

FINAL
ENVIRONMENTAL IMPACT STATEMENT
USDA-SCS-ES-WS-(ADM)-74-13-(F)
**LEONA RIVER WATERSHED
PROJECT**
Uvalde County, Texas

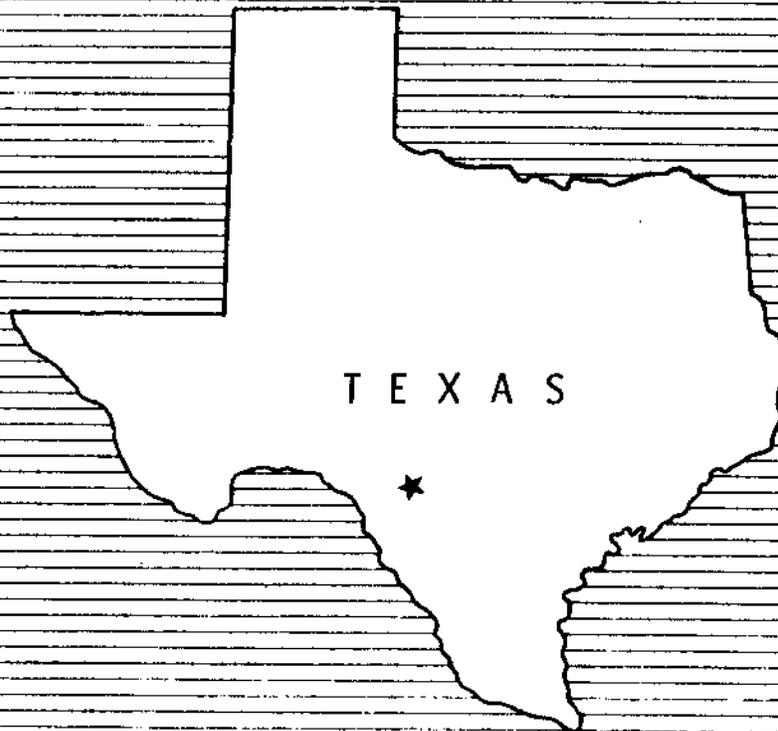


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LEONA RIVER WATERSHED
UVALDE COUNTY, TEXAS

FINAL ENVIRONMENTAL IMPACT STATEMENT

Edward E. Thomas, State Conservationist
Soil Conservation Service

Sponsoring Local Organizations:

Nueces-Frio-Sabinal Soil and Water Conservation District
P.O. Box 270
Uvalde, Texas 78801

Uvalde County Commissioners Court
County Courthouse
Uvalde, Texas 78801

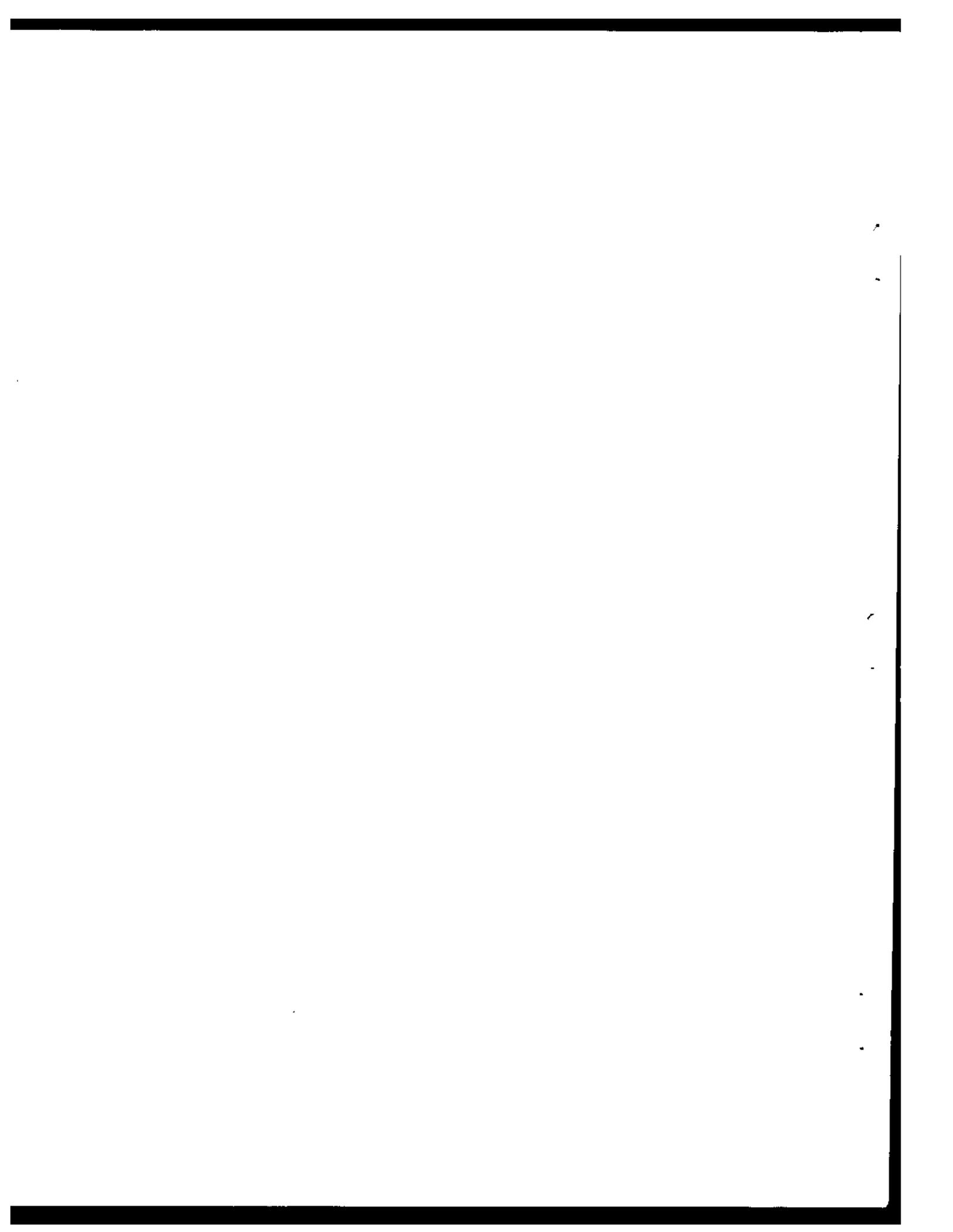
City of Uvalde, Texas
Municipal Building
Uvalde, Texas 78801

Edwards Underground Water District
2402 Tower Life Building
San Antonio, Texas 78205

September 1974

Prepared by:

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Temple, Texas 76501



USDA FINAL ENVIRONMENTAL IMPACT STATEMENT

The Leona River Watershed Project
Uvalde County
Texas

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

SUMMARY

- I. Final
- II. Soil Conservation Service
- III. Administrative
- IV. Description of Action:

A plan for watershed protection and flood prevention in Uvalde County, Texas, will be carried out by the sponsoring local organizations with assistance from the Soil Conservation Service, USDA, under the authority of Public Law 566, 83rd Congress, 68 Stat. 666, as amended. The plan proposes that adequate land treatment be accomplished on about 39,180 additional acres, four single-purpose floodwater retarding structures be constructed, and provides for channel work on 3.47 miles (18,300 feet) of stream channel during a five-year installation period.
- V. Summary of Environmental Impact and Adverse Environmental Effects:
 1. Reduce upland erosion and runoff.
 2. Reduce waste of irrigation water.
 3. Reduce sediment damage to flood plain lands by 76 percent.
 4. Reduce erosion damage to flood plain lands by 65 percent.
 5. Generally benefit wildlife through application of land treatment measures.
 6. Provide flood protection to about 380 owners or occupants of residential units and about 30 owners or operators of business units in Uvalde, Texas, as well as 75 farms and ranches in the flood plain.
 7. Provide flood protection to 8,097 acres of flood plain land by reducing average annual flooding by 66 percent.
 8. Provide a total increase in economic activity of about \$19,880 annually.
 9. Create a need for six new full-time jobs as a result of increased production and create 67 man-years of employment for installation of structural measures during the installation period.
 10. Eliminate or greatly reduce hazards to public health from floodwater and contamination.
 11. Provide incidental annual recharge to ground water aquifers of approximately 2,200 acre-feet annually.
 12. Preserve quality of watershed runoff and ground water recharge.

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13. Increase knowledge and understanding of aboriginal occupancy of the area as a result of archeological investigations to be made prior to construction.
14. Increase dust and sediment slightly during construction.
15. Require the relocation of five families.
16. Restrict the future land use on 1,930 acres of land needed to install and operate the structural measures.
17. Require the land use be changed on 681 acres of rangeland, 71 acres of cropland, 25 acres of pastureland, and 44 acres of residential and industrial land of the 1,930 acres needed to install the project.
18. Result in occasional interruption of the use of 1,082 acres of land in the retarding pool areas subject to temporary inundation.
19. Require the temporary clearing of all vegetation on a maximum of 698 acres and the permanent clearing of all vegetation on 123 acres.
20. Disturb or destroy some archeological resources.

VI. List of Alternatives Considered:

1. An accelerated program of applying land treatment measures for watershed protection.
2. A combination of land treatment, floodwater retarding structures, and restrictions on construction in the flood hazard area.
3. Purchase of urban flood plain areas with relocation of homes, businesses, and improvements, and changing the present use of agricultural land to one that is less susceptible to damage by flooding.
4. Floodproofing of buildings and other improvements, and change in agricultural land use to one less susceptible to flood damage.
5. Foregoing the implementation of a project.

VII. Agencies from Which Comments Have Been Received:

U.S. Department of the Army; U.S. Department of the Interior; U.S. Department of Health, Education, and Welfare; Environmental Protection Agency; Division of Planning Coordination (State agency designated by Governor and State Clearinghouse); and Middle Rio Grande Development Council (Regional Clearinghouse).

- VIII. Draft Environmental Impact Statement transmitted to CEQ on October 27, 1973.

USDA SOIL CONSERVATION SERVICE
FINAL ENVIRONMENTAL IMPACT STATEMENT
for
Leona River Watershed

Uvalde County, Texas

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

SPONSORING LOCAL ORGANIZATIONS

Nueces-Frio-Sabinal Soil and Water Conservation District
Uvalde County Commissioners Court
City of Uvalde
Edwards Underground Water District

PROJECT OBJECTIVES AND PURPOSES

Studies were made by representatives of the sponsoring local organizations and the Soil Conservation Service to determine watershed problems and possible solutions. Project objectives were formulated after determining the location and extent of problems and discussing possible solutions. Watershed protection and flood prevention were the primary objectives set forth by the sponsors. In addition, the Edwards Underground Water District is vitally interested in increased ground water recharge to the Edwards Ground Water Reservoir which will occur incidental to installation of floodwater retarding structures.

The following specific objectives were agreed to for establishment of a complete program for soil and water conservation on the watershed:

1. Reduce erosion and increase rainfall infiltration by establishing land treatment measures which would contribute directly to watershed protection and flood prevention. The goal is to increase the establishment of needed land treatment measures from the present 40 percent to 75 percent during the five-year installation period.
2. Attain a 60 to 65 percent reduction in total average annual agricultural damages.
3. Attain a 90 to 95 percent reduction in average annual flood damages in Uvalde with consideration given to the 100-year frequency storm.

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Rangeland will be managed to maintain or improve existing vegetation. Conservation measures to be applied on rangeland include proper grazing use, range seeding, planned grazing systems, brush management, and deferred grazing. Wells, troughs, and pipelines for additional livestock water will be installed. Proper grazing use, planned grazing systems, and deferred grazing are range management practices which involve the grazing of forage plants at periods of time and at intensities which are compatible with the physiological needs of plants. Application of these practices assures the continued growth and survival of desired plant species. Range seeding is the establishment of adapted plants on rangeland. Range seeding usually follows brush management on lands that do not have an adequate seed source to obtain cover plants through natural succession within a reasonable period of time.

Brush management involves the control or manipulation of stands of brush to allow the establishment or growth of desired plant species. About 12,500 acres of brush management is expected to be accomplished during the project installation period. About one half of this amount will be control of regrowth on areas which have previously been controlled. Dozing and stacking is the most common method of brush management practiced and is used on about 50 percent of rangeland receiving treatment. Shredding accounts for about 25 percent of the total amount of brush management. Aerial spraying, prickly pear control, root plowing, roller chopping and basal treatment with chemicals are practiced to a limited degree. Dozing and stacking usually results in a very limited root kill of woody species and regrowth often begins within thirty days following control. Shredding controls only the top growth of woody species. Most brush management is carried out in an attempt to reduce the density of woody plants and to make them more available for use by grazing animals. Elimination of woody species is neither practical nor desirable in the watershed. Management by shredding or dozing on species such as lotebush (*Condalia obtusifolia*), and guajillo (*Acacia berlandieri*) stimulate new growth and provide forage within the reach of livestock and deer. The resulting decrease in canopy cover and competition for sunlight, water, and plant nutrients allows an increase in desirable forbs and grasses. About 80 percent of the brush management practiced is confined to clay loam and clay flat range sites. A range site is an area of land having a combination of edaphic, climatic, topographic and biotic factors that is significantly different from adjacent areas.^{1/} These are highly productive sites and are interspersed among other less productive sites. Brush management cannot be economically applied on sites such as the shallow ridge site which has a relatively low potential for forage production. Brush management by range sites results in patterns of brush interspersed with open areas.

Wildlife upland habitat management will be applied on about 75 percent of the watershed that will be managed for wildlife as a secondary land use. Wildlife upland habitat management on rangeland will consist primarily of brush management applied with wildlife considerations and the protection of plants having wildlife value. Food plantings will be made on a limited amount of cropland for wildlife.

^{1/} Society for Range Management, 1964, A Glossary of Terms Used in Range Management, Denver, Colorado.

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District cooperators will be provided technical assistance in the application of brush management practices which preserve existing wildlife habitat. On land which is utilized by livestock and wildlife a compromise is often necessary to meet the needs of all animals. Ideally, enough brush should be removed to significantly increase livestock forage production and still retain enough browse and cover for wildlife. Land users who seek optimum wildlife production usually control brush on about 50 to 60 percent of their land. Landowners who seek to optimize livestock production and still retain significant wildlife values should leave at least 30 percent of their land in brush. A brush management program must be carefully planned to fit the existing conditions on a particular land unit. Strips and blocks which alternate with uncontrolled areas is recommended. Steep slopes, stream courses, and turkey roost sites are prime wildlife habitat areas which will be designated for protection in planned programs of brush management.

Grazing use by domestic livestock at a level which results in proper use of plants having wildlife value will be planned on rangeland. Conservation plans will contain data on key wildlife plant species as well as species of value for domestic livestock. Recommended degrees of use for these key species will be provided to land users. Reductions in livestock numbers and reductions in wildlife numbers, particularly deer, may be necessary when excessive use occurs on key forage plants.

Structural Measures

A total of four floodwater retarding structures will be constructed on Cooks Slough, Boon Slough, Taylor Slough, and the Leona River above the city of Uvalde. Channel work is planned on 18,300 feet of Cooks Slough in and near the urban area of Uvalde. The locations of the planned structural measures are shown on the project map (Appendix C).

The structural measures will be constructed during four years of a five-year project installation period in the general sequence as follows:

- Second Year - Floodwater Retarding Structure No. 3
- Third Year - Floodwater Retarding Structure Nos. 1 and 2
- Fourth Year - Channel Work
- Fifth Year - Floodwater Retarding Structure No. 4

A floodwater retarding structure is composed of a dam or embankment with a principal spillway and plunge basin, an emergency spillway, a floodwater retarding pool, and a sediment pool. The dam temporarily impounds floodwater upstream in the retarding pool. The water in the retarding pool flows during a period of predetermined time, through the principal spillway, which is a concrete vertical inlet and a conduit through the base of the dam. Principal spillway flow is released into a plunge basin on the downstream side of the dam. The plunge basin dissipates the energy of the principal spillway flow. The emergency spillway is designed to convey runoff that exceeds the planned capacity of the retarding

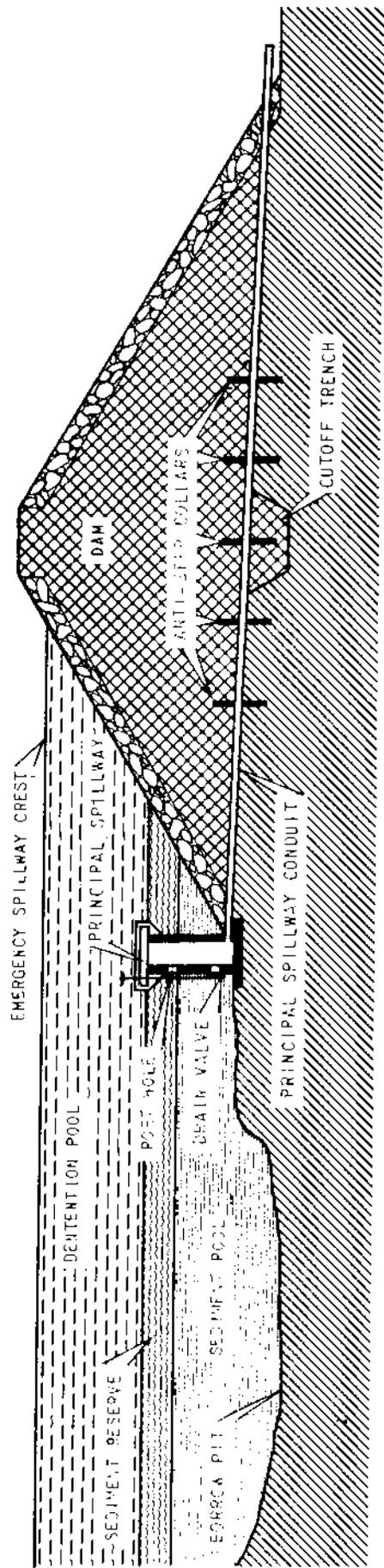


Figure 1

SECTION OF A TYPICAL FLOODWATER RETARDING STRUCTURE

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pool past the embankment and back to the stream channel. The sediment pool is capacity below the principal spillway elevation allocated for the storage of sediment expected to accumulate during a 100-year period.

The four planned floodwater retarding structures will detain an average of 3.13 inches of runoff from 59.08 square miles of drainage area. All structures are designed to pass the 100-year frequency runoff through the principal spillways without emergency spillway flow. These structures will control runoff from approximately 34 percent of the total watershed, approximately 71 percent of the drainage area of Leona River above Uvalde, and approximately 39 percent of the drainage area of Cooks Slough above Uvalde. The total capacity of the floodwater retarding structures is 9,876 acre-feet of which 7,787 acre-feet is for floodwater detention and 2,089 acre-feet is for expected sediment accumulation during the 100-year evaluation period.

Pertinent physical parameters of the floodwater retarding structures are as follows:

Parameter	: Unit :	Floodwater Retarding Structure			
		No. 1	No. 2	No. 3	No. 4
Height of Dam	ft.	27	29	45	35
Length of Dam	ft.	7,750	2,230	4,560	5,360
Sediment Pool - lowest ungated outlet	acres	45	45	42	50
Floodwater Retarding Pool and Sediment Reserve Pool	acres	329	173	690	315
Area in Dam and Emergency Spillway	acres	32	10	52	29
Average Depth of Sediment Pool - lowest ungated outlet	ft.	4.0	3.8	4.4	4.0

Sufficient volumes of clay, silty clay, and gravelly clay for construction of very slowly permeable central embankment sections are available. The remainder of the embankments will be comprised primarily of clayey gravel and limestone. It is anticipated that the embankments of all floodwater retarding structures will have limestone blankets. The upper limit of the limestone blankets will be determined by the yield of durable rock from emergency spillway excavation and the durable gravel and cobble content in common excavation.

Foundations on which the dams will be constructed are characterized by the presence of flood plain and stream terrace deposits of clay, silt,

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and gravel containing rapidly permeable horizons. This alluvium is underlain at relatively shallow depths by limestone bedrock at floodwater retarding structure sites Nos. 2, 3, and 4. Foundation drains will be needed at all floodwater retarding structures because of expected high rates of seepage from sediment and retarding pools.

The principal spillways as planned will be on compressible foundations and will have monolithic rectangular reinforced concrete inlets. The outlet conduits passing through the base of the embankments will be prestressed concrete lined, steel cylinder pipe for structures Nos. 1 and 2, and monolithic rectangular reinforced concrete for structures Nos. 3 and 4. The plunge pools as planned, will be rock lined for structures Nos. 1 and 2 and constructed of reinforced concrete for structures Nos. 3 and 4. Principal spillway crests will be set at the elevation of the 100-year sediment pool. Principal spillways for all floodwater retarding structures will be ported, as required by Texas Water Rights Statutes, at elevations which will limit potential water impoundments to 200 acre-feet or less. The 200 acre-foot limitation includes anticipated borrow areas below port (lowest ungated outlet) elevations. The floodwater retarding structures are not expected to hold water for significant periods of time due to the high seepage rates.

Emergency spillways at all floodwater retarding structure sites will have erosion resistant rock crests and forebays. Exit channels of the emergency spillways will be mostly underlain by rock at shallow depths. All emergency spillways will still have only a one percent chance of use at the end of the 100-year evaluation period. All applicable State laws will be complied with in the design, construction, storage, and use of water for all structural measures.

Installation of floodwater retarding structures will require changes in location or modification of known existing improvements as follows: utility lines at Sites Nos. 2, 3, and 4; private roads and fences at Sites Nos. 1, 2, 3, and 4; and barns, corrals, utility buildings, water well, storage reservoir for livestock water, pipelines for livestock water, drinking troughs for livestock, and dipping vat for livestock at Site No. 4. There are numerous private and public road crossings below the planned floodwater retarding structures which under present conditions will be made impassable by release flows. The public crossings will be improved to make them passable during prolonged release flows or alternate routes will be provided for use during periods of inundation. Private road crossings can be handled the same as public crossings or a permit to inundate the crossing will be required.

In its existing state, Cooks Slough has a well defined natural channel that has not been previously modified. Stream flow is ephemeral, occurring only in response to surface runoff.

Channel work on Cooks Slough will consist of enlargement, by excavation, of the existing channel; spreading of excavated soil; vegetating side slopes, berms, and bottom; and concrete riprap across the channel beneath the

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bridge on U.S. Highway 90. The planned channel work will begin at U.S. Highway 83 and extend approximately 18,300 feet upstream to approximately 1,000 feet south of Farm Road 1052. The channel will have a 180-foot bottom width from approximately station 10+00 to 135+00 (see Appendix C). The depth of excavation beneath the present channel bottom will average about six feet. The entire section of channel work will have 4:1 side slopes. The planned 100-year frequency design discharge was selected from flood routings for present and project conditions. The 100-year frequency flood for project conditions will be contained within the section of channel work from station 10+00 to station 135+00. The 100-year frequency flood protection will end at station 135+00. A transition section will exist between station 135+00 and U.S. Highway 83 where the modified capacity of the channel will be reduced to the capacity of the existing channel at U.S. Highway 83. The depth of excavation will decrease from about six feet at station 135+00 to zero at U.S. Highway 83 where the channel work will end. Flood protection will decrease proportionally as the channel decreases in size in a downstream direction. The transition section is located and designed so that back water effects will be minimal.

The present bridge capacity at U.S. Highway 83 is sufficient to pass the design discharge. Concrete riprap, as agreed upon between the Soil Conservation Service and the Texas Highway Department, will be placed across the channel beneath the U.S. Highway 90 bridge. The Highway Department states that a residual piling penetration of 10 feet is necessary to support the structure loading. The purpose of the riprap is to prevent further exposure of bridge pilings by scour.

Approximately 851,300 cubic yards of soil materials will be excavated from the present channel bottom and banks. This material will be placed on the banks of the channel, spread and shaped. Durable side channel inlet structures are planned as appurtenances to insure proper drainage of areas adjacent to the channel after the excavated soil is placed on the banks of the channel.

The materials through which the channel will be excavated consist of alluvial deposits ranging from Pleistocene to Recent in age. The upper portion of the channel banks will be highly plastic silty clay (Recent Alluvium). The lower portion of banks and the bottom will consist generally of calcareous, silty, sandy clay of moderate plasticity (Leona Formation). However, in some localized portions of the channel work, the entire channel cross section will be composed of highly plastic clay.

Cooks Slough flows across massive to thick bedded, durable Buda Limestone immediately upstream from the upper limit of the planned channel work. The limestone is exposed along about one-fourth mile of the present channel bottom and serves as a natural grade stabilizing feature.

Vegetation is planned throughout the reach of channel work for protection of channel banks, berms, and the flow area outside the berms from infrequent high velocity flows expected to develop during periods of excessive runoff.

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Channel work will require change in location or modification of known existing improvements as follows: fencing; underground telephone cables; television cable poles; telephone poles; power poles; sewer line; water line; gas line; underground street light cable; barns; portions of three city streets; private low water crossings; a public low water crossing; and five substandard houses.

All applicable state laws will be complied with in the design and construction of all structural measures as well as those pertaining to the storage, maintenance of quality, and use of water.

During construction, contractors will be required to adhere to strict standards set forth in each construction contract to protect the environment by minimizing soil erosion and water and air pollution. These standards will be in compliance with U.S. Department of Agriculture, Soil Conservation Service Engineering Memorandum 66, "Guidelines for Minimizing Soil Erosion and Water and Air Pollution During Construction." Excavation and construction operations will be scheduled and controlled to prevent exposure of extraneous amounts of unprotected soil to erosion and the resulting translocation of sediments. Measures to control erosion will be uniquely specified at each work site and will include, as applicable, use of temporary vegetation or mulches, diversions, mechanical retardation of runoff, and traps. Harmful dust and other pollutants inherent to the construction process will be held to minimum practical limits. Haul roads and excavation areas, and other work sites will be sprinkled with water as needed to keep dust within tolerable limits. Contract specifications will require that fuel, lubricants, and chemicals be adequately labeled and stored safely in protected areas, and disposal at work sites will be by approved methods and procedures. Clearing and disposal of brush and vegetation will be carried out in accordance with applicable laws, ordinances, and regulations in respect to burning. Each contract will set forth specific stipulations to prevent uncontrolled grass or brush fires. Disposal of brush and vegetation will be by burying, hauling to approved off-site locations, or controlled burning, as applicable.

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

Necessary sanitary facilities, including garbage disposal facilities, will be located to prohibit such facilities from being a pollution hazard to live streams, wells, or springs in conformance with Federal, State, and local water pollution control regulations. Special provisions in each construction contract will incorporate by reference, and thereby make the contract provisions conform to "Safety and Health Regulations for Construction, Part I and Part II," U.S. Department of the Interior, Bureau of Reclamation. Soil Conservation Service guidelines that provide for the incorporating of the Bureau of Reclamation regulations into construction contracts are in the "Soil Conservation Service Administrative Service Administrative Services Handbook, Chapter 6." Conformance to all environmental control requirements will be monitored constantly by a construction inspector who will be on-site during all periods of construction operation.

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The watershed work plan has been coordinated with the Texas State Historical Commission and the National Park Service, USDI. The Texas State Historical Commission has advised that the installation of the project will not encroach upon any known historic places or any planning by the Commission for historic preservation.

Archeological field surveys of the four floodwater retarding structure sites and the area required for the channel work were conducted by the Texas Archeology Survey, The University of Texas at Austin. The surveys and resulting report, "Leona River Watershed, Uvalde County, Texas, An Archeological and Historical Survey of Areas Proposed for Modification, Research Report No. 37" were carried out and written respectively under the guidance of staff archeologist, Grant D. Hall.

Eleven archeological sites were observed, all in the localities of the four floodwater retarding structures included in the project. No archeological sites were observed along Cooks Slough in the area required for channel work. However, a portion of this area is considered to be an archeologically sensitive zone due to the presence of deep alluvial soil deposits that are apparently undisturbed.

Mr. Hall submitted the following recommendations for further investigation and study of surveyed archeological sites prior to construction of floodwater retarding structures Nos. 1, 3, and 4 and before performing the channel work on Cooks Slough:

"(1) At 41 UV 43 ^{1/} on Cooks Slough, a controlled surface collection of all artifacts and associated lithic residue located within the area defined as a flint source. Analysis of this material could provide valuable data concerning specific activities that took place at the site.

(2) For 41 UV 53 on Cooks Slough, that potentially marginal damage to the site resulting from the placement of a flowage channel be kept to a minimum.

(3) At 41 UV 47 on the Leona River, a limited testing program in the intact eastern portion of the site to retain a hopefully representative sample of the information contained within the entire site.

(4) At 41 UV 51 at Damsite 4 on Taylor Slough, considered to be the most significant archeological resource dealt with in relation to the Leona River Watershed Project because it is relatively deep, of sizable horizontal extent, and appears to be undisturbed, it is suggested either that (a) project plans be

^{1/} Standard archeological site designation system utilized by the Texas Archeological Research Laboratory, The University of Texas at Austin---41 indicates the State of Texas, UV is the abbreviation for Uvalde County, and 43 the numerical designation of the archeological site within the county.

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changed to avoid damaging the site or, (b) if such changes are not feasible, that an intensive program of excavation be conducted to record as much of the information contained within the site as is possible.

(5) Along the Cooks Slough channel through Uvalde, specifically that segment between F.M. 1052 and the Central Power and Light Company station, provision for periodic monitoring of modifications by a qualified archeologist to determine whether or not sub-surface archeological resources do exist and to record, insofar as would then be possible, pertinent information concerning any archeological resources discovered during the course of construction."

In compliance with Public Law 86-523, the Secretary of the Interior, through the appropriate National Park Archeological Center, will be kept informed of the construction schedule so that the Secretary can initiate whatever salvage or preservation of archeological resources is deemed appropriate. The Texas Archeological Survey estimated the cost to effectively reduce the loss of the most significant endangered locations through archeological excavations would be about \$15,000.

The minimum land rights required will be those necessary to construct, operate, maintain, and inspect the structural works of improvement; to provide for flowage of water in, upon, or through the structures; and provide for the permanent storage and temporary detention, either or both, of any sediment or water.

The installation of the floodwater retarding structures will require the commitment of a total of 1,630 acres of agricultural land. Of this area, 42 acres are nonirrigated cropland, 5 acres are irrigated cropland, 15 acres are pastureland, and 1,568 acres are rangeland. A total of 548 acres required for dams, spillways, and sediment pools will be retired from agricultural production. Land use of the area to be retired is 5 acres irrigated cropland and 543 rangeland. The 1,082 acres required for retarding pools are 42 acres nonirrigated cropland, 15 acres pastureland, and 1,025 acres rangeland. The area needed for retarding pools can remain in its present use, but will be subject to periodic inundation. Channel work will require the dedication of about 300 acres to project purposes for excavated channel, berms, and maintenance rights-of-way. Of this required area, about 66 acres are cropland, 25 acres are pasture, 138 acres are rangeland, 44 acres are classified as residential and industrial land, 23 acres are existing channel, and 4 acres are in miscellaneous uses such as streets and road rights-of-way, etc.

Vegetation will be removed on about 503 acres of rangeland required for the construction of dams, emergency spillways, and sediment pools. Vegetation affected by installation of the four floodwater retarding structures is as follows:

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Floodwater Retarding Structure No. 1: About 97 acres will be cleared for the installation of the dam, emergency spillway, and sediment pool. The structure will be located in an area which is characterized by clay loam, clay flat, and shallow ridge range sites.

The west portion of the area has had brush management applied by shredding in strips and has a canopy cover of about five percent. Woody species comprise about seven percent of existing vegetation and is primarily: whitebrush (*Aloysia lycioides*), Texas colubrina (*Colubrina texensis*), and spiny hackberry (*Celtis pallida*).

Grasses comprise about 75 percent of existing vegetation. Predominate species are buffalograss (*Buchloe dactyloides*), curlymesquite (*Hilaria belangeri*), threeawns (*Aristida spp.*), and red grama (*Bouteloua trifida*).

The remaining vegetation is annual forbs.

The east side of the area has had no brush management applied and has a woody canopy of about 10 percent composed of the following species: lotebush, whitebrush, guajillo, spiny hackberry, blackbrush (*Acacia rigidula*), and guayacan (*Porlieria angustifolia*).

Grasses comprise about 80 percent of the composition. The predominate species are: curly mesquite, threeawns, and red grama.

Important browse species on the site such as guajillo and spiny hackberry show no indication of overuse.

Floodwater Retarding Structure No. 2: About 68 acres will be cleared. The area is characterized by clay loam, shallow ridge and stony ridge range sites which have been aerial sprayed in the past, and supports vegetation very similar to the area required for floodwater retarding structure No. 1. Range condition is fair. Guajillo and blackbrush comprise about five percent of existing vegetation.

Floodwater Retarding Structure No. 3: About 229 acres of the total area of 262 acres needed for construction of the floodwater retarding structure will be cleared. The remaining 33 acres has previously been rootplowed and seeded to: green sprangletop (*Leptochloa dubia*), sideoats grama (*Bouteloua curtipendula*), buffelgrass (*Pennisetum ciliare*), and indiangrass (*Sorghastrum nutans*).

The predominate range sites occurring in the area are clay loam and shallow ridge sites. Vegetation is similar to that on areas required for structure Nos. 1 and 2. A portion of the area along the main watercourse is a loamy bottomland site which contains some liveoak (*Quercus virginiana*).

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Floodwater Retarding Structure No. 4: About 109 acres will be cleared for the installation of the dam, emergency spillway, and sediment pool. The predominate range site is a clay loam. The eastern portion of the area in the vicinity of the emergency spillway is a stony ridge site. The clay loam site may have been chained or dozed at some time in the past. Range condition is poor and plants are in low vigor. Red grama, curlymesquite, and threeawns are the predominate grasses and comprise about 80 percent of the plant composition. Canopy cover ranges from 5 to 20 percent. Primary woody species are mesquite (*Prosopis juliflora* var. *glandulosa*) and Texas colubrina. There are very few woody species which have value for wildlife. Some liveoak trees along Taylor Slough will be removed during construction.

Woody vegetation which will be removed on about 90 acres in the area of the proposed channel work is primarily elm (*Ulmus spp.*), mesquite, and scattered liveoak, with an understory of whitebrush, Texas persimmon (*Diospyros texana*), and annual weeds. The primary grasses which will be removed are Texas wintergrass (*Stipa leucotricha*), Johnsongrass (*Sorghum halepense*), and bermudagrass (*Cynodon dactylon*).

Large liveoak trees which will not hinder the function or useful life of the works of improvement will be retained.

Under present conditions, no farm or ranch operation, business, or person will be displaced by installation of the planned floodwater retarding structures. However, with the implementation of the channel work, five families (about 24 individuals) will be relocated. These families will be moved to decent, safe, and sanitary dwellings equal to or exceeding existing conditions. All relocations will be carried out under the provisions and stipulations set forth by Public Law 91-646, Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

Operation and Maintenance

Planned land treatment measures will be maintained by landowners and operators of farms and ranches on which measures are applied under agreement with the Nueces-Frio-Sabinal Soil and Water Conservation District. Representatives of the district will periodically survey the status of land treatment and assist land users in the maintenance of applied measures.

The Commissioners Court of Uvalde County will be responsible for operation and maintenance of the four floodwater retarding structures. The City of Uvalde will be responsible for operation and maintenance of the approximately 18,300 feet of channel work. The Soil Conservation Service, through the Soil and Water Conservation District, will participate in operation and maintenance only to the extent of furnishing technical assistance to aid in inspections and technical guidance and information necessary for the operation and maintenance program.

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The estimated total annual operation and maintenance cost for structural measures is \$4,270 of which \$1,190 is for floodwater retarding structures and \$3,080 is for channel work. Monies for operation and maintenance of the floodwater retarding structures will be from the General Fund of Uvalde County. Operation and maintenance costs for channel work will be defrayed by monies from the General Fund of the City of Uvalde. These funds are supported by revenue from existing taxes. Each year the Uvalde County Commissioners Court and the City of Uvalde will budget sufficient funds for operation and maintenance.

The Uvalde Commissioners Court will operate and maintain each floodwater retarding structure in accordance with a specific operation and maintenance agreement. The City of Uvalde will likewise be responsible for the operation and maintenance of the channel work in accordance with a specific operation and maintenance agreement. The operation and maintenance agreement for each structural measure will be prepared and executed prior to the signing of a project agreement for construction of any of the structures. The agreement will set forth the inspections to be made and the maintenance to be performed to prevent soil erosion and water pollution.

Floodwater retarding structures and channel work will be inspected at least annually and after each heavy rain by representatives of the Uvalde County Commissioners Court, the City of Uvalde, and the Nueces-Frio-Sabinal Soil and Water Conservation District. The Soil Conservation Service will participate in these inspections for a period of at least three years following construction and will participate in inspections as often as it elects to do so after the third year. Items of inspection will include, but will not be limited to: conditions of principal spillways and their appurtenances; emergency spillways and earth fills for floodwater retarding structures; degradation, aggradation, and bank erosion; condition of vegetation; obstruction of flow caused by debris and/or sediment; growth of brush and trees; and the condition of side inlets and drains for the channel work.

A written report will be made of each inspection. A copy of each report will be provided by the Uvalde County Commissioners Court or the City of Uvalde to the designated Soil Conservation Service representative within ten days of the date on which the inspection was made.

Maintenance of the floodwater retarding structures will consist of items such as controlling undesirable vegetation by mowing, hand cutting or using herbicides; painting metal parts; and repairing eroded areas. This should be minimal since the emergency spillways and most of the surface of the embankments will be rock. Maintenance of the channel work will consist of such items as controlling undesirable vegetation by mowing; some hand cutting or herbicides may be needed; repairing eroded areas; and repairing side inlets and other structures. The mowing operations for the most part will be done with a farm-type tractor and shredder.

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Sponsors will control, in accordance with state regulations, the handling, storage, and application of herbicides and pesticides that may be necessary for operation of the structural works of improvement. Approved reagents and compounds will be used. Their application will be compatible with current laws regulating their use. In addition to sound and prudent judgement, ordinances and standards concerned with the disposal or storage of unused chemicals, empty containers, contaminated equipment, etc., will be observed and applied.

Provisions will be made for unrestricted access by representatives of sponsoring local organizations and the Soil Conservation Service to inspect all structural measures and their appurtenances at any time and for sponsoring local organizations to operate and maintain them.

The Uvalde County Commissioners Court and the City of Uvalde will maintain a record of all maintenance inspections made and maintenance performed and have it available for inspection by Soil Conservation Service personnel.

Project Costs

The necessary maintenance work will be accomplished either by contract, force account, or equipment owned by sponsoring local organizations.

The estimated costs for installation of the project are presented in the following tabulation:

Installation Cost Item	Estimated Cost (Dollars) ^{1/}		
	Public	Law 566	Other : Total
<u>Land Treatment</u>			
Installation	-	403,900	403,900
Technical Assistance	-	21,900	21,900
Subtotal		425,800	425,800
<u>Structural Measures</u>			
Construction	1,374,740	-	1,374,740
Engineering Services	70,070	-	70,070
Relocation Payments	25,700	11,030	36,730
Project Administration	201,790	4,980	206,770
Land Rights	-	276,090	276,090
Subtotal	1,672,300	292,100	1,964,400
Total Project	1,672,300	717,900	2,390,200

The estimated average annual cost for operation and maintenance of the four floodwater retarding structures and 18,300 feet of channel work is \$4,270.

^{1/} Price Base: 1972

Leona River Watershed

ENVIRONMENTAL SETTING

Physical Data

The Leona River watershed project area lies in southwestern Texas about 85 miles west of San Antonio. The lower limit of the watershed project area, as included in the work plan, is the Uvalde-Zavala County boundary. The entire project area is within Uvalde County and excludes tributaries which join the Leona River downstream from the southern boundary of Uvalde County (Appendix C). The project area comprises 172 square miles (110,080 acres).

Rising in central Uvalde County about 14 miles north of the City of Uvalde, the Leona River flows southward through Uvalde, thence south-eastward into Zavala County. Continuing its southeasterly course, the Leona River enters the Frio River in southern Frio County. The Frio River joins the Nueces River near the town of Three Rivers in Live Oak County. The Nueces River flows through Lake Corpus Christi and into Nueces Bay on the Gulf of Mexico.

Cooks and Taylor Sloughs are major tributaries of the Leona River within the project area. Cooks Slough flows across the western portion of Uvalde while Taylor Slough skirts the eastern edge of the City. Boon Slough is another tributary which joins Cooks Slough immediately upstream from Uvalde.

Stream channels in the watershed are generally well defined. They range from broad and shallow to incised with nearly vertical banks, depending on the erodibility of soil and rock materials traversed. Most of the stream channels and banks are unaltered from their natural state. However, the City of Uvalde has enlarged approximately 4,500 feet of channel within the City to reduce flooding from the Leona River. A few landowners, on an individual basis, have attempted to enlarge, straighten, or levee portions of channels extending through irrigated cropland areas south of Uvalde.

Streamflow in the watershed is ephemeral with the exception of the main stem of Leona River from about three miles below the City of Uvalde to the lower end of the watershed. This portion is perennial.

Approximately 8,097 acres within the watershed are flood plain subject to inundation by a 100-year frequency flood. Flooding occurs frequently in portions of this area causing damage to agricultural and nonagricultural properties.

The Balcones fault zone, a system of northeastward trending normal faults with upthrown sides generally on the northwest, crosses the watershed and separates two major land resource areas. Uvalde lies within the fault zone, the width of which extends about seven miles north and three miles south of Uvalde. The Edwards Plateau Land Resource Area, underlain by

Leona River Watershed, Texas

lower Cretaceous limestone and shale, is characterized by shallow soils and rough broken slopes. It lies mainly to the northwest of major displacement in the fault zone and occupies about 30 percent of the watershed.

The Rio Grande Plain Land Resource Area lies mostly within and to the southeast of the fault zone and comprises about 70 percent of the watershed. Its topography is mostly gently rolling to nearly level, but occasional hills with moderate to strong relief are common. Most of the bedrock is covered by thick alluvium deposited by ancient streams which flowed southward from the Edwards Plateau. The older deposits (Uvalde Gravel) have been dissected by erosion which was triggered by uplift of the area. As a result, the Uvalde Gravel presently occupies topographically high areas. Alluvium of the younger Leona Formation lies at lower elevations and has been only slightly altered by erosion. Thus, ancient valleys of late Pleistocene streams remain strongly evident. The most significant one is a broad plain extending westward from Uvalde across the poorly defined watershed divide and into the Nueces River valley. Another one is a more narrow valley presently occupied by Taylor Slough. It extends about 10 miles north-northeastward from Uvalde, crosses the watershed divide, and joins the valley of the Dry Frio River. A third but smaller valley, presently occupied by Cooks Slough, extends north-westward from Uvalde into the valley of Indian Creek. The present Leona River has cut a relatively narrow, deep channel into the alluvium of the Leona Formation downstream from Uvalde.

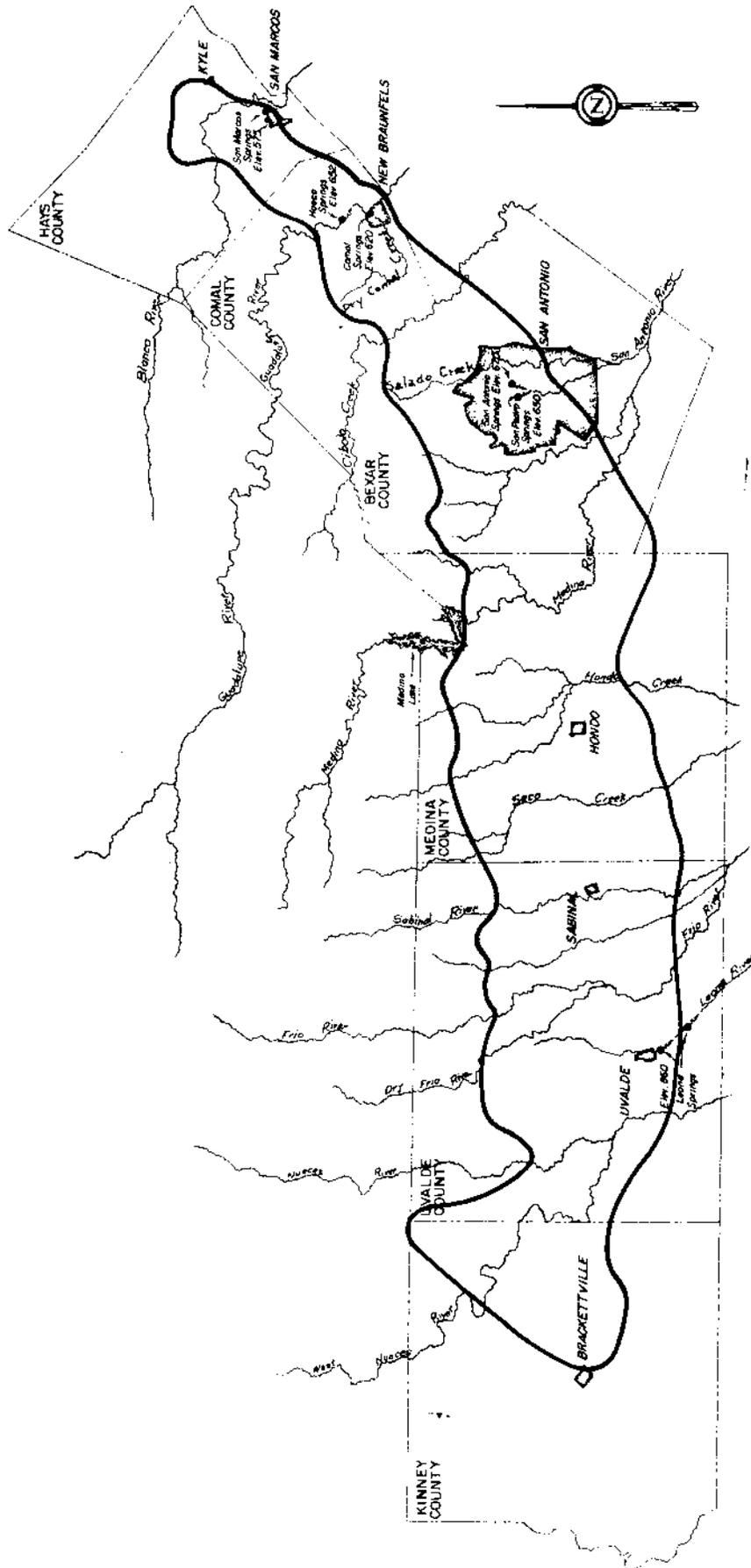
Watershed elevations range from about 1,600 feet above mean sea level along the northwestern divide in the Edwards Plateau to about 770 feet where the Leona River leaves Uvalde County.

Geologic strata exposed in the watershed range in age from Recent to Lower Cretaceous. The units which crop out within the watershed and the approximate area of each outcrop are shown on Tabulation A, Exposed Geologic Strata.

The harder, more pure limestone beds have undergone considerable solution, especially within the Georgetown and Edwards Formations. In the Balcones fault zone, where the limestone beds are highly fractured, a large system of interconnected cavities and caverns exist. The pattern of the system tends to be most pronounced along and parallel to the faults and fractures. Similar conditions occur along the entire Balcones fault zone, which extends more than 200 miles from west of Uvalde eastward to San Antonio and thence northeastward to the vicinity of Georgetown in Williamson County. A vast groundwater reservoir lies beneath the surface in the fault zone. This reservoir is most pronounced in parts of Kinney, Uvalde, Medina, Bexar, Comal, and Hays Counties where it is known as the Edwards Underground Reservoir (See Page 20, Edwards Underground Water Reservoir). In Uvalde County this limestone reservoir is composed primarily of the Georgetown, Kiamichi, Edwards, and Comanche Peak Formations which behave as a single hydrologic unit. The Geological

Tabulation A
EXPOSED GEOLOGIC STRATA

System	Series	Group	Formation	Lithology of Outcrop	Approximate Thickness in Watershed Vicinity (Feet)	Approximate Area of Outcrop Within Watershed (Acres)	
Quaternary	Recent		Alluvium	Clay, silt, sand, and gravel	20	57,240	
			Leona	Clay, silt, sand, gravel, and cobbles	70		
			Uvalde	Gravel, cobbles, silt, clay, sand, and caliche	15		
			Gravel	Poorly cemented, thin bedded, clayey sandstone, and sandy shale	150		
Tertiary	Eocene	Wilcox	Indio	Mostly basalt plugs, dikes, and sills		1,890	
			(Intrusive igneous)			2,260	
Tertiary or Late Cretaceous	Gulf (Upper Cretaceous)	Navarro	Eacondido	Fine-grained sandstone interbedded with shale and clay	285 ±	130	
			Taylor	Anacacho Limestone	Limestone and bentonitic clay	500 ±	220
				Austin	Chalk	Thin bedded to massive, chalky limestone and calcareous shale	400 ±
		Eagle Ford	Washita	Ragle Ford	Interbedded flaggy limestone and calcareous shale	150	1,340
				Buda Limestone	Hard, massive limestone	80	12,290
				Grayson	Calcareous, shaley clay containing thin fossiliferous limestone beds and interspersed gypsum	90	
		Comanche (Lower Cretaceous)	Fredericksburg	Georgetown Limestone	Hard, massive, vugular limestone	350	20,160
				Kiamichi	Flaggy limestone and shale	175	
				Edwards Limestone	Hard, massive, vugular limestone	75	



EDWARDS UNDERGROUND WATER RESERVOIR

Map Courtesy of Edwards Underground Water District

Leona River Watershed, Texas

Survey, U.S. Department of the Interior, refers to these formations as the Edwards and associated limestones.

Streams which cross the fault zone, losing most of their flow, are the primary source of recharge to the aquifer. The Commissioners Court of Uvalde County has installed measures for artificial recharge of the Edwards Underground Reservoir at five locations within the watershed project area. Recharge wells were drilled or natural openings were cleaned out. Openings are protected with heavy grating, and small diversion dams direct runoff water into the ground water reservoir. Although the resulting increased recharge has been small in comparison to total recharge, the methods used have proven to be effective.

Natural outlets for ground water which occur within the watershed are along the Leona River downstream from Uvalde where Leona Springs issue from gravel beds of the Leona Formation. The springs are located about 0.5 mile north of Farm Road 140. A source for these springs is ground water discharging from the Edwards and associated limestones into the Leona Formation. The Geological Survey reports that these two aquifers are hydrologically connected in some places. The springs are also dependent on rainfall and infiltration in the immediate area and have ceased to flow during periods of drought. The maximum recorded flow is 50.8 cubic feet per second with an average flow of 10.0 cubic feet per second.^{1/}

Rains of low to moderate intensity, falling on the Leona River watershed above Uvalde, mostly disappear into the porous rocks in the fault zone and contribute only meager volumes of direct runoff to the Rio Grande Plsin. High intensity rains, however, produce flood flows which exceed greatly the infiltration capacity of the fault zone and result in flooding downstream.

There is a low water concrete dam on the Leona River about five miles south of Uvalde just below the confluence of the Leona River and Cooks Slough. The Commissioners Court of Uvalde County presently operates and maintains this dam. During normal rainfall periods, this lake receives plentiful inflow from Leona Springs, but becomes depleted during extended droughts.

The industrial and municipal water supply for Uvalde is obtained from wells in the Edwards Underground Reservoir. This aquifer has a notable capacity for rapid recharge and there is no immediate threat to the quantity or quality of water. Water for livestock and rural domestic use is obtained from wells and surface ponds. In the Leona River Valley, southeast of Uvalde, large supplies of water for irrigation are pumped from gravel beds of the Leona Formation and from the Edwards and associated limestones.

Important mineral resources in the watershed include limestone, clay, gravel, and igneous rock used for road material. Rock asphalt is quarried from the Anacacho Limestone about 10 miles west of the watershed.

^{1/} "The Edwards Bulletin," No. 148; January, 1974, published by the Edwards Underground Water District, San Antonio, Texas.

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The soils of the watershed, in general, are calcareous. Permeabilities range from very slow to moderately rapid, the major portion having moderate permeability. Edwards Plateau soils are mostly shallow to very shallow, fine textured, and stony. Most of the Rio Grande Plain soils are deep with fine textured surfaces. The occurrence of gravel in both the surface and subsurface horizons is common. The predominant soils are clays of the Knippa, Montell, Tobosa, Kavett, and Val series; silty clay loams of the Uvalde and Frio series; Tarpley gravelly clay; Olmos gravelly loam; Webb fine sandy loam; Hindes-Quemado very gravelly loam; and stony clay loams of the Ector and Ingram series.

The climate is semi-arid. The average annual rainfall at Uvalde is about 23 inches. Two out of three years receive less than average rainfall. Droughts of two to three years duration occur about every 10 years, and droughts of even longer duration can be expected every 20 to 30 years. About 50 percent of the average annual rainfall occurs in May, June, September, and October. Summers are hot. Winters are quite dry and generally mild but subject to rapid temperature changes with the passage of cold fronts. Temperatures range from a mean maximum of 96 degrees Fahrenheit in July to a mean minimum of 40 degrees in January. The normal growing season, extending from March 10 through November 21, is 255 days.^{1/}

Early settlers cleared small fields which were planted primarily to corn for livestock and domestic use. In the 1800's many settlers migrated to the area, and acreage of farmland was greatly expanded. Cotton and corn became the two major crops. Farming continued to advance until the boll weevil and other cotton insects and diseases made cotton growing a marginal enterprise resulting in a gradual turn to stock farming and production of grain sorghum, small grains, grazing, and hay crops.

Cropland in the watershed is used for production of grain sorghums, small grains, and vegetables. About 9,000 acres of cropland are irrigated and are used primarily for vegetable, grain sorghum, and corn production. Wheat and oats are planted for winter grazing by livestock. Coastal bermudagrass and Kleingrass are the most common pasture grasses. Kleingrass has been planted on more than 80 percent of recently established pastureland.

Early explorers described the vegetation of Uvalde County in the eighteenth and nineteenth centuries.^{2/} Their descriptions are somewhat confusing and appear to conflict on occasions but do provide an insight into former conditions. William Bollaert traveled up the Leona River in 1843. He describes the lower Leona River bottoms below Uvalde as having "mean brush." Bollaert's party camped in a more open country about

^{1/} "Climatological Data, Texas Annual Summary," U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service.

^{2/} Inglis, Jack M, 1964, A History of Vegetation on the Rio Grande Plain, Texas Parks and Wildlife Department Bulletin No.45.

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eight miles southsoutheast of the present location of Uvalde. From this point, they traveled to the upper reaches of the Leona River through what was apparently fairly open country. Bollaert's writings identify the presence of antelope in Uvalde County which indicates that an open grassland plant community existed on the uplands.

Hughes crossed the Leona River about two or three miles below Uvalde in 1846 and described the areas about one mile from the river as good grazing and the land within a mile of the river as "covered with a thick growth of mesquite, different varieties of oak, live oak, pecan etc." Most of the trees along the Leona were reported to be young. He traveled up the Leona River and reported, "The valley is wide, well timbered, and extremely rich, the sweet grasses growing with great luxuriance." He climbed Pilots Knob in the vicinity of Uvalde and "could trace the graceful and meandering course of the river by its fringe of woods far up to its mountain source."

Michler in 1849 described the area between the Leona and Frio Rivers as a "high flat prairie" which "extends unbroken until it rises into the range of hills which stretch across the Frio miles above the head springs of the Leona." This prairie was about eight miles in width and was bounded by the valley slopes of the Frio and Leona Rivers which were described as "low chapparel hills." Michler stated that "owing to the greater quantity and greater density of chapparel along the Leona, a great deal of labor can be avoided by keeping nearer the Frio than the Leona."

Bailey traveled from San Antonio to Uvalde in 1900 and recorded, "The country becomes more open with lower, more scattered mesquites and stretches of open prairie... Along streams the mesquite is more dense and there is often thick timber of pecan, elm, celtis, and live oaks." He also stated, "Grass is good."

From these early reports, it is apparent that the original vegetation of the area consisted of open grasslands and savanna type communities on the uplands. The stream courses and valleys apparently supported dense stands of woody species in many instances, although Hughes' description of the Leona as he traveled up the river from Uvalde indicates a grassland savanna type community in the Leona River valley.

Range site descriptions developed by plant ecologists and range conservationists of the Soil Conservation Service confirm the observations of early explorers. The clay loam range site occurs on nearly level to gently sloping areas. The climax plant community of this site was an open grassland with an occasional mesquite tree or woody shrub. Woody species composed five percent or less of the climax vegetation. Mid grasses were dominate and some climax forbs existed. The shallow ridge range site occurs on low gently sloping ridges and plains. The climax plant community was an open grassland with a variety of scattered woody shrubs and perennial forbs. Woody species comprised about ten percent of the climax community.

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The loamy bottomland range site description developed by the Soil Conservation Service describes vegetation which occurs on bottomlands and in valleys along major streams and tributaries. Climax vegetation on the site is characterized as a grassland with shrubs and trees along major stream channels. The density of woody vegetation varies depending on edaphic, topographic, and natural biotic factors.

Climax grasses which comprised significant amounts of the original flora of the area were plains lovegrass (*Eragrostis intermedia*), two-flower trichloris (*Trichloris crinita*), four-flower trichloris (*Trichloris pluri-flora*), Arizona cottontop (*Trichachne californica*), pinhole bluestem (*Andropogon perforatus*), silver bluestem (*Andropogon saccharoides*), plains bristlegrass (*Setaria macrostachya*), buffalograss, curlymesquite, sideoats grama, pink pappusgrass (*Pappophorum bicolor*), whiplash pappusgrass (*Pappophorum mucronulatum*), tobosa (*Hilaria mutica*), vine-mesquite (*Panicum obtusum*), alkali sacaton (*Sporobolus airoides*), big sacaton (*Sporobolus wrightii*), white tridens (*Tridens albescens*), lovegrass tridens (*Tridens eragrostoides*), slim tridens (*Tridens muticus*), green sprangletop, Indiangrass, and Canada wildrye (*Elymus canadensis*).

Woody species which were found in the climax plant communities in the uplands include guajillo, Texas kidneywood (*Eysenhardtia angustifolia*), range ratany (*Krameria parvifolia* var. *glandulosa*), vine ephedra (*Ephedra antisiphilitica*), falsemesquite (*Calliandra eriophylla*), mesquite, guayacan, skunkbush (*Rhus trilobata*), desert yupon (*Schaefferia cuneifolia*), littleleaf sumac (*Rhus microphylla*), Texas colubrina, feather dalea (*Dalea formosa*), live oak, ceniza (*Leucophyllum frutescens*), blackbrush, and spiny hackberry. Liveoak, elm, pecan, hackberry (*Celtus laevigata*), prickly pear (*Opuntia* spp.), grape (*Vitus* spp.), greenbriar (*Smilax* spp.), mesquite, bumelia (*Bumelia* spp.), and devilweed aster (*Aster spinosus*) were the primary species found adjacent to stream courses.

Some important forbs found in climax plant communities included bundleflower (*Desmanthus* spp.), bushsunflower (*Simsia calva*), orange zexmenia (*Zexmenia hispida*), catclaw sensitivebriar (*Schrankia uncinata*), evening primrose (*Oenothera* spp.), menodora (*Menodora* spp.), mallows (*Malva* spp.), perennial croton (*Croton* spp.), sagewort (*Artemisia mexicana*), englemann daisy (*Engelmannia pinnatifida*), gaura (*Gaura* spp.), and snoutbean (*Rhynchosia* spp.).

A more detailed listing of climax plants is provided in range site descriptions maintained in local Soil Conservation Service field offices.

The opening of Texas to settlement in 1820 and its annexation to the United States in 1845 brought a surge of immigration to the State. By 1880, grazing of livestock was widespread. Early livestock raisers had little concept of the grazing capacity of rangelands and heavy overuse of rangeland was common. This heavy use combined with recurring droughts caused a very significant change in natural vegetation. The first angora goats were brought into the county about 1884. Many

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browse species with high forage value have been reduced or eliminated by excessive overuse by goats. Most invading woody plants are adapted to dry climates and sparse cover. As the palatable grass species were destroyed by grazing and drought, the seeds of woody plants germinated and became established. The resulting rapid infestation of woody species replaced the formally productive grasslands. Livestock spread the seed of many woody species and the suppression of range fires probably contributed to the increase of woody vegetation.

As a result of past land use the vegetation within the watershed presently bears little resemblance to its climax condition and is generally in fair condition.

Former grasslands and open glades along stream courses are almost completely dominated by woody plants on the majority of the watershed.

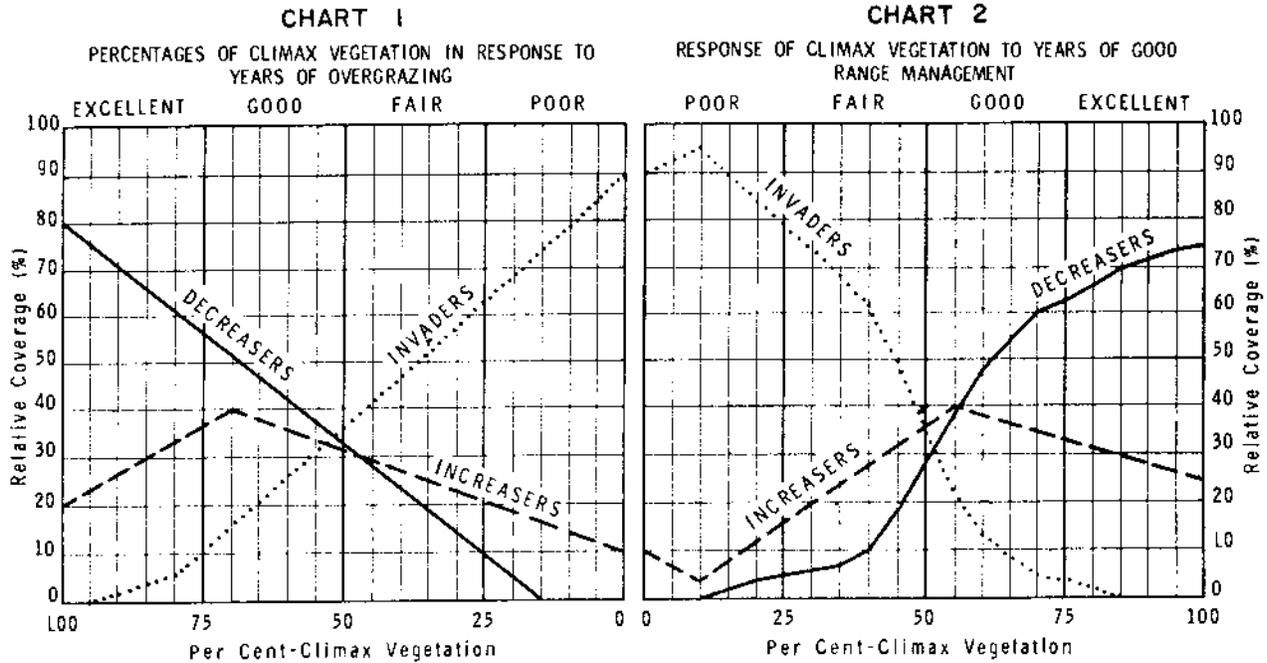
As retrogression within plant communities occurred, climax grasses were replaced by red grama, threeawns, tumblegrass (*Schedonnardus paniculatus*), Texas grama (*Bouteloua rigidisetata*), Halls panicum (*Panicum hallii*), hairy tridens (*Tridens pilosus*), whorled dropseed (*Sporobolus pyramidatus*), annual grasses, and annual forbs. Low stoloniferous grasses such as curlymesquite and buffalograss increased due to their ability to withstand livestock grazing.

Woody species such as mesquite, lotebush, whitebrush, spiny hackberry, tasajillo (*Opuntia leptocaulis*), leatherstem (*Jatropha dioica*), Texas persimmon, mescalbean (*Sophora secundiflora*), agrito (*Berberis trifoliolata*), coyotillo (*Karwinskia humboldtiana*), catclaw (*Acacia greggii*), and pricklypear have increased or invaded and dominate many range sites.

Retrogression of grassland communities has resulted in greatly reduced forage production from rangelands. Range sites capable of yielding 2,500 to 3,500 pounds of forage in excellent condition often yield less than one half this amount in poor or fair condition. The effect of overgrazing and proper grazing management on vegetation is illustrated by charts 1 and 2 on the following page. Charts 3 and 4 illustrate the grazing capacity and production of watershed range sites. Reduction of excess woody species through brush management is often necessary to permit restoration of poor and fair condition rangeland. Stands of woody vegetation which have invaded a site compete with remaining climax plants for water, sunlight, nutrients, and space. The removal or reduction of livestock grazing alone will often not permit desired vegetation to become reestablished.

Hydrologic cover conditions on the watershed differ from ecological conditions in that they are concerned primarily with the quantity of existing vegetation and litter rather than species composition. An estimated 70 percent of the watershed is in fair to good hydrologic condition and the remaining 30 percent is in poor hydrologic condition.

RANGE CONDITION



DECREASERS - Plants present in the potential plant community which decrease with overgrazing.

INCREASESERS - Plants present in the potential plant community which initially increase with overgrazing but eventually decrease if overgrazing is prolonged.

INVADERS - Plants not present in the potential plant community but which encroach and occupy the area vacated by the decreaseers and increasers under prolonged over-use.

CHART NO. 1

This chart illustrates the reaction of rangeland vegetation to prolonged periods of overgrazing. The more desirable plants decrease. Others present increase for a short time and then decrease as the grazing load shifts to them. Undesirable plants present only in trace amounts invade and occupy the area vacated by the original plants.

CHART NO. 2

POOR CONDITION

The invader plants increase in percent ground cover during the first few years when grazing pressure is lightened or wholly removed. This increase continues as long as there is bare ground for this type of plant to occupy. The Increaser plants are low in vigor and are slow to start spreading. Both increaser plants and the trace of decreaseer plants begin to occupy more area as the cover and litter accumulates and plant vigor increases. At this stage, the less competitive invaders, such as annuals, begin to diminish and give way to plants of higher order.

FAIR CONDITION

The increaser plants continue to spread and compete more heavily for the water, nutrients, and light. Decreaser plants gain vigor, produce seed, and begin to spread more rapidly by establishing new plants by vegetative means. The invader species start to decline rapidly as competition becomes more and more severe.

GOOD CONDITION

Decreaser plants increase more rapidly. Invader species continue to be eliminated as competition with plants of higher ecological status becomes more severe. Increasers spread for a short time until competition with plants of higher rank force them to diminish gradually.

EXCELLENT CONDITION

Invader plants are soon reduced to only a trace of the composition. Adjustment between the climax plants continues to take place as the decreaseers slow down their spread but continue a gradual climb in percent coverage. The Increaser species are gradually reduced to their proper percentage in the highly competitive community. Decreasers may not attain as high a percentage of the composition as they occupied before deterioration, due to some species having been eliminated completely.

CHART 3

GRAZING CAPACITY 1/ OF RANGELAND BY
RANGE SITE AND CONDITION CLASS

Range Site	Condition Class			
	Excellent	Good	Fair	Poor
Clay loam	15 - 18	18 - 22	20 - 25	25+
Clay flat	12 - 15	14 - 20	19 - 25	25+
Shallow ridge	17 - 24	24 - 30	28 - 36	32+
Stony ridge	16 - 19	18 - 25	23 - 28	27+
Shallow	19 - 25	23 - 29	27 - 36	35+
Loamy bottomland	8 - 12	10 - 15	14 - 20	20+
Igneous hill	16 - 23	21 - 28	25 - 35	36+

1/ Expressed in acres required to furnish forage for one animal unit on a year-long basis.

CHART 4
 APPROXIMATE TOTAL ANNUAL YIELD IN
 EXCELLENT CONDITION^{1/}

Range Site	: Rainfall and growing conditions	
	: Favorable	: Unfavorable
Clay loam	4,000	2,000
Clay flat	4,000	1,500
Shallow ridge	2,500	1,000
Stony ridge	1,800	900
Shallow	2,500	1,000
Loamy bottomland	4,500	1,800
Igneous hill	3,000	1,500

^{1/} Expressed in pounds of air dry forage per acre.

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Land use within the watershed is shown in the following tabulation:

<u>Land Use</u>	<u>Acres</u>	<u>Percent</u>
Cropland	17,677	16.1
Pasture and Hayland	3,027	2.7
Rangeland	81,746	74.3
Miscellaneous ^{1/}	<u>7,630</u>	<u>6.9</u>
Total	<u>110,080</u>	<u>100.0</u>

^{1/} Includes roads, highways, railroad rights-of-way, urban areas, farmsteads, stream channels, etc.

Present land use in the 8,097 acre flood plain is as follows: rangeland, 49 percent; cropland, 27 percent; pasture and hayland, 11 percent; and miscellaneous uses including urban areas, public roads, and railroads, 13 percent.

Economic Data

The agricultural economy of the watershed is dependent on the production and sale of cash crops and livestock. The most important crops produced for direct sale are vegetables, grain sorghum, and small grains. Vegetables grown include onions, carrots, cabbage, tomatoes, and snap beans. Some farmers grow two crops a year on the same land. Agricultural land not devoted to crop production is used primarily for the grazing of cattle, sheep, goats, and wildlife. About 60 percent of the total agricultural income in the watershed is derived from the sale of cash crops and 40 percent from the sale of livestock and livestock products.

Hunting leases provide a significant income for many landowners. Leasing of hunting rights on private land to individuals on a fee basis is widely practiced in the watershed and surrounding area. Soil Conservation Service field office records indicate that 55 land users in the watershed derive income from hunting leases. About 57,000 acres or 56 percent of the watershed is leased for deer on an annual basis. Hunting on a lease basis for other species is limited. Gross return from hunting leases averages about \$1.15 per acre. The price paid for hunting leases is largely dependent upon quality of hunting, services and facilities provided, and the size and location of the ranch.

There are approximately 160 farms and ranches, wholly or partially within the watershed, averaging 640 acres in size. About 50 percent are smaller than 300 acres. The average value of land and buildings per farm is currently estimated at about \$100,000. The estimated current market price of land ranges from \$135 to \$500 per acre. The range in land prices depends primarily on location, accessibility, and productive capability. Agricultural land is largely owner-operated. About 16 percent is leased or rented.

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About 37 percent of the farms and ranches in Uvalde County, which is representative of the watershed, gross less than \$2,500 annually from agricultural sales. Approximately 40 percent of the farm and ranch operators worked off-the-farm for 100 days or more in 1969.

It is estimated that less than 15 percent of the agricultural land in the flood prone area is devoted to farms and ranches using 1-1/2 man-years or more of hired labor.

The "Work Force Estimates for Nonmetropolitan Counties in Texas for April 1972", the latest statistics which are available, show a labor force of 6,035 from a total population of 17,348 for Uvalde County. Approximately 6.9 percent, or 415 workers, are unemployed. This exceeds the state and national rate of unemployment. Approximately 18.6 percent, 1,125 workers, are employed in the agricultural sector. The nonagricultural sector employs 4,495 workers: 450 workers in the manufacturing sector, and 4,045 workers in the nonmanufacturing sector. A problem of underemployment also exists. Much of the labor force is employed in seasonal occupations which results in significant underemployment of the total labor resources of the area.

The major source of income in the watershed and Uvalde County is from direct sale of agricultural commodities and retail and wholesale agricultural oriented businesses.

The City of Uvalde, located in the center of the watershed, is the county seat of Uvalde County. Uvalde is the commercial center for the surrounding farm and ranch area, providing important marketing and supply services.

It is anticipated that the population of Uvalde will increase from the 1970 census count of 10,764 to about 12,800 ¹/by 1985.

Fish and Wildlife Resources

Fishery resources in the watershed are limited. The small spring fed lake on the Leona River supports a limited population of catfish and other species. The Soil Conservation Service has provided technical assistance to land users in the construction of 32 farm ponds in the watershed. About 20 are stocked and managed for fishing. Black bass, channel catfish, and sunfish are the major species stocked in farm ponds. There is one commercial catfish farm and one catch-out pond located in the watershed.

Habitat for wildlife species found in the area generally is of moderate to good value. Wildlife species in the project area are white-tailed deer, javelina, wild turkey, mourning dove, white-winged dove, bobwhite, scaled quail, fox squirrel, cottontail, jackrabbit, raccoon, ringtailed cat, and armadillo. The population levels of the important game species,

1/ "A Comprehensive Plan for the City of Uvalde, Base Studies", May 1973, Water Resources Engineers, Inc., Austin, Texas.

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according to the Bureau of Sport Fisheries and Wildlife, within the project area are as follows: "Deer are found in moderate to high numbers; turkeys are present in low numbers, except along the Leona River south of Uvalde where they appear only in moderate numbers; bobwhite and scaled quail are found in low to moderate numbers in the project area; mourning doves are abundant; squirrels are found in moderate numbers south of the City of Uvalde; and a few javelina are present in the project area."

Deer census data collected by the Texas Parks and Wildlife Department in 1970 for Uvalde County indicated a deer population of one deer per 12.3 acres. ^{1/} The doe/buck and fawn/doe ratios were 3.14 and .642 respectively. Deer numbers were considered to be in excess of carrying capacity and antlerless deer permits were issued in Uvalde County. 4,580 antlerless permits were issued to 337 landowners who controlled 675,654 acres. 1,004 antlerless deer were harvested.

There are no known rare or endangered zoological or botanical species in the watershed. The watershed is within the range of Wrights pavonia (*Pavonia lasiopetala*). This plant was not observed during planning, but may exist in the watershed. The mountain lion infrequently ranges into the watershed, but is not a permanent resident. The black bear was found in the extreme upper portion of the watershed in the nineteenth century, but is now extinct in the watershed.

Recreation Resources

The most significant recreational resource within the watershed is the various species of wildlife that are hunted. The practice of landowners leasing their lands for hunting privileges is prevalent.

The small spring-fed lake on the Leona River below Uvalde offers limited opportunities for fishing. There is not enough permanent water in the project area to provide significant area-wide water-based recreation. However, Amistad Reservoir, which is located on the Rio Grande approximately 80 miles west of Uvalde, offers an abundance of opportunities for year-round water-based recreation.

Archeology and Historical Values

There are no historic areas, buildings, or properties in the watershed listed in, or in the process of nomination to, the National Register of Historic Places. The Texas State Historical Survey Committee recognizes some buildings in the City of Uvalde as having historical significance. Among these buildings is the home of John Nance Garner who served as Vice-President of the United States.

1/ Texas Parks and Wildlife Department South Central Texas Game Management Survey, Job No. 3, Federal Aid Project No. W-81-R-14, June 1971.

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The Texas Archeology Survey, The University of Texas at Austin, conducted field surveys to locate and appraise archeological resources in the watershed. Eleven archeological sites were observed, recorded, and described in Research Report 37 "Leona River Watershed, Uvalde County, Texas, an Archeological and Historical Survey of Areas Proposed for Modification" by staff archeologist, Grant D. Hall. The recorded number and description of the eleven archeological sites surveyed and an appraisal of the Cooks Slough area to be effected by channel work are as follows:

Two archeological sites, 41 UV 43 and 41 UV 53, were found in the area required for the construction and functioning of floodwater retarding structure No. 1 on Cooks Slough.

41 UV 43 ^{1/}

The site is characterized by an area of flint cobbles eroding out of the stream channel bank. Artifacts found included numerous flint cores, flakes showing bulbs of percussion, and partially worked bifaces. An absence of small flint flakes indicating marginal retouch or finishing of artifacts suggests the possibility that the site represents a flint supply source where flint "blanks" were roughed out and then carried off to some other location for manufacture into finished artifacts.

The heavy concentration of chert cobbles in this area apparently represents a residual accumulation created as a very stony soil deposit was deflated by running water. The material found at the site is most noticeable in a band running parallel to the stream channel where water erosion has been the greatest.

It is obvious from surface indications that the flint cobble source was utilized in obtaining materials for artifact production. Whether the use of this resource was a one-time event or took place over a number of years cannot be determined. It may, however, be conclusively stated that this supply was, in one form or another, expressed surficially during periods of aboriginal activity in the area. Possibilities for further archeological investigation at this site are considered to be limited due to its lack of depth and probable post-depositional disturbance.

41 UV 53

This site consists of an area of scattered burned rock with several locally heavier concentrations. It appears to have some depth to its deposit and has not been drastically modified by land clearing or root plowing operations.

Three sites, 41 UV 44, 41 UV 45, and 41 UV 46 were located in the vicinity of planned floodwater retarding structure No. 2 on Boone Slough. All three sites are above the emergency spillway crest elevation of 981.6 feet above mean sea level.

^{1/} Standard archeological site designation system utilized by the Texas Archeological Research Laboratory, The University of Texas at Austin. Forty-one indicates the State of Texas, UV is the abbreviation for Uvalde County, and 43 the numerical designation of the archeological site within the county.

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41 UV 44

The site is roughly 50 yards square and consists of an area of scattered burned rock, flint debitage, and gravel. Artifacts collected included bifacial scrapers and retouched flint flakes. The site lies on the flank of a rocky hill and is believed to have little or no depth to its deposit.

41 UV 45

The site seemed undisturbed except where bisected by a transmission line. There is a heavy cover of vegetation and the soil deposit is thicker than in the surrounding vicinity.

The surface collection included flint flakes, a bifacial scraper, wire, glass fragments, a square nail, and a porcelain potsherd. The latter artifacts may indicate either an historic Indian encampment or, more probably, a non-aboriginal site superimposed over the remains of aboriginal occupation.

41 UV 46

The site is moderately to heavily eroded and is characterized by scattered burned rock and flint debitage. Utilized flint flakes and biface fragments were recovered.

Four sites were described in the vicinity of the area needed for floodwater retarding structure No. 3.

41 UV 47

Extensive portions of 41 UV 47 lie in an area that has been cleared of brush and root plowed to a depth of approximately one foot below the present ground surface. Surface indications consisted of scattered burned rock with locally heavier concentrations. Numerous artifacts, including projectile points, bifacial scrapers, utilized flakes, and flint cores were recovered.

Two test pits were excavated to provide information concerning the depth of cultural material and the extent to which the deposit has been disturbed by brush clearing activities. Both pits were 5 feet square, oriented on a north/south axis, and excavated in arbitrary 1/2 foot vertical levels.

In Test Pit 1 at the western end of the site, most of the cultural material was concentrated within the first 0.5 feet with lesser indications observed to a depth of two feet. Burned rocks were sparsely scattered through the fill. No obvious changes in soil composition or color were noted during excavation. There was, however, a notable increase in river pebbles from Level 4 to Level 6 (1.5 to 3.0 feet) coincident with a decrease in the occurrence of artifacts.

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In Test Pit 2 at the eastern end, a very dense layer of burned rock with a matrix of black loam was encountered between ground level and a depth of 1.3 feet. Below this cultural layer was a light tan sand interspersed with numerous pebbles. Material recovered included four projectile points, many flint flakes, one specimen of bone, and mussel shell fragments.

Diagnostic artifacts recovered in Test Pits 1 and 2 included an *ansor* dart point and two *Scallorn* arrow points (Suhm and Jelks 1962). ^{1/} On the basis of conclusions reached following investigations at the Kyle Site (Jelks 1962), ^{2/} at Arenosa Shelter (Dibble 1967), ^{3/} and at the La Jita Site (Hester 1971), ^{4/} it may be very tentatively advanced that the occupation at 41 UV 47 represents a time period stretching from Late Archaic (circa A.D. 500) to Late Prehistoric (circa A.D. 1200). It is emphasized that these are gross estimations of periods of occupation and by no means provide a conclusive statement on the temporal situation at the site.

In comparing the two test pits, it is important to note that the culturally productive zone in Test Pit 1 is visually indistinct while in Test Pit 2 it is very well defined. The first pit is located in an area which has undergone brush clearing operations and the second in an undisturbed area of the site. This is one possible explanation for the differences in the concentration of material from one pit to the other. Other possibilities are that the perceived differences are a result of the variations in the type of occupation or localized activities and the time interval involved.

From this, it is emphasized that the more distinct of the cultural deposits tested in the two areas lie in the eastern extent of the site where disturbance has not apparently affected archeological resources. It is believed that the undisturbed portion of the site is worthy of further investigation aimed at collecting at least a sample of the information contained within the site.

41 UV 48

41 UV 48 lies along the right (west) bank of the Leona River starting at its confluence with a major northwest trending tributary. As with 41 UV 47, this site is characterized by burned rock scattered along the

^{1/} Suhm, Dee Ann and Edward B. Jelks, 1962, Handbook of Texas Archeology: Type Descriptions. The Texas Archeological Society, Special Publication No. 1 and Texas Memorial Museum, Bulletin No. 4, Austin.

^{2/} Jelks, Edward B., 1962, "The Kyle Site: A stratified Central Texas Aspect Site in Hill County, Texas," Archeology Series, No. 5. Department of Anthropology, The University of Texas, Austin.

^{3/} Dibble, David S., 1967, Excavations at Arenosa Shelter, 1965-66. Mimeographed Report Submitted to the National Park Service by the Texas Archeological Salvage Project.

^{4/} Hester, Thomas Roy, 1971, "Archeological Investigations at the La Jita Site, Uvalde County, Texas", Bulletin of the Texas Archeological Society, Vol. 29: 63-108.

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river terrace. Relatively greater concentrations occur at the southwest end of the site. Flint blades, a chopper, flakes, and bifacial fragments were surface collected. Few intact deposits remain as significant portions of the site locality have been cleared of brush and root plowed.

41 UV 49

This site consists of an oblong mound approximately 70 yards long and 30 yards wide. A sizeable amount of burned rock is visible on the surface. The site is overgrown with brush and large oak trees. It has not suffered any readily apparent post-depositional disturbance.

41 UV 50

41 UV 50 is located in the bottom of a gently sloping draw. The site consists of two or more definable rock hearths and other scattered burned rock. The area containing these features has been severely eroded. Material collected includes a projectile point, flint blades, and flakes.

Two archeological sites were described in the area required for planned floodwater retarding structure No. 4 on Taylor Slough.

41 UV 51

Surface expressions indicating the location of this site consisted of burned rock and dark midden soil. Test Pit 3 was excavated within site 41 UV 51 in a 5-foot square using 1/2 foot vertical levels and was oriented north/south. The pit was placed on the southeast flank of an apparent midden because surface indications were more pronounced in this area than at higher elevations on the midden. A very dense deposit of burned rock containing numerous flint artifacts was found between the ground surface and a depth of approximately 2 feet. Here, the cultural layer ended abruptly and was underlain by grayish-tan gravelly sand.

Only one diagnostic artifact, an Ensor point, was recovered from Test Pit 3. Although an age estimate made on the basis of one point is highly inconclusive, it is tentatively advanced that the occupation at 41 UV 51 dates back to Late Archaic times with the oldest and most recent dates of occupation being unknown factors.

The information recovered from this testing operation combined with surficial observations indicate that the site is fairly large and contains a cultural deposit at least 2 feet in depth and probably deeper at higher elevations on the site. The general area in which the site is located has apparently undergone little modification, although brush clearance has taken place in the vicinity.

In view of the precarious location of the site in relation to the proposed floodwater retarding structure, the apparent horizontal and vertical dimensions of the site, and its relatively undisturbed nature, it is

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believed that further investigation of the site would be of significant importance to the understanding of the archeology in the Uvalde area.

41 UV 52

This site lies immediately west of 41 UV 51 and is bisected by both a dirt road and a fence. 41 UV 52 consists of an area of burned rock approximately 15 feet in diameter. No artifacts were collected on the site, and it is badly disturbed by the dirt road cutting through it.

Cooks Slough - Area to be Affected by Channel Work

Along approximately 18,300 feet of Cooks Slough running from Farm-to-Market 1052 to U.S. Highway 83, only scattered cultural material was observed. There were no areas deemed to be archeologically significant judging from materials observed on the ground surface. The channel segment extending from F. M. 1052 to the Central Power and Light Company's power station is, however, considered to be an archeologically sensitive zone on the basis of its deep alluvial deposits and apparently undisturbed nature.

The natural setting in the area points to the possible existence of cultural remains even though no evidence is visible on the ground surface in the vicinity.

Soil, Water, and Plant Management Status

The Nueces-Frio-Sabinal Soil and Water Conservation District was organized as a sub-division of State Government with responsibility in the field of soil and water conservation in Uvalde County. The District is dedicated to the conservation of soil, water, plant, wildlife, and related resources. It is governed by a locally-elected board of directors. Technical assistance to the District is provided by the Soil Conservation Service through an existing memorandum of understanding with the United States Department of Agriculture. The District establishes policies and sets priorities for conservation of resources within the district. Soil and water conservation districts constitute a significant level of citizen control in decision making. ^{1/}

The District does not have regulatory authority and operates a cooperative voluntary program of assistance to land users within the district.

Land users who elect to cooperate with the District in the application of a conservation program for land they own or control are provided technical assistance in the planning and application of conservation measures. Most land treatment decisions are based on a resource conservation plan developed by the landowner in consultation with technical personnel assisting the district. Conservation plans are

^{1/} Irland, Lloyd D., and Ross J. Vincent. "Citizen Participation in Decision Making--A Challenge for Public Land Managers", Journal of Range Management, 27 (3) 182-185.

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documents which contain material relative to the use and treatment of soil, water, plant, wildlife, and related resources of an entire individual land unit. Conservation plans contain soil, water, plant, and other needed inventories, data on critical conservation problems, and a record of decisions which land users have made to reach conservation objectives. The length of time required to fully implement a plan is contingent upon many factors, including: available labor, capital, materials, and time.

Conservation plans are developed which accomplish the objectives of the land user and result in conservation of basic resources. A careful evaluation of alternatives often reveals conflicts in the selection of planned land treatment measures. As an example, the conversion of rangeland to pastureland may increase the economic return from livestock and reduce its value to wildlife. The ultimate decision of land use and treatment rests with the landowner so long as it is consistent with sound resource management.

About 138 land users in the watershed are cooperating with the District. Conservation plans have been developed for 135 farm and ranch units covering 85,213 acres or about 83 percent of the watershed.

There is a significant trend to convert marginal cropland to pastureland. Much of this conversion is taking place on ranching units which have small cropland fields that cannot be farmed economically due to high equipment and labor costs. Kleingrass is the primary improved pasture species being established.

The trend to irrigated cropland is diminishing largely due to the increased cost of drilling water wells for irrigation purposes.

There is a significant trend toward the application of specific management practices which benefit wildlife. About 75 to 80 percent of the conservation plans developed contain specific practices designed to enhance wildlife resources on farms and ranches. This trend is expected to continue as the demand for hunting and the resultant fees for leases increase.

The installation of planned grazing systems is increasing and an estimated 10,000 to 15,000 acres are now being operated under systematic grazing programs. This trend is expected to continue.

Projects of Other Agencies

There are no existing or proposed water resource development projects of any other agencies within the watershed.

The planned works of improvement will have no known detrimental effects on any existing or proposed downstream works of improvement of other agencies.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

Land users in the watershed have made significant progress in the application of conservation measures on cropland, pastureland, and rangeland; however, problems still remain that need to be corrected.

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The major problem on irrigated cropland is inefficient use of water. Excessive slope on about 20 percent of irrigated cropland contributes to this problem. Excessive length of irrigation runs, high frequency of water application, inadequate ditches and lack of tail-water recovery systems limit the efficiency of water use. Some irrigation wells do not provide sufficient water during periods of prolonged drought.

Cropland which is not irrigated is generally being adequately treated. Depredation by deer on crops is a problem for farmers in some portions of the watershed.

Pastureland in the watershed would benefit from improved management. Inadequate forage production is the primary problem on rangeland. Extensive areas of rangeland are so heavily infested with woody plants that production of forage is reduced and returns from livestock grazing is significantly lowered.

Effective treatment of undesirable woody vegetation is a complex and difficult problem, as well as a costly operation. The cost alone prohibits some operators from carrying out a planned program of brush management. Control of undesirable brush is only the first step in restoration of brush infested rangeland.

The second step in range restoration is to improve the stand and productivity of the forage plants once the brush has been controlled. Some grasslands have enough of the desirable forage plants left to make needed improvement if existing vegetation is properly managed. Most grass on brush infested rangeland is low in vigor as a result of overgrazing and competition with the brush for sunlight, moisture, and soil nutrients. Other rangeland may have so little grass remaining that reseeding of adapted grasses is necessary. Seedbed preparation and price of seed add to the cost of rangeland restoration. Reseeded areas must be rested for one growing season or longer to permit new seedlings to become established. Deferring grazing following treatment is often the key to successful rangeland improvement. Treatment is nullified when forage plants are not properly grazed following brush management.

Control of reinfestation is the third step in range conservation if lasting benefits are to be realized. Resprouts and seed either on the ground or brought in by birds or animals are important sources of reinfestation. There is no treatment presently known that eradicates all woody plants. Complete eradication is generally impossible and impractical and is usually not desirable because the woody plants may have considerable value as wildlife food and cover.

Complete removal of woody vegetation may also detract from future land values if resale is contemplated.

Many areas which have had control measures applied in the past and have not received follow-up treatment and management now support denser stands of woody species than were present prior to the application of initial control.

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Additional watering facilities for livestock are needed on some ranches. Large pastures need additional cross-fencing in many instances to allow the installation of planned grazing systems and deferred grazing.

Floodwater Damage

An estimated 8,097 acres of the watershed, excluding stream channels, are flood plain. This is the area that would be inundated by a 100-year frequency flood.

Flooding occurs frequently in portions of the watershed causing damages to agricultural and nonagricultural properties. Major floods, inundating more than half the flood plain, occur on the average of once every seven to eight years. Minor floods, inundating less than half the flood plain, occur on the average of about once a year. Cumulative totals of recurrent flooding show an average of 1,709 acres flooded annually during the evaluation period.

Some landowners, on an individual basis, have attempted to enlarge, straighten, and levee some streams. This has resulted in very little reduction of flood damage. The City of Uvalde has attempted to eliminate damages resulting from flooding from the Leona River by altering a segment of the channel within the City. This has materially reduced the damages caused by small floods of frequent occurrence, but has had little effect on larger floods. The adverse economic and physical effect of flooding has been felt throughout the entire watershed.

The most disastrous flood in recent years occurred on August 31, 1953. The total storm rainfall occurred over a 6.5 hour period and varied from approximately 3 inches in the upper portion of the watershed to the official 4.51 inches recorded at Uvalde. The recurrence interval of the resulting flood peak was estimated to be about 17 years. The resulting flood inundated approximately 5,700 acres of flood plain in the watershed, of which 500 acres are located inside the urban area of Uvalde along the Leona River and Cooks Slough. Currents of rushing water caused evacuation of between 30 and 40 families as water crept into their homes. Numerous low water crossings were closed. Under the present level of development, the direct monetary floodwater damage from such a flood is estimated to be \$360,000 of which \$228,400 would be to urban properties. About \$143,900 of urban property damage would be along the Leona River and about \$84,500 along Cooks Slough.

Other recent large floods that caused severe floodwater damages occurred in 1965, 1963, 1959, and 1958.

The estimated direct floodwater damages to existing urban properties that would result from a 100-year frequency flood event are estimated at \$753,830. Of this amount, \$503,670 would be to properties along the Leona River and \$250,160 to properties along Cooks Slough.

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For the floods evaluated, which include floods up to and including a 100-year frequency, the total direct floodwater damage is estimated to average \$159,910 annually at adjusted normalized prices. Of this amount, \$29,810 is crop and pasture damage, \$12,400 is other agricultural damage, \$990 is road and bridge damage, and \$116,710 is damage to urban and other nonagricultural development.

Indirect damages such as interruption of travel, losses sustained by businesses, evacuation of premises when floods threaten, and similar losses are estimated to average \$28,060 annually.

Many residents in the area subject to flooding in Uvalde subsist on below average incomes. These residents are less able to replace or repair losses and damages from flooding without reducing their standard of living. Public funds are required to repair and replace utility installations, public properties, and streets which could otherwise be used for improvements in schools, libraries, parks, and other public facilities that would improve the quality of living. Flood damages and the ever present possibility of greater losses from a flood magnitude not yet experienced have a depressing effect on the economic growth, development, and living standards. As a result, the environmental quality in much of the area has deteriorated.

Erosion Damage

The estimated average annual rate of gross erosion is 2.33 tons per acre. Of this, sheet erosion accounts for 94 percent, streambank erosion three percent, and flood plain scour three percent. The only evident gully erosion occurs in the extreme lower end of the watershed where small tributaries have steep gradients as they enter the Leona River. Upland erosion rates are low, primarily because the soils on steeper slopes are either stony or gravelly and are used as rangeland.

An estimated 183 acres are damaged by flood plain scour. The damaged areas range from 0.5 to 2.0 feet in depth and from 100 to 300 feet in width. It is estimated that scour causes a 10 percent loss of productive capacity on 13 acres and 5 percent on 170 acres. The average annual value of this damage is estimated to be \$1,610 at adjusted normalized prices.

Sediment Damage

The estimated average annual sediment production rate is 0.56 ton per acre. This amounts to an average annual sediment yield of 34 acre-feet at the lower limit of the watershed. The estimated suspended sediment concentration at the lower end of the watershed averages about 1,300 milligrams per liter in 7.6 centimeters (3.0 inches) of watershed runoff with due consideration given to ground water recharge and discharge from Leona Springs. Sediment derived from the watershed is a source of pollution in the Leona, Frio, and Nueces Rivers lowering the quality of water for all present and probable future uses.

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Low inherent erosion rates of most of the watershed soils, the fine texture of sediment, fair to good hydrologic cover on most of the grassland, and the large Leona River channel are primarily responsible for a low rate of sediment damage on the flood plain. An estimated 231 acres of flood plain land within the project area are damaged by overbank deposits of silt and clay. This damage is estimated to average five percent in terms of reduced productive capacity. The average annual monetary value of the damage is estimated to be \$2,290 at adjusted normalized price levels.

Problems Relating to Water Management

Water is obtained from shallow wells in the Leona Formation and also from the Edwards and associated limestones to irrigate about 9,000 acres. The Leona Formation has become dry during periods of lengthy drought. Although hard, water from the Edwards is generally of good quality for all uses except in the southern part of the watershed. There it is too saline for irrigation and most other uses.

A sufficient supply of good quality municipal and industrial water for Uvalde is obtained from wells in the Edwards Underground Reservoir. The aquifer has a notable capacity for being recharged rapidly. Increased rates of withdrawal in the Uvalde area would result in decreased movement of ground water toward the east and the reduction or cessation of spring flow along the Leona River.

Presently there is no significant threat to the quality of Uvalde's water supply. However, projected urban and industrial expansion will result in increased potential sources of pollution. A limestone reservoir such as the Edwards is highly susceptible to contamination. Extreme caution and careful management will be necessary in the recharge zone in order to maintain good quality ground water in the Edwards Underground Reservoir.

Fish and Wildlife

Recurring droughts and inadequate streamflow limit the degree to which fisheries' management can be applied in farm ponds and the Leona River.

Overgrazing and the invasion of woody species in the past has resulted in changed wildlife habitat. Wildlife species, such as javelina, which were able to adapt to changing conditions in their habitat prospered while less adaptable species such as the pronghorn antelope declined. The whitetailed deer not only adjusted to changed conditions, but thrived on the changes. Moderate grassland deterioration, in many instances, has improved the habitat for deer. Brush invasion in formerly open areas has provided browse type food plants and the needed escape cover to support high deer populations. Deer populations have increased beyond the ability of their habitat to support them in some areas of the watershed. Reduced body size, poor reproduction, and small antlers result from overpopulation.

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Although deer require woody cover and browse constitutes an important part of their diet, deer do not prefer vast areas of unbroken woody vegetation. Deer are often referred to as "edge" type animals in that they often forage in the open but near the edge of brush and trees. ^{1/} The diet of deer under normal conditions is not composed of browse alone. During the spring and early summer, when does are nursing fawns, forbs and grasses constitute an important part of their diet. Open areas adjacent to brush and trees furnish this needed food for deer. Too much brush just as too little brush may be disadvantageous to deer. Many areas in the watershed now have such dense stands of brush that deer habitat is less than ideal. It is also difficult to obtain an adequate harvest of deer when brush density limits the ability of hunters to see deer.

Brush management applied without regard to wildlife needs has reduced the quality of wildlife habitat in some areas.

Overgrazing by livestock which removes valuable forage plants and increases the intensity of competition for remaining plants is detrimental to wildlife. Wildlife species are generally less adaptable to stress conditions and changes in diet than are domestic livestock. Reduced wildlife populations occur as a result of overgrazing, particularly during periods of dry weather.

Recreation

Water-based recreation in the watershed and immediate area is severely limited. Opportunities for fishing in the watershed are restricted to the small lake on the Leona River below Uvalde and a few small ponds that will hold water. These impoundments are too small to be used for boating and related activities.

Habitat is favorable and game species populations are large enough to allow hunting in the Edwards Plateau Land Resource Area in the northern portion of the watershed. Landowners in the area lease their lands for hunting privileges, but the demand for these leases usually is greater than availability.

Economic and Social

About 37 percent of the farms and ranches in Uvalde County, which is representative of the watershed, gross less than \$2,500 annually from agricultural sales. Approximately 40 percent of the farm and ranch operators worked off-the-farm for 100 days or more in 1969. It is

^{1/} Leopold, Aldo, 1933, Game Management, Charles Scribner's Sons, New York, N.Y.

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estimated that less than 15 percent of the agricultural land in the benefited area is devoted to farms and ranches using 1-1/2 man-years or more of hired labor.

Additional employment opportunities are needed for the 415 unemployed workers in the county. The population of Uvalde increased from 10,293 persons in 1960 to 10,764 persons in 1970, an increase of 4.6 percent. Further increases in population would be anticipated with a concentrated effort in community development and additional employment opportunities.

ENVIRONMENTAL IMPACT

Flood Prevention, Erosion, and Sediment

The installation of conservation land treatment measures on 39,180 acres of land in addition to effectively maintaining those already applied on 40,980 acres will protect soil, water, and related resources by preventing soil erosion, reducing water pollution by sediment, conserving irrigation water, and reducing runoff.

The application of cropland treatment measures such as terraces and diversions will decrease the rate of runoff and reduce the rate of erosion on untreated fields. Conservation cropping systems and crop residue management will provide soil protecting cover to reduce erosion and help maintain soil productivity. Irrigation water management and associated irrigation land treatment measures including irrigation land leveling, irrigation ditch lining, and irrigation pipelines provide for more efficient use of irrigation water, reduce waste, and prevent erosion of the soil through application of the water.

The application of pastureland treatment measures including pasture planting and proper management will protect the soil and decrease the rate of runoff by providing a good ground cover on this intensively used land.

The application of rangeland treatment measures, including range seeding, planned grazing systems, proper grazing use, deferred grazing, brush control, and livestock watering facilities will increase the productivity and the density of desirable grasses and forbs normally found in the natural plant community. Increasing the quality and quantity of vegetation will reduce erosion by improving the cover and litter on the watershed. Ponds, wells, and pipelines installed for watering livestock will reduce livestock travel and distribute grazing to prevent over-use of vegetation near sources of water and under-utilization of vegetation at greater distances from water.

After the project is complete, the level of accomplishment for needed land treatment is expected to reach at least 75 percent, a 35 percent increase over present conditions.

The combination of watershed conservation land treatment and structural works of improvement will reduce average annual sediment damages from

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overbank deposition by 76 percent, flood plain scour damages by 65 percent, and direct floodwater damages by 89 percent. Suspended sediment leaving the watershed will be reduced from 1,300 to 900 milligrams per liter. Adsorbed chemicals such as fertilizer and insecticides will accordingly be reduced.

During construction of the structural works of improvement, air and water pollution will increase slightly from dust and sediment inherent to the construction process. This increase will be kept within tolerable limits. At the end of construction and with the establishment of vegetation for erosion control, the dust and sediment increase intrinsic to construction operations will have completely subsided.

Owners, residents, and operators of 75 farms and ranches in the flood plain, and 30 business and 380 residential units in Uvalde will be directly affected from reduction of floodwater and associated damages. In addition, the owners and operators of the farms and ranches along Leona River immediately below the watershed will receive some impacts from the proposed project.

The installation of all project measures, conservation land treatment, floodwater retarding structures and stream channel improvement will provide flood protection to 8,097 acres of flood plain land. Average annual flooding will be reduced from 1,709 acres to 584 acres, a reduction of 66 percent. Reduction in area inundated, varies with respect to location within the watershed. The general areas that will experience reduced flooding after the complete project is installed are presented in the following tabulations:

		Average Annual Area Inundated		
Evaluation :	Location	Without Project	With Project	Reduction
Reach :		(acres)	(acres)	(Percent)
1	Leona River below City of Uvalde	958	363	62
2	Leona River-Urban Area-City of Uvalde	30	0	100
3	Leona River above City of Uvalde	161	18	89
4A	Cooks and Boon Sloughs above Uvalde	174	78	55
4B	Cooks Slough below Uvalde	113	81	28
5	Cooks Slough-Urban Area-City of Uvalde	110	0	100
6	Taylor Slough	163	44	73
Total		1,709	584	66

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Evaluation Reach	Area Inundated by Selected Recurrence Intervals							
	Average Recurrence Interval of Flood Event							
	2-Year		5-Year		25-Year		100-Year	
	Without Project	With Project	Without Project	With Project	Without Project	With Project	Without Project	With Project
	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)
1	480	0	1,990	513	3,546	2,392	4,451	3,412
2	0	0	5	0	248	0	338	0
3	30	15	124	30	946	51	1,177	70
4A	105	43	244	132	517	317	708	437
4B	60	30	189	129	435	397	485	448
5	99	0	169	0	305	0	407	0
6	127	28	235	71	374	155	531	241
Total	951	116	2,956	875	6,371	3,312	8,097	4,608

The anticipated growth in population and development in and around Uvalde was considered in selecting the design capacities of all structural measures.

The installed project will provide protection from the 100-year flood event to all existing urban and residential properties in the City of Uvalde.

Fish and Wildlife

The installation of the planned project will not have a significant impact on the limited fishery resource of the watershed. Additional farm ponds may be constructed with technical assistance from the district.

Installation of the four floodwater retarding structures will remove the vegetation on about 503 acres. Browse species on this acreage will be removed. These browse plants and browse on adjoining areas show no evidence of over-use by wildlife. Over-use of plants on adjoining lands will not occur as a result of the removal of browse plants in the vicinity of structures. Additional edge habitat will be created as a result of site clearing. A temporary increase in annual weeds with food value for quail, dove, and songbirds will occur due to disturbance of soil during the construction process. Periodic flooding for periods of two or three days will temporarily displace wildlife which utilize the flood pools. Temporary flooding will result in increased growth of annual weeds in the flood pools.

About 90 acres adjacent to Cooks Slough support woody species which have some wildlife value. This vegetation is utilized primarily as nesting habitat for songbirds and doves. This vegetation will be removed with installation of the planned channel work.

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Application of land treatment measures will generally benefit wildlife in the watershed. Brush management applied with wildlife considerations will have beneficial effects for wildlife by providing more edge type habitat, reducing browse species to heights useable by game animals, and providing more forbs and succulent grasses in open areas. It will also be much easier for hunters to harvest an adequate number of animals to control populations when necessary. Hunter success, hunter safety, and lease income are generally increased as a result of proper brush management. About 80 to 85 percent of brush management to be applied will be accomplished with wildlife considerations.

Various methods of brush management will have different effects on different species. Dozing and stacking brush will result in the disturbance of ground cover and an increase in annual weed production. Initially, if not followed by burning, it will also create brush piles. This method of management will be advantageous for many small mammals, quail, and other seed-eating birds. If proper grazing management is carried out following control, an increase in grass cover will occur. This will provide better quail nesting habitat, but will result in less annual weeds. Grass seeds are an important food source for turkeys and will increase following brush control and proper management. Brush management will not generally be advantageous to javelina.

Most rangeland operators carry out a continuous program of brush management on ranches whereby portions of pastures are controlled each year. Most ranch units do not have sufficient capital to apply all brush management in one operation. As a result, there are usually areas in each pasture which are freshly treated, in various stages of woody plant reinfestation, and areas which are densely covered with woody plants. This rotational effect will assure a continuous availability of annual weeds, grasses, browse plants, and cover needed by a variety of wildlife.

Other range management practices such as deferred grazing, proper grazing use, and planned grazing systems increase the variety, quality, and quantity of vegetation. Overuse of desirable browse, forb, and grass species is largely eliminated. These practices are generally beneficial to most wildlife species.

Kleingrass, which currently is used in more than 80 percent of pasture plantings, will provide an additional food source for dove, quail, and other seed-eating species.

Conservation cropping systems, crop residue use, and plantings of winter cover crops such as oats will provide an increased variety of food and more cover for most species of wildlife.

Economic and Social

The reduction of flooding in the urban area of Uvalde will make the city a more desirable place to live. The protection of the agricultural

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flood plain from frequent flooding will ensure more dependable crop yields and help to stabilize the agricultural sector of the local economy. This will improve farm income and help make it possible for farmers and ranchers of the area to stay in business and not migrate to the city. The increased production resulting from reduction of crop and pasture, sediment, and erosion damages will add to the overall activity of the area and provide additional employment. It is estimated that the additional economic activity will result in an increase of about \$19,980 annually in household income in the area and create a need for six new jobs. In addition, the expenditure of funds for construction of the works of improvement will create approximately 67 man-years of employment in the local area.

Significant intangible public health improvements will accrue in the City of Uvalde including reduced hazards to loss of life and injury, elimination of health hazards associated with damage to water supply and waste disposal systems, more effective vector control, and the prevention of other factors accompanying floods which tend to disrupt the maintenance of public health.

The relocation of five families will be from substandard housing or dwellings that will comply fully with the standards set forth in Public Law 91-646. The social, cultural, and economic impact on these families will be minor inasmuch as they will be relocated in nearby neighborhoods having a similar cultural, ethnic, and social background. These families will undergo the temporary inconvenience of moving household goods and belongings.

Other

Incidental to project installation, an additional 2,200 acre-feet of annual runoff in the watershed will enter underground aquifers as high quality ground water recharge. This recharge will help replenish vital ground water supplies in the Edwards Underground Reservoir.

The quality of watershed runoff entering the Edwards and associated limestones and Leona Formation is not expected to change appreciably with project installation. However, preservation of runoff and ground water recharge quality will be enhanced by land treatment from reduction of sediment concentrations and by proper application of approved herbicide materials for brush management.

The use of the 1,930 acres of the land needed for the installation and operation of the project will impose certain restraints upon future use. The land will be restricted to uses which will not interfere with the operations and maintenance of the structural works of improvement or suffer significant property damage for temporary inundation.

The present use of land required for installation and operation of the structural measures is as follows: rangeland, 1,706 acres; pasture,

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40 acres; cropland, 113 acres; residential and industrial, 44 acres; existing channel, 23 acres; and miscellaneous, 4 acres. The vegetative cover on the 123 acres of land occupied by the dams and spillways will be destroyed. It is not anticipated that much of this area will revegetate because of rock embankment blankets and rock spillways. The vegetative cover on the 425 acres of land occupied by the sediment pools will be disturbed during construction. Inasmuch as dry pools are anticipated, much of this area should revegetate with brushy plants and grasses similar to those disturbed. The composition and productivity of the vegetation on the 1,082 acres in detention pools is not expected to be altered significantly. Existing vegetative cover on the 300 acres of land required for channel work will be disturbed by construction. All land areas, including channel bottom and side slopes will be revegetated immediately with a mixture of native and introduced grasses.

The impacts of the project on archeological resources are discussed by Grant D. Hall in Research Report 37, Texas Archeological Survey, The University of Texas at Austin:

"Sites 41 UV 43 (Damsite 1), 41 UV 47 (Damsite 3), and 41 UV 51 (Damsite 4) are all located in planned sediment pools and borrow areas. They are in a zone of maximum potential disturbance. 41 UV 53 (Damsite 1) will be only marginally and insignificantly damaged if borrow activities are restricted to areas upstream from the damsite.

From the standpoint of their scientific importance, 41 UV 47 and 41 UV 51 are seen to be significant because they have undergone little or no disturbance and contain definable subsurface cultural deposits. 41 UV 43 is considered to be of lesser importance as it is apparently a surface site offering limited opportunities for further, and more intensive, study. Other than establishing its precise location and making a limited surface collection, no test work or further evaluation was done at 41 UV 53 because of its peripheral situation to proposed project modifications.

Beyond their obvious physical attributes, sites 41 UV 47 and 41 UV 51 offer a valuable opportunity for elaboration and clarification of the archeological record in the Uvalde area. This vicinity represents a transitional zone between the relatively well-studied Trans-Pecos and Central Texas regions. As was indicated in the Introduction (of Report No. 37), little archeological investigation has taken place in Uvalde and surrounding counties.

Because so few sites have been located and evaluated in the area, it is virtually impossible to pass valid judgments of a specific nature concerning the cultural and environmental import of those sites believed to be directly endangered by project proposals. Sufficient quantities of sound comparative data necessary for arriving at such conclusions do not exist. Consequently, the relationships of the sites

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dealt with during this survey to the surrounding cultural province cannot be determined.

The minimization of damage to archeological resources endangered by the proposed Leona River Watershed project would insure the availability of resources for future study. Should such protective measures be impractical, intense investigation of archeological resources prior to destruction would undoubtedly result in the generation of original data highly pertinent to the archeology of the Upper Nueces River Region."

FAVORABLE ENVIRONMENTAL EFFECTS

1. Reduce upland erosion and runoff
2. Reduce waste of irrigation water
3. Reduce sediment damage to flood plain lands by 76 percent
4. Reduce erosion damage to flood plain lands by 65 percent
5. Generally benefit wildlife through application of land treatment measures
6. Provide flood protection to about 380 owners or occupants of residential units and about 30 owners or operators of business units in Uvalde, Texas, as well as 75 farms and ranches in the flood plain
7. Provide flood protection to 8,097 acres of flood plain land by reducing average annual flooding by 66 percent
8. Provide a total increase in economic activity of about \$19,980 annually
9. Create a need for six new full-time jobs as a result of increased production and create 67 man-years of employment for installation of structural measures during the installation period
10. Eliminate or greatly reduce hazards to public health from floodwater and contamination
11. Provide incidental annual recharge to ground water aquifers of approximately 2,200 acre-feet annually
12. Preserve quality of watershed runoff and ground water recharge

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13. Increase knowledge and understanding of aboriginal occupancy of of the area as a result of archeological investigations to be made prior to construction

ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

1. Increase dust and sediment slightly during construction
2. Require the relocation of five families
3. Restrict the future land use on 1,930 acres of land needed to install and operate the structural measures
4. Require that land use be changed on 681 acres of rangeland, 71 acres of cropland, 25 acres of pastureland, and 44 acres of residential and industrial land of the 1,930 acres needed to install the project
5. Result in occasional interruption of the use of 1,082 acres of land in the retarding pool areas subject to temporary inundation
6. Require the temporary clearing of all vegetation on a maximum of 698 acres and the permanent clearing of all vegetation on 123 acres
7. Disturb or destroy some archeological resources

ALTERNATIVES

The considered alternatives to the proposed project action were: (1) An accelerated program of applying land treatment measures for watershed protection; (2) land treatment and floodwater retarding structures without channel work, restrictions on construction in the flood hazard area, and flood insurance; (3) purchase of urban flood plain areas with relocation of homes, businesses, and improvements, and changing the present use of agricultural land to one that is less susceptible to damage by flooding; (4) floodproofing of buildings and other improvements, and change in agricultural land use as stated in Alternative No. 3; and (5) foregoing the implementation of a project.

A discussion of each alternative follows:

Alternative No. 1 - Alternative No. 1 consisted of only applying the land treatment measures as proposed in the project action. The impacts of the application of land treatment measures are discussed under environmental impact of the proposed project action. Average annual floodwater sediment, flood plain erosion, and indirect damages would be reduced by about 1.5 percent in downstream areas. The volume of sediment being delivered to the mouth of the watershed would be reduced from 34 acre-feet to 29 acre-feet annually, a reduction of 15 percent.

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Additional ground water recharge (2,200 acre-feet) incidental to installation of the floodwater retarding structures would be foregone. This alternative would have very little effect in reducing flood plain scour on the cultivated flood plain and in reducing the volume of sediment produced by this process. Effects on fish and wildlife would generally be the same as the planned project. The adverse impacts that would be caused by installation of the structural measures would be eliminated. The estimated cost of this alternative is \$425,800.

Alternative No. 2 - Alternative No. 2 consisted of applying land treatment for watershed protection; installing floodwater retarding structures Nos. 1, 2, 3, and 4; regulation of new development in the flood hazard area to prevent damages to new construction; and providing flood insurance to reduce the economic loss to an individual or small business.

Flood damages to the agricultural flood plain would be reduced essentially the same as with the proposed project. Flood damages to urban properties along the Leona River would be reduced the same as with the proposed project. Flood damages to urban properties along Cooks Slough would be reduced by about 54 percent. A total of 107 houses and one business would still be subject to flooding above floor level from a 100-year flood event.

Sediment concentrations in runoff leaving the watershed would be reduced from 1,300 milligrams per liter to 900 milligrams per liter, a reduction of 31 percent. Annual ground water recharge would be increased 2,200 acre-feet. Flood insurance would not eliminate the interruptions to the daily lives of the residents or the loss of much irreplaceable property. Restricting new development into the flood plain would prevent the flood damage from increasing.

Installation and operation of the structural measures would require the use of about 1,630 acres. The land would be used for the following purposes: construction of dam and spillways (123 acres), sediment storage (425 acres), and temporary storage of floodwater (1,082 acres). The future use of this land would be restricted.

Effects on fish and wildlife would generally be the same as the planned project. The need to remove existing wildlife habitat in the channel area would be eliminated.

It is estimated that this alternative would cost \$1,707,020 to install. This cost estimate includes \$425,800 for installing land treatment measures and \$1,281,220 for structural measures. Average annual cost of structural measures are estimated to be \$72,000. Average annual benefits that would accrue to this alternative are estimated to be about \$204,000. No estimate of the average annual cost for providing flood insurance to the community was made.

Alternative No. 3 - Alternative No. 3 consisted of changing the present use of the land to one that is less susceptible to damage by flooding.

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The potential land uses, listed in order from highest to lowest susceptibility to flood damage, are urban and built-up areas, cropland, pastureland, and rangeland. Land used for other purposes, such as transportation systems and wildlife-recreation land, are damaged to varying degrees by flooding, depending upon the type of development and depth and duration of flooding.

In order to reduce the need for flood protection, it would be necessary to relocate 221 homes and associated improvements, and 30 business establishments within the urban area of Uvalde to assure flood-free protection to floor levels from a 100-year event; and change the land use on about 3,100 acres of land used for growing crops and improved pastures. The land could be used for rangeland, pastureland, or wildlife-recreation land if extensive developments were not installed.

This alternative would significantly reduce the actual monetary damage caused by floodwater, sediment, and erosion. Changing the land use from cropland to rangeland would reduce the food supply for many species of wildlife that are present in the watershed. Damages to the transportation system would continue at approximately the same rate because it was determined to be impracticable to move the transportation system out of the flood hazard area. The economic returns to the owners and operators of the 7,352 acres of agricultural land would be reduced by about \$614,000 annually if the land use were changed to rangeland.

Increase of ground water recharge would be foregone. The concentration of sediment in runoff leaving the watershed would continue at about 1,300 milligrams per liter.

The relocation of 221 residences and 30 businesses would require changed land use on the land needed for the relocations, which would undoubtedly contribute to noise and air pollution, and adversely affect the other businesses in Uvalde.

The change in land use within the flood plain could be expected to result in improved wildlife habitat. Removal of existing habitat on areas needed for construction of the planned floodwater retarding structures and channel work would be eliminated. Relocation of homes, businesses, and other improvements in the floodplain would require acquisition of lands outside the floodplain which presently have value as upland wildlife habitat.

It is conservatively estimated the out-of-pocket costs of this alternative would be about \$4,435,000.

Alternative No. 4 - This alternative consisted of flood proofing existing buildings and improvements and changing the land use on agricultural land in the flood hazard area as in Alternative No. 3.

A reconnaissance-type survey of urban properties indicated that complete flood proofing could be accomplished on only a small portion

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of the improvements because of the type of construction and the depth and velocity of expected flooding. Many of the improvements could be expected to be washed off their foundations. The impacts of changing the agricultural land use, on ground water recharge, sediment concentrations in runoff, and fish and wildlife would be essentially as in Alternative No. 3.

Alternative No. 5 - Alternative No. 5 consisted of foregoing the implementation of a project.

This alternative would result in a lower priority of technical assistance to watershed land users in the application of land treatment measures. This would delay the rate at which measures would be applied and delay the effects of the land treatment measures on erosion reduction, flood prevention and conservation of soil, water, plant, and related resources.

Flooding would continue, resulting in damage to the agricultural land, urban and built-up areas in Uvalde, and the transportation system.

The deterioration of the cultivated flood plain soils by scour would continue until the cumulative effect of this damage forced land use conversion to less productive uses.

Areas subject to scour and streambank erosion would continue to produce sediment.

The opportunity to increase ground water recharge by 2,200 acre-feet incidental to installation of floodwater retarding structures would be foregone.

The need to use 1,930 acres of land for installation of the structural measures and the resultant adverse impacts would be eliminated.

The removal of existing habitat on areas needed for the construction of dams and for channel improvement would be eliminated. Effects on fish and wildlife of this alternative would be significant. Without the project there would be a reduction in priority of technical assistance to land users for land treatment practices beneficial to wildlife. This would have significant adverse effects on wildlife resources.

The opportunity to realize about \$111,390 in average annual net benefits would be foregone.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S
ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT
OF LONG-TERM PRODUCTIVITY

The current land use in the watershed is primarily for agricultural production. This condition is expected to prevail in the future with or without a watershed protection and flood prevention project.

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However, with the anticipated increase in population of the City of Uvalde and installation of the planned project, the 7,630 acres of the watershed presently in miscellaneous land uses will undoubtedly increase at the expense of agricultural land.

The primary objectives of the project are to provide at least adequate conservation treatment, improvements, and productivity to allow a decent standard of living for the present; and preserve and improve the land, water, and other environmental resources for future generations.

The project is based on projected needs and population trends in addition to current problems in the watershed area. Special emphasis has been placed on conservation and improvement of agricultural lands, and reducing floodwater damages in rural and urban areas. Consideration has been given to the necessity of at least maintaining the quality and quantity of ground water resources. The project will compliment any other water resource development program which may be implemented in the future. Wildlife preservation and enhancement were included in the project as applicable. The present and projected economic, recreational, and social conditions also influenced the development of the project.

After the designed 100-year project life, the structural measures will be effective in protecting agricultural and urban flood plain properties and conserving land and water resources.

Approximately 548 acres of land which will be used for dams, emergency spillways, and sediment pools will be lost to long term agricultural production. The 1,082 acres of land dedicated to use as floodwater retarding pools will be limited to restricted agricultural use in the long-term. Long-term productivity of flood plain lands will be increased as a result of reduced flooding and erosion.

Five families will be relocated to areas outside the flood plain. This will require the acquisition of additional land and housing in the short-term. About 300 acres of land in the channel area will be dedicated to open space in the long-term encroachment on and development of this area will be eliminated.

Short-term project induced wildlife habitat losses will occur in the areas required for construction of dams and in the area required for channel work. The application of land treatment measures with wildlife consideration during the project installation period and the maintenance of these measures will significantly affect the wildlife resources. Application of measures which provide adequate food and cover for wildlife species is the essential element needed for long-term maintenance of wildlife populations. Project applied measures are those which will provide improved food and habitat for wildlife species on a long-term basis.

The Leona River watershed project is within the Nueces River Basin. The total area of the basin is about 16,950 square miles, or 6.4 percent

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of the area of Texas. The Nueces River is joined in its course to Nueces Bay, an estuary of Corpus Christi Bay, by a number of important tributary streams, several of which head above the Balcones Escarpment rimming the Edwards Plateau. The average annual rainfall in the Nueces Basin is 26 inches ranging from 20 inches in the northwest to 32 inches in the southeast.

There are no watershed projects in the Nueces River Basin which have been installed or approved for operations. The Leona River watershed is the only watershed in the basin currently being planned. In addition to the Leona River watershed, there are three watersheds located wholly or partially within the basin that appear to be feasible for planning. The total drainage area within the basin, of the four watersheds is about 747 square miles.

The drainage area of these watersheds is about 4.4 percent of the drainage area of the Nueces River Basin. Applications for assistance have been made to the Texas State Soil and Water Conservation Board on all three watersheds that appear to be feasible. The Leona River has a total drainage area of about 630 square miles and the Leona River watershed is the only watershed located within its drainage area for which a watershed project is likely to be planned.

The Texas Water Plan (Summary) indicates that there is only one reservoir existing in the Nueces River Basin which has a total capacity in excess of 5,000 acre-feet. Based on the report of the U.S. Study Commission, Texas, there are 42 reservoirs in the basin with capacities of less than 5,000 acre-feet. It is estimated that if all the watershed projects that appear to be feasible were installed, a total of about 15 structures and 28 miles of channel work would be constructed in the basin. The structures would temporarily retard runoff from only 1.25 percent of the total area of the Nueces River Basin.

The works of improvement proposed in this project, along with works of improvement in the three other projects that appear to be feasible, will have no significant or measurable cumulative effects in the Nueces River Basin because of relative size of the cumulative area and the wide diversion of locations. Impacts of the proposed project and all other feasible projects will be localized in nature.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Construction, operation, and maintenance of the project will commit about 1,930 acres of land now being used for agricultural, urban, existing channel, and miscellaneous uses to project purposes. Floodwater retarding structures will require change in the use of 543 acres of rangeland and 5 acres of cropland for dams, emergency spillways, and areas temporarily inundated by sediment pools. Another 1,025 acres of rangeland, 15 acres of pastureland, and 42 acres of cropland will be subjected to periodic interrupted use because of temporary inundation by

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floodwater in the retarding pools. Channel work and maintenance areas will require change in the use of 66 acres of cropland, 25 acres of pastureland, 138 acres of rangeland, and 44 acres classified as residential and industrial land.

Installation of the project will also require the commitment of labor, energy, and materials for construction.

No other commitment of resources is known to be required for this project.

CONSULTATION WITH APPROPRIATE AGENCIES AND OTHERS

General

The application for assistance for watershed protection and flood prevention in the Leona River watershed was submitted to and approved by the Texas State Soil and Water Conservation Board. The plan was developed in full consultation and cooperation with all interested agencies and individuals. Written notification of initiation of work plan development was sent to all Federal, State, and local agencies that might have an interest in the project, soliciting information, comments, and participation. Contacts were made with several agencies during planning to obtain information and assistance. Public meetings were held during planning to explain the program and solicit public reaction and participation.

The Bureau of Sport Fisheries and Wildlife, U.S. Department of the Interior prepared a reconnaissance report on the Leona River watershed describing the fish and wildlife resources in the project area, the effects of the proposed project, and recommendation for maintaining and enhancing the fish and wildlife resources of the watershed.

The Texas State Historical Survey Committee was contacted to determine if there were any known historical sites either listed on, or nominated to, the National Register of Historic Places that would be adversely affected by the installation of measures included in the project. The Texas Archeological Survey, The University of Texas at Austin, carried out field surveys to locate and evaluate archeological resources that will be affected by the construction of the floodwater retarding structures and implementation of the channel work.

Representatives of the sponsoring local organizations contacted landowners for permission to survey and to explain how the project would affect their lands. The sponsors carried on an active public information program including public meetings in an effort to inform all interested agencies and individuals, and solicit public reaction and participation as the project was formulated.

On May 23, 1972, prior to the preparation of the draft plan, an informal field level review was held in Uvalde, Texas. Interested agencies and individuals were invited and given the opportunity to present their views and recommendations either orally or in writing. The plan and

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environmental statement have been prepared considering the comments and recommendations offered by the agencies who reviewed the plan.

The following Federal agencies were requested to review and submit comments and recommendations:

U.S. Department of the Army
U.S. Department of Commerce
U.S. Department of the Interior
U.S. Department of Health, Education, and Welfare
U.S. Department of Transportation
Environmental Protection Agency
Federal Power Commission

The following State and local agencies were requested to review and submit comments and recommendations:

Division of Planning Coordination (State agency designated by Governor and State Clearinghouse)
Middle Rio Grande Development Council

Discussions and Disposition of Each Comment on Draft Statement

All of the above agencies, with the exception of the U.S. Department of Commerce, U.S. Department of Transportation, and the Federal Power Commission, responded. The responding agencies' comments and the disposition for each are as follows:

U.S. Department of the Army Corps of Engineers

Comment: The Department didn't foresee any conflict with any of its projects or current proposals.

Response: Noted

U.S. Department of the Interior

Comment: The Department stated that no more recent data were found to change earlier conclusions that no mineral resources would be affected by the project, and that the proposed flood control measures would probably have a beneficial effect on the production of asphalt, stone, sand and gravel, and natural gas in the vicinity.

Response: Noted

Comment: The Department stated, "This proposed action will not adversely affect any existing, proposed, or known potential units of the National Park System, or any known historic, natural,

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or environmental education sites eligible or considered potentially eligible for the National Landmark Programs."

Response: Noted

Comment: The Department stated it should be more clearly stated in the work plan that the project area covers only a portion of the entire Leona River watershed.

Response: The description of the watershed's southern limit as considered for the project has been revised in the final work plan and environmental statement.

Comment: In regard to channel work on Cooks Slough, the Department stated there apparently is no provision mentioned in the work plan for avoiding harmful backwater effects when floodflows reach the reduced size transition section of the channel work.

Response: The channel improvement design with project conditions along Cooks Slough fully accounted for avoiding harmful backwater effects in the transitional sections. Location of the transitional section, grade, involved area, and termination point was carefully analyzed and evaluated using hydrologic routings and water surface profiles. With the installation of the entire project, peak flows below the transition section will be less than with present conditions, due to control provided by upstream floodwater retarding structures.

Comment: The Department stated that on pages 38 and 39 of the Draft Work Plan there appears to be repetition of information presented.

Response: The narrative in the Work Plan has been revised to delete the repetition.

Comment: The Department commented on the statement in the work plan referring to salt-water encroachment in the Edwards aquifer as the storage of good quality water is decreased. The Department stated that the threat of salt-water encroachment in the aquifer in the area of the watershed is extremely remote and is not significant in regard to development in the Leona River watershed.

Response: The cited reference to encroachment of saline water has been deleted from the final work plan.

Comment: The Department requested that the 1968 Bureau of Sport Fisheries and Wildlife report on the watershed accompany the work plan when it is submitted to Congress.

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Response: The report will accompany the work plan when it is submitted to Congress.

Comment: The Department expressed dissatisfaction with the format and "lack of specifics" in the Environmental Statement.

Response: Noted

Comment: The Department stated the Environmental Statement should indicate the installed project's effect on stream flow and place more emphasis on environmental effects and less emphasis on fiscal and statistical data.

Response: Data indicating the project's effect on stream flow and additional information on other effects such as those from land treatment has been incorporated in the Environmental Statement.

Comment: The Department stated that the general effect of doubling the population by 1985 in the project area on the proper functioning of the flood control measures should be indicated.

Response: The discussion of anticipated population growth in the watershed area has been revised using the latest available statistics and data. A statement in regard to the population increase on the functioning of the flood control measures has been included in the Environmental Impact Statement.

Comment: The Department stated that it does not believe adequate attention has been devoted to cultural (historical, archeological, architectural) values, and that professionally trained personnel locate, identify, and evaluate historical, architectural, and archeological resources and submit a report of findings with descriptions, assessment of project installation on the resources, and recommendations for further study or mitigation.

Response: Investigations, under the auspices of the Texas Archeological Survey, The University of Texas at Austin, were made at the locations of the four proposed floodwater retarding structures and along the segment of Cooks Slough to be altered by channel work. As a result of these investigations, "Research Report No. 37, Leona River Watershed, Uvalde County Texas: An Archeological and Historical Survey of Areas Proposed for Modification" was compiled. Findings of this report are incorporated into the Work Plan and Environmental Statement and are the bases for describing and recommending further studies and for mitigating measures for archeological resources that will be affected by project installation.

Leona River Watershed, Texas

- Comment:** The Department stated that the "Environmental Setting" section of the Environmental Statement, does not adequately describe plant communities within the watershed. A thorough description of flood plain, rangeland, cropland, and pastureland vegetation should be presented.
- Response:** A detailed description of the flood plain, rangeland, and pastureland and their vegetation has been added to the final environmental statement.
- Comment:** The Department stated, "The economic importances of hunting leases is not discussed. Hunting leases provide a significant source of income to landowners in Uvalde County and therefore deserve mention."
- Response:** A discussion pertinent to hunting leases and their economic importance has been included in appropriate sections of the Environmental Impact Statement.
- Comment:** The Department pointed out a typographical omission was made in a quotation describing wildlife populations.
- Response:** The discrepancy has been corrected.
- Comment:** The Department suggested that the project description section of the Environmental Statement precede the environmental setting section.
- Response:** The Environmental Impact Statement format has been revised as suggested.
- Comment:** The Department stated, "The project description as now presented is only partially adequate because it does not fully describe what structural measures will be built. The fourth paragraph on page 15 (of the draft environmental statement) obliquely refers to embankments, but it would be better to fully describe the embankments in the second paragraph. Also, figures 2 and 3 from the work plan might be added to the environmental statement to enhance the project map in Appendix C."
- Response:** The narrative in the PLANNED PROJECT section has been revised and additional information added to describe more precisely the structural measures to be constructed. A section of a typical floodwater retarding structure has been included in the Planned Project section as Figure 1.
- Comment:** The question was asked, "...if structure No. 3 must be ported within a 200 acre-foot limitation as prescribed by the State water rights law, why is it permissible to port structures Nos. 1, 2, and 4 at the 50-year sediment pool elevation?"

Leona River Watershed, Texas

Response: The discussion on this subject has been revised in the Final Environmental Impact Statement to clarify the necessity for ports below the elevations of the principal spillways.

Comment: The Department stated that there should be an explanation why the principal spillway crests are to be set at the 100-year sediment pool elevation when the 200 acre-foot limitation exists.

Response: Each floodwater retarding structure is designed to store the volume of sediment expected to accumulate in the structure during a 100-year period. Principal spillway crests are constructed at the elevation necessary to accommodate the storage of this sediment. For each of the four planned floodwater retarding structures, the principal spillways if constructed without ports below the crests, would provide the potential of creating impoundments in excess of 200 acre-feet. Therefore, in order to abide by the State law limiting water impoundments, ports below the principal spillway crests are needed.

Comment: The Department stated that the PLANNED PROJECT section of the Draft Environmental Statement does not fully discuss the planned channel work on Cooks Slough from the standpoint of how much excavation of soil materials will be required and where the excavated material will be placed.

Response: The volume of soil to be excavated and where and how it will be placed has been included in the Final Environment Impact Statement under the PLANNED PROJECT section.

Comment: The Department commented that on page 14 of the Draft Environmental Statement under "Planned Project", the statement, "Damage to land caused by rapid runoff from steeper areas will be reduced by construction of diversions", is an impact and should be treated in the "Environment Impact" section.

Response: This oversight has been corrected in the Final Environmental Impact Statement.

Comment: The Department stated that in the Environmental Statement as in the Work Plan, no provision is apparent for avoiding harmful backwater effects when floodflows in the improved channel reach the reduced size transition section, and the potential for these effects as well as possible mitigating procedures should be discussed.

Response: See previous response to similar comment submitted by the Department.

Leona River Watershed, Texas

Comment: The geology and engineering of the floodwater retarding structures and the channel work are discussed in some detail in both the draft environmental statement and the work plan. These discussions appear to indicate an adequate awareness of construction problems, of environmental impacts related to geologic conditions, and of the engineering methods required to mitigate these impacts.

Response: Noted

Comment: The reference to requiring contractors to adhere to guidelines for control of air and water pollution and soil erosion during construction could be improved by listing the guidelines and the issuing agency. Also, the same could be done for the reference to sanitary facilities.

Response: Guidelines and issuing agencies have been included as suggested.

Comment: The Department expressed concern that slight increases of dust and sediment inherent to construction of the structural measures would possibly continue after construction as a long-term effect rather than a short-term effect.

Response: With the completion of construction and with the establishment of vegetation for erosion control on denuded soil, dust and sediment increases caused by construction will completely subside. A statement to this effect has been included in the final Environmental Statement.

Comment: In general, the project impacts are inadequately described. Specific information describing the species, density, and age classes of vegetation destroyed or modified and its importance to wildlife would permit a better assessment of the project effects. Without detailed information describing the effect of structural and land treatment measures, we can only anticipate significant environmental impacts.

Response: A discussion of vegetation and the effects of structural measures and land treatment measures has been added to the Environmental Impact Statement.

Comment: Specific wildlife measures and their quantitative application as described in the statement are inadequate. The statement should state the degree of success the sponsors and the Soil Conservation Service will anticipate in encouraging watershed landowners to include wildlife measures in their overall management plans.

Response: Specific wildlife measures and the anticipated degree of their application has been included in the Environmental Impact Statement.

Leona River Watershed, Texas

Comment: We note that two different pages are numbered 22. We are concerned with the Fish and Wildlife remarks on the first page 22, because brush control as a land treatment measure would have an impact on wildlife resources within the watershed. We suggest an additional sentence stating "Brush control without proper wildlife considerations would also have an adverse impact on deer, turkey, bobwhite, and scaled quail populations."

Response: This typographic omission has been corrected.

Comment: On page 23, item "e" and page 24, item "b", conflicting statements contained in the items listed should be corrected or deleted. Item "e" states, "Application of planned land treatment measures with management practices will be beneficial to big game and upland game. The project in general would not influence game populations." Whereas item "b" states, "Eventually decrease the food supply for dove and quail on rangeland restored to near climax grass vegetation," item "e" implies all land treatment measures and management practices will be beneficial to wildlife. Item "b", however, states some land treatment practices will have an adverse effect on upland game.

Response: The conflicting statements have been deleted and additional information concerning the effects of land treatment measures on various species has been added.

Comment: The Department stated there is no documentation in the Work Plan or Draft Environmental Statement as to how the increase in ground water recharge (2,200 acre-feet annually) due to project installation was estimated and an explanation should be made as to how the additional recharge was appraised.

Response: The increase in average annual ground water recharge was estimated by: considering the locations of the floodwater retarding structure sites, drainage area characteristics as to recharge potential, size of drainage areas, length of stream channel crossing the recharge zones, the geology of the recharge zones, the number of floodwater retarding structures to be constructed, and finally adjusting the amount of average annual runoff presently entering the aquifer as recharge. The average annual runoff presently available for recharge and the estimated volume presently entering the aquifer was determined as outlined in "Work Plan for Watershed Protection and Flood Prevention, Leona River Watershed, Uvalde County, Texas, Investigations and Analysis, Ground Water."

Comment: The Department noted that on page 22 of the Draft Environmental Statement the increase in ground water recharge is "2,000 acre-feet" whereas all other references to this increase are 2,200 acre-feet.

Leona River Watershed, Texas

Response: This discrepancy has been corrected in the Final Environmental Statement.

Comment: The Department suggested that an explanation as to how the quality of ground water recharge will be improved by implementation and establishment of project measures be included in the Environmental Statement.

Response: A discussion on project effects on ground water recharge has been added under ENVIRONMENTAL IMPACT subheading Other. Also item 1, under FAVORABLE ENVIRONMENTAL EFFECTS has been revised as a result of adding this discussion.

Comment: The Department stated the word "improved" rather than "increased" would describe more appropriately the effects of the project on ground water recharge quality.

Response: The word "improved" has been used in the Final Environmental Statement as suggested.

Comment: The Department commented that the sentence on page 13 of the Draft Environmental Statement and on page 17 of the Work Plan stating the average annual discharge from the Edwards underground aquifer is slightly in excess of average annual recharge is misleading.

Response: The sentence has been deleted from both documents.

Comment: The Department stated "In Alternative No. 2 there appears to be an error in the percent reduction of sediment leaving the Leona Watershed. Instead of 23 percent, it should be 31 percent."

Response: This discrepancy has been corrected.

Comment: On pages 24-27 several alternatives to the proposed project were discussed. The impact of each of these alternatives on fish and wildlife should be discussed and included in the revised environmental statement.

Response: A discussion of the effects of various alternatives on wildlife has been added.

Comment: The short-term and long-term impacts are inadequately described in the statement. This section should contain a brief discussion of the extent to which the proposed action involves tradeoffs between short-term environmental gains at the expense of long-term losses. Project incurred wildlife losses and possible enhancement measures should be discussed in the short-term/long-term analysis.

Response: A brief discussion of the projects' effects on wildlife in the short-term/long-term analysis has been added.

Leona River Watershed, Texas

U. S. Department of Health, Education, and Welfare

Comment: The request was made that the environmental statement include assurances that all provisions of Public Law 91-646 will be offered to families and/or persons dislocated as a result of project installation.

Response: On page 14, in paragraph 4, of the Final Environmental Impact Statement, the declaration is made, "All relocations will be carried out under the provisions and stipulations set forth by Public Law 91-646, Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970."

Environmental Protection Agency

Comment: The agency stated the environmental statement and the work plan adequately cover the environmental impacts of the project and commended the Soil Conservation Service for in-depth analysis of alternatives and consequences of the project.

Response: Noted

Comment: The agency suggested that Appendix A of the environmental statement be expanded to show the costs and benefits that would result if only the floodwater retarding structures were constructed.

Response: The requested information has been included in the environmental statement; however, it has been added to the discussion of alternatives considered rather than Appendix A.

Texas Parks & Wildlife Department

Comment: The documents should be revised to include a thorough discussion of the alternatives, particularly their impact on fish and wildlife resources.

Response: The discussion of alternatives has been revised in the environmental impact statement to include a discussion of each alternative's effect upon fish and wildlife.

Comment: Alternative No. 2 should be closely analyzed due to the possible fulfillment of project purposes without inclusion of the channelization feature.

Response: As stated in the Work Plan and Environmental Statement, one of the specific objectives of the project is to reduce urban average annual damage from the 100-year frequency storm by 90 to 95 percent. Alternative No. 2 will not achieve this objective. With the channel work, however, this objective can be realized.

Leona River Watershed, Texas

Comment: Neither the environmental statement nor the watershed work plan includes economic consideration of the value of hunting leases to the area. In view of the projected implementation of brush control on approximately 40,000 acres of land, it is imperative that the value of wildlife habitat be considered.

Response: Information concerning the economic value of hunting leases has been incorporated into the Environmental Impact Statement. A detailed description of brush management to be applied during project installation has been added. Approximately 12,500 acres of brush management is expected to be applied.

Comment: The paragraph on page 8 and 9 of the Draft Environmental Impact Statement which discusses fish and wildlife resources has a typographical omission. On page 9, lines 7 and 8 should read: Deer are found in moderate to high numbers, turkeys in low numbers except....

Response: This typographical omission has been corrected.

Texas Water Rights Commission

Comment: The commission stated, "The staff notes the assurances contained in the Work Plan that appropriate comments from the field-level review of May 23, 1973, and the comments of agencies which reviewed the Review Draft Work Plan of March, 1972, and the Preliminary Draft Environmental Statement thereon, have been fully considered in the preparation of the referenced Work Plan of January 1973."

Response: Noted

Comment: The Commission stated, "The Commission staff assumes that it is understood by the project planners and sponsors that State of Texas Statutes require that a permit be obtained for a dam or reservoir which is to be used to retain water for recharge of groundwater. This statement is worthy of emphasis in view of the fact that the referenced work plan indicates an estimated annual average groundwater recharge of 2,200 acre-feet from four proposed reservoirs; and it appears now, as it did in our May 15, 1972 review, that these four reservoirs may need to be permitted for groundwater recharge purposes."

Response: The Sponsoring Local Organizations are aware of the need, as required by law, for permits and will comply with all State laws prior to construction of any floodwater retarding structures included in the Work Plan.

Comment: The Commission stated that its staff believes the Draft Environmental Impact Statement conforms satisfactorily with the provisions of Section 102 (2)(C) of the National Environmental Policy Act of 1969.

Leona River Watershed, Texas

Response: Noted

Comment: In order to improve and protect the farms and other lands of Uvalde County, and the City of Uvalde, Texas, the Commission staff urges early implementation of the project.

Response: Noted

The University of Texas at Austin
Bureau of Economic Geology

Comment: The Bureau stated, "The greatest danger from flooding of the Leona River occurs downstream from Uvalde and within the city, proper. Urban runoff from streets, lawns, and rooftops is probably a major contributor to flood problems, but the implementation of the watershed project will not lessen the impact of this locally-derived peak flow. No data exist showing the amount of floodwater derived from the urban area. These data should be collected before such a project is implemented. It may be that this rural watershed project will not significantly decrease the magnitude or recurrence of flood events downstream from Uvalde."

Response: The watershed was segmented by evaluation reaches and runoff was expressed by rainfall-runoff characteristics for each segment of the watershed. Evaluation of flooding was determined for present and with project conditions within each evaluation reach and its effects to downstream flooding. The urban area of Uvalde is an evaluation reach within itself and its runoff characteristics are determined not to be a major contributor to peak flows downstream.

Comment: The Bureau pointed out that rapid sedimentation can have a significant effect in reducing the useful life of a floodwater retarding structure, and as a result of this sedimentation, ground water recharge can be reduced.

Response: Deposition of sediment in the planned floodwater retarding structures was considered when estimating the average annual increase in ground water recharge derived from watershed runoff as a result of construction of the floodwater retarding structures. Sedimentation rates are a basic consideration in determining the useful life of any Soil Conservation Service designed floodwater retarding structure. The volume of sediment expected to accumulate during a 100-year period has been estimated for each of the four floodwater retarding structures. Planned capacities have been included in the design of the structures to accommodate the expected accumulations.

Leona River Watershed, Texas

Texas Land Commission

Comment: The Commission stated that the project is well justified and should promote improved land use in the area.

Response: Noted

Texas Water Quality Board

Comment: The Board has concluded that the project would not cause lasting environmental problems.

Response: Noted

Texas Industrial Commission

Comment: The Commission stated it had no negative comments on this project.

Response: Noted

Texas Water Development Board

Comment: The Commission stated that in its opinion it is very difficult to substantiate 2,200 acre-feet of recharge to ground water aquifers in the area.

Response: The best available data developed by other agencies and the SCS, was used to estimate the increase in ground water recharge. Included in the data used were stream gage data, above and below the recharge zone, in similar watersheds; the locations of the floodwater retarding structures; drainage area characteristics as to recharge potential; length of stream channels crossing recharge zones; and the geology of the recharge zones.

Comment: The Board stated "There also could be questions regarding the total benefits to be derived from reducing runoff. Unless water that is detained by land treatment measures is used, in place, there could be an economic loss to the watershed by depriving downstream users of needed water supplies."

Response: Noted

Leona River Watershed, Texas

Comment: The Board stated that apparently the short-term and long-term uses of the environment are expected to serve man's needs throughout the life of the project.

Response: Noted

Comment: The Water Development Board has no objections to the proposed Work Plan as set forth in the Draft Environmental Impact Statement, Leona River Watershed, Uvalde County, Texas.

Response: Noted

Comment: The Board stated "Also the trade-off involving use of 1,930 acres of agricultural land for flood-control structures to protect 1,709 acres of urban or near-urban lands against flooding cannot be evaluated in this review."

Response: It is stated in the Environmental Impact Statement, "Average annual flooding will be reduced from 1,709 acres to 584 acres, a reduction of 66 percent." It is also stated in the Environmental Impact Statement that installation of all project measures will provide flood protection of 8,097 acres of flood plain land. This 8,097 acres includes urban and agricultural land. Therefore, if a comparison, and trade-off were to be made considering the land needed for installation of structural measures and flood plain area to be protected, 1,930 acres for structures and 8,037 acres to be protected should be used.

Texas Highway Department

Comment: The Department recommended that a positive statement be made saying release flows will not cause existing public crossings, including state highways, to be impassable or that funds will be provided for improvements to make them passable.

Response: The Work Plan provides that all public crossings will be made passable during prolonged release flow or alternate routes will be provided. This is a responsibility of the sponsoring local organizations. Treatment of each crossing will be determined and implemented on an individual bases in coordination with the entity having jurisdiction prior to installation of structural measures.

Comment: The cost of work to be done by the Department concerning concrete riprap should show an increase in estimated cost of approximately 30 percent to more nearly reflect current costs.

Response: This additional cost is a very minor increase, less than one-tenth of one percent, of the total installation cost. This minor increase in cost will not be shown in the Final Environmental Impact Statement. However, should other costs be increased to a significant amount, a revised cost estimate will be made to include current costs.

Leona River Watershed, Texas

LIST OF APPENDIXES

- Appendix A - Comparison of Benefits and Costs for Structural Measures
- Appendix B - Letters of Comment Received on the Draft Environmental Impact Statement
- Appendix C - Project Map

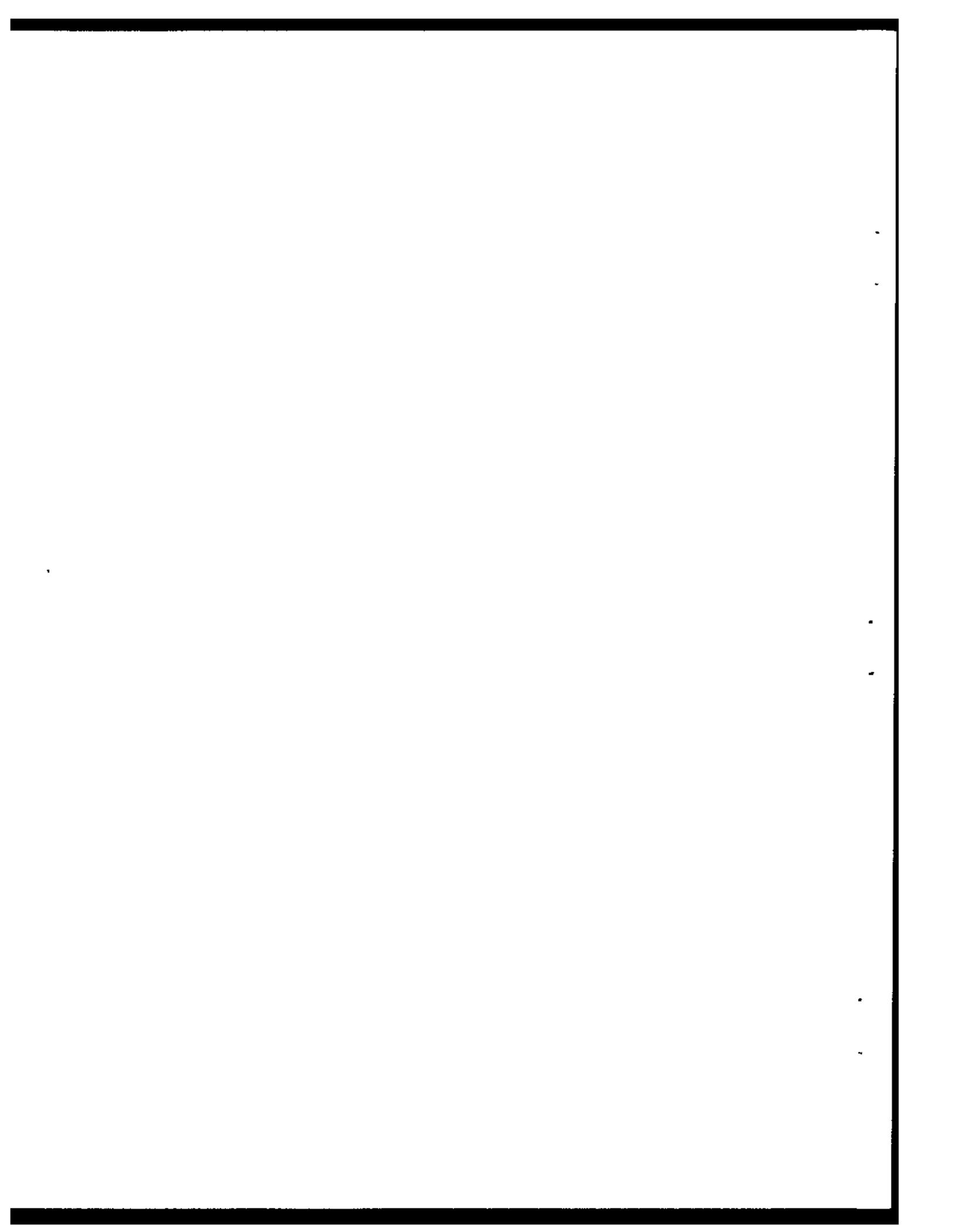
APPROVED BY: Edward E. Thomas Date: 11-20-74
Edward E. Thomas
State Conservationist

COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Leona River Watershed, Texas
(Dollars)

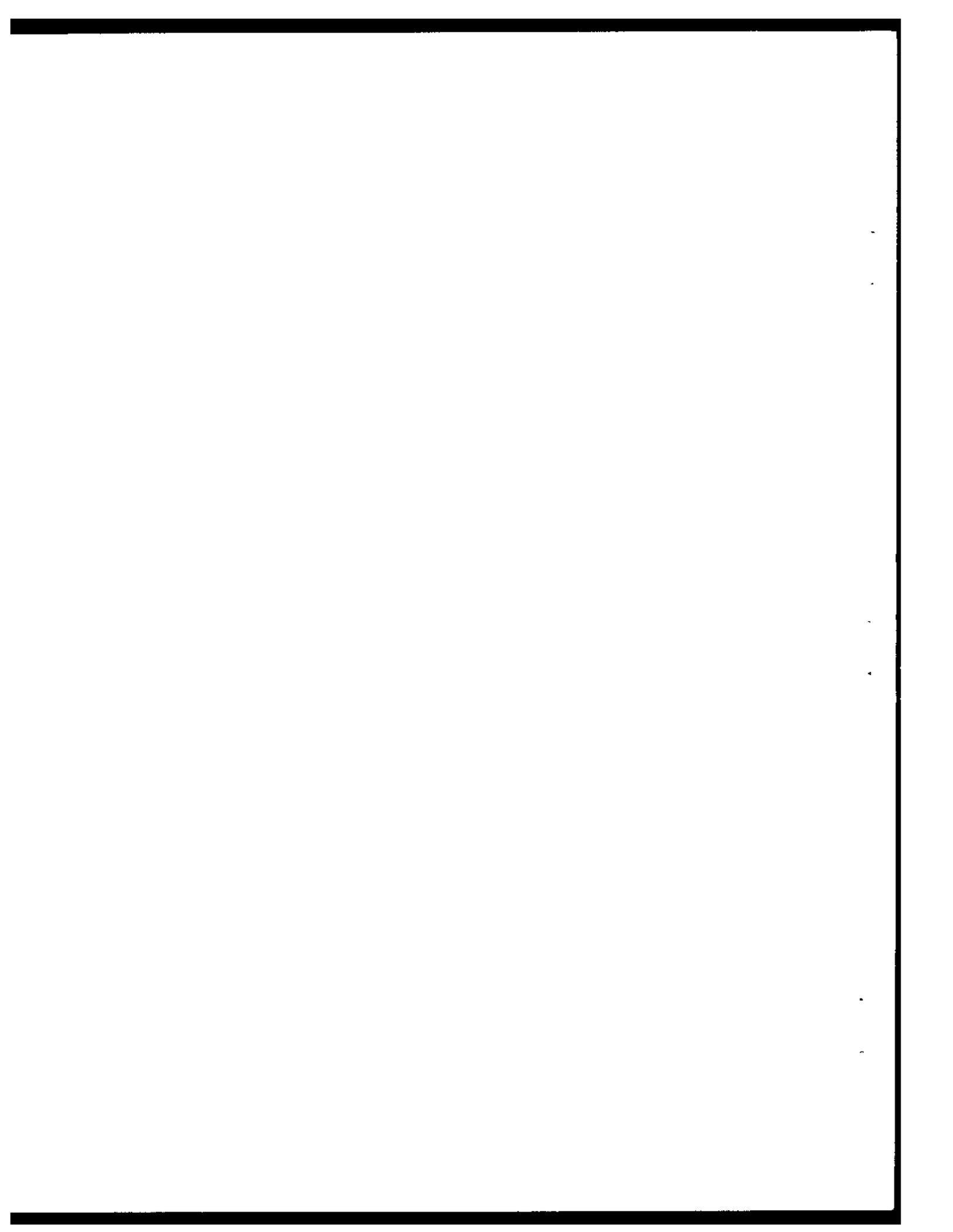
Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/				Secondary	Total	Average Annual Cost	Benefit-Cost Ratio
	Incidental	Ground	Water	Other				
Floodwater Retarding Structures Numbers 1 through 4 and Channel Work	169,190	33,000	4,000	19,980	226,170	101,390	2.2:1.0	
Project Administration						11,430		
GRAND TOTAL	169,190	33,000	4,000	19,980	226,170	112,820	2.0:1.0	

1/ Price Base: Nonagricultural benefits - Current prices (1972); All other benefits adjusted normalized prices, April 1966.
 2/ Benefits from reduction of damages on the main stem of the Leona River outside the watershed.
 3/ Installation: 1972 prices amortized for 100-years at 5.500 percent interest; O&M - adjusted normalized prices, April 1966.
 4/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$2,860 annually.



APPENDIX B

Letters of Comment Received on the
Draft Environmental Impact Statement



E. E. Thomas, SCS, Temple, Texas ✓



DEPARTMENT OF THE ARMY
OFFICE OF THE UNDER SECRETARY
WASHINGTON, D.C. 20310

3 DEC 1973

Honorable Robert W. Long
Assistant Secretary of Agriculture
Washington, D. C. 20250

Dear Mr. Long:

In compliance with the provisions of Section 5 of Public Law 566, 83rd Congress, the Administrator of the Soil Conservation Service, by letter dated 26 September 1973, requested comments on the watershed work plan and draft environmental statement for the Leona River Watershed, Uvalde County, Texas.

We have reviewed the work plan and foresee no conflict with any projects or current proposals of this Department. We have no comments on the draft environmental statement.

Sincerely,

Charles R. Ford
for Herman R. Staudt
Under Secretary of the Army



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER-73/1289

FEB 4 1974

Dear Mr. Grant:

Thank you for the letter of September 26, 1973, requesting our views and comments on a work plan and draft environmental statement for the Leona River Watershed, Texas.

We have completed our review of the work plan and draft statement and submit the following comments for your consideration and use.

Work Plan

In general, we find that the proposed measures and the area involved are essentially the same as those specified in the preliminary work plan and environmental statement reviewed earlier. No more recent data were found to change the earlier conclusions that no mineral resources should be adversely affected by the project. The flood control measures proposed probably will have a beneficial effect on the production of asphalt, stone, sand and gravel, and natural gas in the vicinity.

This proposed action will not adversely affect any existing, proposed, or known potential units of the National Park System, or any known historic, natural, or environmental education sites eligible or considered potentially eligible for the National Landmark Programs.

It should be more clearly stated in the work plan that the proposal covers only a portion of the Leona River Watershed. A reviewer must rely on the Project Map (Figure 7) to establish an overview of the various project segments. Regarding the channel improvement along Cooks Slough, there appears to be no provision for



avoiding harmful backwater effects when floodflows reach the reduced size transition section (see additional comment under environmental statement section). On page 38 under "structural measures," the first paragraph appears to be repeated in the fourth paragraph on the following page.

On page 53, paragraph 2, of the work plan, a statement is made that the danger of saline-water encroachment is increased as the storage of good-quality water in the aquifer is decreased. Although this statement may be technically true, it is not significant in regard to development in the Leona River watershed. The threat of salt-water encroachment in the aquifer is extremely remote, especially in this part of the aquifer.

It is requested that the 1968 Bureau of Sport Fisheries and Wildlife report on the Leona River watershed accompany the work plan when it is submitted to Congress.

Draft Environmental Statement

In general, the organization of the statement is poor, making it difficult to separate the project description from its potential environmental impacts. The statement does not flow easily from one subject to another. Description of the environment precedes the description of the project. All sections of the statement lack specifics, and the statement does not explain in detail what will actually take place and the anticipated effects on the environment. The environmental statement should indicate that the project will slightly reduce streamflow downstream from the project, and it should place more emphasis on the environmental effects than on fiscal and statistical aspects. Specific comments below will follow the format of the draft statement.

Environmental Setting

On page 8, the general effect that doubling the population by 1985 will have on the success of the flood control measures should be stated.

While we are pleased to note the evidence of consultation with the National Register of Historic Places and the Texas State Historic Preservation Officer and the reported absence of properties listed or presently deemed eligible for listing in the National Register, we do not believe that the draft environmental statement devotes adequate attention to cultural (historic, archeological, architectural) values. The letter from the National Park Service referred to on page 9 pointed out the likelihood that cultural (particularly archeological) resources could be present and emphasized the importance of a preconstruction investigation. Archeological resources are frequently subtle and unlikely to be detected by untrained persons. To assure adequate consideration of all archeological values, professionally trained archeologists should directly examine the area and render substantive advice on the existence of such resources, the likelihood of project impact upon them, and any appropriate mitigation.

The draft statement reports that Soil Conservation Service personnel conducted a field examination. While this examination was evidently carried out in the spirit of the National Environmental Policy Act and in compliance with Executive Order No. 11593, we still feel that an interdisciplinary analysis as described in the above paragraph would benefit the assessment of archeological resources. We recommend that the findings and report of such an interdisciplinary investigation be included in the final statement.

The project areas should also be directly examined by persons professionally trained to locate, identify, and evaluate historic and architectural resources. The results of that interdisciplinary investigation should be sufficient to provide information for discussion in all relevant parts of the environmental statement. These resources should be substantively described and assessed as environmental values, expected project impacts on them should be set forth, any mitigating measures that will be instituted to avoid adverse effects should be outlined, and all unavoidable adverse effects and irreversible or irretrievable commitments of these resources should be discussed in the final statement.

The section does not adequately describe plant communities within the watershed. A thorough description of floodplain, rangeland, cropland, and pastureland vegetation should be presented.

On pages 7 and 8 of the environmental statement and pages 9 and 10 of the work plan, the economic importance of hunting leases is not discussed. Hunting leases provide a significant source of income to landowners in Uvalde County and therefore deserve mention. A Texas Parks and Wildlife Department survey conducted in 1970 indicated approximately 40 percent of Uvalde County was under hunting lease agreement.

On page 9, first paragraph of the environmental statement and page 10, Fish and Wildlife Resource Data, of the work plan, a typographical omission was made in the description of the wildlife populations. Following the listing of wildlife species in the project area, the description should read: "Deer are found in moderate to high numbers; turkeys are present in low numbers, except along the Leona River south of Uvalde where they appear in moderate numbers; bobwhite and scaled quail"

Project Description

We suggest that the project description precede the environmental setting section. This will enable the reviewer to evaluate the project impacts with a clear picture of the various components of the project.

The project description as now presented is only partially adequate because it does not fully describe what structural measures will be built. The fourth paragraph on page 15 obliquely refers to embankments, but it would be better to fully describe the embankments in the second paragraph. Also, Figures 2 and 3 from the work plan might be added to the environmental statement to enhance the project map in appendix C. On page 15 the third paragraph under structural measures is unclear in that if structure No. 3 must be ported within a 200 acre-foot limitation as prescribed by the State water rights law, why is it permissible to port structures Nos. 1, 2, and 4 at the 50-year sediment

pool elevation? It should also be explained why the spillway crests are to be set at the 100-year sediment pool elevation when the 200 acre-foot limitation exists.

Further, the section does not fully discuss the channelization of Cooks Slough from the standpoint of how much dredging will occur and where the dredged material will be deposited. This information is important in an environmental statement because it helps to determine environmental impact of materials which are generally of significant volume. Impacts are also mixed in with the description of the project, e.g., on page 14 it is stated that "Damage to land caused by rapid runoff from steeper areas will be reduced by construction of diversions." It would be better to separate this concept and put it under the impact section.

As we stated in our comments on the work plan, no provision is apparent for avoiding harmful backwater effects when floodflows in the improved channel reach the reduced size transition section. Potential for backwater effects should be discussed as well as possible mitigating procedures.

The geology and engineering of both the floodwater retardation structures and the stream channelization are discussed in some detail in both the draft statement (pages 15-17) and the work plan (pages 50-56). These discussions appear to indicate an adequate awareness of construction problems, of environmental impacts related to geologic conditions, and of the engineering methods required to mitigate these impacts.

On page 18 reference is made to requiring contractors to adhere to guidelines for control of air and water pollution and soil erosion during construction. This reference could be improved by listing these guidelines by title and the issuing agency. This information would give the reviewer a basis on which to evaluate the extent to which contractors are likely to comply. The same comment applies to the forth paragraph on the same page concerning sanitary facilities.

Environmental Impact

As in the previous section, the fifth paragraph on page 20 refers to a "slight" increase in air and water pollution but

that this increase will be kept within "tolerable" limits. This is vague and introduces concern that short-term air and water pollution from construction operations will continue because it is slight. It would be better to cite appropriate guidelines, estimate the quantities of increased air and water pollution, and demonstrate compliance by comparing estimates with the tolerable limits, and naming the regulating body.

In general, the project impacts are inadequately described. Specific information describing the species, density, and age classes of vegetation destroyed or modified and its importance to wildlife would permit a better assessment of the project effects. Without detailed information describing the effect of structural and land treatment measures, we can only anticipate significant environmental impacts.

Specific wildlife measures and their quantitative application as described in the statement are inadequate. The statement should state the degree of success the sponsors and the Soil Conservation Service will anticipate in encouraging watershed landowners to include wildlife measures in their overall management plans.

We note that two different pages are numbered 22. We are concerned with the Fish and Wildlife remarks on the first page 22. because brush control as a land treatment measure would have an impact on wildlife resources within the watershed. We suggest an additional sentence stating "Brush control without proper wildlife considerations would also have an adverse impact on deer, turkey, bobwhite, and scaled quail populations."

On page 23, item e. and page 24, item b. conflicting statements contained in the items listed should be corrected or deleted. Item e. states, "Application of planned land treatment measures with management practices will be beneficial to big game and upland game, The project in general would not influence game populations." Whereas item b. states, "Eventually decrease the food supply for dove and quail on rangeland restored to near climax grass vegetation." item e. implies all land treatment measures and management practices will be beneficial to wildlife. Item b., however, states some land treatment practices will have an adverse effect on upland game.

Throughout the statement and the accompanying watershed work plan, it is stated that the development will increase the recharge to the Edwards aquifer by 2,200 acre-feet. We find no documentation which shows how this figure was determined. We feel that proper explanation should be made as to how the additional amount of recharge was estimated. Regarding the additional recharge, on the second page 22 of the draft statement, the amount of additional recharge is given as 2,000 acre-feet; elsewhere, the figure is repeatedly given as 2,200 acre-feet. These figures should be reconciled.

On page 23 of the draft statement, it is stated that the quality of groundwater recharge originating in the watershed will be increased. There is no explanation of this increase in quality. It might be inferred that the quality will be increased by reduction of silt content of the recharge water. However, this is not clear. We suggest a discussion of this topic be included. Also the word "improved" would give a better description of the effect on water quality than "increased."

On page 13 in the draft statement and page 17 in the work plan, it is stated that the average annual discharge from the Edwards underground reservoir is estimated to be slightly in excess of the average annual recharge. This could probably be deduced from reports of the U.S. Geological Survey, depending on which reports were examined. However, the statement is misleading. As long as the major springs are flowing, more water is being recharged to the aquifer than is actually being used. Furthermore, the aquifer can be nearly fully replenished during periods of excessive rainfall. This is borne out by the conditions during the summer and fall of 1973. During this period, record or near record rainfall in the San Antonio area resulted in all time high-water levels in the aquifer and all time high spring discharge from the aquifer. It would be helpful to further clarify these statements.

Alternatives

In Alternative No. 2 there appears to be an error in the percent reduction of sediment leaving the Leona Watershed. Instead of 23 percent, it should be 31 percent.

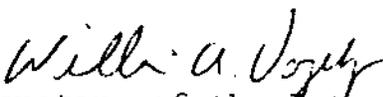
On pages 24-27 several alternatives to the proposed project were discussed. The impact of each of these alternatives on fish and wildlife should be discussed and included in the revised environmental statement.

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

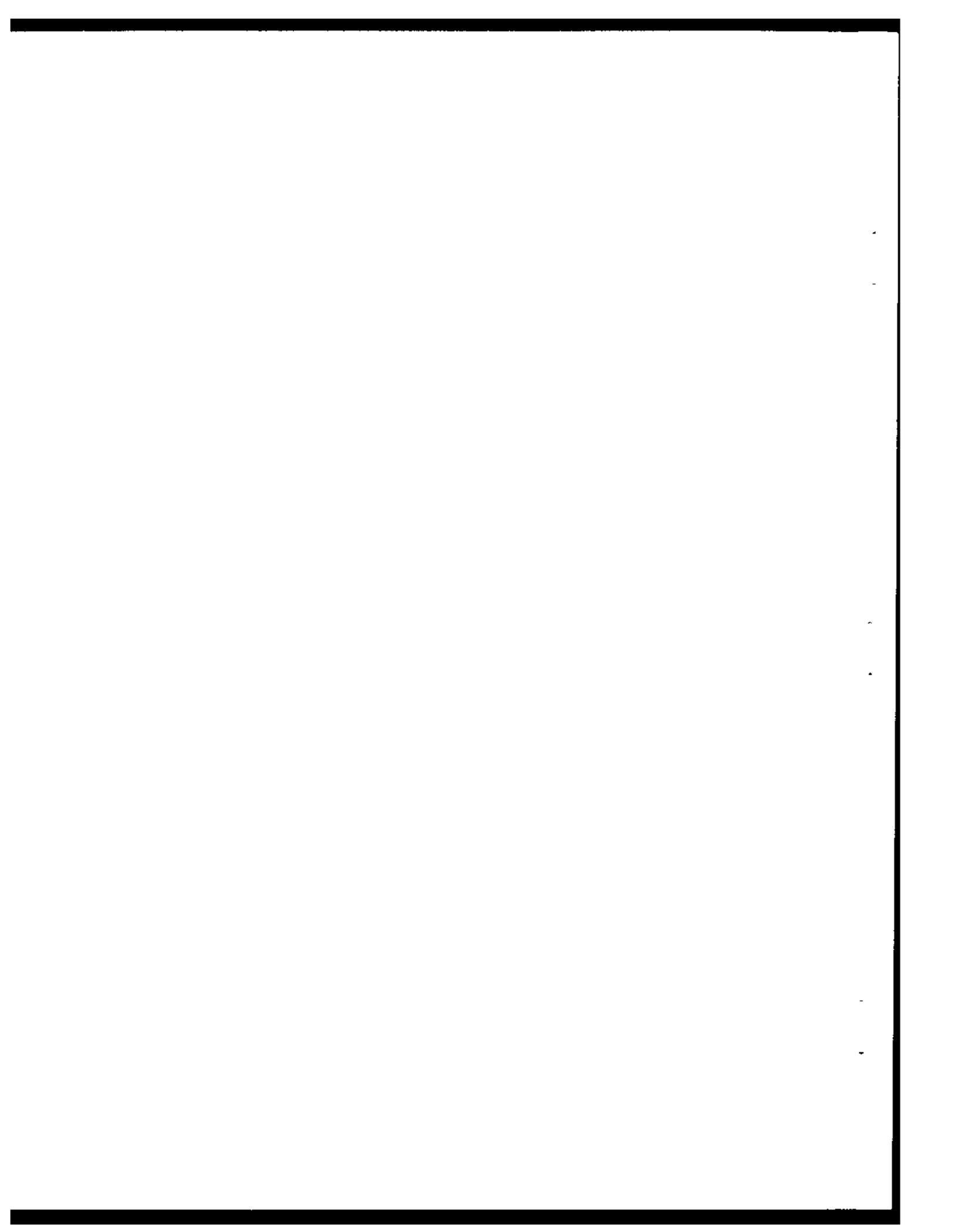
The short-term and long-term impacts are inadequately described in the statement. This section should contain a brief discussion of the extent to which the proposed action involves tradeoffs between short-term environmental gains at the expense of long-term losses. Project incurred wildlife losses and possible enhancement measures should be discussed in the short-term/long-term analysis.

We hope these comments will be of assistance in preparing the final environmental statement.

Sincerely yours,


Acting Deputy Assistant Secretary of the Interior

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





E. E. Thomas, SCS, Temple, Texas ✓

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

OFFICE OF THE SECRETARY

WASHINGTON, D.C. 20201

January 17, 1974

Department of Agriculture
Soil Conservation Service
Washington, D. C. 20250

ATTENTION: Jim Bean
Room 5229

Dear Mr. Bean:

Pursuant to our telephone conversation of January 16, I am forwarding a copy of this Department's comments on the draft Environmental Impact Statement on Leona River Watershed, Texas which were sent out on October 31, 1973.

Also, I was informed by our Regional Environmental Officer in Chicago that he has no comments to offer on the draft Environmental Impact Statement on First Capital Watershed, Wisconsin.

I apologize for any delays that this may have caused you, and appreciate your cooperation in this matter.

Thank you.

Sincerely,

Madeline Pospur
Office of Environmental Affairs

Enclosure

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

Reaction Review and Comments on Environmental Impact Statement for Project Proposal:

Draft Environmental Impact Statement Reviewed With Objections

XX

Draft Environmental Impact Statement Reviewed With No Objections

Date: 30 October 1973

EI# 1073-271

Agency/Bureau: DHEW/U.S. Public Health Service

Project Proposal: Leona River Watershed, Uvalde County, Texas

Comments: Although the EIS indicates that the five families to be dislocated as a result of this proposed project will be provided "dwellings" which will comply fully with the standards set forth in P.L. 91-646, the attached Work Plan Agreement cites P.L. 566, as the source for benefits that will be paid to these families. Since we are not familiar with the provisions of this latter Public Law, but are responsible for the review assurance that all provisions of P.L. 91-646, will be extended to families and/or persons dislocated as a consequence of Federal environmental intervention, we would ask that the EIS for this project include assurances to that extent for the five families concerned.

E. E. Thomas, SCS, Temple, Texas ✓

ENVIRONMENTAL PROTECTION AGENCY

REGION VI

1600 PATTERSON, SUITE 1100

DALLAS, TEXAS 75201

December 3, 1973

OFFICE OF THE
REGIONAL ADMINISTRATOR

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

Dear Mr. Grant:

We have reviewed the Draft Environmental Impact Statement and the watershed work plan for the Leona River Watershed Project, Uvalde County, Texas. Project plans call for the construction of four single purpose floodwater retarding structures and 3.47 miles of channelization.

The impact statement and the work plan adequately cover the environmental impacts of the proposed project. Your agency is to be commended for its in-depth analysis of the alternatives and consequences of this project. Our only suggestion is that you expand Appendix A of the impact statement to include the costs and benefits that would result if only the floodwater retarding structures were built. This would allow the reader to evaluate separately the effects of the channelization feature and the floodwater retarding structures.

These comments classify your Draft Environmental Impact Statement as LO-1. The classification and the date of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions, under Section 309 of the Clean Air Act.

Definitions of the categories are provided on the attachment. Our procedure is to categorize our comments on both the environmental consequences of the proposed action and on the adequacy of the impact statement at the draft stage, whenever possible.

We appreciate the opportunity to review the Draft Environmental Impact Statement. Please send us two copies of the Final

Environmental Impact Statement at the same time it is sent to the Council on Environmental Quality.

Sincerely yours,



Arthur W. Busch
Regional Administrator

Enclosure

ENVIRONMENTAL IMPACT OF THE ACTION

IO - Lack of Objections

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

ER - Environmental Reservations

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

EU - Environmentally Unsatisfactory

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

ADEQUACY OF THE IMPACT STATEMENT

Category 1 - Adequate

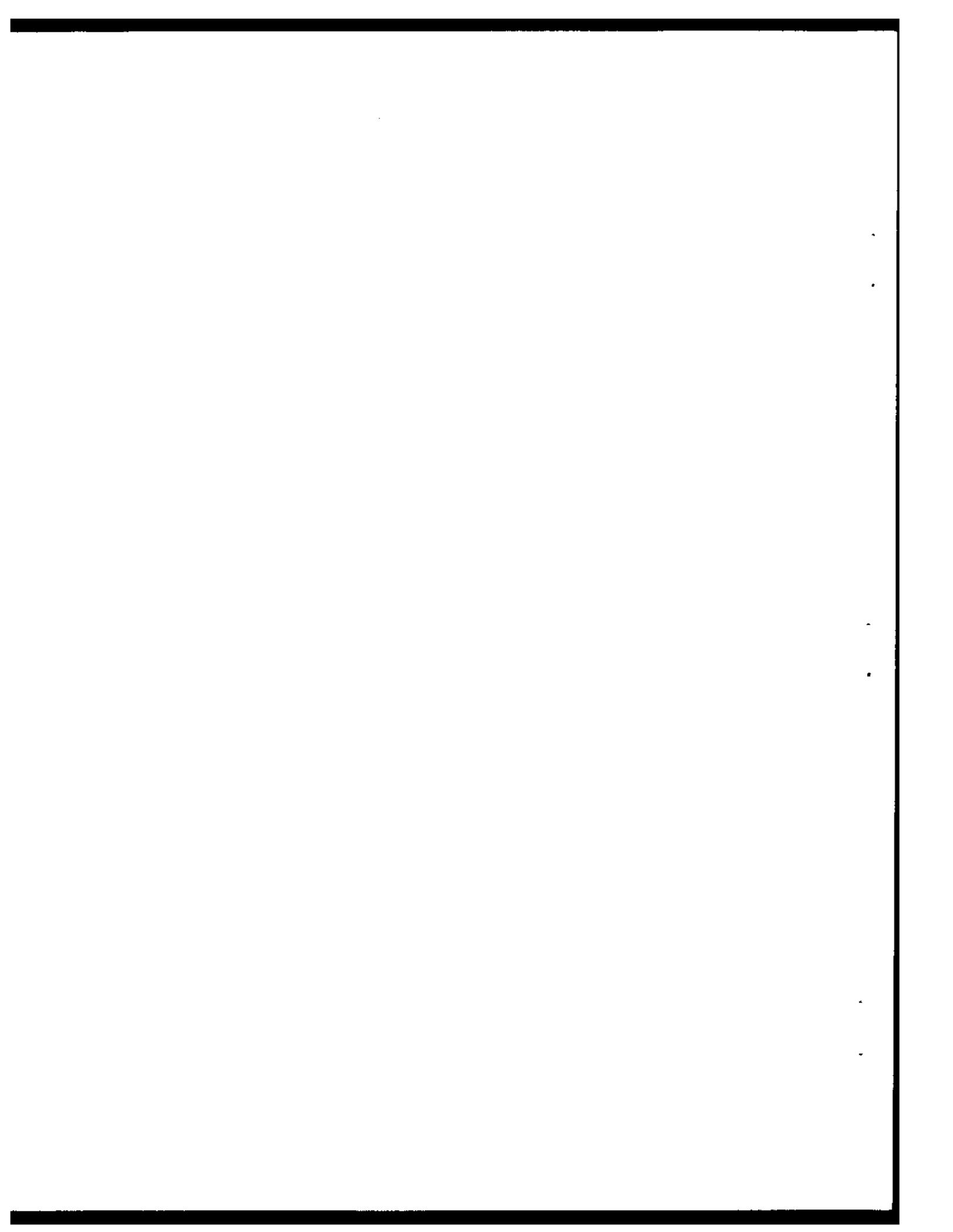
The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2 - Insufficient Information

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

Category 3 - Inadequate

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





OFFICE OF THE GOVERNOR
DIVISION OF PLANNING COORDINATION WS(PL 566) 0-5

JAMES M. ROSE
DIRECTOR

OLPH BRISCOE
GOVERNOR

December 13, 1973

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

Dear Mr. Grant:

The United States Department of Agriculture, Soil Conservation Service Draft Environmental Impact Statement (EIS) and Work Plan titled, "Leona River Watershed Project in Uvalde County, Texas," has been reviewed by the Governor's Division of Planning Coordination and by affected State agencies pursuant to the requirements of Section 102 (2) (c) of the National Environmental Policy Act of 1969 and the Office of Management and Budget Circular A-95.

Review participants generally felt that the environmental impact statement needed to be strengthened and more specific data should be included. The Bureau of Economic Geology of the University of Texas noted that the urban runoff from Uvalde is probably a major contributor to the flooding problem. Specific data showing the amount of runoff and its affects on this project should be included before implementation of this project.

The Texas Parks and Wildlife Department commented that the EIS should be revised to include a thorough discussion of the alternatives, particularly their impact on fish and wildlife resources. Specific consideration should be given to the economic value of hunting leases in the area.

Since the project will include over 2,000 acre-feet of groundwater, the Texas Water Rights Commission noted that the Texas Statutes require that a permit be obtained from their agency. Also, it was recommended that the five year project should be started early to improve and protect the lands of Uvalde County.

The Texas Highway Department commented that the proposed EIS should include a positive statement noting that if public crossings or State

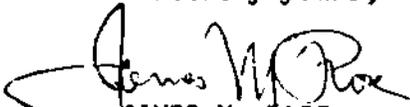
Mr. Kenneth E. Grant
Page 2

highways are made impossible, funds will be made available for improvements and reconstruction of the sites.

The Texas Department of Agriculture, the Texas Water Quality Board, the Texas Industrial Commission, and the Texas Water Development Board also commented on this project. The specific comments made by all State agencies are attached and should be considered in their entirety for the development of this final EIS.

If we can be of further assistance, please let us know.

Sincerely yours,


JAMES M. ROSE
Director

JMR/vw

Enclosures

cc: Mr. A. E. Richardson, Texas Water Rights Commission
Mr. Clayton Garrison, Texas Parks and Wildlife Department
Dr. W. L. Fisher, Bureau of Economic Geology
Mr. B. L. DeBerry, Texas Highway Department
Hon. John C. White, Texas Department of Agriculture
Mr. Hugh C. Yantis, Texas Water Quality Board
Mr. James H. Harwell, Texas Industrial Commission
Mr. Harry P. Burleigh, Texas Water Development Board

TEXAS
PARKS AND WILDLIFE DEPARTMENT



CLAYTON T. GARRISON
EXECUTIVE DIRECTOR
JOHN H. REAGAN BUILDING
AUSTIN, TEXAS 78701

COMMISSIONERS
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ACK R. STONE
CHAIRMAN, WELLS
BOE K. FULTON
LUBBOCK
EARCE JOHNSON
AUSTIN

November 19, 1973

Mr. James M. Rose
Director
Division of Planning Coordination
Post Office Box 12428, Capitol Station
Austin, Texas 78711

Dear Mr. Rose:

Reference is made to the draft environmental impact statement and watershed work plan for the Leona River Watershed,

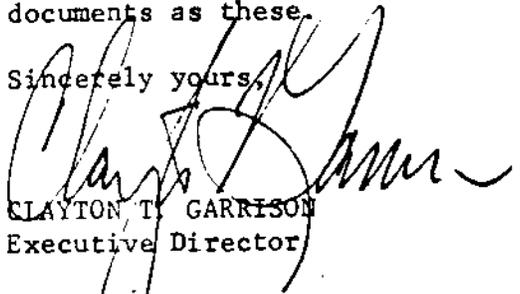
The documents should be revised to include a thorough discussion of the alternatives, particularly their impact on fish and wildlife resources. Alternative #2 should be closely analyzed due to the possible fulfillment of project purposes without inclusion of the channelization feature.

Neither the environmental statement or watershed work plan includes economic consideration of the value of hunting leases to the area. In view of the projected implementation of brush control on approximately 40,000 acres of land, it is imperative that the value of wildlife habitat be considered.

The paragraph on page 8&9 of the environmental statement which discusses Fish and Wildlife Resources has a typographical omission. On page 9, lines 7 and 8 should read: Deer are found in moderate to high numbers, turkeys in low numbers except.....

The Department appreciates having the opportunity of reviewing such documents as these.

Sincerely yours,


CLAYTON T. GARRISON
Executive Director

CTG:BM:dp

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TEXAS WATER RIGHTS COMMISSION

SAM HOUSTON STATE OFFICE BUILDING

COMMISSIONERS

JOED. CARTER, CHAIRMAN
475-2453

OTHA F. DENT
475-2451

DORSEY B. HARDEMAN
475-4325

November 20, 1973

A. E. RICHARDSON
EXECUTIVE DIRECTOR
475-2452
AUDREY STRANDTMAN
SECRETARY
475-4514

Mr. James M. Rose, Director
Governor's Division of Planning
Coordination
Sam Houston State Office Bldg.
Austin, Texas 78711

Re: U.S. Department of Agriculture,
Soil Conservation Service's
A: "Work Plan for Watershed
Protection and Flood Pre-
vention, Leona River Water-
shed, Uvalde County, Texas,"
January 1973.
B: Draft Environmental Statement,
USDA-SCS-ES-WS (ADM) -74-13-(D),
September 1973.

Dear Mr. Rose:

In reply to the request in the Memorandum of October 21, 1973, the staff of the Texas Water Rights Commission has reviewed the referenced documents involving the \$2,390,200 Watershed Protection and Flood Prevention Project in Uvalde County, Texas.

The staff notes the assurances contained in the Work Plan that appropriate comments from the field-level review of May 23, 1973, and the comments of agencies which reviewed the Review Draft Work Plan of March 1972, and the Preliminary Draft Environmental Statement thereon, have been fully considered in the preparation of the referenced Work Plan of January 1973.

The Commission staff assumes that it is understood by the project planners and sponsors that State of Texas Statutes require that a permit be obtained for a dam or reservoir which is to be used to retain water for recharge of groundwater. This statement is worthy of emphasis in view of the fact that the referenced Work

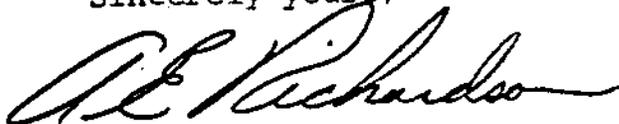
Mr. James M. Rose
November 20, 1973
Page 2

Plan indicates that an estimated annual average groundwater recharge of 2,200 acre-feet from four proposed reservoirs; and it appears now, as it did in our May 15, 1972, review, that these four reservoirs may need to be permitted for groundwater recharge purposes.

The staff believes that the Environmental Impact Statement conforms satisfactorily with the provisions of Section 102(2) (C) of the National Environmental Policy Act of 1969.

Based on the enhanced project and the assurances indicated above, the staff urges early undertaking of the five-year project in order to improve and protect the farms and other lands of Uvalde County, and the City of Uvalde, Texas.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "A. E. Richardson".

A. E. Richardson

AER-AJD:11



THE UNIVERSITY OF TEXAS AT AUSTIN
BUREAU OF ECONOMIC GEOLOGY
AUSTIN, TEXAS 78712

University Station, Box X
Phone 512-471-1534

November 28, 1973

General James M. Rose, Director
Division of Planning Coordination
Post Office Box 12428, Capitol Station
Austin, Texas 78711

Dear General Rose:

The staff of the Bureau of Economic Geology has reviewed the Draft Environmental Statement prepared by the Soil Conservation Service on the Leona River Watershed, Uvalde County. Our examination of the project indicates possible environmental impact beyond the content of the draft statement.

The greatest danger from flooding of the Leona River occurs downstream from Uvalde and within the city, proper. Urban runoff from streets, lawns, and rooftops is probably a major contributor to flood problems, but the implementation of the watershed project will not lessen the impact of this locally-derived peak flow. No data exist showing the amount of floodwater derived from the urban area. These data should be collected before such a project is implemented. It may be that this rural watershed project will not significantly decrease the magnitude or recurrence of flood events downstream from Uvalde.

Induced recharge in multiple-use catchment basins may be impeded by siltation, as an impermeable seal may be deposited on the reservoir bottoms. Also rapid siltation can markedly decrease the useful life of the catchment basins.

Thank you for the opportunity to review this impact statement.

Sincerely,

A handwritten signature in dark ink, appearing to read "W.L. Fisher".

W.L. FISHER
Director

WLF:dj



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EDMUND L. NICHOLS
Assistant Commissioner

November 30, 1973

General James M. Rose, Director
Division of Planning Coordination
Office of the Governor
P. O. Box 12428
Austin, Texas 78711

Dear General:

We have reviewed the Draft Environmental Impact Statement,
Leona River Watershed, Uvalde County, Texas.

It is evident that considerable thought has been given to the
preparation of this document. The project is well justified
and should be of considerable benefit to improved land use of
the area.

We appreciate the opportunity to review this statement.

Sincerely,

A handwritten signature in black ink, appearing to read "Edmund L. Nichols".

Edmund L. Nichols

ELN/lt

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J. DOUGLASS TOOLE
CHAIRMAN

FRANK LEWIS
VICE-CHAIRMAN

HARRY P. BURLEIGH

CLAYTON T. GARRISON

TEXAS WATER QUALITY BOARD



314 WEST 11TH STREET 78701
P.O. BOX 13246 CAPITOL STATION 78711
AUSTIN, TEXAS

JIM C. LANGDON

J. E. PEAVY, MD

HUGH C. YANTIS, JR.
EXECUTIVE DIRECTOR

PH. 475-2651
A.C. 512

November 30, 1973

Re: Draft Environmental Impact
Statement - Leona River
Watershed

Mr. James M. Rose, Director
Division of Planning Coordination
Office of the Governor
Box 12428, Capitol Station
Austin, Texas 78711

Dear Mr. Rose:

The staff of the Texas Water Quality Board has reviewed the draft environmental impact statement for the watershed project referenced above and have concluded that this project would not pose lasting environmental problems. We have noted that provisions have been made for protecting the area from soil erosion and from water and air pollution during construction.

Thank you for the opportunity to review this project. If we can be of further assistance, please let us know.

Very truly yours,

Emory G. Long, Director
Administrative Operations Division

GEJ:dh

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TEXAS INDUSTRIAL COMMISSION

ALL SAM HOUSTON STATE OFFICE BUILDING ☐ 512/475 4221 ☐ BUREAU



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John B. Turner, Jr., Houston

November 13, 1973

Mr. James M. Rose, Director
Governor's Office
Division of Planning Coordination
Sam Houston State Office Building
Austin, Texas

Dear Mr. Rose:

I have reviewed the Draft Environmental Impact Statement, Leona River Watershed, Uvalde County, Texas, for the Texas Industrial Commission and have no negative comments on this project.

If I may be of further assistance in this area, please do not hesitate to contact me.

Sincerely,

A handwritten signature in cursive script that reads "Frank J. Call".

Frank J. Call, Director
Research & Planning

FJC/gep

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TEXAS WATER DEVELOPMENT BOARD

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P. O. BOX 13087
CAPITOL STATION
AUSTIN, TEXAS 78711

November 30, 1973

HARRY P. BURLEIGH
EXECUTIVE DIRECTOR

AREA CODE 512
475-2201
301 WEST 2ND STREET

IN REPLY REFER TO
TWDBP-O

General James M. Rose, Director
Division of Planning Coordination
Office of the Governor
P.O. Box 12428, Capitol Station
Austin, Texas 78711

Dear General Rose:

Please refer to your memorandum dated October 31, 1973 transmitting for review and comment the United States Department of Agriculture's "Draft Environmental Impact Statement, Leona River Watershed, Uvalde County, Texas," and the Work Plan for the Leona River Project.

The Work Plan had been submitted to us for review at an earlier date, and our favorable comments had been returned to your office on May 12, 1972. Our comments at this time will, therefore, be confined to the Environmental Impact Statement.

Stated purposes of this project are to provide land treatment on about 39,180 acres; four single-purpose flood-water retarding structures; and channel work on 3.47 miles on stream channel. These measures are intended to enhance uses and habitability of flood plain areas, and to reduce sediment and flood plain erosion damages. It is estimated that groundwater recharge resulting from flood-water retardation will amount to about 2,200 acre feet annually.

Land required to construct the four flood-water retarding structures will be 1,630 acres, with an additional 300 acres for channel construction. Vegetative cover on 123 acres will be destroyed in emergency spillway construction, and cover will be altered on an additional 239 acres required for sediment pools. The report states that vegetative cover is not expected to be significantly altered on 1,268 acres of land included in the flood retarding basins.

General James M. Rose, Director
November 30, 1973
Page 2

The following comments are offered on specific items of environmental impact.

1. The Environmental Impact of the Proposed Action

Measures proposed in this Work Plan will provide land treatment of 39,180 acres of land, and the maintenance of measures already applied to 40,980 acres. Purposes of land treatment measures are: to reduce soil erosion; reduce water pollution caused by sediment; to conserve irrigation water; and to reduce runoff. Some direct benefits are expected to accrue to the City of Uvalde, where flooding will be reduced in the Leona River and tributaries passing through the City. It is anticipated that 2,200 acre feet of flood-water will be recharged annually to groundwater formations.

Adverse environmental impacts include the alterations in use of 2,169 acres of land required for construction and flood easements. We note that the average area inundated annually without the project is 1,709 acres. Based on review of the Draft Environmental Statement and the Work Plan for Flood Prevention in the Leona River Watershed, Uvalde County, Texas, it is our opinion that the estimated 2,200 acre feet of annual recharge to groundwater aquifers is very difficult to substantiate. Much would depend upon the flood-water retarding structure siting with respect to faulting and geology, and also many factors not thoroughly understood at this time. There also could be questions regarding the total benefits to be derived from reducing runoff. Unless water that is detained by land treatment measures is used, in place, there could be an economic loss to the watershed by depriving downstream users of needed water supplies.

2. Any Adverse Environmental Effects Which Cannot be Avoided Should the Proposed be Implemented

Temporary adverse effects will include dust during construction. Until the "as constructed" facilities are stabilized under normal conditions, there will be an increase in erosion and the production of silt. There will be temporary or permanent clearing of 635 acres of land, and interrupted use of 1,268 acres within the flood pools of the 4 retarding reservoirs. In total, 1,930 acres of land will have only restricted use after construction is completed. Five families must be relocated.

3. Alternatives to Proposed Action

Five alternative courses to the plan selected were considered; one alternate being to forego any action. The other alternatives were either more costly than the plan selected; required relocating more families; or failed to provide both flood protection and erosion control.

General James M. Rose, Director
November 30, 1973
Page 3

4. The Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The Environmental Statement summarizes the plan objectives as follows:

"The primary objectives of the project are to provide at least adequate conservation treatment, improvements, and productivity to allow a decent standard of living for the present; and preserve and improve the land, water and other environmental resources for future generations."

It thus appears that the short-term and long-term uses of the environment are expected to serve man's needs throughout the life of the project.

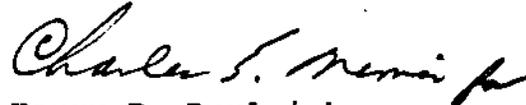
5. Irreversible and Irretrievable Commitments of Resources

In addition to the total commitment of labor and material, there is a term commitment of 1,930 acres of land now used for agricultural purposes. Most of the land could later be reclaimed and restored to its original or other useful purposes should such uses become more desirable than project purposes.

The Water Development Board offers no objections to the proposed Work Plan as set forth in the Draft Environmental Impact Statement, Leona River Watershed, Uvalde County, Texas. As stated previously, however, the projected quantity of groundwater recharge and resulting benefits are considered to be highly speculative. Also, the trade-off involving use of 1,930 acres of agricultural land for flood-control structures to protect 1,709 acres of urban or near-urban lands against flooding cannot be evaluated in this review.

The opportunity to comment on this report is appreciated.

Sincerely,


Harry P. Burleigh

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COMMISSION

REAGAN HOUSTON, CHAIRMAN
DEWITT C. GREER
CHARLES E. SIMONS

TEXAS HIGHWAY DEPARTMENT
11TH AND BRAZOS
AUSTIN, TEXAS 78701

STATE HIGHWAY ENGINEER
B. L. DEBERRY

November 28, 1973

IN REPLY REFER TO
FILE NO. D-5

Uvalde County, Texas
Draft Environmental Statement for Leona River
Watershed

Mr. James M. Rose
Division of Planning Coordination
Office of the Governor
Room 207, Sam Houston State
Office Building
Austin, Texas 78701

Dear Mr. Rose:

Please refer to your letter of October 31, 1973 transmitting, for our review and comments, one copy of the above-cited Draft Environmental Impact Statement.

We have reviewed the subject statement and offer the following comments. On page 17 it is stated that numerous private and public crossings will be made impassable by release flows from retarding structures. It further states that public crossings will be improved to make them passable during prolonged release flows. We recommend that a positive statement be made that release flows will not make existing public crossings, including State Highways, impassable or that funds will be provided for improvements to make them passable.

In connection with page 16 concerning concrete riprap agreed on between the Soil Conservation Service and the Texas Highway Department, the cost of work to be performed by the Department should show an increase in estimated cost of approximately 30% to more nearly reflect current costs.

Mr. James M. Rose

-2-

November 28, 1973

We appreciate the opportunity to review and comment on this material.

Sincerely yours

B. L. DeBerry
State Highway Engineer

BY: *Marcus L. Yancey Jr.*

Marcus L. Yancey, Jr.
Asst. State Highway Engineer

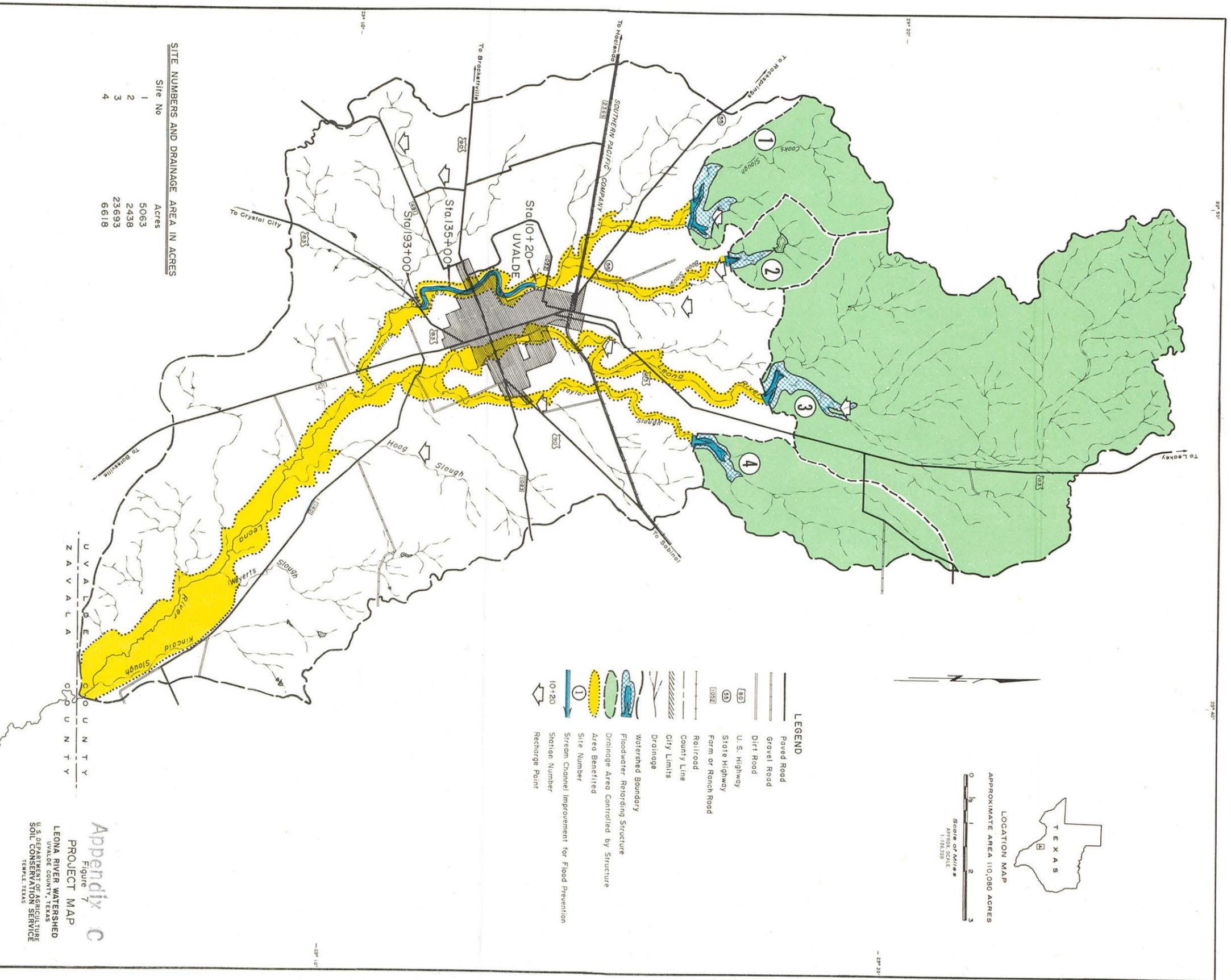


LOCATION MAP
 APPROXIMATE AREA 110,080 ACRES
 Scale of Miles 0 1 2 3
 APPROX SCALE 1:150,000

- LEGEND**
- Paved Road
 - Gravel Road
 - Dirt Road
 - U.S. Highway
 - State Highway
 - Farm or Ranch Road
 - Railroad
 - County Line
 - City Limits
 - Drainage
 - Watershed Boundary
 - Floodwater Retarding Structure
 - Drainage Area Controlled by Structure
 - Area Benefitted
 - Site Number
 - Stream Channel Improvement for Flood Prevention
 - Station Number
 - Recharge Point

SITE NUMBERS AND DRAINAGE AREA IN ACRES

Site No	Acres
1	5063
2	2438
3	23693
4	6618



Appendix C
 Figure 7
 PROJECT MAP
 LEONA RIVER WATERSHED
 UVALDE COUNTY, TEXAS
 U.S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 TEMPLE, TEXAS