropland will include conservation cropping systems, grassed waterways or concrete structures for terrace outlets, terraces, diversions, contour farming, crop residue use, and proper fertilizer use. Technical assistance will be required primarily on the first four practices. This treatment will be essential on the cropland acreage above the floodwater retarding structure sites.

Grass is an important product of the watershed covering almost one-third of its surface. Grassland

provides grazing and hay and is one of the best deterrents to excessive runoff and erosion. Cultivated fields that are more suited to grass than crop production will be seeded to tame or native grasses.

Treatment of grassland will include stockwater developments, brush and weed control, and pasture and range proper use. Stockwater developments will allow better utilization, aid in obtaining uniform grazing, and will reduce erosion caused by trailing or overgrazing. Mechanical and chemical treatment will be used to control brush and weed trees which are invading grasslands. Recovery of native grass is usually rapid if remnants of good grasses are present. Care will be taken to avoid chemical damage to adjacent areas. Careful management must be practiced following treatment to maintain a good productive grassland composition.

The watershed district in cooperation with the soil conservation districts will work with landowners to install approximately 15 detention dams. These will be for the reduction of flood damages primarily on tributary streams and localized in character.

In order to maintain or improve hydrologic conditions of woodland sites, areas must support vigorous, fully-stocked stands of trees with undisturbed ground cover. Watershed benefits from woodland management and from proper land use of forest sites will be sustained by realizing the maximum economic returns consistent with site capabilities. To obtain these objectives, land treatment measures including tree and shrub plantings, timber stand improvement, windbreak and shelterbelt renovation, proper timber harvesting, grazing control, and fire control are proposed. To accomplish these forestry land treatment measures, accelerated technical assistance will be provided to landowners by the Kansas State Extension Forester through cooperative agreement with the U. S. Forest Service.

Sponsors recognize the importance of protecting natural wildlife habitat in the development of watershed structures. During the installation of needed works of improvement, some habitat regrettably is impaired or

destroyed. Every effort will be made to reduce to a minimum these damaging effects and measures are planned to help offset these losses. At the same time, an educational program is planned to inform rural residents of the watershed of the economic benefits gained from excluding livestock from woodlands and shelterbelts. This also benefits wildlife. Recommendations of the Fish and Wildlife Service will be followed where economically feasible.

Amounts and estimated costs of land treatment measures to be applied during the project period are shown in table 1. The estimated total cost of soil surveys necessary to the planning and installing of land treatment measures is $5,900. $2,400 of this is for acceleration during the project period and will be paid for from P. L. 566 funds. Public Law 566 funds will be furnished in the amount of $124,400 to provide technical assistance to accelerate the land treatment program. Funds from other sources will be provided in the amount of $1,764,800 for installing these measures.

Structural Measures

A system of twelve floodwater retarding structures and one multiple-purpose reservoir for flood prevention and recreation will be installed at locations shown on the Project Map. This system controls the runoff from 74.6 square miles which is 27.3 percent of the total drainage area of the watershed. The structures will have an aggregate storage capacity of 17,877 acre feet for floodwater, 675 acre feet of recreation water supply storage, and 3,258 acre feet for sediment. Physical data for each structural measure is presented in table 3.

All structures will be earth dams with vegetated or rock emergency spillways provided to release runoff exceeding reservoir storage capacity safely past the embankment. These spillways have been planned so that their chance of operation in any one year is 4 percent or less. A cross section of a typical structure is shown on page 66.

Multiple-purpose site No. 14 is planned with water storage for recreation of 675 acre feet. It is planned

with a sediment volume of 855 acre feet and a floodwater retarding storage of 4,101 acre feet. At full recreation pool the multiple-purpose reservoir will have a surface area of 231 acres.

An area around the water supply pool of 838 acres will be purchased for recreation. This area includes 440 acres that are necessary for the temporary storage of floodwater, 50 acres for the dam and spillway, and 348 acres located above this area for access and installation of recreational facilities.

Facilities for recreation to be installed during the project period include fencing, landscaping, signs, access roads, parking, utilities, camp sites, picnic facilities, sanitary and waste facilities, swimming beach, and facilities for boating. For a complete list of facilities with amounts and costs see table 2B.

The multiple-purpose structure and all recreational facilities will be installed, operated, and maintained to meet or exceed the requirements of the state and local public health agencies.

Structures have been planned with a floodwater storage ranging from 3.85 to 4.80 inches of runoff from their drainage areas. Storage will be provided for the expected 100-year accumulation of sediment with a storage volume equivalent ranging from 0.48 to 1.08 inches per acre from the drainage area above detention structures. Emergency spillway capacities are planned to handle storms ranging in volume from 8.5 to 14.5 inches of rainfall in a six-hour period. Determination of spillway capacity within this range was based on spillway material and class of structure. Principal spillways will be reinforced concrete or a comparable quality material. They will have inlets with uncontrolled average release rates varying from 20 c.s.m. to 27 c.s.m. The inlet of all floodwater retarding structures will be placed at the elevation of the 50-year accumulation of sediment.

Eight of the structures will affect physical features already present on the land. These features are primarily roads, bridges, an abandoned oil well, and utilities that

will be flooded by back water of the flood pools during infrequent storm events. An abandoned oil well in the flood pool of Site No. 15 will be plugged. Footnotes on table 2 show by structure the effects and the estimated cost.

Structural measures will be installed at an estimated total cost of $2,639,400. Individual structural measure costs are shown in table 2.

EXPLANATION OF INSTALLATION COSTS

Areas needing treatment and estimated costs of land treatment measures are shown in table 1. The estimated total cost of planning and installing land treatment measures is $1,889,200. Public Law 566 funds will be furnished in the amount of $124,400 to provide technical assistance to accelerate the current program. Funds from other sources will be provided in the amount of $1,764,800 for installing these measures.

The cost of applying land treatment measures is based on current costs of applying such measures under existing programs.

Construction cost estimates in this plan are based on computation of quantities derived from survey data using unit costs of similar work on other projects with a contingency allowance of 12 percent.

Engineering services include all direct and related costs of engineers and geologists for surveys, geologic site investigations, soil mechanics, structure design, construction plans, and specifications.

Project administration costs are P. L. 566 and other administrative costs associated with installation of structural measures. These costs include contract administration, review of engineering plans prepared by others, government representatives, and necessary inspection service during construction to insure that structural measures are installed in accordance with plans and specifications.

Values of land rights for the floodwater retarding structures were determined by the board of directors of

the Whitewater River Watershed Joint District No. 22 and agreed to by the Soil Conservation Service. Land cost estimates were based on current land values which varied from $130 per acre for pastureland to $325 per acre for tributary flood plain cropland. Additional local costs are involved to dike around improvements and raise and replace roads, bridges, pipelines, and utilities. Costs are shown by individual structure sites on table 2. These values may not coincide with actual out-of-pocket costs to the local sponsoring organizations because some land rights may be obtained by donation.

Public Law 566 costs for the 12 floodwater retarding structures include 100 percent of construction and engineering services costs. Whitewater River Watershed Joint District No. 22 will furnish all of the land rights needed for the floodwater retarding structures.

The use of facilities method was used to allocate joint costs to the purposes served by the multiple-purpose reservoir No. 14. Allocations computed in this manner are flood prevention 88 percent and public recreation 12 percent.

Construction costs of the dam, estimated at $281,700, are joint costs to all purposes and will be shared as follows:

Item	Harvey County		P. L. 566	
	Percent	Amount	Percent	Amount
Public Recreation	50	16,900	50	16,900
Flood Prevention			100	247,900
Total	6	16,900	94	264,800

Engineering services cost of the dam, estimated at $45,000, are joint costs, but will be paid in total by P.L. 566 funds.

Land rights for the multiple-purpose reservoir and associated recreation development are to be acquired on

about 1,117 acres at an estimated cost of $382,100. These areas and costs are divided as follows:

Dam and Reservoir	
Fee Title - 721 acres	216,300
Flowage Easements - 48 acres	1,900
Recreation Area	
348 acres	104,400
Road, Bridge, and Utility Modification	50,500
Surveys, Legal Fees, etc.	9,000
Total	382,100

The cost of the 48 acres of flowage easements is allocated in full to flood prevention. All other costs associated with land rights are allocated to recreation.

Costs of land rights for the multiple-purpose structure and recreation facilities will be shared as follows:

Item	Harvey County		P. L. 566	
	Percent	Amount	Percent	Amount
Dam and Reservoir				
Fee Title - 721 acres	50	108,150	50	108,150
Recreation Area				
348 acres	50	52,200	50	52,200
Road, Bridge, and Utility Modification	50	25,250	50	25,250
Flowage Easements				
48 acres	100	1,900		
Surveys, Legal Fees, etc.	100	9,000		
Total		196,500		185,600

Land values in connection with the multiple-purpose site were determined by the county commissioners of Harvey County and agreed to by the Service.

Construction and engineering services costs of the recreation facilities amount to $200,200. These costs are to be shared 50 percent by P.L. 566 and 50 percent by Harvey County. Engineering and architectural services for surveys and design of recreational facilities will be obtained by A&E contract and from the engineering staffs of Harvey County and the Service. The county and the Service will make such inspections as necessary to assure that construction conforms to plans and specifications. It is expected that the installation services by the Service and the county will be equal in value.

The total estimated cost of the floodwater retarding structures, multiple-purpose structure, and recreation facilities is $2,279,900. This cost in relation to purpose and cost sharing is as shown in table 2A.

The total project administration cost is estimated to be $359,500. P.L. 566 will bear $352,400 of this cost with other funds picking up the remaining $7,100.

The estimated total Public Law 566 structural cost and other obligations by fiscal years during the project installation period are as follows:

LAND TREATMENT

Fiscal Year	P.L. 566 Costs	Other Costs	Total
First	12,400	176,500	188,900
Second	18,700	176,500	195,200
Third	24,900	441,200	466,100
Fourth	25,000	441,200	466,200
Fifth	18,700	176,500	195,200
Sixth	18,700	176,500	195,200
Seventh	6,000	176,400	182,400
Total	124,400	1,764,800	1,889,200

STRUCTURAL MEASURES

Fiscal Year	P. L. 566 Costs	Other Costs	Total
First	85,300	14,300	99,600
Second	242,400	43,400	285,800
Third	316,200	85,600	401,800
Fourth	385,800	126,700	512,500
Fifth	379,500	171,300	550,800
Sixth	328,600	170,000	498,600
Seventh	240,400	49,900	290,300
Total	1,978,200	661,200	2,639,400

EFFECTS OF WORKS OF IMPROVEMENT

Land treatment will reduce soil and water loss on the upland resulting in increased farm yields and income. Depletion of soil resources will be reduced. Sedimentation of road ditches and farm ponds will be slowed down. Land treatment will reduce flooding and scouring on the flood plain. Water for livestock and domestic use will be more plentiful and of better quality. Wildlife will increase which will provide recreation and income for the landowners and operators. Road and bridge maintenance caused by floods will be reduced saving tax money and benefiting the public.

The watershed area is protected by rural fire districts. Equipment procurement, fire training, and fire prevention education will continue to be developed through the going Cooperative Fire Control Program. Adequate watershed fire protection can be achieved through the program without accelerated technical assistance.

The forest land treatment program will make woodlands more effective in handling water and reducing erosion. These woodlands will bring greater economic returns to the landowner.

The watershed project will reduce by about 50 percent the number of floods causing damage. It will also reduce the depth, sediment load, velocity, and extent of the

remaining damaging floods. With the watershed in effect it is expected that the flood risk to crop production will be no greater than from other risks.

The program of land treatment and structural measures will accomplish a 65 percent reduction in average annual flood damages. Area benefited in each reach along with percent reduction in damages is shown in the following table:

Reach	Area Benefited	Percent Damage Reduction
1	565	56
2	470	71
3	375	77
6	88	84
13	820	66
14	338	88
15	110	96
16	1,075	44
17	525	53
18	285	55
19	84	86
20	550	50
21	917	86
22	129	80
23	483	39
24	184	69
Total	6,998	Overall 65

Effects of flood prevention in East and West Sectors Whitewater River Watershed will vary depending on location within the watersheds. Flood plain areas above Towanda Reservoir and tributary flood plains will be protected by the watershed project. The Whitewater River flood plain including the urban area in Augusta downstream from the Towanda Reservoir will be protected by the reservoir as well as the watershed projects.

Reaches located on the mainstem of the Whitewater River below the Towanda Reservoir and the mouth of the watershed and above the junction with the Walnut River are afforded a high degree of flood protection. 5,610 acres are benefited in these reaches. An additional area of about 32,800 acres of Walnut River flood plain lies below the junction of the Whitewater and Walnut Rivers. This area is damaged by floods and will be benefited by the watershed project. 920 acres of this area are urban and 28,100 acres are cultivated. 5,676 residents live in the area subject to flood damage and an additional 1,986 people are employed in the flood plain area. Many other farm people are affected by direct flood damages by owning land on the flood plain with residence out of the flood plain area.

Mainstem reaches below the mouth of the watershed were evaluated by the Corps of Engineers. Benefits were allocated back of projects by the Corps of Engineers and were concurred in by the Soil Conservation Service and the Kansas Water Resources Board. The benefits accrue to the works of improvement in this plan through the reduction of floodwater damages to crops, other agricultural properties, roads and bridges, urban properties, and flood plain lands.

The watershed protection and flood prevention program will benefit an estimated 924 people living within the watershed. All or parts of 308 farms are located in the flood plain area and are directly benefited by the works of improvement of this plan.

Reduction in depth and frequency of flooding will substantially reduce crop losses. Reduction in flood hazard will induce farmers to use more fertilizer, improved crop varieties, and establish soil building rotations. Farmers will be able to perform tillage, planting, and harvesting operations on a timely basis for improved production.

Losses in productivity due to removal of soil by flood plain scour will be substantially reduced. Reduction in flooding will make it possible to regain normal productivity on previously damaged land.

A substantial reduction in cost of maintaining roads and bridges on the flood plain will be realized. The reduction in cost of repairing road and bridge damage will release funds for use in improving and modernizing the existing road system.

The watershed project will bring about a land use adjustment. A more complete job of conservation farming on the upland will cause a conversion of some cropland to pasture. A reduction in frequency of flooding on the flood plain will allow 192 acres of land now in brushy pasture and other woody vegetation to be converted to cropland without adversely affecting watershed stability. Construction of the twelve floodwater retarding structures and one multiple-purpose structure will convert both pasture and cropland to water storage in the sediment pools. 208 acres of cropland in reservoir areas will be converted to water storage and incidental recreational use.

Works of improvement will provide benefits to Towanda Reservoir. These benefits have been coordinated with the Corps of Engineers, Tulsa District, and the Soil Conservation Service. Benefits to Towanda Reservoir represent the value of re-allocation of floodwater and sediment storage to water supply storage made possible by storage included in the upstream Soil Conservation Service structures.

Secondary benefits stemming from the project are realized from transporting, processing, and marketing agricultural commodities produced as a result of reducing crop losses by flooding. Secondary benefits induced by the project include: increased net return to suppliers of farm equipment and materials required to achieve the increased agricultural production made possible by the project; increased net return to local retailers and wholesalers from consumer expenditures by the farm family resulting from increased farm income; and any other increase in net returns resulting from costs directly associated with marketing or using project goods or services. Secondary benefits from a national viewpoint were not considered pertinent to the economic evaluation.

Recreation as a project purpose is included in the development of this plan. Benefits to a large land area and sector of the general public will accrue to the recreation feature of the multiple-purpose reservoir. It is estimated that 50,000 people will visit this area for recreation annually. Approximately 85 percent of these people will use the recreation facilities from May 15 to September 15. It is expected that 1,000 visitors will use the recreation facilities on any one weekend day. This development will supply the facilities necessary for boating, fishing, swimming, picnicking, camping, sightseeing, and outdoor games for this number of people.

Experience has shown that recreational benefits will accrue from incidental use of water in sediment pools. Access will be available to most of the reservoirs through permission of the landowner. The concentration of people at any one reservoir is expected to be small. Sponsors will discourage recreational use of any reservoirs where adequate sanitation facilities are not available.

Sediment pools of the twelve proposed floodwater retarding reservoirs will provide about 400 acres of potential fishing water. These pools will average about 33 surface acres in area and range in size from 19 to 70 acres. Average depth of the pools will be sufficient to provide fishing ranging in quality from poor to excellent depending on the degree and type of management applied. As the ponds fill with silt their value as fisheries will decrease. Stream fishing in the watershed will be benefited by stabilized streamflows and lowered turbidities downstream from floodwater retarding structures.

Under project conditions about 554 acres of land will be inundated permanently by the sediment and conservation pools. An additional 2,379 acres in the flood pools of the reservoirs will be flooded occasionally. The project will remove some wildlife habitat. This will be partially offset by reduced flooding on 11,638 acres of which some is good wildlife habitat. Fortunately, the watershed has an abundance of excellent wildlife habitat and there will be no significant detrimental effect on wildlife populations or on hunting opportunities in the watershed.

Benefits to wildlife, particularly ground-nesting species, will be realized as a result of reduced flooding downstream from the proposed structures. As the sediment pools gradually fill in with sediment, emergent and woody vegetation is expected to increase around the water's edge. The value of the sediment pools as terrestrial wildlife habitat will increase in direct proportion to the age of the pools.

The increased water area and wide distribution of project structures will benefit waterfowl by providing additional resting and feeding areas. There will be increased opportunities for waterfowl hunting with the project.

Soil conservation district programs include wildlife conservation practices along with other conservation measures. These practices will compensate for reduced wildlife habitat brought about in reservoir areas.

PROJECT BENEFITS

Evaluated annual project benefits amount to $263,600. Of these, $32,700 are flood prevention benefits accruing to land treatment measures and $230,900 are attributable to structural measures. Individual items of benefit are shown in tables 5 and 6.

Average annual damage reduction benefits with the project installed total $93,200 of which $75,100 accrue to structural measures. Benefits from reduction in floodwater damage to crops and pasture average $59,000 annually and account for 63 percent of the damage reduction benefits. Reduction in flooding achieves benefits of $5,900 to other agricultural property such as stored feed, fences, buildings, and other farm improvements. Benefits to roads and bridges are in the amount of $14,400 on an average annual basis. Benefits from reducing damages to flood plain land by scour will average $4,700 annually, accounting for about 5.0 percent of the total damage reduction benefits. Indirect average annual benefits realized from less interruption of travel, halting or delays in mail, school busses, and milk routes amount to $9,200.

Reduction of the flood hazard makes possible benefits from more intensive use of land through improved crop rotations and use of fertilizer. More intensive use benefits will average $26,000 annually. Agricultural benefits from changed land use will amount to $6,900 annually within the watershed.

The value of local secondary benefits stemming from the project will be $20,100. Secondary benefits induced by the project will amount to $3,900 giving a secondary benefit total of $24,000 annually. Secondary benefits from a national viewpoint were not considered pertinent to the economic evaluation.

Benefits from the reduction of sediment yield and floodwater volume delivered to Towanda Reservoir as a result of works of improvement of this plan are $8,700.

Benefits to the Walnut River flood plain from this watershed average $29,800 annually.

The multiple-purpose development will produce annual benefits to recreation of $75,000. These benefits will accrue to boating, fishing, sightseeing, camping, picnicking, and swimming.

Incidental recreation and fish and wildlife benefits will be realized from the project. These benefits were not evaluated or used for monetary justification of this plan.

In addition to the monetary benefit, there are other substantial intangible values which will accrue from the project such as better living conditions, a sense of economic security, and abatement of fear from flooding.

COMPARISON OF BENEFITS AND COSTS

The average annual cost of structural measures, including installation, operation, maintenance, and replacement, is $147,400. When the project is completely installed, the structural measures are expected to produce average annual benefits of $230,900. The benefit-cost ratio without the inclusion of local secondary benefits is 1.4 to 1.0. With secondary

benefits included the project will produce benefits of $1.60 for each dollar of equivalent cost (see table 6).

PROJECT INSTALLATION

Works of improvement will be installed in a seven year period. Federal assistance for carrying out works of improvement on non-federal land as described in this work plan will be provided under authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 68 Stat. 666) as amended.

Land Treatment Measures

Land treatment measures will be established on the land by the farm owners and operators in cooperation with the Butler, Sedgwick, and Harvey Counties Soil Conservation Districts. Costs of applying these measures will be shared by owners and operators of the land and the Agricultural Conservation Program. The Soil Conservation Service with financial assistance from the Whitewater River Watershed Joint District No. 22 will provide technical assistance in planning and establishing land treatment measures. Technical assistance to the soil conservation districts will be accelerated to assure application of the planned measures within the installation period of the project.

Forestry land treatment measures will be installed and financed by the landowners and operators. Fire control measures will be installed by the rural fire districts through the Cooperative Fire Control Program. Technical assistance for installing both the forestry and fire control measures will be provided by the State Extension Forester through cooperative agreement with the Forest Service. Costs of accelerated technical assistance for forestry measures will be shared by P.L. 566 and the Kansas State Extension Forester. Technical assistance for fire control measures will be provided and financed by the Kansas State Extension Forester through the going Cooperative Fire Control Program.

The Extension Service will assist in carrying out the educational phase of the program by preparation of

general information in cooperation with the governing bodies of the soil conservation and watershed district boards. The Farmer's Home Administration Soil and Water Loan Program will be available to eligible farmers in the area. The County Agricultural Stabilization and Conservation Committees will cooperate with the governing bodies of the soil conservation districts to accelerate Agricultural Conservation Program financial assistance for those practices which will accomplish the conservation objectives. Supervisors of the soil conservation districts will encourage landowners and operators within the Whitewater River Watershed to install soil and water conservation measures on their farms.

Structural Measures

Under provisions of the Watershed Protection and Flood Prevention Act, as amended, all construction costs (including engineering costs) allocated to flood prevention will be paid by P. L. 566. One half of the construction costs, all of the engineering costs of the dam and reservoir, and up to one half of the engineering costs of recreation facilities will be paid by P.L. 566.

Land rights costs allocated to flood prevention will be borne by non-federal interests. Land rights costs allocated to recreation will be cost shared 50 percent by P. L. 566 and 50 percent by local interests.

After federal assistance is authorized for installation of the project, the Soil Conservation Service will furnish engineering services to prepare construction plans and specifications for twelve floodwater retarding structures and the multiple-purpose structure.

Engineering and architectural services for surveys and design of recreational facilities will be obtained by A&E contract and from the engineering staffs of Harvey County and the Service. The county and the Service will make such inspections as necessary to assure that construction conforms to plans and specifications. It is expected that the installation services by the Service and the county will be equal in value.

Local sponsors will either contract for construction or request that the Soil Conservation Service contract for construction. Structural measures will be installed through construction contracts awarded on the basis of competitive bidding. Separate contracts will be awarded for general construction and for vegetative establishment. Local sponsors will appoint a contracting officer and will bear the cost of contract administration for contracts which they let.

Construction inspection will be in the amount necessary to satisfy each that satisfactory installation has been completed.

Local sponsors will obtain all land rights needed for installation of structural measures. They have power of eminent domain to obtain land rights for public improvements and have agreed to use such authority when needed. Local sponsors will make arrangements with the Butler, Sedgwick, and Harvey County Commissioners for abandonment, relocation, or modification of any county roads requiring such action. They will likewise arrange for any relocation or modification of pipelines, communication lines, or other public utilities which are necessary in connection with project installation.

Construction can be started when necessary land rights have been obtained, P.L. 566 funds are available, and local sponsoring organizations have complied with State laws relating to approval of construction plans.

FINANCING PROJECT INSTALLATION

Land Treatment Measures

Soil conservation districts will seek such allocation of Agricultural Conservation Program funds as needed to cost share on land treatment measures to meet project objectives within the watershed. Technical assistance available from the Soil Conservation Service in its program of assistance to soil conservation districts will be accelerated in order to meet the project objectives.

The estimated cost of woodland treatment measures is $12,800. Estimated costs of fire control measures are $55,000. Individual landowners, rural fire districts, and funds from other federal programs such as ACP will bear the costs of installation.

Technical assistance costs to be borne by going cooperative programs are estimated to be $4,000. Estimated costs of accelerated technical assistance are $7,900. These costs will be borne by P.L. 566 ($6,400) and the State of Kansas ($1,500), cooperating with the Forest Service.

Structural Measures

Whitewater River Watershed District and Harvey County have all the necessary authority and power to finance and to carry out watershed improvements. These powers include the right to accept contributions, levy taxes, make assessments against land benefited, issue bonds, and exercise the right of eminent domain.

Whitewater River Watershed Joint District No. 22 was created and validated in accordance with the Kansas Watershed District Act as amended.

Expenses for organizing the watershed district have been paid and current general expenses are being paid from a general fund supported by an annual tax levy.

Land rights work maps have been furnished for all structural measures as a basis for contacting landowners and appraising costs. Watershed district directors believe, based on contacts with the landowners, that some of the land rights for floodwater retarding structures will be donated.

The watershed district will finance the local share of the costs of the floodwater retarding structures. They expect to use funds currently on hand and budgeted for that purpose, funds that will be collected through taxes before construction takes place, and will issue general obligation bonds to raise any additional funds that may be needed.

Harvey County will finance the local share of the costs of the multiple-purpose development. They expect to use funds currently on hand and budgeted for that purpose, funds that will be collected through taxes before construction takes place, and will raise any additional funds that may be needed through the issuance of general obligation bonds. The county expects to finance the operation, maintenance, and replacement of the multiple-purpose development by an annual tax levy for that purpose.

Funds for construction costs will be provided to the local sponsoring organizations through project agreements for construction executed with the Soil Conservation Service.

Federal technical assistance, engineering services, project administration, and funds for construction are contingent upon appropriations for these purposes.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land Treatment Measures

Land treatment measures will be maintained by landowners and operators of the farms on which measures are installed under agreements with the Butler, Sedgwick, and Harvey Counties Soil Conservation Districts. Representatives of the soil conservation districts will make periodic inspection of the land treatment measures to determine maintenance needs and will encourage landowners to perform needed maintenance.

Technical assistance to landowners and rural fire districts for operating and maintaining the forestry and fire control measures beyond the installation period will be provided by the State Extension Forester in cooperation with the Forest Service under regular continuing programs.

Structural Measures

An agreement will be executed providing for operation and maintenance of the floodwater retarding structures by the Whitewater River Watershed Joint District No. 22 and

for the multiple-purpose development by Harvey County before federal construction funds are made available for these purposes.

Floodwater retarding structures will be operated and maintained by the watershed district. The multiple-purpose structure and recreation facilities will be operated and maintained by Harvey County. All structural measures will be inspected annually, after unusually severe floods, and after any other unusual condition that might adversely affect the structural measures. Inspections will be made for a three year period following completion of construction by representatives of the local sponsoring organizations and Soil Conservation Service. Thereafter, responsible local organizations will make the annual inspections throughout the life of the structures and report their findings to the Soil Conservation Service. Items of inspection will include but not be limited to the conditions of principal spillways and their appurtenances, emergency spillways, earth fills, vegetative cover of earth fills and emergency spillways, fences installed as a part of the structural measures, and all recreation facilities. A record of maintenance inspections will be maintained.

Recreation facilities will need to be replaced periodically. Useful life will vary as to facility and its use. Replacement costs were determined for each facility based on its life expectancy. Harvey County will replace recreation facilities following a schedule based on need.

Maintenance work will be carried out when needed. Kinds of maintenance work that would be expected rather frequently are repairs to fence and recreation facilities, clearing of debris, mowing of dam and spillway, etc. Repairs to the emergency spillways will primarily consist of filling in eroded areas and reseeding. Repairs to major construction items such as the dam, emergency spillway, and principal spillway are expected to be needed infrequently.

The estimated average annual operation, maintenance, and replacement costs are $17,600. Necessary maintenance

will be accomplished through hired or contributed labor and equipment. Funds for accomplishing the maintenance work will be obtained from an annual tax levy.

Provisions will be made for free access of city, state, and federal representatives to inspect the structural system at any time.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

West Sector Whitewater River Watershed, Kansas

Installation Cost Item	Unit	Number Non-Fed. Land	Estimated Cost (Dollars)[1] P. L. 566	Other	Total
LAND TREATMENT					
Soil Conservation Service					
Cropland	Ac.	31,591		1,466,700	1,466,700
Rangeland	Ac.	21,533		49,800	49,800
Technical Assistance			118,000	175,000[2]	293,000
SCS Subtotal			118,000	1,691,500	1,809,500
Forest Service					
Woodland	Ac.	610		12,800	12,800
Fire Control	Ac.	60,124		55,000	55,000
Technical Assistance			6,400	5,500[3]	11,900
FS Subtotal			6,400	73,300	79,700
TOTAL LAND TREATMENT			124,400	1,764,800	1,889,200
STRUCTURAL MEASURES					
Soil Conservation Service					
Construction					
Floodwater Retarding Structures	No.	12	888,200		888,200
Multiple-Purpose Structure	No.	1	264,800	16,900	281,700
Recreation Facilities	No.	1	91,000	91,000	182,000
Subtotal Construction			1,244,000	107,900	1,351,900
Engineering Services			196,200	9,100	205,300
Project Administration					
Construction Inspection			260,800		260,800
Other			91,600	7,100	98,700
Subtotal Administration			352,400	7,100	359,500
Other Costs					
Land Rights			185,600	537,100	722,700
TOTAL STRUCTURAL MEASURES			1,978,200	661,200	2,639,400
TOTAL PROJECT			2,102,600	2,426,000	4,528,600
SUMMARY					
Subtotal SCS			2,096,200	2,352,700	4,448,900
Subtotal FS			6,400	73,300	79,700
TOTAL PROJECT			2,102,600	2,426,000	4,528,600

1/ Price base 1968
2/ Includes $25,000 from local watershed district funds
3/ $4,000 of this figure is contributed through going programs

August 1969

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT

West Sector Whitewater River Watershed, Kansas

Measures	Unit	Applied to Date	Total Cost (Dollars) 1/
LAND TREATMENT			
Soil Conservation Service			
Conservation Cropping System	Acre	57,475	1,207,000
Diversion	Mile	32	20,000
Farm Pond	No.	332	425,000
Grade Stabilization Structure	No.	437	157,300
Grass Waterway	Acre	1,203	187,100
Range Proper Use	Acre	29,450	29,500
Range Seeding	Acre	1,680	42,000
Pasture Planting	Acre	2,231	61,400
Terraces, Gradient	Mile	798	263,500
Subtotal SCS			2,392,800
Forest Service			
Tree and Shrub Planting	Acre	100 2/	5,000
Fire Control	Acre	60,124 2/	88,700
Subtotal FS			93,700
TOTAL			2,486,500

1/ Price base 1968
2/ These acres are included in table 1 as needing further treatment

August 1969

59-848 O-71 —— 6

TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION
West Sector Whitewater River Watershed, Kansas

(Dollars)[1]

Item	Installation Cost P. L. 566 Funds				Installation Cost - Other Funds				Total Installation Cost
	Construction	Engineering	Land Rights	Total P. L. 566	Construction	Engineering	Land Rights	Total Other	
Floodwater Retarding Structures									
12	54,000	8,600		62,600			20,600	20,600	83,200
13	56,700	9,100		65,800			12,300	12,300	78,100
15	68,500	10,900		79,400			26,500[2]	26,500	105,900
16	54,400	8,700		63,100			18,000[3]	18,000	81,100
17	83,800	13,400		97,200			49,300[4]	49,300	146,500
18	102,500	16,400		118,900			36,800[5]	36,800	155,700
19	74,900	12,000		86,900			39,800[6]	39,800	126,700
20	63,500	10,200		73,700			12,600	12,600	86,300
21	94,300	15,100		109,400			15,700[7]	15,700	125,100
22	55,600	8,900		64,500			12,100	12,100	76,600
23	59,400	9,500		68,900			11,900	11,900	80,800
24	120,600	19,300		139,900			85,000[8]	85,000	224,900
Subtotal FRS	888,200	142,100		1,030,300			340,600	340,600	1,370,900
Multiple-Purpose Structure No. 14	264,800	45,000	133,400[9]	443,200	16,900		144,300[10]	161,200	604,400
Basic Facilities	91,000	9,100	52,200	152,300	91,000	9,100	52,200	152,300	304,600
Subtotal	1,244,000	196,200	185,600	1,625,800	107,900	9,100	537,100	654,100	2,279,900
Project Administration				352,400				7,100	359,500
GRAND TOTAL	1,244,000	196,200	185,600	1,978,200	107,900	9,100	537,100	661,200	2,639,400

1/ Price base 1968 August 1969
2/ Includes $1,500 to raise road, $6,000 for bridge, $4,400 for blacktop, $855 for new farmstead road, & $200 to plug an oil well
3/ Includes $544 to dike around house
4/ Includes $8,258 to raise road, $10,000 to replace bridge, and $528 to dike around farmstead
5/ Includes $1,000 to relocate power lines and $1,020 to raise road
6/ Includes $1,500 for dike, $1,500 to raise road, and $2,000 to relocate transmission lines
7/ Includes $1,285 to dike around farmstead and $257 to raise road
8/ Includes $420 for dike and $3,000 to relocate utilities
9/ Includes $25,000 for road and bridge modification and $250 for utility modification
10/ Includes $9,000 for legal fees, surveys, etc., $25,000 for road and bridge modification, and $250 for utility modification

TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

West Sector Whitewater River Watershed, Kansas

(Dollars)[1/]

Item	COST ALLOCATION			COST SHARING					
	PURPOSE			P. L. 566			OTHER		
	Flood Prevention	Recreation	Total	Flood Prevention	Recreation	Total	Flood Prevention	Recreation	Total
12 Floodwater Retarding Structures	1,370,900		1,370,900	1,030,300		1,030,300	340,600		340,600
Multiple-Purpose Structure	288,600	315,800	604,400	286,700	156,500	443,200	1,900	159,300	161,200
Recreational Facilities		304,600	304,600		152,300	152,300		152,300	152,300
GRAND TOTAL	1,659,500	620,400	2,279,900	1,317,000	308,800	1,625,800	342,500	311,600	654,100

1/ Price Base 1968

August 1969

TABLE 2B - RECREATIONAL FACILITIES
ESTIMATED CONSTRUCTION COSTS

West Sector Whitewater River Watershed, Kansas

(Dollars)[1/]

Item	Number	Estimated Unit Cost	Total Construction Cost
Access Roads			
One-way	1,700 ft.	$1.50/lin.ft.	2,550
Two-way gravel	21,600 ft.	$2.00/lin.ft.	43,200
Two-way hard surface	3,000 ft.	$3.50/lin.ft.	10,500
Campsites	25	175	4,375
Sewage Lagoon	3	800	2,400
Comfort Stations	3	12,500	37,500
Fence, Woven Wire	1,700 ft.	$2.00/lin.ft.	3,400
Water Supply, Pressure	1	3,000	3,000
Picnic Shelter	3	1,000	3,000
Picnic Tables	55	50	2,750
Grills or Fireplaces	40	50	2,000
Parking Areas	1,100	$2.00/lin.ft.	2,200
Boat Launching Ramps	3	4,000	12,000
Boat Docks	3	800	2,400
Swimming Area	1	5,000	5,000
Bathhouse	1	15,000	15,000
Landscaping	LUMP	10,000	10,000
Signs, DIRECTIONAL	20	50	1,000
		TOTAL	162,275
Contingencies (12%)			19,725
			182,000

1/ Price base 1968

August 1969

TABLE 3 - STRUCTURE DATA
MULTIPLE-PURPOSE AND FLOODWATER RETARDING STRUCTURES

West Sector Whitewater River Watershed, Kansas

ITEM	UNIT	STRUCTURE NUMBER	
		12	13
Class of Structure		a	a
Drainage Area	Sq. Mi.	2.75	2.71
Controlled	Sq. Mi.	--	--
Curve No. (1-day) (AMC II)		85	85
Tc	Hours	1.90	2.20
Elevation Top of Dam	Feet	1,439.8	1,445.3
Elevation Crest Emergency Spillway	Feet	1,434.8	1,440.3
Elevation Crest Low Stage Inlet	Feet	1,425.8	1,430.5
Maximum Height of Dam	Feet	27.3	27.3
Volume of Fill	Cu. Yds	69,000	76,000
Total Capacity	Ac. Ft.	759	747
Sediment Submerged 1st 50 years	Ac. Ft.	100	97
Sediment Submerged 2nd 50 years	Ac. Ft.	58	58
Beneficial Use (Recreation)	Ac. Ft.	--	--
Retarding	Ac. Ft.	601	592
Surface Area			
Sediment Pool	Acres	29	26
Beneficial Use Pool (Recreation)	Acres	--	--
Retarding Pool	Acres	135	117
Principal Spillway			
Rainfall Volume (areal) (1-day)	Inches	6.2	6.2
Rainfall Volume (areal) (10-day)	Inches	10.1	10.1
Runoff Volume (10-day)	Inches	6.58	6.58
Capacity of Low Stage (Max.)	c.f.s.	59	60
Frequency Operation-Emer. Spillway	% Chance	4	4
Size of Conduit	Dim.	24"	24"
Emergency Spillway			
Rainfall Volume (ESH) (areal)	Inches	5.9	5.9
Runoff Volume (ESH)	Inches	4.21	4.21
Type		Veg.	Veg.
Bottom Width	Feet	40	40
Velocity of Flow (V_e) 1/	Ft./Sec.	2/	2/
Slope of Exit Channel	Ft./Ft.	2/	2/
Maximum Water Surface Elevation	Feet	2/	2/
Freeboard			
Rainfall Volume (FH) (areal)	Inches	8.5	8.5
Runoff Volume (FH)	Inches	6.70	6.70
Maximum Water Surface Elevation	Feet	1,436.7	1,442.4
Capacity Equivalents			
Sediment Volume	Inches	1.08	1.07
Retarding Volume	Inches	4.10	4.10

1/ Maximum during passage of hydrograph
2/ Emergency spillway hydrograph is contained below crest of emergency spillway

TABLE 3 - CONTINUED

STRUCTURE NUMBER					
15	16	17	18	19	20
a	b	b	b	a	b
6.15	2.77	6.35	8.50	8.49	3.24
--	--	--	--	--	--
83	83	84	83	83	83
2.70	1.80	3.30	3.50	3.00	1.50
1,436.7	1,345.0	1,411.9	1,396.9	1,403.1	1,388.7
1,431.7	1,339.7	1,406.5	1,391.1	1,397.6	1,383.7
1,416.5	1,329.8	1,391.3	1,377.8	1,384.0	1,369.1
35.7	31.0	33.9	34.9	36.1	32.7
91,000	70,000	122,000	141,000	89,000	91,000
1,446	828	1,830	2,571	1,962	1,106
115	83	126	272	136	97
69	50	78	168	82	59
--	--	--	--	--	--
1,262	695	1,626	2,131	1,744	950
25	28	30	60	34	23
--	--	--	--	--	--
162	142	232	324	265	132
6.2	7.0	7.0	7.0	6.2	7.0
10.1	11.5	11.5	11.5	10.1	11.5
6.18	7.45	7.73	7.45	6.18	7.45
138	59	143	191	191	64
4	2	2	2	4	1
36"	24"	36"	42"	42"	24"
5.9	8.5	8.5	8.5	5.9	8.5
4.00	6.45	6.58	6.45	4.00	6.45
Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
40	40	100	60	40	80
2/	5.1	5.1	5.8	2/	4.8
2/	.054	.030	.032	2/	.050
2/	1,341.1	1,408.2	1,393.0	2/	1,384.8
8.5	14.4	14.4	14.4	8.5	14.4
6.45	12.20	12.35	12.20	6.45	12.20
1,436.7	1,344.1	1,411.9	1,396.9	1,400.6	1,387.9
0.56	0.90	0.60	0.97	0.48	0.90
3.85	4.70	4.80	4.70	3.85	5.50

August 1969

TABLE 3 - STRUCTURE DATA

MULTIPLE-PURPOSE AND FLOODWATER RETARDING STRUCTURES

West Sector Whitewater River Watershed, Kansas

ITEM	UNIT	STRUCTURE NUMBER	
		21	22
Class of Structure		a	b
Drainage Area	Sq. Mi.	3.47	1.72
Controlled	Sq. Mi.	--	--
Curve No. (1-day) (AMC II)		83	83
Tc	Hours	2.00	1.50
Elevation Top of Dam	Feet	1,299.7	1,392.9
Elevation Crest Emergency Spillway	Feet	1,294.4	1,387.9
Elevation Crest Low Stage Inlet	Feet	1,283.7	1,379.7
Maximum Height of Dam	Feet	27.2	22.9
Volume of Fill	Cu. Yds.	138,000	75,000
Total Capacity	Ac. Ft.	857	523
Sediment Submerged 1st 50 years	Ac. Ft.	91	57
Sediment Submerged 2nd 50 years	Ac. Ft.	54	35
Beneficial Use (Recreation)	Ac. Ft.	--	--
Retarding	Ac. Ft.	712	431
Surface Area			
Sediment Pool	Acres	31	19
Beneficial Use Pool (Recreation)	Acres	--	--
Retarding Pool	Acres	124	110
Principal Spillway			
Rainfall Volume (areal) (1-day)	Inches	6.2	7.0
Rainfall Volume (areal)(10-day)	Inches	10.1	11.5
Runoff Volume (10-day)	Inches	6.18	7.45
Capacity of Low Stage (Max.)	c.f.s.	78	39
Frequency Operation-Emer. Spillway	% Chance	4	2
Size of Conduit	Dim.	30"	24"
Emergency Spillway			
Rainfall Volume (ESH) (areal)	Inches	8.5	8.4
Runoff Volume (ESH)	Inches	6.45	6.36
Type		Veg.	Veg.
Bottom Width	Feet	40	40
Velocity of Flow (V_e) 1/	Ft./Sec.	6.6	4.2
Slope of Exit Channel	Ft./Ft.	.040	.030
Maximum Water Surface Elevation	Feet	1,296.7	1,389.3
Freeboard			
Rainfall Volume (FH) (areal)	Inches	14.5	14.4
Runoff Volume (FH)	Inches	12.30	12.20
Maximum Water Surface Elevation	Feet	1,299.7	1,392.9
Capacity Equivalents			
Sediment Volume	Inches	0.78	1.00
Retarding Volume	Inches	3.85	4.70

1/ Maximum during passage of hydrograph

2/ Emergency spillway hydrograph is contained below crest of emergency spillway

TABLE 3 - CONTINUED

STRUCTURE NUMBER			TOTAL
23	24	14	
b	b	b	xxx
1.62	10.47	16.36	74.60
--	3.34	--	3.34
83	83	83	xxx
1.20	3.50	5.25	xxx
1,394.3	1,347.2	1,434.7	xxx
1,389.3	1,342.2	1,429.2	xxx
1,382.8	1,331.7	1,418.3	xxx
21.3	31.2	41.1	xxx
74,000	146,000	301,000	1,483,000
495	3,055	5,631	21,810
55	268	513	2,010
33	162	342	1,248
--	--	675	675
407	2,625	4,101	17,877
25	70	154	554
--	--	231	231
116	504	570	2,933
7.0	7.0	7.0	xxx
11.5	11.5	11.5	xxx
7.45	7.45	7.45	xxx
36	296	337	xxx
2	2	2	xxx
24"	48"	48"	xxx
8.4	8.4	8.2	xxx
6.36	6.36	6.17	xxx
Veg.	Veg.	Veg.	xxx
40	80	200	xxx
2.7	4.6	4.6	xxx
.040	.030	.030	xxx
1,389.9	1,343.6	1,430.6	xxx
14.4	14.4	13.99	xxx
12.20	12.20	11.80	xxx
1,392.7	1,347.2	1,434.7	xxx
1.02	0.77	0.98	xxx
4.70	4.70	4.70	xxx

August 1969

TABLE 4 - ANNUAL COST

West Sector Whitewater River Watershed, Kansas

(Dollars)[1/]

Evaluation Unit	Amortization of Installation Costs[2/]	Operation and Maintenance Costs	Total
12 Floodwater Retarding Structures and 1 Multiple-Purpose Structure	112,100	17,600	129,700
Project Administration	17,700		17,700
GRAND TOTAL	129,800	17,600[3/]	147,400

1/ Price base: Installation 1968, O & M adjusted normalized prices
2/ 100 years at 4 7/8 percent interest
3/ Includes $12,900 for operation, maintenance, and replacement for the recreational development

August 1969

TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

West Sector Whitewater River Watershed, Kansas

(Dollars)[1/]

Item	Estimated Average Annual Damage		Damage Reduction Benefits
	Without Project	With Project	
Floodwater			
Crop and Pasture	91,700	32,700	59,000
Other Agricultural	7,500	1,600	5,900
Non-agricultural			
Road and Bridge	21,200	6,800	14,400
Subtotal	120,400	41,100	79,300
Erosion			
Flood Plain Scour	8,800	4,100	4,700
Indirect	14,000	4,800	9,200
Total	143,200	50,000	93,200

1/ Price base - Adjusted normalized

August 1969

TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

West Sector Whitewater River Watershed, Kansas

(Dollars)[1/]

Evaluation Unit	Average Annual Benefits[2/]							Total	Average Annual Cost[3/]	Benefit Cost Ratio
	Damage Reduction	More Intensive Land Use	Changed Land Use	Towanda Reservoir	Off-Project Mainstem Walnut River	Recreation	Secondary			
12 Floodwater Retarding Structures and 1 Multiple-Purpose Reservoir	75,100	23,800	6,300	7,800	20,800	75,000	22,100	230,900	129,700	1.8:1
Project Administration									17,700	
GRAND TOTAL	75,100	23,800	6,300	7,800	20,800	75,000	22,100	230,900	147,400	1.6:1

1/ Price base adjusted normalized

2/ In addition it is estimated that land treatment measures will annually provide benefits of $18,100 more intensive land use benefits of $2,200, changed land use benefits of $600, off-project mainstem Walnut River benefits of $9,000, benefits to Towanda Reservoir of $900, secondary benefits of $1,900 giving a total benefit of $32,700

3/ From table 4

August 1969

INVESTIGATION AND ANALYSIS

COOPERATION IN PLANNING

General

Whitewater River Watershed Joint District No. 22 retained consulting engineering firms to furnish aerial photography and a preliminary investigation report of the watershed.

The State of Kansas through the State Soil Conservation Committee provided funds to accomplish certain engineering phases of watershed planning. These funds supplied services through engineering contracts between the State Soil Conservation Committee and Bucher and Willis, Consulting Engineers, Salina, Kansas, and Cook, Flatt, and Strobel, Engineers, Topeka, Kansas.

Services rendered under these contracts included establishment of bench marks; preparation of watershed maps; cross section surveys; hydraulic investigation; computation of area inundated; computation of length of road inundated; topographic surveys of reservoirs, spillways, and dam sites; plotting reservoir stage-storage curves; and centerline profiles of structure sites.

All other engineering, geology, and economics were accomplished by the Soil Conservation Service.

Forestry

A Forestry Work Plan was developed by the State Extension Forester, Kansas State University, Manhattan, Kansas, and the U. S. Forest Service, U. S. Department of Agriculture. Contents of the forestry plan have been included in the overall plan.

Statewide fire loss index goals are 0.1 percent for forest land and 0.5 percent for non-forested watershed land. The fire records for the area are not available prior to 1966. Fire losses in the protected areas of the watershed for 1966 and 1967 have averaged 2.5 percent. This high percentage was due primarily to record dry

years resulting in several large fires totaling 15,000 acres which included a portion of the watershed acreage. Property damage alone from fires on the watershed averaged more than $9,000 per year during 1966 and 1967.

Fish and Wildlife

A letter report covering fish and wildlife conditions and recommendations for improvement was supplied by the Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service. The report was concurred in by the Kansas Forestry, Fish and Game Commission.

HYDROLOGY AND HYDRAULICS

Ten evaluation reaches were selected to coincide with the subwatershed area limits and to divide the flood plain for proper hydrologic and economic evaluation. Evaluation reaches and major subwatershed areas are shown on the Project Map.

Hydrologic curve numbers were developed for each subwatershed area for present and future watershed conditions. Future watershed conditions exist when the land treatment and cover measures outlined in this plan are established.

Rainfall frequency was obtained from United States Weather Bureau Technical Paper Number 40. To obtain the relation of rainfall to runoff, the procedure as outlined in Chapter 10, National Engineering Handbook, Section 4, Hydrology, was followed. A factor of 4 was used for conversion of annual flood plotting positions to partial duration plotting positions. The frequency versus volume runoff relationship was developed for the actual range of hydrologic curve numbers.

The Step Method as described in National Engineering Handbook, Section 4, Hydrology, was used to define the hydraulics of the flood plain. A range of discharges was considered from below non-damage flow to above the 100-year frequency event.

Plan-profile sheets were prepared for the entire flood plain. Profiles were plotted showing the channel

will not exceed channel capacity. Individual structure release rates are shown in table 3.

The floodwater detention storage volume was determined by mass routing procedures with storm durations of up to 10 days considered. Storms used in connection with this procedure were taken from Weather Bureau Technical Paper No. 40. The volume for floodwater storage was computed using 25, 50, or 100 year frequency storms depending on structure hazard class. Floodwater storage volumes were selected to fit site conditions with minimum storage volumes exceeding those computed by the method in Chapter 21, National Engineering Handbook, Section 4, by approximately 5 percent.

Dimensions of the emergency spillways were determined by floodrouting the storms indicated in SCS Engineering Memorandum No. 27 by the method outlined in Lincoln E&WPU Memorandum No. 2. Emergency spillways will exceed minimum criteria as established by the State of Kansas.

ENGINEERING

Surveys

Vertical control lines were run throughout the watershed with permanent bench marks established within two miles of each structure site. Ten permanent bench marks and 109 temporary bench marks were set in the watershed. All surveys were referenced to mean sea level.

Eighty-two valley and 34 road and bridge cross sections were field surveyed. Sufficient readings were made to define the topography along each section; to locate all crop boundaries and changes in roughness factor; to locate all roads, fences, and other objects along the sections; and to define the shape of the channel in detail. The type of road surface and bridge was indicated on each road cross section.

Topographic maps of the twelve floodwater retarding structures and one multiple-purpose structure were made using a Kelsh plotter. The maps made by the Kelsh plotter were developed from aerial photographs taken from an altitude of approximately 4,800 feet. A maximum contour

bottom, bank line, and at least five discharges. The plan map is a semi-controlled screened aerial mosaic of the flood plain projected onto the plan-profile sheets.

The relationship between discharge and area of inundation was based on 82 valley and channel cross sections. These cross sections were all related vertically to mean sea level datum. They were horizontally related by being located on aerial photographs. The width flooded at the cross section and the distance between cross sections entered into computation of area flooded by depth increments. Area flooded data by cross sections was accumulated to produce reach totals.

Thirty-four road and bridge cross sections provided basis for computation of length of road inundation by depth increments.

Frequency discharge relationships were developed for each reach using the SCS TR-20 computer program with service provided by the Central Technical Unit, Hyattsville, Maryland. Four storms were routed to define the discharge frequency curve. This determination was made for present conditions, future land treatment conditions, future land treatment conditions with various percentages of each sub-watershed controlled by floodwater retarding structures, and future land treatment conditions with the formulated structural system. This gave the discharge-frequency relationship for each evaluation reach considering a zero to maximum percent range of area controlled by reservoirs and the structural system presented in this plan.

A determination was made of the discharges for historical storms which occurred in the watershed in 1953, 1957, and 1965. This was accomplished by securing high water marks for these storms and plotting them on the water surface profiles. TR-20 routings were also made for the 1965 storm. This made it possible to determine the discharge of the actual storm at each reach.

Floodwater retarding structure release rates were established considering downstream channel capacities and reservoir drawdown times. Single stage release rates are planned in all structures. Combined maximum release rates

interval of 4 feet was used. Storage capacities were measured from the topography maps and stage-storage curves developed. Embankment quantities were calculated from centerline profiles which were field surveyed. Accuracy of the Kelsh work was verified by field surveying all of the centerline profiles.

Structure Design and Cost Estimates

The twelve floodwater retarding structures and one multiple-purpose structure are planned with single stage principal spillways. The average release rate varies from 20 c.s.m. to 27 c.s.m. Elevations of emergency spillway crests were planned to provide at least a 25-year detention storage.

Structures are planned with storage for the 100-year accumulation of sediment. The crest of the inlet for floodwater retarding structures is planned at the elevation of the 50-year sediment storage capacity. Remaining sediment volume is provided for above the crest of the principal spillway inlet.

The freeboard hydrograph was routed through all structures with the maximum elevation equal to or less than the elevation of the top of the dam. The minimum emergency spillway size used was five feet deep by forty feet wide.

Structure drainage areas were delineated and measured from U.S.G.S. 7 1/2 minute quadrangle maps.

Structural data for each site is shown in table 3.

A cost estimate was calculated for each structure. Quantities of each item were based on surveyed data. Unit costs reflecting current bid prices for embankment, principal spillways, riprap, fencing, drains, seeding, clearing, etc., were used to arrive at the total construction cost of each structure. Contingencies were calculated at 12 percent of the engineer's estimate. Engineering services and project administration costs were calculated as a percent of construction costs.

Costs of land rights were calculated for each site using unit values for cropland and pastureland agreed on by the sponsors.

Individual structure cost data is presented in table 2 and the total cost of all proposed structures is shown in table 1.

GEOLOGY

Dam Site Investigation

A geologic investigation was conducted on each proposed dam site. The work was accomplished by field observation, use of existing geologic maps, surveying instruments, and hand and power augers. The report on each dam site includes a centerline profile showing geologic conditions. The borrow area is shown on the topographic map and a summary sheet attached.

Significant geologic features that might influence the design or construction of a structure were investigated. A limited number of test holes on the centerline determined stability of the foundation. Necessary stripping and depth of core trench were indicated from logs of the test holes.

Recommended location of the principal spillway was determined from foundation stability, amount of excavation, length of conduit and alignment of the outlet to the stream channel. Quantities of material to be excavated from the emergency spillway were estimated and their potential uses during construction were determined.

A thorough surface study of geologic formation was made at each location. The multiple-purpose site, No. 14, was drilled to bedrock on centerline. All holes were logged and plotted on the centerline profile. Similar investigations were carried out in the emergency spillway and borrow areas.

A special geologic report of the investigations with findings, recommendations, and conclusions was written for use in further planning and design.

59-848 O-71——7

All soils investigated were classified by the Unified Soil Classification System.

Sedimentation in Reservoirs

Sediment rates and volumes were determined from sedimentation surveys made on existing reservoirs in and around the watershed. Reservoirs surveyed were selected with sediment source areas similar to the erosion conditions above planned structures. The range survey method was used to determine the volume accumulated in each reservoir. Equipment used included survey instruments, boat, cable and meter, spud bar, and sounding bell.

Age of reservoir and trap efficiency were used to compute the total sediment yield per year from the measured accumulation of sediment. Significant sediment producing factors above the reservoir such as soil type, slope of the land, land use and treatment, and type of erosion were used to evaluate the rate and source of sediment.

Sediment rating curves related sediment yields to land use with varying cover, slope and degree and type of erosion. These curves were plotted to show yield in acre feet per square mile per year versus drainage area size.

All sediment producing factors in watersheds above proposed dam sites were mapped and compiled. The yield to each proposed reservoir was read opposite the drainage area size from a curve developed from the surveyed sites. Developed curves represented a range of physical characteristics of the measured reservoir drainage areas. Adjustments in the readings were made when the watershed had unusual sediment producing factors.

Flood Plain Scour

The extent and severity of sheet scour and channel scour resulting from floods was determined from field surveys. Scoured areas were mapped on aerial photographs. The degree of damage was based on the loss of soil depth and related to productivity as compared with the unaffected parts of the field. Information derived from interviews

with soil scientists and farmers aided in assembling land damage information. The soil scientist assisted the geologist in determining soil losses.

Sheet and channel erosion was tabulated in acres with the percent of damage in each of the evaluation reaches. Only eroded areas affected by upstream runoff were considered.

Future scour erosion was estimated without the program for each reach. Future damage was based on soil type, present soil depth on eroded areas, and annual rate of erosion.

The recovery period for each reach in years was established from the amount of damage, soil type, and length and number of crop rotations required for potential recovery.

Potential recovery of soil productivity without floods was determined primarily on capability class and present depth of soil. Affected areas having soil 60 inches or more in depth with 15 inches or more of topsoil and good subsoil drainage are considered capable of full recovery. Other areas of land with less depth and permeability were considered to recover partially as compared to original productiveness.

ECONOMIC INVESTIGATIONS

The Frequency Method as described in Chapter 3 of the Economics Guide was followed in determining the average annual floodwater damages.

The watershed flood plain was divided into sixteen evaluation reaches.

Basic data for the determination of damages were collected by personal contacts with farm operators, township and county officials, and with local agricultural technicians.

Damage interviews were obtained from 60 to 90 percent of the landowners and operators of the flood plain area in each evaluation reach. The specific storms covered were May 1953, June 1965, and May 1957.

Damages were computed by types in each of the evaluation reaches over the evaluation period for present land treatment conditions, future land treatment conditions, for a range of structure control up to a maximum, and with the formulated works of improvement in place. Benefits were computed for more intensive use and changed land use under these same conditions.

Floodwater damage to crops reflects the net loss in income for the 100-year storm series. It was computed by the determination of acres of cropland flooded and their depths of inundation. Two composite acres of flood plain use were determined by measuring the percent the amount of each land use as indicated by the 82 valley cross sections. The composite acres varied only in the percent of land use.

Average crop yield for the area, adjusted to flood-free conditions by judgment of farm operators and agricultural technicians familiar with the area, and projected to reflect completed project conditions were used in the evaluation. A different composite acre and average yields were developed in a similar manner for use in determining the benefits attributable to more intensive use and changed land use.

The net value of the composite acre was weighted using lower values in the scoured areas. The damageable values by depth increments were adjusted to reflect the weighted values.

A percent loss from each crop was developed considering depth, duration, and month of flooding. The percent damage was used to determine damage for the composite acre. The rates of damage thus developed were weighted by the percent of the year's excessive storms that occur in each month and the weighted rate multiplied by acreages inundated by selected discharges. A dollar damage versus discharge curve was developed to provide a monetary value for each storm discharge in the 100-year storm series.

Other agricultural damages such as losses of livestock, damage to private roads, dikes, and fences, and the removal of debris were determined for each of the previously mentioned storms by interview. From rainfall records and high water marks, the discharge of these storms was

determined for each evaluation reach. From this data a dollar damage versus discharge curve was developed and applied to the 100-year storm series.

Road and bridge damages were based on repair or replacement costs which were obtained from county engineers. Road damages were computed as the dollar damage per foot by depth increments of inundation for the various types of road surfaces within the watershed. Bridge damages were estimated for a range of discharges for individual bridges. Road and bridge damages were then combined in each evaluation reach and dollar damage versus discharge curves were plotted. These curves were then applied to the 100-year storm series.

Indirect damages include such items as electric power failure resulting in food spoilage; slower rate of gain and extra expense caused by interruption of livestock feeding even though livestock were not in the flood; and additional distances driven by rural mail carriers, school busses, and farmers because of flooded roads. The indirect damages were computed as 10 percent of the agricultural damages and 15 percent of the non-agricultural damages.

Flood plain land damages from scour were derived from field data furnished by the geologist. Factors considered were acres damaged, severity of damage, and period and degree of recovery due to the installed program. The economic evaluation was based on the net value of the composite acre. The changes in net income due to scour damage were discounted at a 6 percent interest rate.

The off-project benefits assigned to the project are its fair share of benefits accruing to the Whitewater River flood plain from Towanda Reservoir to its mouth and to the Walnut River from Augusta to its junction with Arkansas River. These benefits were jointly evaluated by the Kansas Water Resources Board; Corps of Engineers, Tulsa District; and the Soil Conservation Service, and are presented in the Survey Report on the Walnut River, Kansas, 1963.

It was estimated that 192 flood plain acres of pastureland interspersed with brush and trees in localized

areas will be cleared and used for crop production. This determination was supported by interviews with farmers, measurement of aerial photos, and from past experiences in watersheds. The farm owners and operators reported that where the topography allows, and where the expected frequency of damaging floods can be substantially reduced, that this change of land use will occur.

Recreational benefits were determined using methods outlined in Chapter 9 of the Economics Guide. A value of $1.50 per visitor day was used for benefit computations.

All structures were individually evaluated. The relative contribution that structural control in each upstream subarea made toward reduction of peak discharge was computed as a basis for distribution of benefit value to each evaluation reach.

Secondary benefits were computed following procedures outlined in Chapter 11 of the Economics Guide. Indirect benefits were excluded from consideration in computing secondary benefits. These benefits were used in project justification.

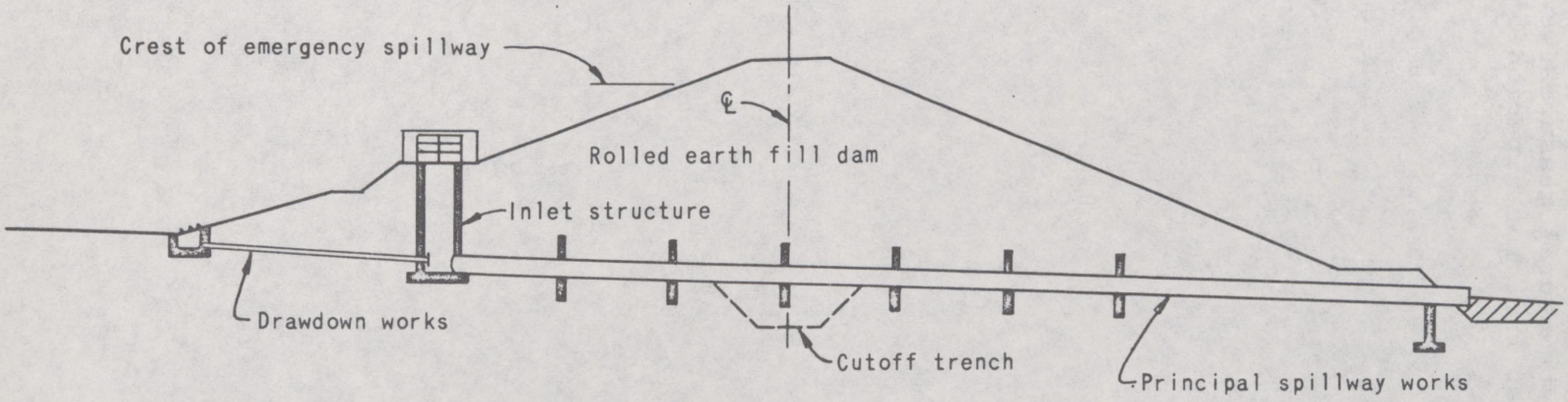
The cost of land rights were based on the value of cropland and pasture as determined by the Whitewater River Watershed directors. These values, slightly higher than the capitalized value of net production, were used for project evaluation. The values agreed on were $275 per acre for upland cropland, $325 per tributary bottom cropland, $130 per acre for pasture, and $400 per acre for mainstem bottom cropland. Land costs for areas affected by structures were computed using 100 percent values for sediment pools, 75 percent for dams and spillways, and 50 percent for detention pools. The productive capacity retained under future conditions was thereby considered.

All monetary evaluations for benefits were based on adjusted normalized prices using "Interim Price Standards for Planning and Evaluating Water and Land Resources" dated April 1966. Nineteen sixty-eight construction costs as experienced in Kansas P.L. 566 projects were used to estimate costs of structural measures. Operation

and maintenance costs were computed at 0.40 percent of construction cost for floodwater retarding structures. This method of computing O & M costs was developed by the Soil Conservation Service and is based on the principle that the relative probability of need for major type repairs decreases as the number of structures increases. Federal and local costs for structural measures were amortized at 4 7/8 percent interest rate for a period of 100 years.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TYPICAL EARTH DAM WITH PIPE DROP INLET



CROSS SECTION OF DAM ON CENTERLINE OF PRINCIPAL SPILLWAY

NOTES:

1. FOR INDIVIDUAL STRUCTURE DATA SEE TABLE 3.
2. EMBANKMENT AND FOUNDATION DESIGN FEATURES NOT SHOWN.

USDA-SCS-LINCOLN, NEBR. 1965

5,L-21,037

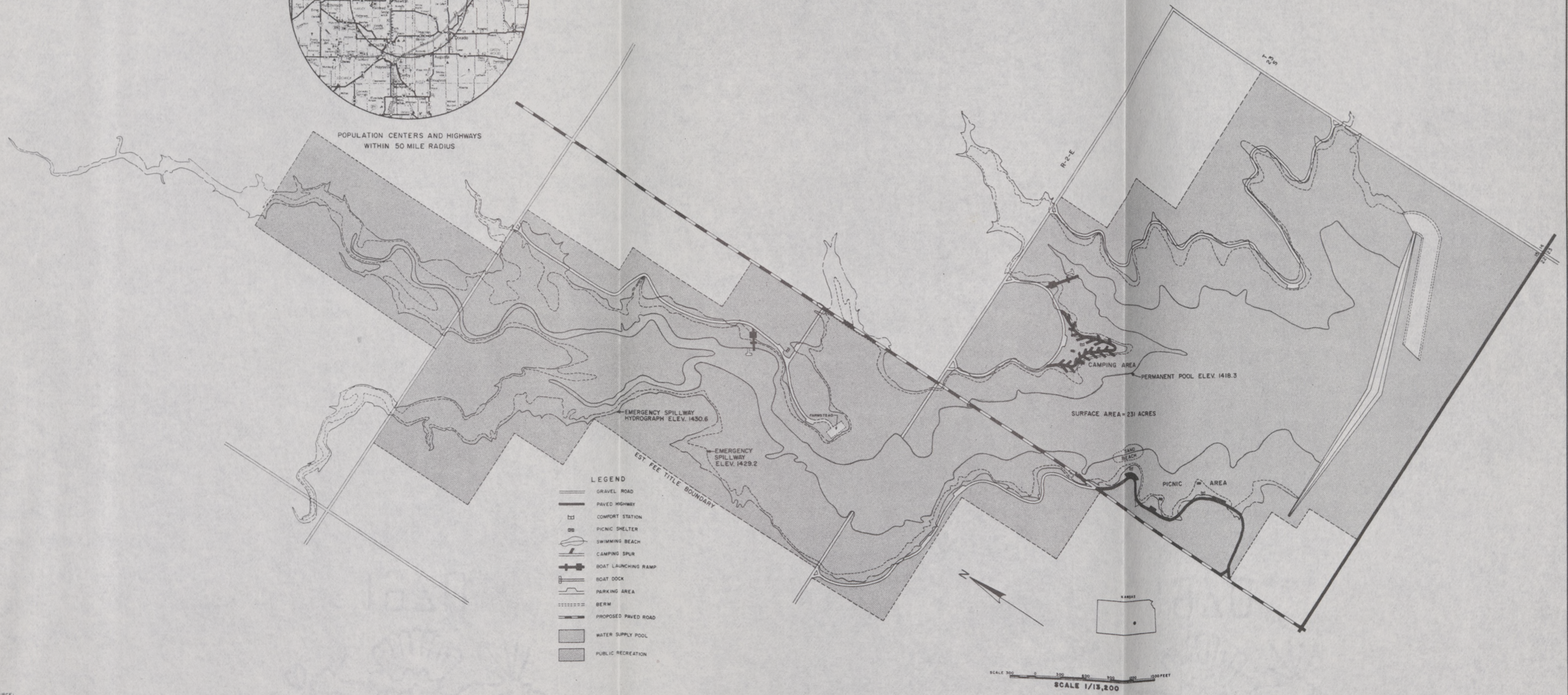
U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

MULTIPLE PURPOSE DEVELOPMENT MAP
FLOODWATER RETARDING AND RECREATION
WEST SECTOR WHITEWATER RIVER WATERSHED
STRUCTURE NO. 14
HARVEY COUNTY, KANSAS



POPULATION CENTERS AND HIGHWAYS
WITHIN 50 MILE RADIUS



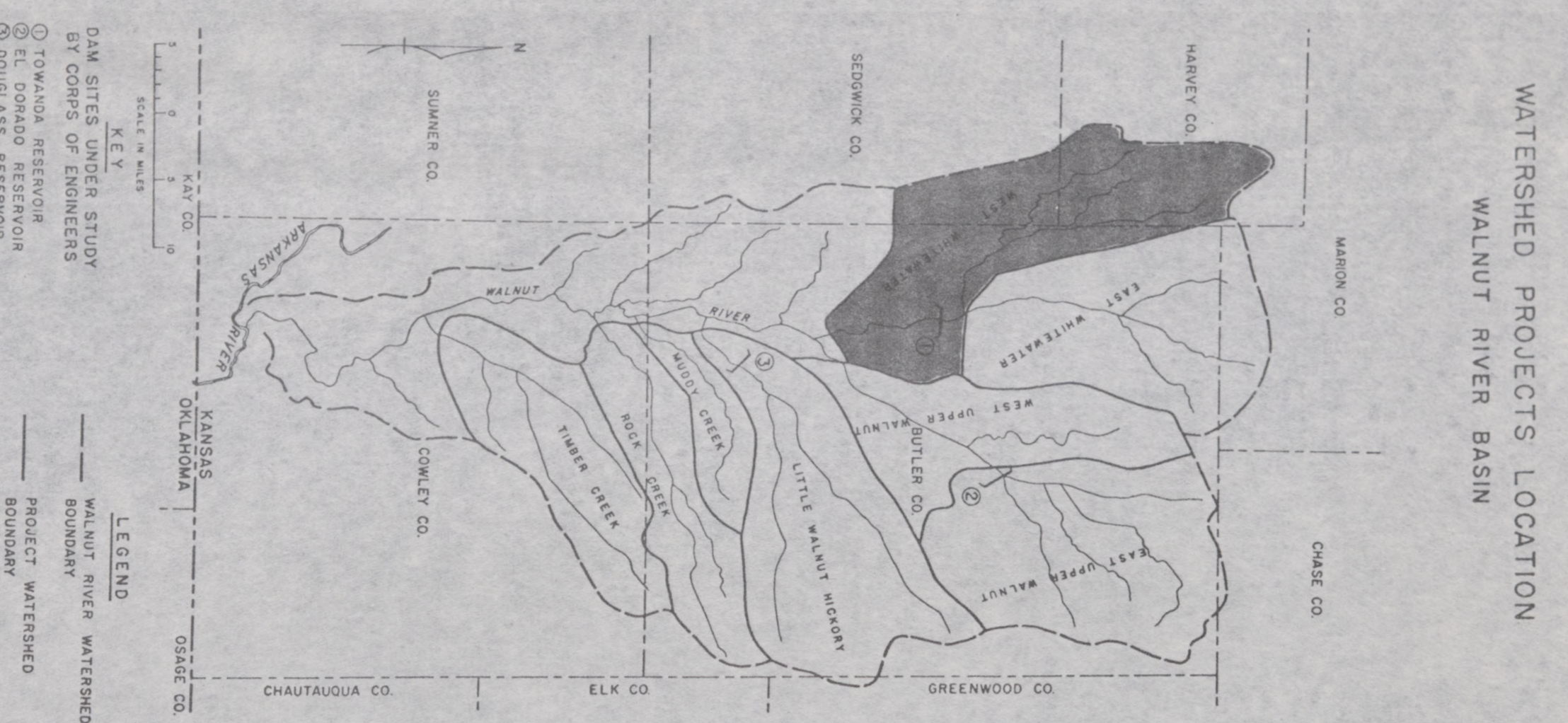
SOURCE:
BASE MAP FURNISHED BY
FIELD TECHNICIANS

7-31-69
5,R-27,639

59-848 O-71 (Face p. 66) No. 1

WATERSHED PROJECTS LOCATION

WALNUT RIVER BASIN



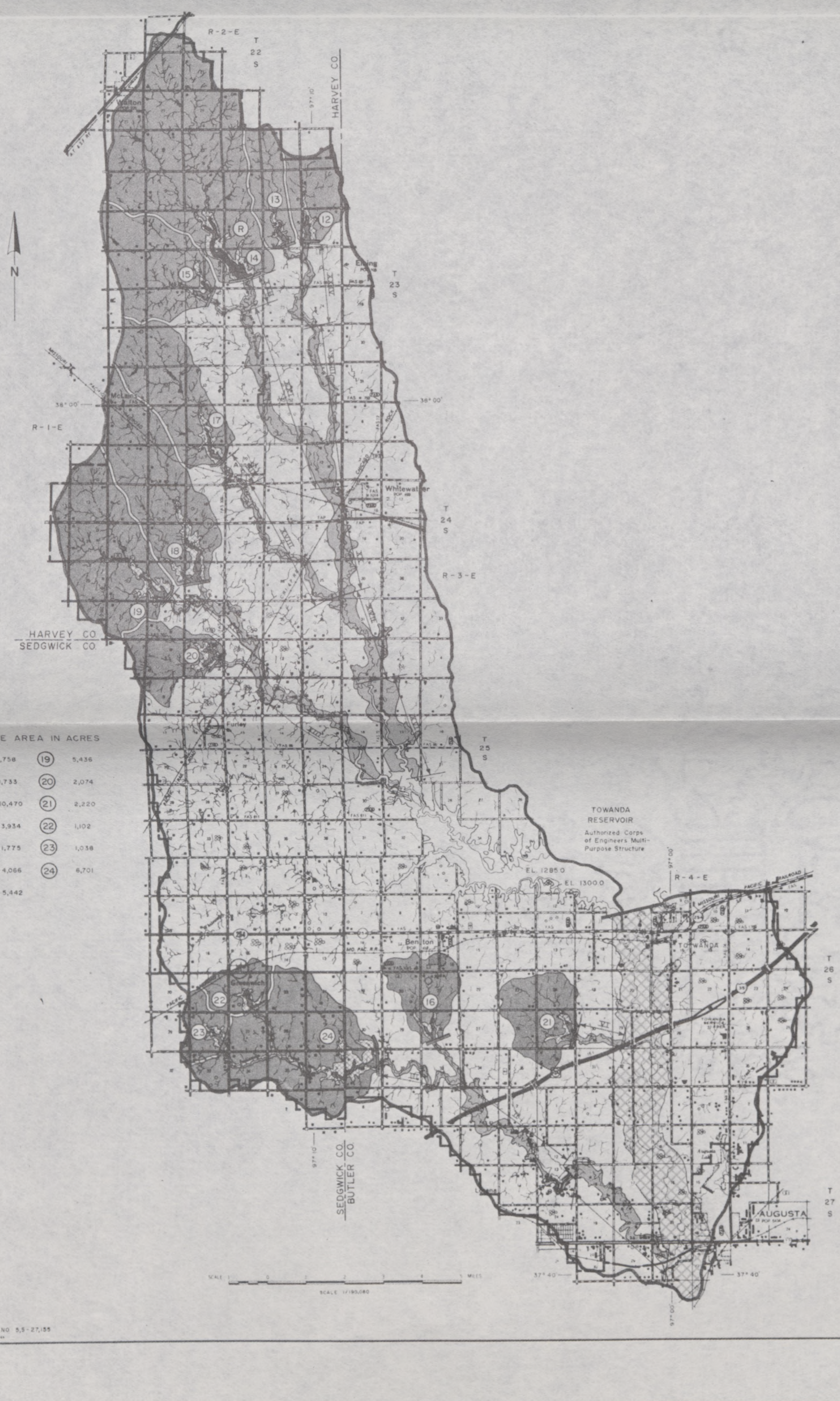
U. S. DEPARTMENT OF AGRICULTURE — SOIL CONSERVATION SERVICE

PROJECT MAP

WEST SECTOR WHITEWATER RIVER WATERSHED

BUTLER, HARVEY, AND SEDGWICK COUNTIES

KANSAS



SOURCE:
S.C.S. DRAWING NO. 5,S-27,155

5-20-69
5,S-27,166

ADDENDUM

West Sector Whitewater River Watershed, Kansas

This addendum shows the effect of using the 5 1/8 percent interest rate.

The new total average annual cost is $153,800. The total average annual benefits are $230,900. The project benefit-cost ratio based on all costs and benefits is 1.5 to 1.