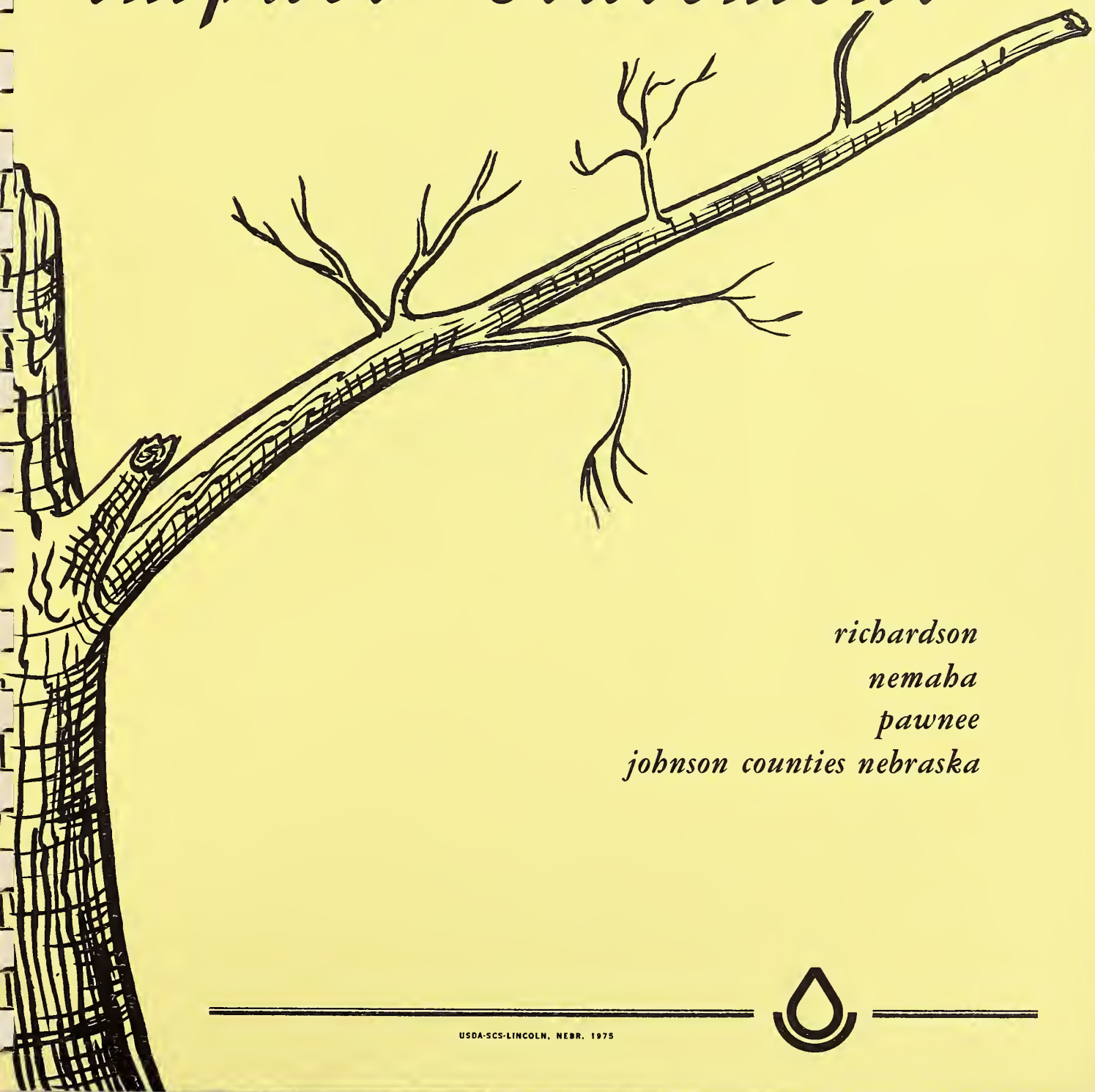
long branch environmental impact statement



richardson
nemaha
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johnson counties nebraska

USDA-SCS-LINCOLN, NEBR. 1975

USDA-SCS-EIS-WS-(ADM)-76-2-F-NE

F I N A L E N V I R O N M E N T A L I M P A C T S T A T E M E N T

LONG BRANCH WATERSHED

Nemaha, Pawnee, Richardson, and Johnson Counties, Nebraska

W. J. Parker, State Conservationist
Soil Conservation Service

Sponsoring Local Organization

Nemaha Natural Resources District
Box 717
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April 1976

PREPARED BY

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service

Lincoln, Nebraska

USDA ENVIRONMENTAL IMPACT STATEMENT

LONG BRANCH WATERSHED PROJECT

Nemaha, Pawnee, Richardson, and Johnson Counties, Nebraska

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:

The project purposes are watershed protection, flood prevention (including grade stabilization), and recreation development. The proposed structural works consist of land treatment measures, 12 floodwater retarding structures, 12 grade stabilization structures, and one multiple-purpose floodwater retarding recreation structure with recreation facilities. All structural measures and beneficiaries are located in Nemaha, Pawnee, Richardson, and Johnson Counties, Nebraska. This project is to be implemented under authority of the Watershed Protection and Flood Prevention Act (P.L.-566, 83d Congress, 68 Stat. 666), as amended.

V Summary of Environmental Impacts:

Approximately 25,700 acres of land would receive benefits from the structural measures to be constructed in Long Branch Watershed. This includes 5,670 acres in the watershed and about 20,000 acres in downstream areas of the Lower Big Nemaha River and the South Fork Big Nemaha River. About 7,800 acres of dry cropland, 3,070 acres of pastureland, and about 1,590 acres of forestland will be treated during the project installation period with one or more land treatment measures. These measures will benefit all farms in the watershed by improving the overall visual environment of the watershed and by reducing the soil loss from sheet and rill erosion to the maximum allowable of 5.0 tons/acre/year or less.

The land treatment program in combination with the floodwater retarding and grade stabilization structural system will have a significant affect in reducing present damages within the watershed. Sediment deliveries from all erosion sources will be reduced to Long Branch channels by 51 percent or 107,600 tons/year, to the Nemaha River by 51 percent or 69,900 tons/year, and from critical sediment source areas by 78 percent or 27,000 tons/year. Reduced sediment yields to the channels will reduce turbidity and nutrient loads. The overall quality of water in the stream system should be improved with a resultant overall improvement of the fish and aquatic life ecosystem.

The structural system will affect a reduction in present flood damages to 2,570 acres in the 100-year flood plain resulting in a 65 percent reduction to crop and pasture and other agriculture and a 67 percent reduction to road and bridges, etc.. Sediment and scour damages will be reduced by 84 percent on 187 acres of flood plain and 3,100 acres or 77 percent of the critical sediment source areas will be treated due to installation of grade stabilization structures.

Installation of the structural system will create about 426 surface acres of water that can provide fisheries and resting and feeding areas for waterfowl. The recreational deficiency of the Beatrice Socioeconomic area will be reduced by providing access to 460 acres of water-land based recreational facilities. Also, 69 acres of prime woody habitat will be created to improve the wildlife and aesthetic quality of the area.

Installation of the structural measures and their resultant permanent water pools results in various adverse effects. Agricultural production will be lost on approximately 377 acres due to installation of the structural measures and their resulting permanent pools. This includes about 121 acres of woody pasture, 90 acres of open pasture, and 166 acres of cropland. An additional 245 acres will no longer furnish agricultural production as a result of being purchased for development of the multipurpose site 21. This 245 acres includes 24 acres of wooded pasture, 127 acres of open pasture, and 94 acres of cropland.

Approximately 20.5 miles of ephemeral, 1.3 miles of intermittent, and 2.3 miles of perennial stream channel will be permanently inundated.

An additional 97 acres of woodland will be lost during the project life and approximately 219 acres of existing wildlife habitat will be eliminated by installation of structural measures.

Temporary or occasional inundation by flood pools will reduce agricultural production on about 106 acres of woody pasture, 95 acres of open pasture, and 246 acres of cropland; and about 1.1 miles of perennial and 13 miles of ephemeral stream channels will be subject to periodic inundation.

Construction activities will reduce agricultural production for one season on 15 acres and the relocation of one farm family will create a temporary disruption in their normal routine.

Project installation will create downstream effects to the Big Nemaha River in that reduced sediment yields and flood flows will reduce flood damages to about 20,000 acres by 16 percent and also improve the quality of water entering the Big Nemaha River system.

VI List of Alternatives Considered:

A. Accelerated land treatment alone.

B. Accelerated land treatment supplemented by nonstructural measures - conversion of flood plain cropland to noncrop uses.

C. Elimination of the project recreational development and the accelerated land treatment program.

D. No project.

VII Agencies from which comments have been received are as follows:

Advisory Council on Historic Preservation
U. S. Department of the Army
U. S. Department of Commerce
U. S. Department of Health, Education, and Welfare
U. S. Department of the Interior
U. S. Department of Transportation
U. S. Environmental Protection Agency
U. S. Forest Service
Office of the Governor of Nebraska
Nebraska Natural Resources Commission
Nebraska Office of Planning and Programming (State Clearinghouse)

VIII Draft environmental impact statement transmitted to CEQ on December 1, 1975.

USDA SOIL CONSERVATION SERVICE

DRAFT ENVIRONMENTAL IMPACT STATEMENT 1/

for

Long Branch Watershed

Nemaha, Pawnee, Richardson, and Johnson Counties, Nebraska

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

SPONSORING LOCAL ORGANIZATION

Nemaha Natural Resources District

PROJECT PURPOSES

The primary goals of the Sponsoring Local Organization and the Service in developing this project plan are to help meet man's requirements for goods and services while the natural environment is maintained in a quality condition.

In order to meet these goals, the Sponsoring Local Organization believes the following goals must be accomplished:

WATERSHED PROTECTION (CONSERVATION LAND TREATMENT)

Apply needed land conservation practices on at least 75 percent of the land in the watershed by the end of the project installation period to reduce soil losses to or below the maximum allowable soil loss of 5 tons/acre/year, the rate at which fertility can be maintained by offsetting soil losses with practices that increase fertility. Fifty percent of planned land treatment measures have presently been applied and seventy-four percent or 199 basic conservation plans have been written for cooperators in the watershed.

Another goal of the Sponsoring Local Organization is to realize the maximum returns consistent with forest sites capabilities. To meet this goal fire

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1/ All information and data, except as otherwise footnoted, was collected during watershed planning investigations by the U. S. Department of Agriculture - Soil Conservation Service and Forest Service.

protection, grazing control, forestation, and improved forestry practices measures are needed.

Studies of past achievements of cooperators in the watershed indicate that proposed land treatment goals can be accomplished during the 8-year project installation period.

FLOOD PREVENTION

The Sponsoring Local Organization believes it will be necessary to approximate the following damage reductions within the various flood plain components to achieve their desired level of protection.

1. Cropland 1/ - Cropland areas of significance are located in all reaches. The Sponsoring Local Organization's goal is to achieve a 65 percent reduction in average annual damages in these areas.

2. Pasture 1/ - Pastureland totals about 12 percent of the flood plain area. The Sponsoring Local Organization felt that pasture damages were moderate in nature and extent and a specific goal for damage reduction was not set.

3. Sediment and Scour 1/ - The Sponsoring Local Organization's goal is to achieve a level of protection that will prevent the gradual acceleration of present sediment and scour damages and reduce the present damages by about 65 percent.

GRADE STABILIZATION

Twenty critical gully erosion areas affecting the installation of land treatment measures on about 4,000 acres exist within the watershed.

A primary goal of the sponsors is to achieve structural control on a sufficient number of these areas to allow for land treatment measures to be installed and maintained on at least 75 percent of the affected acres. A 60 percent reduction in sediment yields from these areas is also a part of the overall grade stabilization goal.

RECREATION

The Sponsoring Local Organization has established the following goals for recreation development.

1. Create a lake with a surface area of approximately 159 acres near the city of Humboldt.

2. Install facilities near the city of Humboldt to provide about 25,200 recreation visits annually. Goals for a Sunday peak use day, without turnover, will approximate: boating, 105; picnicking, 240; fishing, 90; and nature walks, 25. The 125 parking

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1/ Refer to page 28 for acres and damages and to the project map (Appendix B) for locations of areas.

spaces will be adequate to provide for a peak use design capacity of about 480 people. The estimated recreational season is 70 weekdays and 28 weekend days.

PLANNED PROJECT

LAND TREATMENT MEASURES 1/

Cropland treatment will require a combination of one or more of the following: Conservation Cropping System, Contour Farming, Terraces, Waterways, Erosion Control Structures, Proper Grazing, Deferred Grazing, Pasture Seeding, Pasture Management, Livestock Ponds, Critical Area Plantings, and Farmstead Windbreaks. Alternative combinations of land treatment measures are provided for in the SCS Field Office Technical Guides. Land capability class I might require only a conservation cropping system. Land capability classes II, III, and IV will require, in addition to this, contour farming, grassed waterways, and terraces. Under certain field conditions field border plantings, diversions, and grade stabilization structures may be required for adequate land treatment. Alternative uses for land capability classes I through IV may include a change to less intensive use such as pastureland.

Pastureland treatment will include pasture management. In addition, such practices as farm ponds, grassed waterways, and terraces may be installed.

Other land treatment will include critical area planting and wildlife habitat development.

Woodlands contribute most to environmental quality and produce satisfactory economic returns when tree stands are protected, fully stocked, and vigorous. To attain these objectives the following land treatment measures are included: grazing control, 1,300 acres; continued fire protection, forestation, 40 acres; and improved forestry practices, 250 acres. Technical assistance will continue to be provided to rural fire districts through the regular fire control technical assistance program. Accelerated technical forestry assistance will be provided to landowners by the Service and by the Nebraska State and Extension Forester through cooperative agreement with the U. S. Forest Service. 2/

Approximately 60 percent of the soil surveys have been completed in this watershed. The remaining surveys will require 1,000 man-hours of technical assistance.

At present, 50 percent of the required land treatment has been applied and a minimum of 75 percent of the needed land treatment will have been installed within Long Branch Watershed prior to or concurrent with construction of structural measures. It will require 11,400 man-hours of technical assistance to install these additional land treatment measures. The remaining area will receive partial land treatment or management practices.

1/ For detailed explanation of expected land treatment measures see Appendix G.

2/ Forestry Work Plan by U. S. Forest Service in cooperation with and through the Nebraska State and Extension Forester.

NONSTRUCTURAL MEASURES

After project installation Humboldt will be protected from the 100-year frequency flood. The Humboldt City Park and a small acreage to the west will still receive flood damage from the 100-year frequency flood. As soon as Nebraska zoning laws are in effect (they are presently in the implementation stage) any further residential or commercial development in urban or rural areas within the 100-year flood plain will be prevented.

STRUCTURAL MEASURES

A system of 12 floodwater retarding structures, 1 multiple-purpose floodwater retarding recreation structure with recreation facilities, and 12 grade stabilization structures will be installed at locations indicated on the project map (Appendix B). The system of floodwater retarding structures will control runoff from 31.26 square miles which is approximately 43 percent of the total drainage area of the watershed.

Those structures for which data is shown in Appendix H will have an aggregate storage capacity of 5,958 acre-feet for floodwater and 1,636 acre-feet for sediment. In addition, these grade stabilization structures shown on Appendix I will store a total of 359 acre-feet of sediment.

The emergency spillway for each structure will be excavated in earth abutments and will be vegetated. Material removed in emergency spillway excavation plus borrow from conservation pools and adjacent areas will provide adequate embankment material for all structures.

All structures will have single-stage principal spillways except Site 61 which will have a two-stage inlet structure. The principal spillway components will be constructed of reinforced concrete for all those structures listed in Appendix H. The principal spillway components for those structures shown in Appendix I will be constructed of corrugated metal with appropriate cathodic protection devices. All structures will initially retain water at their riser crests and all have been designed to contain a 50-year accumulation of sediment. The percent chance use of the emergency spillways varies among the several sites in accordance with the applicable hydrologic criteria for the structure class and purpose. See Appendices H and I for individual structure data.

All structures and their emergency spillways plus any other areas where the existing cover is disturbed during construction will be vegetated to provide erosion control and wildlife habitat enhancement. Temporary erosion control measures will be installed during construction to eliminate downstream sediment pollution. A minimum of 69 acres of trees, shrubs, and similar plantings will be established in the watershed for wildlife habitat mitigation and aesthetic values (refer to Mitigation Summary Table on page 9).

Borrow areas resulting from construction of the dam shall be located where they will be permanently inundated, if possible. Borrow areas located in the normal summer fluctuation zone or outside the reservoir basin shall be made self-draining.

The installation of site 70 will require the closure of the north - south road immediately upstream from the site. About 600 feet of the east - west road above site 7 will be built up a maximum of 5 feet. At site 21, the east - west road on the north side of section 31 will be closed. Also, the north - south road on the east side of section 31 will be officially closed. This road is not in use presently, since there is no bridge over Kirkham Creek. The intersection at the southwest corner of section 29 will be rounded slightly so that roads to the east and north of the intersection can remain open. The installation of site 21 will require relocation of a rural water district pipeline. Some minor changes to utilities may be required at several locations. After relocation the structure will not affect the pipeline. The two natural gas pipelines (6" and 16") which cross the upstream end of the flood pool at site 2 will be encased in concrete to prevent any possible leakage or floatation during periods of inundation. The proposed alteration will involve about 300 feet of each line or a total of 600 feet of concrete encasement.

Site 21 will be a multiple-purpose floodwater retarding and recreation structure. The surface area of the proposed recreation pool will be 159 acres. The initial storage available at the riser crest is 1,686 acre-feet. The expected accumulation of submerged sediment over the evaluation period is 211 acre-feet leaving a total of 1,475 acre-feet of recreation water available. One farmstead is located within the flood pool and purchase boundary of site 21 and relocation will be necessary.

The recreation facilities to be constructed adjacent to site 21 will be located in six areas as shown in Appendix C. Area I is intended to be primarily a picnic area with a fishing dock. Area II will be a day use area which will be used for picnics and field sports, and Area III is planned as a boat launch. Areas IV and V will be for fishing access, and a nature trail will be constructed in Area VI. All sanitary facilities will be of masonry construction and along with the fishing dock will be designed for access and use by the physically handicapped. It is expected that drinking water for all such developments will be obtained from a rural water district pipeline.

The land to be used for installation of site 21 and adjacent recreation facilities will be purchased in fee title and will total approximately 460 acres. An additional 4.5 acres of flowage easement will be required. The area of the recreation pool is about 159 acres and the area of the retarding pool is about 265 acres. The remaining 195 acres will be available for the facilities and additional public use.

A study of the planned or incidental recreation potential and the need for public access was made for each site in the watershed.

The need for public recreation areas within the watershed was recognized by the Sponsoring Local Organization. Site 21 was selected for recreational development. The structure was increased in size to provide a recreation pool of 159 surface acres. The design capacity of 480 people daily or 25,200 recreation visits annually will significantly alleviate projected recreational deficiencies for the immediate area until the year 2000.

Structures P-8, 1-1, N-1, N-5, N-7, R-3, R-11, R-15, P-4A, P-4B, 7, and 42 were determined as not having significant recreational potential. These structures will have surface areas varying from 1.8 to 9.0 acres. It was determined that because of small surface areas and shallow water levels these structures would offer little in the way of public fishing or recreational opportunities. Based on existing landowner response, sponsors have agreed that public access will not be furnished. It is understood, however, that should any of these structures be opened for public access, installation of sanitary facilities must be provided to comply with Nebraska health laws.

The remaining structures can provide incidental recreational benefits such as boating and fishing. The sponsors have agreed to prohibit or discourage such use since they are providing site 21 for public use and do not have adequate funds to install the needed sanitary facilities at any additional site areas. Planned or incidental recreational benefits were not used for economic justification of any structures other than site 21.

During construction of this project, contractors will be required to follow strict guidelines pertaining to air and water pollution. Air pollution guidelines are presently being developed in Nebraska that contractors will be required to adhere to. Guidelines for water pollution reduction during construction include construction of principal spillway prior to removing vegetation in other areas, selective borrow pit openings, and construction of diversions above emergency spillway areas.

The archeological, historical, and architectural report states that the project measures will not affect any archeological sites. No historic sites, historic buildings, or buildings of architectural significance will be affected by construction of or inundation by project measures. 1/

Consultation with the State Historic Preservation Officer and the latest available monthly supplement to the National Register of Historic Places indicates that no National Register property will be affected by the proposed structural measures.

The National Park Service and the Nebraska State Historic Preservation Officer will be notified if any previously unidentified evidence of cultural values are discovered during detailed investigations of construction and that the procedures in (Section 106, P.L. 89-665, 16 USC 470 (f)) of the National Historic and Executive Order 11593 (Section 1 (3)), will be adhered to.

A field investigation was made of all proposed structural measures in December 1972. The Soil Conservation Service planning personnel and biologists with the U. S. Fish and Wildlife Service and the Nebraska Game and Parks Commission were active participants in these investigations. Each structure was reviewed for the quality of habitat expected to be destroyed by inundation and construction of the structural measures. Habitat conditions were evaluated in accordance with the joint Fish and Wildlife Service.

1/ Prehistoric and Historic Resources Report, November 1974, Department of Anthropology, University of Nebraska-Lincoln.

and Soil Conservation Service habitat evaluation criteria. The table on page 9 lists by structure the acreage required for intensive habitat management to mitigate habitat losses. A total of 69 acres of wildlife plantings will be established and fenced to exclude livestock use to mitigate the loss of wildlife habitat by project construction. This investigation will provide for more effective integration of a fish and wildlife conservation program in compliance with the Fish and Wildlife Coordination Act, P.L. 85-624.

Geologic investigations, surface and/or subsurface, during the planning stages were conducted of the dam sites, borrow, conservation pool, and flood pool areas. These investigations indicated that the project measures would have no adverse effect on known mineral resources or mineral operations, nor would it significantly hamper the future exploration or production of petroleum.

OPERATION AND MAINTENANCE

Land treatment measures will be operated and maintained by landowners and operators. Technical assistance will be furnished by the Service in applying maintenance to land treatment measures.

The Nemaha Natural Resources District will operate and maintain all structural measures.

Representatives of the Service and the Sponsoring Local Organization will make a joint inspection annually or after unusually severe storms for three years following installation of each structural measure. Inspection after the third year will be made annually by the Sponsoring Local Organization and reports will be made by them with a copy to the Service representative. Reports prepared will state maintenance and repairs needed and an agreed date when repairs will be completed.

Maintenance of the wildlife habitat plantings will include controlling weeds, providing for livestock exclusion, fire protection, etc..

The table on the next page lists the mitigation measures by structure site.

Maintenance of all structures may include major repairs such as repair or replacement of principal spillways, replacing trash racks, and repairing or replacing concrete materials. Other items include clearing the trash rack, cleaning debris from the face of the dam and shoreline, repairing eroded areas, controlling rodents, mowing, repairing fences, and the periodic control of mosquitos by mechanical, chemical, or biological measures if conditions develop in depressions or borrow areas, affected by the maximum pool levels of the reservoir, that are conducive to mosquito production.

Operation and maintenance of the multiple-purpose structure will also include all cost for services required to operate the recreational facilities which might include such items as collection of use revenues, caretaker,

LONG BRANCH WATERSHED, NEBRASKA

Mitigation Summary 1/

Structure No.	Site 2/ Acres	Woods Acres	Woods Mitigation Factor	Woods Mitigation Acres	Woody Pasture Acres	Woody Pasture Mitigation Factor	Woody Pasture Mitigation Acres	Total Mitigation Acres
2	29.2	2.0	.3	.60	10.0	.3	3.00	3.60
3	16.2	6.7	.3	2.00	-	-	-	2.00
4	18.2	9.7	.3	2.90	-	-	-	2.90
7	19.2	5.0	.3	1.50	10.0	.1	1.00	2.50
21	181.0	10.0	.7	7.00	38.0	.3	11.40	18.40
41	30.0	7.0	.6	4.20	2.0	.5	1.00	5.20
42	13.0	7.7	.2	1.50	3.5	.1	.35	1.85
61	16.5	-	-	-	12.0	.2	2.40	2.40
70	19.2	9.0	.4	3.60	4.1	.1	.40	4.00
71	28.3	9.4	.6	5.60	7.2	.4	2.90	8.50
73	20.2	13.0	.3	3.90	-	-	-	3.90
77	14.1	3.5	.3	1.10	3.4	.3	1.00	2.10
91	16.1	-	-	-	5.7	.3	1.70	1.70
1-1	4.1	1.1	.5	.60	-	-	-	.60
N-1	8.5	-	-	-	2.0	.1	.20	.20
N-5	11.0	-	-	-	7.8	.1	.78	.78
N-6	16.0	3.5	.3	1.10	2.5	.2	.50	1.60
N-7	6.6	-	-	-	-	-	-	-
P-3	13.6	4.3	.3	1.30	3.0	.2	.60	1.90
P-4-A	12.2	-	-	-	6.2	.1	.62	.62
P-4-B	10.2	-	-	-	-	-	-	-
P-8	9.6	1.0	.5	.50	-	-	-	.50
R-3	13.0	0.5	.4	.20	2.0	.2	.40	.60
R-11	9.6	4.1	.7	2.90	-	-	-	2.90
R-15	6.7	-	-	-	2.0	.3	.60	.60
TOTAL	542.3	97.5		40.50	121.4		28.85	69.35

1/ Developed from preliminary data furnished by Bureau of Sports Fisheries and Wildlife on December 7, 1972, after a joint field review with Soil Conservation Service and Nebraska Game and Parks Commission personnel on November 27 and 28, 1972.

2/ Dam, spillway, and sediment pool.

concessions, replacement of facilities, waste disposal, etc.. This cost will be borne by the Nemaha Natural Resources District. The installation and operation and maintenance of the planned features will meet the requirements of the state and local health agencies.

An establishment period, to allow time for latent defects to become apparent shall extend three years from the date the structural works of improvement are accepted from the contractor as being completed. The establishment period for vegetative work associated with a structural measure is to terminate when any of the following conditions are met:

a. Adequate vegetative cover is obtained.

b. Two growing seasons have elapsed after the initial installation of vegetative work.

c. The establishment period for the associated structural measure has terminated.

Operation and maintenance responsibility rests with the sponsor during the establishment period as it does during the remainder of the project life, except that the Service will consider sharing in the cost of repairs (on a case-by-case basis) which become necessary as a result of latent defects. Cost sharing will be at the rate used in project installation.

Funds, materials, and labor for carrying out operation and maintenance work will be furnished by the Nemaha Natural Resources District. Average annual operation and maintenance costs are estimated to be $11,240 for all structures and recreation facilities. Operation, maintenance, and replacement of recreation facilities is estimated at $6,300 annually.

Should it become necessary to collect a use fee, such fees will not exceed the amount needed to defray operation and maintenance expense and pay off the sponsor's original investment.

An agreement between the Service and the Sponsoring Local Organization specifying detailed operational requirements for all structural measures will be developed and signed concurrently with the signing of the first project agreement. The operation and maintenance agreement will include specific provisions for retention and disposal of property acquired or improved with P.L.-566 financial assistance.

PROJECT COSTS

Cost of installing the project is $2,902,020. The Federal Government; under the authority of the Watershed Protection and Flood Prevention Act, Public Law 566, as amended; will provide $2,047,970. Local interests, using other authorities and private funds, will provide $854,050. The installation cost is divided $445,100 for land treatment and $2,456,920 for structural measures.

Land treatment costs will be borne by other funds, $423,100 and P.L.-566, $22,000. Construction cost is estimated at $1,631,480 of which $1,517,730 will be borne by P.L.-566 funds and $113,750 by other funds.

ENVIRONMENTAL SETTING

PHYSICAL RESOURCES

Long Branch Watershed is located in southeastern Nebraska in the counties of Richardson, Nemaha, Johnson, and Pawnee. The city of Humboldt is located at the confluence of Long Branch Creek and the North Fork of the Big Nemaha River.

Long Branch Watershed is comprised of four hydrologic units identified as follows: Long Branch Creek, Kirkham Creek, Round Grove Creek, and a small area east of Humboldt containing drains that outlet directly into the Nemaha River. Long Branch Creek drainage originates approximately 9 miles west and 14 miles north of Humboldt and flows in a southeasterly direction outletting into the North Fork of the Big Nemaha River in the southwestern city limits of Humboldt. Kirkham Creek drainage begins approximately 6 miles west and 7 miles north of Humboldt and then flows generally parallel and adjacent to Long Branch Creek to its junction with Long Branch approximately 2 miles northwest of Humboldt. Round Grove Creek drainage begins 5 miles west and 3 miles north of Humboldt and flows southeasterly outletting directly into the North Fork of the Big Nemaha River. The four small drains east of Humboldt that outlet directly into the Nemaha River have southerly flow and a maximum length of about 3 miles.

Long Branch Watershed is approximately 5 miles in width and 15 miles in length. It contains 46,905 acres (73.3 square miles) including 20,672 acres in Richardson County, 12,044 acres in Nemaha County, 6,963 acres in Johnson County, and 7,226 acres in Pawnee County. Topography on the bottomland varies from nearly level to gently sloping. Upland topography varies from gently sloping ridge crest to moderately steep valley sides.

Surface elevations range from approximately 963 feet mean sea level at the mouth of the watershed to 1,283 feet mean sea level on the divide. Total relief is 320 feet. Average channel grade in the watershed is 9.5 feet per mile.

The National Oceanic and Atmospheric Administration (NOAA) National Weather Service provides flood forecasting services for major river basins. This system involves predictions of anticipated stages at a particular gage or gages in the basin. These forecasts are based on observed precipitation and stages at upstream points and anticipated weather conditions. The flood forecast is tranmitted to City officials, newspapers, and radio and television stations in the basin. These media disseminate the information to residents of the flood plain in the form of a flood warning. This timely forewarning permits protective measures to be undertaken by industrial plants, public utilities, municipal officials, and individuals with property in the lowlands. Services available are of the following types:

1. Flash Flood: The responsible Weather Service Forecast Office supplies weather forecasts twice daily for the State. In addition to the routine forecasts, special forecasts of severe storms and general

flash flood watches for small streams are issued as required. WSR-57 Weather Radar installations have capability for immediate detection and evaluation of rainfall intensity, location, and storm movement. Information is promptly relayed by teletype circuits and telephone to news media and community officials and law enforcement agencies. The Weather Service Office issues Flash Flood Warnings as required for small streams in its area of responsibility.

2. Major Floods: River stage forecasts are based on radar coverage, reports from river and rainfall reporting stations and telemetry in or near the basin. The River Forecast Centers are staffed with professional hydrologists responsible for the preparation of river forecasts based on water equivalent of snow cover, rainfall-runoff relations, streamflow routing, and a working knowledge of anticipated weather conditions. The lead time between distribution of the forecasts and the flood crest may be short; however, lead time normally ranges from 12 hours for rainfall and up to several weeks for snowmelt. Specific crest forecasts are issued as required. River District Offices are responsible for the interpretation and distribution of flood forecasts and the operation of the hydrologic reporting substation network in its area of responsibility.

3. Hydroclimatic Data: Most of the data from the network is published. These records provide the basis for forecasts as well as for the planning and design of protective works and their operation during floods. River and flood forecasting is fundamental in the design and essential in the operation of a levee or reservoir system.

Most of the precipitation is from high intensity short duration thunderstorms. The expected magnitudes and frequencies of the rains that could occur during a 24-hour period are as follows: 100-year - 7.2 inches; 50-year - 6.5 inches; 25-year - 5.75 inches; 10-year - 3.25 inches; and 1-year - 2.65 inches.1/

The maximum recorded 24-hour precipitation in the immediate vicinity is 8.72 inches on July 14, 1907, at Table Rock, Nebraska located 7 miles west of Humboldt. 2/

Rainfall often causes flooding problems along with gully and sheet erosion.

Average annual precipitation for Long Branch Watershed is 34 inches with approximately 70 percent of the precipitation occurring during the growing season. The average length of the growing season is 170 days from April 26 through October 12. The average annual temperature is 53.9 degrees. The monthly average temperature varies from 26.6 degrees in January to 79.5 degrees in July. 3/

1/ Weather Bureau Technical Paper 40.
2/ Weather Bureau Technical Paper 16.
3/ For further information on climate and character of damaging storms refer to "Climates of the States - Nebraska", Climatological Data - Nebraska, and Weather Bureau Technical Papers 40 and 57.

The watershed is situated within the Nebraska and Kansas Loess-Drift Land Resource Area and Underground Water Area 11 - Southeast Nebraska Glacial Drift Region. 1/ The features of this area are similar to those in northeast Nebraska. The principal stream valleys are underlain by thin to moderately thick deposits of Pleistocene sand and gravel, and bedrock valleys beneath the glacial till are filled either with Pleistocene sand and gravel or finer grained fluvial sediments. Bedrock of Cretaceous, Permian, and Pennsylvanian age is exposed in many places, especially in ravines and along valley sides. The Dakota Sandstone of Cretaceous age is the uppermost bedrock throughout a broad band in the northwestern and western part of the region and is available as a bedrock source of water when permeable zones are saturated. Pennsylvanian and Permian limestones and shales form the uppermost bedrock in the remainder of the region and do not provide a satisfactory source of groundwater because of low permeability or high mineralization.

The principal use of water in the watershed is for domestic use, both rural and urban. The domestic rural source is usually inadequate; however, the new rural water system presently under development will provide an adequate supply.

The upland areas within the watershed are mantled with a varying thickness of Peoria and Loveland Loess. Below the loess is a weathered phase of the Kansan Drift. The Kansan drift proper is below the weathered phase and consists of a heterogeneous mass of clay, silt, sand, gravel, and boulders. Below the Kansan drift lies Aftonian material consisting of stratified sand and gravel with a few boulders. This does not occur as a continuous stratum but as sand or gravel trains. This material outcrops west and northwest of Humboldt.

The lowest drift (Nebraskan) does not outcrop nor was it encountered during subsurface investigations in the watershed.

The loess and drift beds lie on an uneven surface of bedrock belonging to the Pennsylvanian division of the Carboniferous System. The upper layers of bedrock consist of well defined beds of shale and limestone, the shale grading into sandstone locally. The mantle of rock is from 20 to 100 feet deep with only local outcrops.

Flood plain unconsolidated deposits are represented by fluviatile deposits of Peoria, Loveland, Grafton, and Sappa with the Grand Island sand and gravel member, clays, silts, and sands. Recent alluvial deposits mantle the flood plain to moderate depths.

The soils in the Long Branch Watershed are developed in three basic soil associations. These soil associations and their principal characteristics are as follows:

1/ Underground Water Area Map - Compiled by E. C. Reed. Published by the Conservation and Survey Division, University of Nebraska - Lincoln, January 1, 1969.

Kennebec-Judson-Wabash association 1/ - Deep, nearly level to gently sloping, silty and clayey soils formed in alluvium on bottom lands and colluvium on foot slopes.

This soil association consists of foot slopes, bottom lands, and stream terraces in the valleys of the Big Nemaha River and adjoining streams. Slopes range from nearly level to gently sloping. This association represents the lowest relative elevations of the landscape. Some areas on bottom lands are flooded for short periods after heavy rains. Kennebec, Judson, and Wabash soils are dominant. Kennebec soils are deep and moderately well drained. They formed in silty alluvium near the rivers and creeks. Kennebec soils have a black silt loam surface layer and very dark grayish brown silt loam underlying material.

Judson soils are deep, well drained, and on foot slopes. They formed in silty sediments locally washed from adjacent uplands. These soils have a black silt loam or silty clay loam surface layer and a dark brown silty clay loam subsoil.

Wabash are deep, poorly drained soils formed in clayey alluvium. Wabash soils are nearly level and in depression like areas. They have a black silty clay surface layer and a very dark gray underlying material.

Small areas of silty alluvial land occurring along meandering streams and creeks are subject to frequent overflow.

Most of the acreage is cultivated. Corn, grain sorghum, and wheat are the principal crops.

The principal limitations when using these soils are maintenance of fertility levels and good tilth. Flooding is a hazard and the need for drainage is a concern of management in some areas. Water erosion is ordinarily not a hazard except on the gently sloping Judson soils.

Wymore-Pawnee association 1/ - Deep, nearly level to strongly sloping moderately well drained, silty and loamy soils with clayey subsoils, formed in loess and glacial till on uplands.

This association is on the loess and till uplands. The nearly level and gently sloping ridgetops are loess capped. The soils on sloping sideslopes to valleys are commonly formed in glacial till. Included are the uppermost parts of some natural drainageways. This association represents some of the highest elevations of the landscape in the upper part of the basin.

1/ Refer to the Nemaha River Basin, Nebraska, Type IV Report, Economic Research Service, Forest Service, and Soil Conservation Service, 1975, for a general soil association map and additional soils data. Soil survey reports for Pawnee and Richardson Counties are complete, but not published. Information in these reports can be obtained at the SCS field offices.

Wymore and Pawnee soils are dominant. The nearly level to gently sloping Wymore soils are on ridgetops and are deep and moderately well drained. They formed in loess. The surface layer is black silty clay loam. The subsoil is grayish brown silty clay. The underlying material is mottled olive gray silty clay loam.

Pawnee soils are deep, gently sloping to strongly sloping and are moderately well drained. The surface layer is very dark brown clay loam. The subsoil is brown clay. Below a depth of three feet is olive brown heavy clay loam.

Minor soils in this association are Judson soils on colluvial foot slopes, Kennebec soils on narrow bottom lands, and Burchard soils on sloping valley sides.

A large portion of this association is used for cultivated crops. Grain sorghum and wheat are the principal crops, but corn and alfalfa are also grown. Grain sorghum is grown more than corn, because the soils release moisture slowly to plants during hot, dry days. Concerns of management are controlling runoff and erosion and selecting crops that are best suited to the soil and climate.

Pawnee-Burchard-Wymore association 1/ - Deep, gently sloping to moderately steep, moderately well drained and well drained, loamy and clayey soils; formed in glacial till on uplands.

This association consists of the tops and sides of upland ridges and the dissected upper valley hillsides. These soils have formed largely in material of glacial origin. A few loess capped ridge tops are on less sloping areas. Slopes range from gently sloping to moderately steep. Included are many narrow bottoms of the drainageways that extend into the uplands. Boulders, stones, gravel, and sand pockets are at the surface in many places. Many areas are severely eroded. Extensive areas are in the lower more dissected part of the basin.

Pawnee, Burchard, and Wymore are the dominant soils.

Pawnee soils are deep, gently sloping to strongly sloping and are moderately well drained. They are on ridgetops above the Burchard soils. The surface layer is a very dark brown clay loam. The subsoil is a brown clay. Below a depth of three feet is olive brown heavy clay loam.

Burchard soils are deep, well drained soils formed in glacial till. They are not so fine textured in the subsoil as Pawnee or Wymore soils. The surface layer is very dark brown clay loam. The subsoil is a grayish brown clay loam. The underlying material is mottled olive brown clay loam.

Wymore soils are deep, moderately well drained soils formed in loess. They are on ridgetops in the highest part of the landscape. The surface layer

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1/ See footnote 1 on page 15.

is black silty clay loam. The subsoil is grayish brown silty clay. The underlying material is mottled olive gray silty clay loam.

About 50 percent of this association is used for cultivated crops. The remainder is mainly in hayland, pasture, and range. The principal cultivated crops are grain sorghum and wheat. Erosion by water is the principal hazard to the soils of this association. Other concerns of management are maintenance of fertility. Areas in grass need grazing control and weed and brush control to insure vigorous growth of the grasses.

The Kennebec-Judson-Wabash, Wymore-Pawnee, and Pawnee-Burchard-Wymore soil associations are present within the watershed boundaries in the following percentages respectively, 17, 23, and 60.

About 22 percent of the watershed cover is in pastureland rated as having fair to good hydrologic conditions. These grasses are randomly scattered throughout the watershed on soils of varying slopes and consist of little bluestem, brome grass, Indian, big bluestem, switch grass, and sideoats grama plus other species of lesser importance. Pasture conditions were determined to be approximately 30 percent excellent, 20 percent good, 20 percent fair, and 30 percent poor.

Watershed woodlands consist of a mixture of hardwood species. The main commercial species found are bur oak, cottonwood, green ash, red oak, walnut, and maple. The main noncommercial species found are elm, box elder, honey locust, and willow. An estimated 60 percent of the woodland acres are located along the water courses in narrow bands. The remaining woodland acres are located on upland slopes and tend to be mature even aged stands of bur oak. 1/

From representative samples and examination of aerial photographs it was determined that of the 3,037 acres of watershed woodlands, 1,974 acres or 65 percent is being grazed and 2,533 acres or 83 percent is understocked. 1/

The woodland sites are well adapted to the production of high value hardwoods and would produce rapid growth. 1/

Some modification of the natural Long Branch channel has occurred in the lower 3.5 miles. The total length of the various segments which have been modified is approximately 1.9 miles. These 1.9 miles would therefore classify as "M" or modified channel. The remainder of Long Branch and all of its tributaries classify as "N" or well defined natural channels or streams. The flow in the lower 12 miles of Long Branch as well as the flow in the lower 4 miles of Kirkham Creek is classified as "Pr" or perennial. The flow in the lower mile of tributaries on which structures 7, 41, and 70 will be located is classified as "I" or intermittent. The flow in all other tributaries is classified as "E" or ephemeral. The lower 12 miles of Long Branch Creek and the lower 4 miles of Kirkham Creek are classified as Category I, Class "B",

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1/ Forestry Work Plan by U. S. Forest Service in cooperation with and through the Nebraska State and Extension Forester.

Perennial Waters. 1/ The balance of Long Branch and Kirkham Creeks and the lower mile of tributaries on which structures 7, 41, and 70 will be located are Category II, Intermittent Waters. The remaining channels and tributary drains within the watershed are ephemeral streams and are not classified under present Nebraska water quality standards.

Category I waters apply to perennial flowing waters with a 7-consecutive day, 1-in-10 year low flow greater than 0.1 cfs. Category II consists of waters which have periodic zero flows (7-consecutive day, 1-in-10 year low flow) and/or which have a 7-consecutive day, 1-in-10 year low flow less than 0.1 cfs.

Class "A" quality waters are suitable for full body contact sports, domestic water supplies, growth and propagation of fish, waterfowl, furbearers, wildlife, and other aquatic and semiaquatic life.

Class "B" quality waters are suitable for partial body contact sports, growth and propagation of fish, waterfowl, furbearers, wildlife, and other aquatic and semiaquatic life. It is also suitable for agricultural use, including irrigation, livestock watering, and industrial use.

Historical water quality records are scarce for Long Branch Watershed. Some recent samples have been collected and tests run by the Nebraska Department of Environmental Control. The results of the tests are tabulated as follows:

Sample Location	Date Begun	Number of Samples	pH (SU)		DO (mg/l)		Total Dissolved Solids (mg/l)		Conductivity (umho/ccm)	
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
A	3/22/74	8	7.8	8.5	5.1	11.0	284	382	419	628
B	3/22/74	8	8.0	8.5	6.2	13.0	270	342	399	540
C	3/22/74	8	8.05	8.5	6.4	11.6	264	402	419	621

Sample Location	Water Temperature (^oC)		Nitrate Expressed as N (NO_3) (mg/l)		BOD 5-day One Sample (mg/l)	COD High Level One Sample (mg/l)	Fecal Coliform One Sample (MF/100ml)
	Min.	Max.	Min.	Max.			
A	7.0	24.0	0.1	1.8	5.2	19	0
B	6.0	27.0	1.1	2.4	3.4	15	1250
C	6.0	26.5	0.1	4.1	3.3	23	-

1/ Water Quality Standards Applicable to Nebraska Waters, State of Nebraska Department of Environmental Control, June 11, 1973.

Sample location A is situated immediately downstream from the recreation site (No. 21) on Kirkham Creek, location B is one mile north of highway no. 4 and Long Branch Creek, and location C is at the highway no. 4 bridge and Long Branch Creek. All samples were collected at road crossings.

Type A water quality tests are currently being conducted on all sampling stations. Type B tests have been taken at each station and will be taken quarterly at sample location A. The findings of eight samples taken at each sampling location show only one violation of the "Water Quality Standards Applicable to Nebraska Waters" published by the State of Nebraska Department of Environmental Control for Class "A" waters. The one violation in nitrate concentration was at sample location C. The nitrate test value was 4.1 mg/l which exceeds the standard of 3.5 mg/l or less, as established in the "Water Quality Standards Applicable to Nebraska Waters".

Hydrogen ion concentrations expressed as pH shall be maintained between 6.5 and 8.5 for Class "A" and between 6.5 and 9.0 for Class "B" waters with a maximum total change of 0.5 pH unit from the value in the receiving waters of both classes.

The dissolved oxygen (D.O.) standard shall not be lower than 5 mg/l in warm water of either Class "A" or Class "B" waters.

The total dissolved solids, expressed as conductivity, standards for Class "A" waters shall not exceed 900 micromhos per cm at $25^{o}C$. Class "B" waters shall not exceed 2250 at $25^{o}C$.

The water temperature standard for Class "A" and Class "B" warm waters will not exceed $32.2^{o}C$ ($90^{o}F$).

Fecal coliform organisms shall not exceed a geometric mean of 200 per 100 ml nor equal or exceed 400 per 100 ml in more than 10 percent of the samples for Class "A" waters. For Class "B" waters they shall not exceed a geometric mean of 1,000 per 100 ml nor equal or exceed 2000 per 100 ml in more than 10 percent of the samples. A single fecal coliform test on sample location B had a reading of 1250 which exceeds Class "A" standards and possibly Class "B". This sample location, however, is well below any structure sites and is not indicative of the true situation.

A quarterly water sampling schedule has been set up in Long Branch and other watersheds within the Nemaha Basin. Samples will be collected at these points on a quarterly or storm event schedule by designated Soil Conservation Service personnel and water quality tests will be performed by the Nebraska Department of Environmental Control.

These samples will be collected on a regular basis during the planning process and test results will be monitored to determine if any changes in structural designs or other phases of the planning process are needed to maintain or improve present water quality.

An additional sampling area has been selected approximately one mile above the recreation structure to provide data for an assessment of waters flowing into the impoundment area.

PRESENT AND PROJECTED POPULATION

The population of Long Branch Watershed in 1970 was estimated to be 1,738 which included 544 rural people and 1,194 people living in Humboldt. Population projections made in the Nemaha River Basin Report project that urban population will increase 23 percent and rural population will decrease by 8 percent by the year 2020.

Year	Urban Population	Percent	Rural Population	Percent	Total Population	Percent
			Nemaha Basin			
1970	22,840	100	42,280	100	65,120	100
2020	28,000	122	39,000	92	67,000	103
			Long Branch			
1970	1,194	100	546	100	1,740	100
2020	1,463	122	500	92	1,963	103

Population studies in the Nemaha River Basin Report project an increase of 22 percent from 1970 to 2020 in the urban population, a decrease of 8 percent in the rural population and a net increase of only 3 percent. 1/ Of greater significance is the OBERS 2/ projections which project an increase of 53 percent on the same time frame in the general area of southeast Nebraska which includes the cities of Lincoln and Omaha.

Urbanization is expected to continue within the watershed while very little change occurs in the rural sector. Pressure from increase in population will come from outside the area of the Nemaha Basin in which Long Branch Watershed is located.

ECONOMIC RESOURCES

Livestock and cash-grain farms predominate in Pawnee, Johnson, Richardson, and Nemaha Counties. The bulk of the feed grains produced in Long Branch Watershed is utilized within the watershed.

Long Branch Watershed land is utilized in the following manner:

Cropland	70 percent
Pasture	22 percent
Woodland	6.5 percent
Other Land	1.5 percent

Land use patterns of Long Branch Watershed's flood plain are as follows:

1/ Nemaha River Basin Type IV Report (1973).
2/ OBERS - Office of Business Economics and Economic Research.

Cropland	85 percent
Pasture	12 percent
Woodland	1 percent
Other Land	2 percent

Principal crops presently grown in the watershed include corn, grain sorghum, wheat, alfalfa, and introduced grass pastures. The estimated annual gross value of $82.75, production per acre in the flood plain was based on the following flood free yields: corn, 106 bushels; grain sorghum, 115 bushels; soybeans, 36 bushels; wheat, 52 bushels; and alfalfa, 5.2 tons.

Timber is a very minor source of revenue compared to crop and livestock returns. Stands show the effects of a general misunderstanding of the importance of proper timber management. Years of cutting the better trees and leaving the inferior species has left many stands dominated by trees of low commercial value. The damage to woodlands by grazing far outweighs the value of the forage. 1/

Two new sawmills have been established approximately three miles west of the watershed boundary at Table Rock. These sawmills will greatly decrease the hauling distance for timber products and should stimulate interest in proper harvest techniques. 1/

Most of the watershed land is owned by the private sector of the economy. The estimated 147 Long Branch Watershed farms average 315 acres in size. The estimated market value of land is $360 per acre.

The watershed is served by agricultural markets in Pawnee City, Humboldt, Falls City, Auburn, Tecumseh, Johnson, Elk Creek, and Table Rock, Nebraska and Seneca, Kansas. Nebraska State Highways 4, 105, and 62 and several secondary roads provide access to agricultural markets for farms located in the watershed.

The population of Long Branch Watershed is estimated at 1,740. It includes 546 people living on farms and 1,194 (1970 census) living in Humboldt.

The average value of agricultural products sold per farm in 1969 range from $14,390 in Pawnee County to $25,740 in Richardson County. The overall average value of agricultural products sold in the Long Branch Watershed is $20,770 per farm.

The economy of the Long Branch Watershed is agriculturally based and will continue to be agriculturally based after the watershed project is completed. It is estimated that there are about 147 farms in the watershed which average 315 acres in size. It is expected that the trend toward fewer but larger farms, caused by techological changes, will continue.

The average farm in the watershed is a typical one family operation. Data indicates that only 3.9 percent of the farms employ more than 150 hours of

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1/ Forestry Work Plan by U. S. Forest Service in cooperation with and through the Nebraska State and Extension Forester.

labor annually. The average size of farms of 315 acres in 1969 is well within the reach of a family operated farm. 1/

In 1969 the average value of land and buildings was $84,840 and the average price per acre was $240. From 1967 to 1973 land prices have increased 45 percent in Nebraska. 2/ This increase plus a $12 per acre premium for bottomland would make a conservative value of $360 per acre for bottomland.

SURFACE WATER

Long Branch Watershed is an ungaged tributary of the North Fork Big Nemaha River. The North Fork Big Nemaha River has been monitored by the United States Department of the Interior Geological Survey since 1952. The gage is located at Humboldt, with the station number of 06814500 and named North Fork Big Nemaha River at Humboldt, Nebraska. The drainage area of the gage is 548 square miles and over the period of record has had an average discharge of 125,300 acre-feet per year. Therefore, the water yield for the basin can be assumed to be 4.28 inches per acre. The total drainage area in Long Branch is 46,905 acres, resulting in a present watershed yield of approximately 17,000 acre-feet per year.

FISH AND WILDLIFE RESOURCES

Many species of wildlife exist in the watershed. Density of the bobwhite quail is moderate (100 to 300 per square mile) while pheasant population is low (10 to 50 per square mile). 3/ Cottontail rabbit population is moderate (100 to 300 per square mile) and the density of deer varies throughout the watershed from 1 to 8 per square mile. Fox, raccoon, coyote, muskrat, and mink are found in the area. The population of mourning doves is rated high; however, few waterfowl make use of the area.

Lands within the watershed are privately owned and public access to the existing resource is limited, only in that, permission for right of trespass must be obtained from the landowner.

The only stream reach rated as productive for fish in the watershed is the lower 10 miles of Long Branch and this warm water fishery is classified as of local importance only.

Increased sediment deposition after high intensity rainfalls adversely affects production of food organisms upon which fish depend.

RECREATIONAL RESOURCES

The nearest existing water body with substantial recreational use is the Tuttle Creek Reservoir, a large U. S. Army Corps of Engineers' reservoir on

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1/ "1969 Census of Agriculture".
2/ Economic Research Service Farm and Rural Land Survey, March 1973.
3/ The Nebraska Fish and Wildlife Plan (Volume I) - By the Nebraska Game and Parks Commission

the Big Blue River near Manhattan, Kansas. This impoundment is approximately 70 miles distant and this distance is a factor limiting the use of Tuttle Creek for waterbased recreation by residents in and adjacent to Long Branch Watershed.

There are two Game and Parks Special Use Areas located within 30 miles of site 21. The larger of the two, Pawnee Prairie Special Use Area, is located about 22 miles southwest of site 21, or 3 miles northeast of Summerfield, Kansas. Pawnee Prairie consists of 1,120 acres managed mainly for wildlife production and public hunting of upland game and deer. There are also 6 small ponds on the area, with a total of about 10 surface acres of water. These ponds provide a bass-bluegill fishery used mainly by local residents.

The second public use area near the project recreation site is Iron Horse Trail Special Use Area. This consists of scattered parcels of abandoned railroad right-of-way extending from DuBois to Beatrice, the largest contiguous strip of which is about 1.5 miles long. Most segments of this linear public use area run in the range of 0.25 to 0.5 mile. Total area of the scattered parcels amounts to about 210 acres. Principal recreation uses are hunting (squirrel and bobwhite quail), nature study, and hiking.

Burchard Lake State Special Use Area, located about 25 miles west of this watershed, contains a 160-acre lake owned and operated by the State of Nebraska. Its primary function is for wildlife management purposes. It has a day use area and turn-outs for primitive camping. It does serve some local and regional park needs even though that is not the primary administrative function of the area. This lake supports considerable fishing pressure and is available for restricted boating use.

The state recreation area at Verdon, about 15 miles southeast of Long Branch Watershed, includes a 30-acre lake and provides basic camping facilities.

Local interest in the development of waterbased recreation is increasing. Several small watersheds have the opportunity to develop recreation structures. A recreation structure near DuBois with a water surface area of 85 acres is included in the work plan for South Fork Watershed. Two recreation structures have been constructed near Beatrice. One of these is Rockford Lake which has about 150 acres of water in Mud Creek Watershed and the other is a 77-acre lake in Big Indian Watershed.

In the Lincoln and Beatrice Socioeconomic areas there is a total of 16,806 acres of Class I, II, and III nonurban recreational lands as of 1967 and a deficiency of 2,782 acres. By the year 2000 this deficiency is projected to increase to 35,945 acres. 1/

The Lincoln and Beatrice Socioeconomic areas have a need in 1972 for 838 acres of picnic lands and 5,864 tables. The present supply is 575 acres of land and 2,449 tables, leaving a deficit of 275 acres of land and 3,415 tables. The projected need for the year 2000 is 1,672 acres of land and

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1/ "A Comprehensive Plan for Outdoor Recreation for Nebraska" (1968).

11,688 tables and the estimated deficiency is 1,154 acres of land and 9,454 tables. 1/

There is a need for 570 acres of campgrounds and 2,853 units of camper spaces to meet the camping needs in the Lincoln and Beatrice Socioeconomic areas. The supply in 1972 is 98 acres of campgrounds and 490 units of camper spaces, leaving a deficiency of 472 acres and 2,363 units in 1972. The projected need for camping in 2000 is 1,520 acres and 7,597 units, leaving a deficiency of 1,422 acres of campgrounds and 7,107 camping spaces.

ARCHEOLOGICAL AND HISTORICAL VALUES AND UNIQUE SCENIC RESOURCES

The archeological, historical, and architectural report states that the project measures will not affect any archeological sites. No historic sites, historic buildings, or buildings of architectural significance will be affected by construction of or inundation by project measures. 2/

Consultation with the State Historic Preservation Officer and the latest available monthly supplement to the National Register of Historic Places indicates that no National Register property will be affected by the proposed structural measures.

SOIL, WATER, AND PLANT MANAGEMENT STATUS

There are about 100 acres of woody pasture located along the flood plain below proposed structures to their junction with Long Branch Creek. About 30 acres are located adjacent to the stream with the remaining acres located on steep slopes associated with normal channel entrenchment. The first area to be flooded is the wooded area near the stream and this area will still have out of bank flows on the average of at least once every four years even with project installation. The additional acres are unsuitable for cropland or pasture primarily because of slopes in excess of 10 percent or inaccessibility due to wide meander pattern of the stream channel.

It is expected that some conversion of woody pasture to cropland along the flood plain will continue but with the level of protection achieved, based on similar conditions in other watersheds, it does not appear that significant land clearing will take place as a result of the project.

The area subject to flooding from a 2-year flood frequency totals 970 acres; the area flooded from a 5-year flood frequency totals 1,594 acres.

Eighty-one percent of the watershed area is covered by district agreements and 50 percent of the planned practices have been applied. There are presently 206 cooperators in Long Branch Watershed. The district has 199 conservation plans written on farms and ranches in the watershed.

1/ "A Comprehensive Plan for Outdoor Recreation for Nebraska" (1968).
2/ Prehistoric and Historic Resources Report, November 1974, Department of Anthropology, University of Nebraska-Lincoln.

Standard soil surveys have been completed in Richardson and Pawnee County portions of the watershed which represents approximately 60 percent of the area. The project cost includes $10,000 for technical assistance to complete the soil surveys and maps in the Johnson and Nemaha Counties' portion of Long Branch Watershed. Soil survey maps are the primary tool used in recommending proper land use and applying needed land treatment.

Improper land use has been observed within the watershed and is associated with random farm units, many of which are in need of complete land treatment. Much of the pasture is overgrazed 50 percent of the time.

PROJECTS OF OTHER AGENCIES

A study of the Big Nemaha River Basin was made by the Corps of Engineers during the period 1968 - 1973. Six dam sites in the basin were investigated as a possible means of reducing flooding and providing recreational opportunities. One of these was the Humboldt site which would have been on Long Branch near its outlet to the Nemaha River. Possible levee and channel modification projects were also studied in the basin. A public meeting concerning the Corps of Engineers study was held in Tecumseh, Nebraska, on April 10, 1973, at which time the Corps of Engineers reported that none of the structural alternatives were economically justifiable and would not be recommended for project action.

The Bureau of Reclamation's "Nemaha River Basin Reconnaissance Report" dated June 1965, indicates there is no significant prospect for the development of project type irrigation in the basin.

A rural water district has been organized and the system is presently being installed.

WATER AND RELATED
LAND RESOURCE PROBLEMS

LAND AND WATER MANAGEMENT

Land treatment and land treatment needs in the watershed basically result from a need to maintain soil moisture and prevent water erosion. Soils are deep, fertile, and moderately to highly productive. These soils are highly susceptible to sheet and gully erosion with a resultant loss in production and increase in farming operational costs. Approximately 4,000 acres of cropland are experiencing severe sheet and gully erosion due to the presence of an unstable grade. Unstable grades create conditions where suitable outlets for runoff water cannot be maintained. The absence of a suitable outlet limits the use that may be made of land above an unstable grade and limits the net return from the land.

There is a need for establishing permanent cover on approximately 2 percent of the watershed currently being cropped.

Studies of past achievements of cooperators in the watershed indicate that conservation measures can be applied on a minimum of 75 percent of the land within the watershed during the 8-year project installation period. Financial assistance for applying needed conservation practices is available under P.L.-98-86, the Agricultural and Conservation Protection Act of 1973 and under cooperative programs authorized by the Clarke-McNary Act. Assistance is available from the annual program or as a complete conservation plan with monies obligated under a long-term agreement.

The scattered nature of the woodland stands, relatively low site quality and small areas, has discouraged improved woodland management. Grazing and sheltering is common in many of the stands with the resulting effect of soil compaction and loss of litter and humus.

Encouraging desirable reproduction and protecting valuable species is needed. A more extensive educational program can help prevent tree damage from chemical spraying and emphasize the multiple-use benefits derived from woodlands.

Approximately 65 percent of the woodland suffers from varying degrees of grazing pressure. The beneficial effects of woodland in retarding surface flow and erosion is greatly reduced by grazing.

The dead timber in the woodlands is primarily American Elm trees located in isolated areas along the stream courses. These dead trees can create a potential hazard to the stream channel from clogging, thus reducing channel capacity during flood flows.

Approximately 83 percent of the woodlands in the project area are understocked or are comprised of undesirable species.

Continued control of wildfires is essential to both the hydrologic and economic benefits of the woodlands. 1/

FLOODWATER DAMAGE

Damaging floods occur annually on the Long Branch flood plains. The majority of the flooding occurs during the months that crops are growing and are thus most vulnerable to damage. The relatively smaller storm events (5-year frequency or smaller frequency storms) are responsible for the bulk of present floodwater damages. Records indicate that floods occur on an average of 3 times every year. The storm that night be expected to occur once in 100 years would flood about 2,570 acres while a storm that could be expected to occur once every 5 years would flood about 1,594 acres.

The land use pattern for Long Branch Watershed is shown on page 20. Primary crops grown include corn, grain sorghum, and soybeans with small tracts in wheat or alfalfa. At the present time about 56 landowners are involved in farm operations within the flood plain boundaries. Flood damages are restricted to crops, related agricultural damages, and road and bridge. There are no farmsteads receiving flood damages in Long Branch Watershed.

The lower reach of Long Branch Creek passes through the west portion of Humboldt. Flooding to two basements begins at the 25-year flood frequency. At the 50-year flood frequency an additional nine residences and the city park receive damages with a total of 16 residences receiving flood damages at the 100-year frequency flood.

EROSION DAMAGE

Sheet erosion is the dominant erosion factor in the watershed, accounting for approximately 64 percent of all sediment movement within the watershed.

Total gross erosion in the watershed approximates 582,300 tons/year, 373,000 tons/year from sheet erosion and 209,300 tons/year from gully erosion. Under present conditions annual soil losses on untreated cropland range from 7 tons/acre/year on 0 - 3 percent slopes to 19 tons/acre/year on 3 - 9 percent slopes. An average yield from untreated cropland sheet erosion approximates 14 tons/acre/year. Soil losses from untreated pastureland on average slopes of 10 - 15 percent range from less than 5 to 7 tons/acre/year.

Gully erosion and streambank and channel erosion are active in the watershed. Gully erosion contributes 36 percent or 209,300 tons/year of the total gross erosion yield and is categorized within the following elements:

Critical source areas	49,300 tons/year
Main channel bank erosion	15,000 tons/year
Remaining tributary areas	145,000 tons/year

1/ Condensed from the Forestry Work Plan by U. S. Forest Service in cooperation with and through the Nebraska State and Extension Forester.

Twenty critical source areas were identified and investigated in the watershed. Approximately 20 miles of the main channel of Long Branch is undergoing bank erosion at the rate of 0.47 acres/mile/year. 1/

Approximately 225 miles of major tributaries and upland drains are contributing sediment in the form of gully and bank erosion at the rate of 0.40 acres/mile/year. 1/

Data obtained in the Platte Level 'B' Study on critical sediment sources was projected for use in similar areas undergoing bank erosion in Long Branch Watershed.

Gully growth, void damage, will physically destroy approximately 3 acres of cropland annually during the 50-year evaluation period. The void damages will average $4,750 annually.

In addition to direct damages resulting from gully growth, economic returns to land above an unstable grade are reduced. The absence of a suitable outlet for runoff water severely limits the use that may be made of land above an unstable grade and limits the net return from the land. An estimated loss of $70,000 from 4,000 acres of land is being sustained due to these associated land damages. Gullies will also damage roads and bridges at one location for an average annual damage of $380.

Deep gullies are also hazardous to livestock and often prevent livestock from crossing drains to pastures. Farm equipment and equipment operators are also subjected to hazardous conditions as a result of gully growth and associated ditches and bank sloughing. Gullies also detract from the overall appearance of the specific area and the countryside in general.

SEDIMENT DAMAGE

Estimated average annual sediment and scour damages of $4,950 are occurring in Long Branch Watershed. Sediment and scour damages are closely related items in the watershed and they were not treated as separate items. Presently, 187 acres or 11 percent of the flood plain subject to annual flooding is undergoing sediment and scour damages.

Sediment yields from the watershed are moderately high to high. Soils formed in loess and glacial till are susceptible to erosion. Steep (6 percent) slopes and high rainfall are the prime factors contributing to the high sediment yields.

Approximately 212,000 tons of sediment, 89,500 tons from sheet and 122,500 tons from gully and streambank erosion, are deposited annually within the channel and flood plain boundaries below planned structural measures. Approximately 65 percent (137,800 tons) of this sediment yield reaches the

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1/ Channel and Streambank Erosion Studies in the Platte Level 'B' Study, 1974. A joint study by the Soil Conservation Service, Corps of Engineers, and the Bureau of Reclamation.

mouth of the watershed or the Nemaha River. Quantities of sediment delivered to major streams reduce stream capacity and are harmful to stream fishery resources. This sediment also reduces water quality and contributes to a general degrading of the environment because insecticides, herbicides, heavy chemicals, and phosphates from fertilizers used in agricultural production adhere to or are adsorbed by sediment particles. Nitrogen is also carried in runoff sediment, particularly in organic form and as adsorbed ammonium on clay particles.

Total estimated sediment and erosion damages of $48,700 are occurring in the watershed annually. In addition, $15,400 of annual downstream sediment damages are occurring. A tabular breakdown of floodwater, sediment, and erosion damages is shown below by stream reaches.

Present Flood Plain Damages Without Project Installation

Reach	I	II	III	IV	V	Total
Acres Flooded (Crop and Pasture) by Flood Frequency						
2	0	38	813	91	28	970
5	54	191	1,114	166	69	1,594
10	146	247	1,230	242	138	2,003
100	182	308	1,408	346	325	2,569
Dollar Damages (Crop and Pasture) by Flood Frequency						
2	0	1,679	29,661	3,456	1,145	35,941
5	1,272	6,587	47,893	6,892	2,555	65,199
10	5,824	9,842	58,031	10,551	5,278	89,526
100	10,669	14,744	78,302	18,017	13,887	135,619
Sediment and Scour Damages (Avg.Ann.)						
Acres	14	34	107	29	3	187
Dollars	159	598	1,921	592	69	3,339
Urban Damages (Avg. Ann.)						
Dollars	300					300

MUNICIPAL AND INDUSTRIAL WATER PROBLEMS

The watershed is rural. Surrounding urban areas have a limited supply of water, but rural water districts are presently being organized that will result in additional water supplies to rural areas. Humboldt's water supply is obtained, via pipeline, from a well located approximately five miles west of town. There are three older wells in Humboldt that can be put in use if a water shorgage develops. The system is presently providing an adequate water supply.

RECREATION PROBLEMS

Nebraska is divided into 14 socioeconomic areas (SEA's). About 33 percent of the Long Branch Watershed lies in the Lincoln SEA and the balance in the Beatrice SEA. The population within a 50 mile radius of the proposed Long Branch recreation reservoir (site 21) is 92,000. In most socioeconomic areas of the state the population is projected to decrease, but the Lincoln SEA population is projected to increase from 274,300 in 1967 to 343,897 in 1985, a 39 percent increase. 1/

The Comprehensive Plan estimates various significant recreational deficiencies in the Lincoln SEA. In 1972 the plan estimates a deficiency of approximately 7,500 acres of land and 48,000 acres of water developed for recreational activities. Included in the overall deficiencies are 275 acres of picnic area, 11,900 acres of water for boating, 5,500 acres for water skiing, 472 acres for camping, and 30,500 acres for fishing. Deficiencies projected for the year 2000 are estimated to be 344 percent higher than in 1972 for developed land and 248 percent higher for developed water.

PLANT AND ANIMAL RESOURCE PROBLEMS

The limiting factor for fish and wildlife species in the area was determined to be a lack of ground cover in wooded areas due to heavy use by livestock and a lack of wetland areas created by water impoundment. 2/ Land treatment measures to reduce sedimentation and improve water quality, shelterbelts, woody plantings, and food plantings to improve cover and feeding areas are needed to provide additional and improved wildlife habitat. Water and the shoreline of additional impoundments is needed to improve the habitat of shorebirds, wood ducks, and all waterfowl species.

WATER QUALITY PROBLEMS

Test results of water quality samples collected are tabulated on page 18.

The nitrate concentration ranging from 1.8 to 4.1 mg/l would induce algae growth in impounded water provided that a high phosphate level is present. The 4.1 mg/l nitrate concentration exceeds the "Water Quality Standards Applicable to Nebraska Waters". The Standards list 3.5 mg/l as being the upper limit of nitrate concentration for Class "A" or "B" waters. The possible buildup of nutrients in such impoundments could result in eutrophication of the reservoirs; however, with the expected spring and early summer turbidity, reservoir water will suppress the growth of algae and rooted aquatic vegetation. 3/ Turbidity may exceed the Class "A" water quality standards during peak runoff periods but it is not expected to exceed the standards during nonrunoff periods.

1/ "A Comprehensive Plan for Outdoor Recreation for Nebraska" (1968).
2/ Report of Fish and Wildlife Investigations - December 8, 1972, joint field study by staff biologists representing the Soil Conservation Service, Fish and Wildlife Service, and Nebraska Game and Parks Commission.
3/ TRANSACTIONS of the Nebraska Academy of Sciences, Volume II.

ECONOMIC AND SOCIAL PROBLEMS

The average size of farms in the Long Branch Watershed is 315 acres. 1/ The average net value of agricultural products sold per farm was $8,152 compared to a state average of $9,605. Thus the farm units are below the state average in net production. This is a generalized farming area with relatively small family farms.

About 15 percent of the Long Branch Watershed lies in Pawnee County. Pawnee County was designated as a Redevelopment Area in 1966 under provisions of the Area Development Act (P.L. 87-27). The major criteria qualifying an area to be a Redevelopment Area was that the rate of unemployment was 6 percent or more at the time of designation and that the unemployment rate had been 50 to 100 percent above the national average for 1 to 3 prior years. Areas adjacent to Pawnee County should not radically change at the county lines; therefore, a valid generalization would be that the unemployment rate in Long Branch Watershed is above the national average.

The general income of workers in the area of Long Branch Watershed is lower than for the State of Nebraska. The median income for families in the Long Branch area was $3,030 as compared to $4,862 for the state, or about 62 percent as much. The mean income per person in the area of the watershed was $2,346 while the comparable figure for the state was $3,239, or about 72 percent as much. 2/

Long Branch Watershed is located in Water Resources Region 1024 and the per capita income in 1969 in this region was 88 percent of the national average. 3/ The earnings per worker were 79 percent of the national average. The ratio of employment to population was 42 percent compared to the national average of 40 percent.

1/ "1969 Census of Agriculture".
2/ Census of Population for Nebraska, Volume I, Part 29.
3/ 1972 OBERS Projections - Volume 4 - U.S. Water Resources Council.

RELATIONSHIP TO LAND USE PLANS, POLICIES AND CONTROLS

The proposed plan stays within the regulations and guidelines as set forth in the "Federal Water Pollution Control Act Amendments of 1972" in regard to agricultural pollution.

Nonpoint sources of pollutants include runoff and sediment from fields and crops and forest lands due to agricultural and silvicultural activities. Land treatment and structural measures will reduce runoff, flooding, and erosion; thus, preventing, reducing, and eliminating pollution from agriculture.

Contractors will be required to follow current guidelines pertaining to air and water pollution as developed by the State of Nebraska.

Land use regulations in the city of Humboldt meet the requirements of the National Flood Insurance Program as outlined in the emergency phase requirements of the 1973 Disaster Protection Act. These regulations will remain in affect until implementation of the State of Nebraska zoning laws. At that time all urban and rural areas within the 100-year flood plain will be zoned to prevent any further residential or commercial development.

ENVIRONMENTAL IMPACT

CONSERVATION LAND TREATMENT

About 7,800 acres of dry cropland will be treated during the project installation period. Practices to be applied include conservation cropping systems, contour farming, grade stabilization structures, terraces, grassed waterways, and conservation tillage.

About 3,070 acres of pasture will be treated during the project installation period. Practices to be applied include proper grazing use, pasture plantings, diversions, livestock pits and ponds, livestock wells, pipeline and tanks, cross fencing, and wildlife habitat development. 1/

Fifty percent of the needed land treatment practices have presently been applied in the watershed. This in conjunction with the above acres will total 75 percent of the area having land treatment applied by the end of the project installation period.

This meets the minimum goal of 75 percent set by the sponsoring local organization. The remaining acres, 25 percent, will receive partial land treatment or management practices.

Application of land treatment measures will affect all farms in the watershed. The application of field border plantings, grassed waterways, grass seeding, critical area plantings, wildlife habitat development, and reduction of sediment movement will provide long range additional habitat for fish and wildlife.

Conservation land treatment measures will improve the aesthetics or visual environmental setting. The already attractive landscape will be further enhanced through improved green areas and the graceful contours of conservation farming which produces a symmetry of land use in corresponding harmony.

The forestry land treatment measures, to maintain and improve the ability of woodlands to control runoff and reduce soil losses, will be provided to landowners by the Service and the Nebraska State and Extension Forester through cooperative agreement with the U. S. Forest Service under cooperative programs authorized by the Clarke-McNary Act. Economic returns to landowners will improve as improved methods are put into practice. Tree planting to enhance recreation qualities of the watershed is needed and will be of great benefit to many families of the community. 2/

Technical assistance for the control of wildfire will be provided to rural fire districts through the regular fire control technical assistance program.

1/ National Handbook of Conservation Practices.
2/ Condensed from the Forestry Work Plan by U. S. Forest Service in cooperation with and through the Nebraska State and Extension Forester.

Land treatment measures will reduce sheet and rill erosion delivery rates to main channels within the watershed about 17 percent or 74,700 tons/year. Cropland erosion rates will be reduced from 13.6 to 5.0 tons/acre/year and pasture rates will be reduced from 7.7 to the maximum allowable of 5.0 tons/acre/year or less.

STRUCTURAL MEASURES

The following table illustrates project measure effects on floodwater discharges and areas inundated in each of the evaluated stream reaches by four selected flood frequencies.

Reach	Flood Frequency	Without Project Discharge (cfs)	Without Project Area (Acres)	With Project Discharge (cfs)	With Project Area (Acres)
I	100-year	19,250	182	9,360	75
	10-year	11,160	146	6,140	0
	5-year	8,840	54	5,030	0
	2-year	6,075	0	3,360	0
II	100-year	19,000	308	9,345	208
	10-year	10,950	247	6,135	43
	5-year	8,680	191	5,015	14
	2-year	6,020	38	3,335	4
III	100-year	14,230	1,408	8,650	1,251
	10-year	8,330	1,230	5,555	987
	5-year	7,160	1,114	4,445	782
	2-year	4,580	813	2,860	352
IV	100-year	7,745	346	3,995	171
	10-year	4,490	242	2,390	94
	5-year	3,460	166	1,820	66
	2-year	2,340	91	1,115	20
V	100-year	6,575	325	385	224
	10-year	3,870	138	205	71
	5-year	2,950	69	156	44
	2-year	1,795	28	96	28
TOTAL	100-year	---	2,569	---	1,929
	10-year	---	2,003	---	1,195
	5-year	---	1,594	---	906
	2-year	---	970	---	404

An estimated 1,594 acres of land would be inundated by a (5-year) 20 percent chance storm event under present conditions. A storm of this same magnitude will inundate an estimated 906 acres when the proposed measures have been installed. If flooding is expressed in average annual acres, the completion of the project will decrease flooding from 1,617 to 617 average annual acres.

Reaches I, II, III, and IV are located on Long Branch Creek and Reach V is part of Kirkham Creek. Only the lower portion of Reach V receives floodwater damage reduction due to site 21 being located towards the lower end of the reach.

A 100 percent chance of beginning flooding implies that a stream will probably reach or exceed bankfull capacity at least once annually. A 200 percent chance of beginning flooding means that on an average a stream will reach bankfull capacity twice annually. A 25 percent chance of beginning flooding means that a stream will run at full capacity once in four years.

In Reach I the present percent chance of beginning flooding is 32 percent versus a 4 percent chance of beginning flooding with project. A 97 percent reduction in floodwater damages is expected in this reach. Urban damage presently begins with a 4 percent chance storm. No urban damage will occur from a 1 percent chance storm with project.

In Reach II the percent chance of beginning flooding is presently 290 percent which will be reduced to 75 percent with project. An 84 percent reduction in floodwater damages is expected.

In Reach III the major portion of the crop and pasture damages occur, with present percent chance of beginning flooding being 300 percent. With project a 136 percent chance of beginning flooding and a floodwater damage reduction of 63 percent is expected.

In Reach IV the percent chance of beginning flooding will be reduced from 239 to 91 percent. A floodwater damage reduction of 76 percent is expected.

In Reach V only the lower portion of the reach is affected by the project. The present percent chance of beginning flooding below the structure is 26 percent being reduced to near zero percent. A reduction in floodwater damages approaching 100 percent is expected.

Of the total crop and pasture damage reduction within Long Branch Watershed, 77 percent occurs in Reach III. Within this reach a 63 percent damage reduction is expected to occur.

Reaches I and V contribute only 4 percent of the total crop and pasture reduction in the watershed; however, within the two reaches the flood damage is reduced by 42 percent.

Reaches II and IV have crop and pasture damage reductions of 8 percent and 11 percent respectively of the total crop and pasture reduction. The damage reductions within each reach are 84 percent and 76 percent respectively of the damages under present conditions.

Categorized on the next page by reach and storm frequency are flood plain flooding, sediment, and scour benefits.

Flood Plain Benefits With Project Installation

Reach	I	II	III	IV	V	Total
Acres Flooded (Crop and Pasture) by Flood Frequency						
2	0	4	352	20	28	404
5	0	14	782	66	44	906
10	0	43	987	94	71	1,195
100	75	208	1,251	171	224	1,929
Dollar Damages (Crop and Pasture) by Flood Frequency						
2	0	126	11,558	529	1,145	13,358
5	0	785	28,804	2,425	2,072	34,086
10	0	1,763	39,017	3,863	3,103	47,746
100	1,764	7,324	60,073	7,735	8,962	85,858
Dollar Benefits (Crop and Pasture) by Flood Frequency						
2	0	1,553	18,103	2,927	0	22,583
5	1,272	5,802	19,089	4,467	483	31,113
10	5,824	8,079	19,014	6,688	2,175	41,780
100	8,905	7,420	18,229	10,282	4,925	49,761
Sediment and Scour Damages (Avg.Ann.) Dollars	22	86	275	110	11	504
Sediment and Scour Benefits (Avg.Ann.) Dollars	137	512	1,646	482	58	2,835
Urban Dollars (Avg.Ann.)	380					380

No significant land use changes are expected to occur as a result of project measures. Flooding will be reduced, but the level of protection planned for the flood plain is not sufficient to warrant more intensive land use than is presently practiced.

Within the Long Branch Watershed construction of the project will result in a 75 percent decrease in agricultural damages and a 67 percent decrease in nonagricultural damages. Indirect damages will be reduced 66 percent. The total damages will be reduced 74 percent.

It is presently estimated that 187 acres have suffered a loss of production due to sediment and scour damages. This loss of production ranges from 12

to 20 percent for an average loss of 19 percent. Without project this loss is projected to increase to 20 to 30 percent with an average loss of 29 percent. After installation of the project the projected increase in damages is prevented and the present damage is reduced 69 to 93 percent or an average of about 84 percent. In addition, land treatment will reduce the present damage an estimated 4 percent.

Total floodwater damages within the watershed will be reduced by 65 percent ($69,520) on 2,500 acres of crop and pasture; by 67 percent ($8,220) at 14 bridge locations; and by 65 percent ($7,000) to other agriculture.

Sheet and gully erosion within the watershed will be reduced approximately 21 percent with the installation of land treatment measures. Average soil losses of 14 tons/acre/year from cropland and average soil losses of 5.5 tons/acre/year from pastureland will be reduced to or below the maximum allowable soil loss of 5.0 tons/acre/year with the application of needed conservation measures. The grade stabilization structural measures will reduce gully erosion from critical sediment source areas by 78 percent, or from 34,500 tons/year to 7,500 tons/year. Sheet and gully erosion yields to the Long Branch channel will be reduced from 212,000 tons/year to 104,400 tons/year or 51 percent with project installation.

Sediment yield to the mouth of the watershed will be reduced about 29,000 tons/year with the installation of land treatment.

Twelve grade stabilization structures will prevent the loss of an estimated 83 acres or 1.6 acres/year that would be voided by advancing gullies. An additional 3,100 acres whose use is being restricted due to the presence of unstable grades will benefit from the construction of grade stabilization structures. Such structures will permit the installation of certain land treatment practices on areas adjacent to gullies which will permit more intensive cultivation while still maintaining an acceptable soil loss. Grade stabilization structures will reduce sediment yields to Long Branch channels from 34,500 to 7,500 tons/year or 27,000 tons/year.

Downstream sediment damages will be reduced approximately 51 percent or from 137,800 to 67,900 tons/year. This reduction is accounted for by an overall reduction in sheet and rill erosion of 50 percent, 57,900 to 29,000 tons/year, and a 51 percent reduction in gully erosion and streambank erosion, 79,900 to 38,900 tons/year.

Nemaha River pollution as related to sediment concentrations will be reduced 69,900 tons/year or from an average daily concentration of 375 to 110 tons/day. This reduction in sediment yields to the Long Branch channels and the Nemaha River will improve the present water quality by reducing turbidity and nutrient loads within the stream system.

Water quality data collected presently shows no violations of the Nebraska Class "A" water quality standards 1/ for sample location A, located downstream

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1/ Water Quality Standards Applicable to Nebraska Waters, State of Nebraska Department of Environmental Control, June 11, 1973.

from the recreation site (site 21) on Kirkham Creek. It is expected that there will be few if any violations of Class "A" standards in the recreation reservoir when constructed as indicated from present data.

The other proposed floodwater retarding structures are located on ephemeral or intermittent streams. From the data collected on the perennial streams in the watershed it is expected these impoundments will comply with Class "B" water quality standards.

Eutrophication is not expected to be a problem in the recreation structure or in the single purpose floodwater retarding structures. Upland fine particled loessal soils coupled with a moderately high to high sediment yield should create turbid waters during spring and early summer preventing the heavy growth of algae and rooted aquatic plants. 1/ Impoundments in the general vicinity have not experienced signs of accelerated eutrophication such as nuisance algae bloom or odor problems.

With project, a total of 433.1 acres of surface water will be created. Evaporation and seepage losses on these impoundments will result in a depletion of approximately 450 acre-feet per year.

Land under adequate conservation treatment presently represents approximately 75 to 80 percent of the land, and under project conditions this percent is expected to range from 80 to 90 percent. Therefore, no significant effect on present surface supply of water is anticipated from land treatment. Evaporation and seepage will deplete the present surface supply by approximately 3 percent.

The lower 12 miles of Long Branch Creek and the lower 4 miles of Kirkham Creek are classified as perennial streams in this report. There are no known long term gaging stations on either stream to confirm this or calculate what the quantity of base flow might be. There is some question as to whether Kirkham Creek is properly classified. The Nebraska Game and Parks Commission lists this section of stream as "I" or intermittent.

Stream flow measurements taken in conjunction with water quality samples indicate that Kirkham Creek's base flow is less than 1 cubic foot per second and contributes approximately 20 percent to the total base flow downstream from its junction with Long Branch Creek.

It is not anticipated that the project measures will reduce the base stream flow on Long Branch Creek above the Kirkham Creek junction. All the project measures are located on intermittent streams. When these streams are flowing, the reservoirs will be maintained at pool capacity and therefore pass the upstream flow. Some minor losses could be expected due to evaporation.

During periods of normal rainfall, runoff, and streamflow conditions it is not anticipated that the structure on Kirkham Creek will affect downstream base flows. Upstream flows will essentially pass directly through the principal spillway. However, during periods of droughty conditions, high reservoir evaporation losses, and reduced upstream base flow it can be expected that

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1/ TRANSACTIONS of the Nebraska Academy of Sciences, Vol. II.

the reservoir losses would be more than the stream inflow, resulting in no passage of flow through the principal spillway. This could reduce the base flow on Kirkham and Long Branch Creeks by some indeterminable quantity. However, seepage losses around and through structures do occur, with a portion of this flow being excreted into the stream below the structure. This quantity of flow is very difficult to determine, but may tend to balance upstream losses.

Consultation with the Nebraska Game and Parks Commission indicates there are no stream fisheries habitats on Kirkham Creek at the present time. An increase or decrease in flows below site 21 to the Long Branch channel will not have a significant affect on the development of this segment for fish habitat.

Although no recreation benefits were claimed regarding the 12 floodwater retarding structure sites and the 12 grade stabilization structures, some sites can provide incidental recreation benefits such as fishing and boating. A breakdown of the recreation potential of all sites in the watershed is presented on pages 6 and 7. Water quality is expected to be adequate for such incidental use but sponsors are aware that more intensive usage could result in the need for installation of sanitary facilities. The sponsors, however, have agreed to discourage such use since they are providing site 21 for public use and do not have adequate funds for such facilities at other locations.

The proposed recreational development will greatly alleviate recreational deficiencies within a 30-mile radius of the site (estimated population of 33,700). The primary recreational activities will be picnicking, boating, fishing, primitive camping, and environmental and nature studies. The recreation development will have a "designed capacity" of 480 people per day. An estimated 25,200 recreation visits will be provided annually.

The city of Humboldt presently experiences no significant flood damage except during large infrequent floods. No damage occurs at the 10-year frequency flood, and only two basements are flooded at the 25-year flood. At the 50-year flood frequency an additional nine residences and the city park receive damages with a total of 16 residences receiving flood damages at the 100-year frequency flood. After project installation no damage will occur from the 100-year frequency flood and the flood stage will be two feet lower than present.

Works of improvement in Long Branch Watershed will reduce damages downstream on the Big Nemaha flood plain. The proposed floodwater retarding structures in the watershed will control about 1-1/2 percent of the Big Nemaha Basin's drainage area.

The flood retarding structural system planned for Long Branch Watershed will place over 43 percent of the watershed area above structures. The flood reduction benefit downstream in the Big Nemaha flood plain is estimated to be $121,080 average annual with 75 percent of this being crop and pasture benefits. Long Branch Watershed is only one of several watersheds draining into the Big Nemaha flood plain and the damage reduction resulting from the Long Branch Watershed is about 16 percent of the estimated total flood damages without project.

FISH AND WILDLIFE AND RECREATION

Approximately 426 acres of water will be created initially by the installation of all structural measures and 159 acres (at site 21) will remain after the project evaluation period. The total area to be occupied by dams, emergency spillways, sediment pools, and the recreation pool is about 542 acres. An additional 532 acres will be subject to infrequent inundation by flood pools. The following table identifies the land use by areas to be affected.

ALL STRUCTURES	CHANNEL ACRES	WOODS ACRES	WOODY PAST. ACRES	OPEN PAST. ACRES	CROP ACRES	MISC. ACRES	TOTAL ACRES
Dam & Spillway	3.8	19.9	20.9	21.4	43.2	-	109.2
Permanent Pool	57.9	77.6	100.5	68.6	122.9	5.6	433.1 1/
Flood Pool	37.2	39.3	106.2	95.3	246.2	8.1	532.3

1/ Includes total sediment pool of 15 acres on structure 7 although only an 8-acre pool will be created initially.

As can be seen from the table above, approximately 219 acres of woodland and wooded pastureland will be occupied by dams, emergency spillways, and sediment pools. This wildlife habitat of varying quality will be mitigated by the planting of at least 69 acres of high quality habitat within the watershed.

It is expected that approximately 460 acres of land will be purchased for installation of structure 21 and the adjacent recreation facilities. The dam, emergency spillway, and recreation pool will prevent further agricultural production from about 154 acres consisting of 38 acres wooded pasture, 48 acres open pasture, and 68 acres of cropland.

At site 21 an additional 24 acres of wooded pasture, 127 acres of open pasture, and 94 acres of cropland will no longer furnish agricultural production since a portion of this area will occasionally be inundated by the flood pool and the remainder will be converted to public use and the installation of recreational facilities.

The remaining 61 acres of the total 460 acres to be purchased at site 21 presently consists of woodland, stream channels, and other miscellaneous areas.

The results of these studies were reviewed with or carried out in coordination with the Fish and Wildlife Service and the Nebraska Game and Parks Commission to provide a more effective fish and wildlife conservation program and to comply with the Fish and Wildlife Coordination Act, P.L. 85-624.

Structure 21 will provide 159 acres of recreation water plus 300 acres of developed and undeveloped land to which the public will have access. This will significantly reduce the deficiency of recreational land and water in the Beatrice Socioeconomic area in which the structure is located. The water surface plus approximately 6.6 miles of shoreline which will be created will

provide about 90 fishing opportunities per day. A 5,000 feet nature trail will be provided which will furnish 25 recreational opportunities per day.

The 125 parking spaces will be adequate to provide for a peak use day design capacity of about 480 people. The estimated recreation season is 70 weekdays and 28 weekend days.

The installation of the dams and their resulting sediment pools will change characteristics on approximately 20 miles of stream channels classified as having "E" flows, 1.3 miles having "I" flows, and 2.3 miles having "Pr" flows. The flood pools of the structures will infrequently inundate about 13 miles of channel having "E" flows and 1.1 miles of channel with "Pr" flows.

Ephemeral stream channels flow only during periods of surface runoff, intermittent stream channels have continuous flow through some seasons of the year but little or no flow through other seasons, and perennial flow stream channels have flows at all times except during extreme drought.

Installation of the structures may create conditions favorable for the development of mosquito breeding areas, due to flucuations of reservoir water levels, on about 40 miles of shoreline to be created with the installation of the structural measures.

The wood tick (Dermacentor variabus) may potentially become a problem in mitigation areas around structural measures. Generally, mitigation areas are planned for "odd" areas or inaccessible acreages adjoining the sediment pools of structures where the general public has little or no access to them. These mitigation areas are fenced. No mitigation acreage will be planted in close proximity to the recreation facilities and road access on structure 21. The Service believes that any increase in wood tick numbers due to mitigation plantings will have little effect on the environment.

ECONOMIC AND SOCIAL

Project measures will produce average annual secondary monetary benefits amounting to $20,670 which represent increased earnings to persons in the watershed which are induced from the project.

Under the Redevelopment Act of 1964, Pawnee County was selected as a redevelopment area in accordance with specified indicators of unemployment and poverty among semiskilled labor. The act is based on the premises that over a 20-year period unemployment of semiskilled labor will be largely alleviated by an increase in local employment and by the mobility of labor. In 20 years of a declining rate of unemployment the total redevelopment benefits are calculated to be $134,340, which amortized over 50 years amounts to an average annual redevelopment benefit of $10,090.

The total average annual benefits from the project are $340,640 which includes $121,080 of downstream benefits. These benefits are 2.1 times as much as the average annual cost of $164,410 (See Appendix A). Included in the total benefits are damage reduction due to reduced flooding, benefits from

introduced waterbased recreation, redevelopment benefits which will reduce unemployment, and secondary benefits.

The increase in gross income to each of the 147 farms in the watershed due to reduced flood damages will be approximately $540 per year. This does not include road and bridge benefits and urban benefits. The impact of the project on population retention and distribution was not determined.

There has been $9,360 allocated for relocation payments with an additional $800 allocated for relocation assistance advisory services.

FAVORABLE ENVIRONMENTAL EFFECTS

A summary of favorable environmental effects within Long Branch Watershed is listed as follows:

a. Apply land treatment measures on about 7,800 acres of dry cropland and about 3,070 acres of pastureland during the project period, thus, reducing the soil loss on these areas from sheet and rill erosion to the maximum allowable of 5.0 tons/acre/year or less.

b. Improve the visual environment of the watershed with the application of land treatment measures, wildlife habitat development, and an overall reduction in erosion process.

c. Improve woodlands with forestry treatment measures and increased fire protection.

d. Reduce sediment delivery to main channels of Long Branch from all erosion sources by 51 percent or 107,600 tons/year.

e. Reduce sediment delivery to the mouth of the watershed and the Nemaha River from all erosion sources by 51 percent or 69,900 tons/year.

f. Reduce gully erosion from critical sediment source areas by 78 percent or 27,000 tons/year.

g. Reduce floodwater damages by 65 percent to 2,500 acres of crops and pastures, by 65 percent to other agriculture, by 67 percent to fences, buildings, roads, and 14 bridges, etc.

h. Reduce sediment and scour monetary damages to 187 acres of flood plain land by 84 percent.

i. Install grade stabilization structures on 12 critical sediment source areas within the watershed, thereby, allowing for installation and maintenance of land treatment measures on 3,100 of the 4,000 (77 percent) affected acres.

j. Reduce flood damages on 2,570 acres of flood plain resulting in higher personal incomes to families who are direct beneficiaries of flood control measures.

k. Creation of about 426 surface acres of water that will provide fisheries and serve as resting and feeding areas for waterfowl.

l. Create 69 acres of prime woody habitat for wildlife and improve the aesthetic quality of the area.

m. Reduce turbidity and nutrient loads to the lower portion of Long Branch Creek and the Nemaha River thus improving the quality of the water.

n. Improve fish and aquatic life by prolonged channel flows from structural release rates and reduced sediment yields to the channels.

o. Accelerate land treatment application which will benefit and improve the overall ecosystem.

p. Reduce downstream flood damages to about 20,000 acres of the Big Nemaha flood plain by 16 percent.

q. Reduce the deficiency of recreational land in the Beatrice Socioeconomic area by providing public access to 460 acres of water - land based recreational facilities.

r. Reduce the average annual flooding on about 1,000 acres, thus reducing the potential for the development of mosquito breeding areas on these acres.

ADVERSE ENVIRONMENTAL EFFECTS

a. Agricultural production will be lost on approximately 377 acres due to installation of the structural measures and their resulting permanent pools. This includes about 121 acres of woody pasture, 90 acres of open pasture, and 166 acres of cropland. An additional 245 acres will no longer furnish agricultural production as a result of being purchased for development of the multipurpose site 21. This 245 acres includes 24 acres of wooded pasture, 127 acres of open pasture, and 94 acres of cropland.

b. About 97 acres of woodland will be lost during the project life.

c. Approximately 219 acres of existing wildlife habitat will be eliminated by installation of structural measures.

d. Approximately 20.5 miles of ephemeral, 1.3 miles of intermittent, and 2.3 miles of perennial stream channel will be permanently inundated. An additional 1.1 miles of perennial and about 13 miles of ephemeral stream channel will be subject to periodic inundation by flood pools.

e. Temporary or occasional inundation by flood pools will reduce agricultural production on about 106 acres of woody pasture, 95 acres of open pasture, and 246 acres of cropland.

f. Agricultural production will be reduced temporarily (1 season) on about

15 acres because of disturbances created by construction equipment activity during installation of structural measures.

g. The normal routine of one farm family will be temporarily disrupted while the farmstead is relocated.

h. The installation of structural measures with their sediment pools will create about 40 miles of shoreline that could be conducive to the development of mosquito breeding areas.

i. Create conditions that could be favorable to an increase in the wood tick population with the installation of 69 acres of prime wildlife habitat - mitigation measures.

ALTERNATIVES

Various alternatives to the proposed project action were considered. These alternatives included:

1. Accelerated land treatment alone.

2. Accelerated land treatment supplemented by nonstructural measures - conversion of flood plain cropland to noncrop uses.

3. Elimination of the project recreational development and the accelerated land treatment program.

4. No Project - including on-going land treatment program.

The ideal solution to problems may well be the use of several alternatives in the optimum combination; however, each alternative and its impact will be discussed as a separate and lone alternative.

1. This alternative would consist of the accelerated application of land treatment measures on 7,800 acres of cropland, 3,070 acres of pasture, 3,000 acres of woodland, and the conversion of 2,270 acres of cropland to pastureland. The accelerated land treatment program would reduce the soil loss to the acceptable goal of 5 tons/acre/year. The application of land treatment measures would provide long range additional wildlife habitat and would reduce sheet and rill erosion about 17 percent. The land and forestry treatment measures would improve the visual environmental setting and economic returns to landowners would improve with improved management practices. Land treatment measures would reduce the present flood plain crop and pasture damages an estimated 4 percent. The nation's demand for food and fiber, as well as the economics to the resident farmers, rules out any large scale conversion of cropland to pastureland. Also, a 4 percent reduction in flood plain crop and pasture damages would be insignificant. Total cost of this alternative is approximately $400,000.

2. This alternative includes the land treatment program of alternative 1 and the conversion of flood plain land from cropland with high potential for damages to grassland or woodland with lesser potential for damages. Such conversions in lieu of the planned project would require monetary compensation to landowners whose farming enterprises are presently geared to crop production on flood plain lands. This plan would cost the community about $319,000 annually, eliminate an annual net income of $161,000 to 147 farms, reduce the production of food and fiber to the economy, forego waterbased recreational benefits from structures, and forego beneficial effects from reduced sediment to the stream system. One advantage of this alternative would be the improvement of wildlife habitat in the flood plain. Some other advantages are landbased recreational use, pollution control, grazing use, hay production, and erosion control.

3. The exclusion of the recreational development from the selected plan would result in a reduction of about $122,220 in construction costs for facilities, about 100 acres less land devoted to the recreation pool, and about 275 acres less of land devoted to recreational development. The average annual recreation benefits of $56,700 would also be eliminated as well as the benefits to be derived from the land treatment program. An estimated 25,200 recreation visits would be lost annually in an area that is presently experiencing recreational deficiencies of about 2,800 acres of recreational land, 800 acres of picnic areas, and 600 acres of campgrounds.

4. This alternative, which has been in existence up to the present, is the absence of any project to solve existing flood and gully problems. Such an alternative would permit problems, too costly for individual operators to solve, to continue without solution and would forego the development of waterbased public recreation. Under the alternative the flooding, sedimentation, and gully deterioration would continue and accelerate. The "no project" alternative would forego $340,640 in average annual benefits and save $164,410 in average annual cost, thus foregoing net benefits of $176,230 annually (Appendix A).

   Advantages of the alternative of no program is that 532 acres devoted to structures and their sediment pools would not be needed for this purpose, the cost of operation and maintenance would not be needed, the temporary loss of certain wildlife habitat would be avoided, and the inconvenience of construction would be avoided.

SHORT-TERM VS. LONG-TERM USE OF RESOURCES

Short-term includes the project installation period plus the next 10 to 15 years. Long-term considers the time period from short-term to 100 years and beyond.

The plan provides a level of protection consistent with present and projected agricultural uses of the flood plain. The benefited areas are utilized primarily for agricultural production and this use is expected to continue. A tiny portion of the flood plain is occupied by the western edge of the city of Humboldt. No urban development has occurred on the benefited areas outside of Humboldt and none is anticipated. The planned project would not result in a level of protection compatible with increased urban development.

Present land use regulations for Humboldt are in compliance with the Disaster Protection Act of 1973. These regulations will remain in effect until implementation of the State of Nebraska zoning laws. At that time all urban and rural areas within the 100-year flood plain will be zoned to prevent any further residential or commercial development.

The planned floodwater retarding and grade stabilization structures will be designed to store sediment and thus reduce sediment delivery rates to Long Branch and the Nemaha River and ultimately to the Missouri River. Following the 50-year period, the structures will have progressively less effect on sediment deliveries. The structural system is designed to be fully effective in reducing floodwater damages for 50 years.

Following the 50-year design life, the floodwater retarding features will continue to function; however, floodwater storage capacities of the structures will gradually be reduced as the flood pools are being filled with sediment.

Three watersheds have been approved for construction or are under construction in the Big Nemaha drainage area. These watersheds are: Upper Big Nemaha (114,900 acres), Rock Creek (9,600 acres), and South Fork (30,400 acres).

In addition to Long Branch Watershed, planning is underway on Middle Big Nemaha Watershed (136,475 acres); with Big Muddy (176,800 acres), Turkey Creek (120,600 acres), and Lower Big Nemaha (91,300 acres) in the preliminary investigation stage.

Applications for assistance for watershed protection have been received from all of the Big Nemaha drainage area.

All water and land resource projects within the area have applied for assistance under Public Law 83-566. Flood protection to agricultural lands is the primary purpose of these projects.

The watershed is located within the Big Nemaha Subbasin of the Nemaha River Basin of the Missouri River Region, as designated by the Water Resources Council.

There are 13 active P.L.-83-566 applications within the area covering all or about 1,311 square miles.

There are 6 projects that have been authorized to develop plans in the sub-region. The area covers 796 square miles or 61 percent of the area.

Of those authorized for planning, three have been approved for construction. The area covers 242 square miles or 18 percent of the area.

Two watersheds, one authorized for construction and one approved for planning, include recreation sites as part of their overall objective. These two sites will provide an additional 244 acres of water and an additional 557 acres of land for recreational purposes, or less than 3 percent of the estimated 1980 recreational deficiencies for the Lincoln and Beatrice SEA's.

The projects installed under P.L.-83-566 consist of conservation land treatment, floodwater retarding reservoirs, multiple-purpose structures, and grade stabilization structures.

Both short-term and long-term cumulative effects of these projects will provide an improved solution to the major river basin water related problems.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

An estimated 20 acres of woodland, 21 acres of woody pasture, 21 acres of open pasture, and 43 acres of cropland will be occupied by the planned dams and emergency spillways. This area will be seeded to permanent grasses and therefore its future use after project installation will be restricted primarily to wildlife habitat. The permanent pool areas resulting from installation of the dams will occupy approximately 78 acres of woodland, 100 acres of wooded pasture, 69 acres of open pasture, and 123 acres of cropland. About 39 acres of woodland, 106 acres of woody pasture, 95 acres of open pasture, and 246 acres of cropland will become more subject to occasional inundation as these areas will be located within planned flood pools.

An additional area consisting of approximately 12 acres of woodland, 11 acres of wooded pastureland, 97 acres of open pasture, and 46 acres of cropland will be purchased at site 21. Its future use will be restricted to wildlife habitat, location of recreation facilities, and other public uses.

Capital is committed to the project which includes labor and materials. Capital committed includes $2,456,920 in construction cost plus approximately $11,240 annually for operation and maintenance of structural measures.

CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

GENERAL

It was the intent of the sponsoring local organization and of the Service to encourage participation of interested public agencies and particularly of the general public in the planning process. This was accomplished by keeping them informed of planning progress and providing them with forums to discuss their respective opinions. The diverse interests expressed by the public agencies and private citizens were considered in the formulation of the project.

The sponsors, consisting of the Johnson, Nemaha, Pawnee, and Richardson Counties Soil and Water Conservation Districts, submitted an application for watershed assistance to the Nebraska Soil and Water Conservation Commission in March 1965.

A field examination of Long Branch Watershed was conducted on May 6, 1965, at the request of the Nebraska Soil and Water Conservation Commission. Participants included representatives of the Soil and Water Conservation Districts, the Nebraska Soil and Water Conservation Commission, the Soil Conservation Service, and interested local people. A public meeting held that evening in the courthouse at Auburn, Nebraska, was attended by sponsors and endorsers of the watershed.

The floodwater, grade stabilization, recreation, and other problems and information included in the application were discussed. The field review party decided that the damage information in the application was probably conservative and recommended that the application for assistance under the Small Watershed Act be approved.

The Nebraska Soil and Water Conservation Commission approved the application in May 1965.

On April 28, 1966, the formation of the Long Branch Watershed Conservancy District and the election of a board of directors became effective. At this meeting the Long Branch Watershed Conservancy District became a co-sponsor of the Long Branch application with the four original Soil and Water Conservation Districts.

The Nebraska Soil and Water Conservation Commission issued a planning priority for Long Branch Watershed on September 29, 1967. State and federal agencies were notified that preliminary investigations would commence.

A preliminary investigation was conducted by Service personnel. During the preliminary investigation, status reports were periodically presented at meetings of the Sponsoring Local Organization. Following acceptance of a preliminary investigation report by the Sponsoring Local Organization and upon receipt of planning authorization in May 1971, state and federal

agencies were so advised through correspondence and were encouraged to participate in the planning process. Copies of the preliminary investigation report accompanied these announcements.

During development of the work plan, July 1, 1972, the Nemaha Natural Resources District replaced the Long Branch Watershed Conservancy District and the four Soil and Water Conservation Districts as the sponsoring local organization.

The project was formulated at a series of meetings of the sponsoring local organization which were open to the public and which were advertised. The Fish and Wildlife Service, U. S. Forest Service, Extension Forester, Nebraska Game and Parks Commission, State Historic Preservation Officer, National Audubon Society, Wachiska Audubon Society, and other interested federal and state agencies, and local organizations were requested by correspondence to evaluate proposed project measures and to make possible recommendations. Upon tentative project formulation a public meeting was called in order to discuss the plan.

The public hearing was held on April 24, 1973. The public was advised of the hearing through use of the news media (televation, radio, and newspapers). State and federal agencies were advised through correspondence of the public nearing and they were encouraged to participate.

The Long Branch Watershed board voted to accept the plan as presented at the public hearing at their May 1973 meeting and requested the Soil Conservation Service to begin work on the initial drafts of the work plan and environmental impact statement.

The initial draft work plan and environmental impact statement were prepared and sent out for informal review to 11 federal agencies, 9 state agencies, and 8 conservation groups on December 19, 1974.

As a result of the informal review, additional changes and studies were activated within the watershed. The impact of the project on gross erosion and resultant sediment yields to the main channels was reevaluated. Additional tests were run on water quality samples and the effect of project measures on future water quality within the watershed was reevaluated in response to comments received from the Council on Environmental Quality.

As a result of comments received from various agencies and local people during the informal interagency review, the Soil Conservation Service and the Nemaha Natural Resources District felt that another public hearing would be appropriate.

This public meeting was held and conducted by the Nemaha Natural Resources District at Humboldt, Nebraska, on January 7, 1975. Comments and changes in the work plan and environmental impact statement were reviewed at this meeting and changes were agreed upon by the sponsoring local organization. These changes, or responses to comments received were incorporated into the documents and they were submitted for formal agency review on December 1, 1975.

The Council on Environmental Quality published the notice of availability of the draft environmental impact statement for the project in the December 12, 1975, issue of the Federal Register.

Approval of the plan was received from the Office of the Governor of the State of Nebraska.

Comments received from the formal agency review were evaluated and incorporated into the work plan and/or environmental impact statement. The State Conservationist then prepared the final environmental impact statement including a discussion of all comments raised on environmental issues.

DISCUSSION AND DISPOSITION OF EACH COMMENT ON DRAFT ENVIRONMENTAL IMPACT STATEMENT

The following is a list of agencies requested to comment on the Draft Environmental Impact Statement:

Advisory Council on Historic Preservation
U. S. Department of the Army
U. S. Department of Commerce
U. S. Department of Health, Education, and Welfare
U. S. Department of the Interior
U. S. Department of Transportation
U. S. Environmental Protection Agency
Federal Power Commission
U. S. Forest Service
Office of Equal Opportunity
Office of the Governor of Nebraska
Nebraska Natural Resources Commission
Nebraska Office of Planning and Programming (State Clearinghouse)
Southeast Nebraska Council of Governments (Area Clearinghouse)
State Historic Preservation Officer
Environmental Defense Fund
Environmental Impact Assessment Project
Friends of the Earth
National Audubon Society
National Wildlife Federation
Natural Resources Defense Council
Nebraska Environmental Coalition
Wachiska Audubon Society

Comments were not received from the following agencies or organizations:

Federal Power Commission
Office of Equal Opportunity
Southeast Nebraska Council of Governments
State Historic Preservation Officer
Environmental Defense Fund
Environmental Impact Assessment Project
Friends of the Earth
National Audubon Society

National Wildlife Federation
Natural Resources Defense Council
Nebraska Environmental Coalition
Wachiska Audubon Society

More than 60 days have passed since publication in the Federal Register by CEQ; therefore, in accordance with regulations, it is assumed the above agencies or organizations have no comments to make.

A request for a 15 day time extension was received from and granted to the U.S. Department of the Interior. Comments were received three weeks after the deadline. Due to the fact that the documents were being finalized, no changes were made in the work plan; however, summary of comments and disposition are included in the environmental impact statement Consultation section and the letter of comments is included in Appendix E.

The following agencies stated their full support of the project or stated that the project did not conflict with any projects or current proposals of their department. These agencies had no comments to make regarding changes in the environmental impact statement; therefore, disposition of comments was not necessary.

U. S. Department of the Army
U. S. Department of Health, Education and Welfare
U. S. Forest Service
Office of the Governor of Nebraska
Advisory Council on Historic Preservation
Nebraska Office of Planning and Programming

U.S. Department of Commerce

Work Plan

Comment - Comment addressed the fact certain available National Weather Service forecast services regarding flood warnings and long range radar coverage were not reflected in the report.

Disposition - The information for responding to this comment was also furnished by the agency making the comment. This material was added to the documents, see page 3 of the work plan and page 12 of the environmental impact statement.

U.S. Department of Transportation

Comment 1 - Expresses concern for the need for the prevention and control of oil spills and the need for sewage pump-out facilities for the recreational boats.

Disposition - This problem was discussed with officials of the Nebraska State Game and Parks Commission. Studies of numerous recreation facilities throughout the state by the Game and Parks Commission indicate that on surface areas of 200 acres or less the need for the above facilities has proven to be economically unfeasible. This is primarily due to the

fact that nearly all the vessels in use on areas of this size are not adapted to or equipped with sanitary facilities. The Nebraska State Law regarding pollution is stated to the effect:

> "Every vessel equipped with kitchen or toilet facilities shall handle and treat solid and liquid wastes in a manner that will prevent water pollution. No wastes or container of such wastes shall be placed, left, or discharged in or near any waters of this state."

Comment 2 - Expressed desire that the Nebraska State Game and Parks Commission be involved in the planning process from the early stages to completion of the plan.

Disposition - All draft and final work plans and environmental impact statements are sent to this agency for their in-staff review. As of this date they have not expressed any concern regarding design or use of recreation designed structures and facilities.

U.S. Environmental Protection Agency

Comment - The draft environmental impact statement was rated LO-2, meaning EPA has no significant objections to the project as proposed.

The Environmental Protection Agency did request that the potential for the water quality of the recreation reservoir not to meet the Class "A" standards be discussed with the Nebraska Department of Environmental Control and the results be included in the final statement.

Disposition - The Department of Environmental Control was contacted to determine if the water in the recreation reservoir will be of quality to meet the Class "A" standards. The Department of Environmental Control's response was that they felt that further information should be gathered before valid conclusions could be drawn.

To obtain this additional data the Soil Conservation Service will maintain its present schedule of collecting water samples at this site up to start of construction. Also, the Department of Environmental Control is undertaking a special study program of monitoring selected areas within the state to evaluate fecal coliform. The Department of Environmental Control agreed to include site 21 as one of the selected study areas. At this time with the analyses made from the samples collected, the Soil Conservation Service feels that the waters do meet Class "A" standards. In June or July of 1976 the Department of Environmental Control, Soil Conservation Service, and other interested federal and state agencies will meet to evaluate the present water quality sampling and testing program within the state.

A major purpose of this coordination meeting is to determine the need for additional or fewer sample collections to be taken and tests to be run. Also, a time schedule for testing prior to and after construction, and the agency or organization responsible for maintaining this schedule will be discussed.

In this situation, test results will indicate if the water quality is such that Class "A" or other standards are not being met. In the case of recreation areas, water contact sports associated with Class "A" standards would be prohibited until the source of pollution was identified and controlled.

State of Nebraska

Natural Resources Commission

Comment - Was addressed to the rewording under Alternatives, item 2, page 26 of the work plan.

Disposition - The Natural Resources Commission, as a part of their comment, furnished the wording for their requested change. This rewording was used verbatim and made a part of page 26 of the work plan and page 45 of the environmental impact statement.

Department of Health

Comment - This comment expressed concern that the planting of 69 acres of prime woody habitat for wildlife may have an adverse impact in that it will increase the wood tick habitat.

Disposition - The creation of the 69 acres of prime woody wildlife habitat was recognized as creating a possible potential for an increase in the wood tick habitat and was included in item (i) on page 44 of the environmental impact statement. A paragraph was added to page 41 of the environmental impact statement expressing the reasons that the Service believes this potential will have little effect upon the public.

U.S. Department of the Interior

Comment 1 - Expresses the opinion that the determination of recreation benefits could be strengthened by providing the justification for assigning a unit day value of $2.25 a recreation visit.

Disposition - A range of permissible unit day values from $0.75 - $2.25 for a recreation visit is given in the Federal Register (Vol. 38, #174, Part III, page 52). Since the recreation structure in the plan is planned and designed as a full use facility, it was deemed appropriate to use the maximum allowable figure in determining recreation benefits.

Comment 2 - Recommends measures be taken to minimize erosion of borrow areas.

Disposition - It is a standard construction practice on all P.L.-566 measures to take all possible precautions to minimize erosion during and after construction.

Comment 3 - States there is no inventory or description included in the plan of the fish species to be found in the watershed.

Disposition - A list of the more important species has been included as Appendix J of the environmental impact statement. Additional information assembled during the environmental assessment can be found in the base files.

Comment 4 - Expressed the opinion that the environmental impact statement should identify dominate invertebrate species present in streams.

Disposition - The project measures will bring about a significant reduction in the sediment yield to the stream channels. Since most biologists agree that a decrease in sediment yields favorably effects production of food organisms upon which fish depend it was determined that any further assessment of this impact was not necessary

Comment 5 - Expressed opinion that water quality data was inadequate as it was based on one measurement.

Disposition - Three water quality sampling stations were established in the watershed over two years ago. Samples were taken on a monthly basis for about one year and then to a quarterly or storm event basis. The specific items sampled for were recommended by the Nebraska Department of Environmental Control and concurred in by the Environmental Protection Agency. These test results are shown on page 18 of the environmental impact statement.

Comment 6 - Expressed concern that nongame species were not described.

Disposition - A list of nongame species was included in Appendix J.

Comment 7 - Expressed opinion that environmental impact statement should:

1. Evaluate impacts of ponds and other impoundments on groundwater levels in adjacent and downstream areas.

2. Mention net effects of flood control on recharge to aquifers and evaluate effects of land treatment on recharge and quality of water.

3. Express a few more significant details on the occurrence of water in the sand and gravel valley fills.

Disposition -

1 & 2. The soils and geologic conditions of the watershed are such that ponds and other impoundments will not have any significant effect on groundwater levels.

3. The sand and gravel valley fills are overlain by moderately thick (10 - 50 feet) deposits of relatively impermeable deposits of fluvial origin. The clay - silt deposits are relatively impermeable and the recharge effect to the valley fills from project measures will be insignificant.

Comment 8 - Suggests the effects on eutrophication resulting from nutrient enrichment should be considered.

Disposition - Eutrophication was considered under Water Quality Problems, page 30. Based on 20 years of observing structures similar to those in the plan the Service expects the spring and early summer turbidity to continue to suppress the growth of algae which might otherwise result from nutrient enrichment.

Comment 9 - States the environmental impact statement does not address the impact on wildlife resources through the period of time it takes for mitigation plantings to mature enough to mitigate losses. Also states the environmental impact statement does not discuss the impact on wildlife when natural growing woodlands are replaced with planted rows of shrubs and trees.

Disposition - Policy, as outlined in the Watershed Protection Handbook, states that losses of existing habitat caused by project works of improvement must be mitigated as fully as physically possible and economically feasible by adding measures or features of measures to minimize, restore, replace, or compensate for the losses.

In compliance with this policy a team of biologists from the Soil Conservation Service, Nebraska Game and Parks Commission, U.S. Fish and Wildlife Service, and a representative of the Nemaha NRD conducted a mitigation field trip to evaluate these losses and impacts to wildlife resources. This team agreeded upon mitigation measures that would compensate for these losses and they were included in the project plan.

Comment 10 - Suggests there is a need to discuss the effects of weed control in wildlife habitat plantings.

Disposition - The sole purpose of weed control is to reduce competition with planted trees and shrubs to insure their survival. Weed control is a part of the Operation and Maintenance section, page 8. The provisions for weed control will be detailed in the Operation and Maintenance agreement between the Service and the sponsoring local organization prior to installation of structural measures and the associated mitigation measures. The overall effect of weed control in wildlife plantings will not produce any adverse effects as the weed control program for P.L.-566 measures will not be any different from the program presently used by landowners in the watershed.

Comment 11 - Suggests the statement, "The project will create 69 acres of prime woody habitat for wildlife." is misleading as the 69 acres are being planted for mitigation.

Disposition - Since the destruction of about 219 acres of habitat is shown under adverse effects it is proper to show the planting of 69 acres of prime habitat under favorable effects. Another alternative would have been to eliminate both items from the favorable and adverse effects which is impractical at this time.

Comment 12 - States that since there are no provisions in the project to protect shorelines around the reservoirs that the following statements are grossly inaccurate:

1. "One of the limiting factors for fish and wildlife species in the area was determined to be a lack of wetland areas created by water impoundments."

2. "Water and the shoreline of additional impoundments is needed to improve the habitat of shorebirds, wood duck, and all waterfowl species."

Disposition - Statements referred to are from the problem section and are intended to indicate a need. Since sponsorship is not available for protecting shorelines from livestock no benefits from creation of 40 miles of shorelines have been claimed; however, there will be some incidental benefits to shorebirds and waterfowl without livestock exclusion.

Comment 13 - Suggests the Soil Conservation Service should use an updated State Recreation Plan for reference.

Disposition - The updated State Recreation Plan will be used for future plans. The 1968 (SCORP) was in effect at the time of the original recreation evaluations. The updated (SCORP) changes were relatively insignificant as related to Long Branch Watershed and surrounding area and the Service felt that an additional evaluation was unwarranted at this time.

Comment 14 - Suggests the environmental impact statement should elaborate on the relationships, associated impacts, and provide the decision makers an assessment of this project's regional ramifications in relation to the Corps of Engineers' flood control projects and other projects within the basin.

Disposition - The relationship of this project to other P.L.-566 watersheds is presented in the Short-Term vs. Long-Term Use of Resources section of the environmental impact statement, page 47. The projects of other agencies are presented on page 25 of the environmental impact statement. This project, as all other P.L.-566 projects within the basin, are not in conflict with any present or proposed Corps of Engineers projects. This is further substantiated in the letter of comment included in Appendix H received from the Department of the Army.

During the phase-in for projects formulated under Senate Document 97 an Addendum is included in the Watershed Work Plan. Pages A-9 through A-11 summarize regional effects.

Comment 15 - States that flood plain zoning should have been included in the selected plan.

Disposition - This measure was discussed as part of Alternative no. 2 but was not accepted by the sponsor. Land use controls and cost sharing for agricultural land to force land use management has not been legislated.

LIST OF APPENDIXES

Appendix A - Comparison of Benefits and Costs for Structural Measures

Appendix B - Project Map

Appendix C - Structure 21 Recreation Development

Appendix D - City of Humboldt - Flood Damage Area

Appendix E - Letters of Comment Received on the Draft Environmental Impact Statement

Appendix F - Typical Drawings

Appendix G - Definition of Expected Land Treatment Measures

Appendix H - Structure Data

Appendix I - Structure Data

Appendix J - Inventory of Common and Abundant Birds, Mammals, Reptiles, Amphibians, Aquatic Invertebrates, and Fishes

APPROVED BY W. J. Parker DATE MAY 21 1976

W. J. Parker, State Conservationist

COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

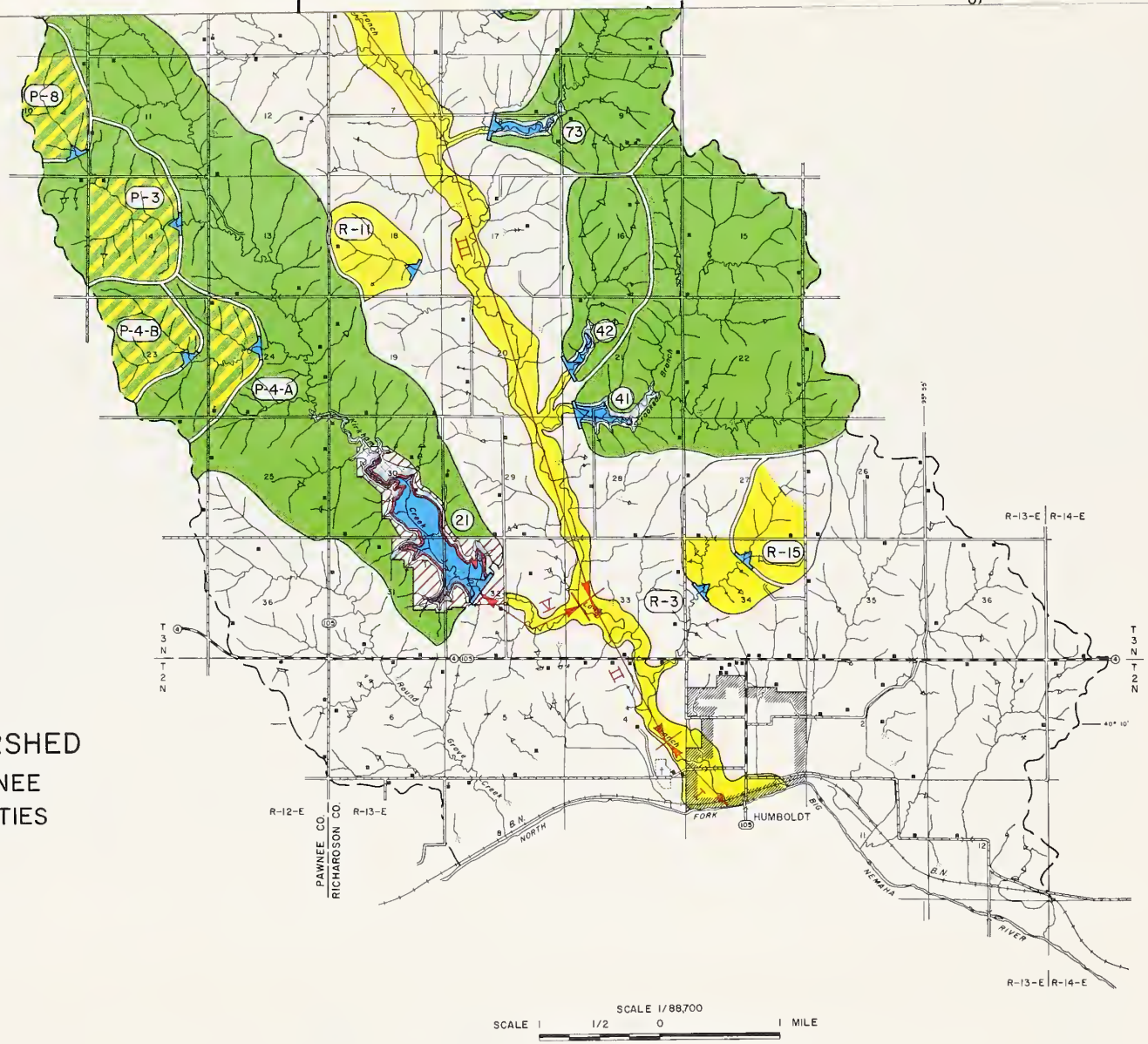
Long Branch Watershed, Nebraska
(Dollars)

Evaluation Unit	Average Annual Benefits 1/					Average Annual Cost 3/	Benefit Cost Ratio
	Damage Reduction	Recreation	Redevelop-ment	Secondary	Total		
12 Grade Stabilization Structures, 12 Floodwater Retarding Structures, and 1 Multi-purpose Structure	253,180	56,700	10,090	20,670	340,640	147,360	2.3:1.0
Project Administration						17,050	
GRAND TOTAL	253,180 2/	56,700	10,090	20,670	340,640	164,410	2.1:1.0

1/ Price base current normalized.
2/ In addition, land treatment measures will provide damage reduction benefits of $10,310, including $5,250 downstream.
3/ Amortized at 5-7/8 percent interest for 50 years.

	Bd. Ft. Sed. Pr. Dy.
N-6	600
N-7	184
R-3	364#
R-11	256
R-15	430
P-3	730#
P-4-A	454#
P-4-B	354
P-8	308

UNCONTROLLED DRAINAGE AREA



PROJECT MAP

LONG BRANCH WATERSHED

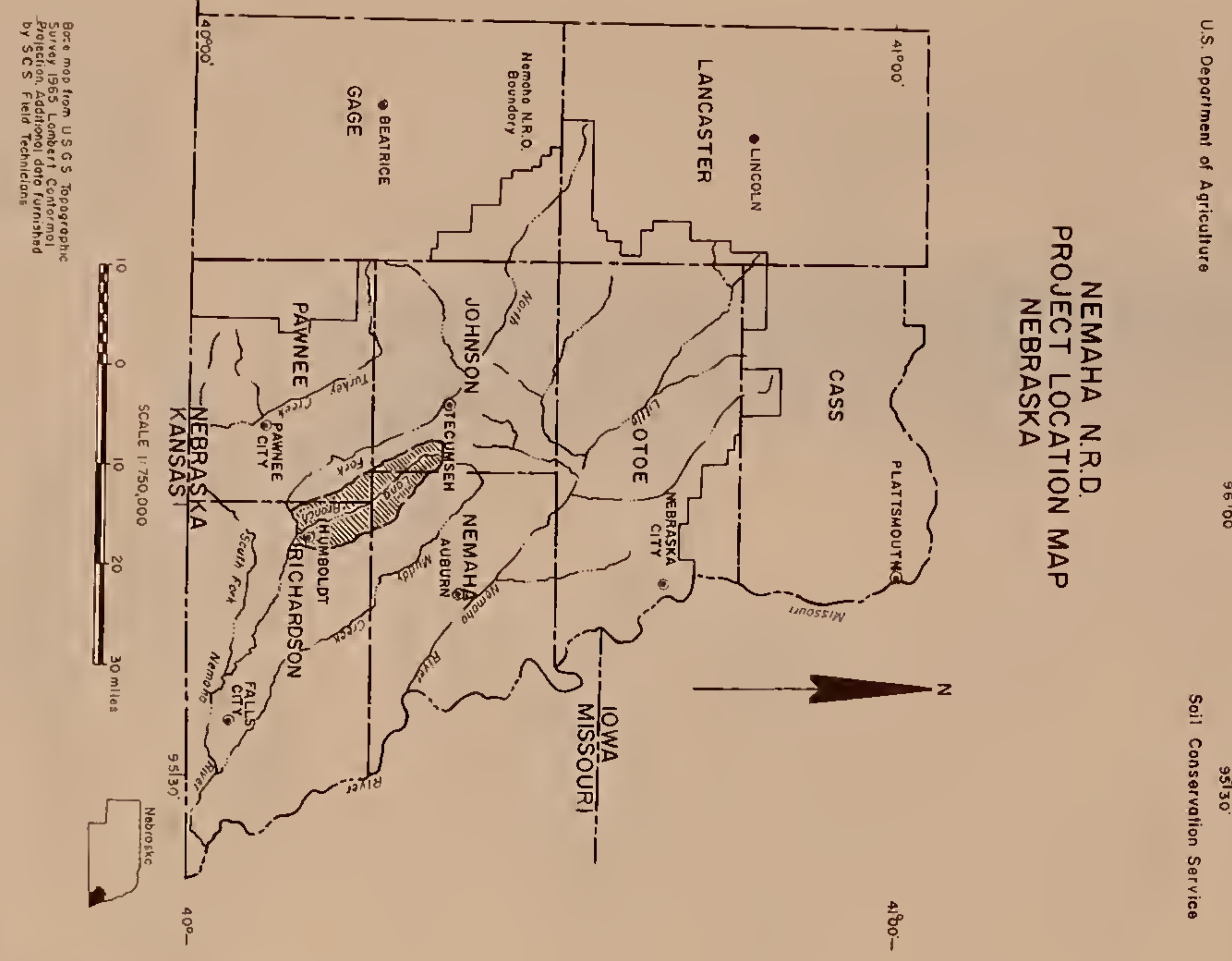
JOHNSON, NEMAHA, PAWNEE
AND RICHARDSON COUNTIES
NEBRASKA

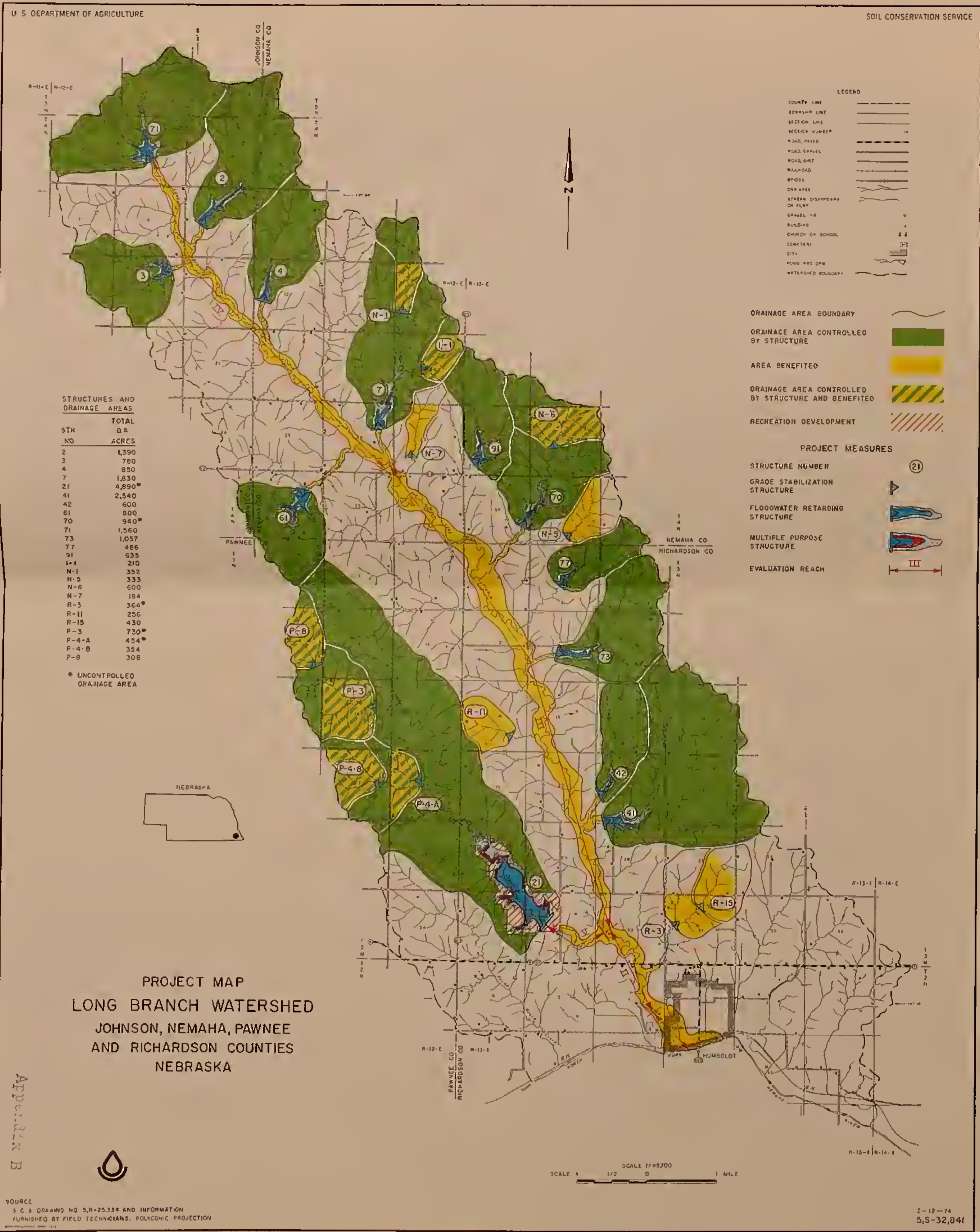
Appendix B

SOURCE:
S. C. S. DRAWING NO. 5,R-25,334 AND INFORMATION
FURNISHED BY FIELD TECHNICIANS. POLYCONIC PROJECTION

USDA SCS LINCOLN, NEBR. 1974

2-12-74
5,S-32,841



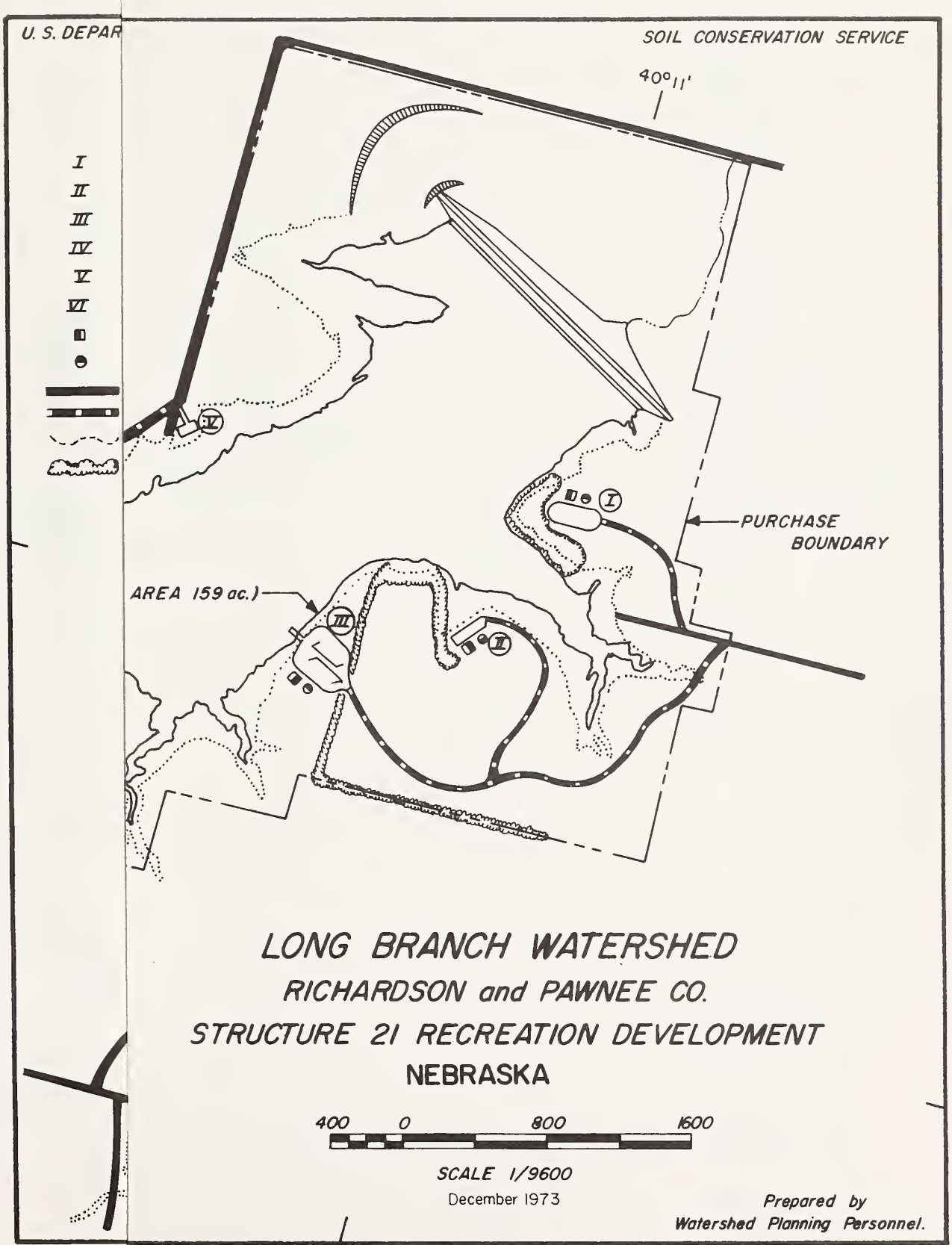


STRUCTURES AND DRAINAGE AREAS

STR NO	TOTAL D.A. ACRES
2	1,390
3	780
4	850
7	1,830
21	4,890*
41	2,540
42	600
61	800
70	940*
71	1,560
73	1,057
77	486
91	635
I-1	210
N-1	352
N-5	333
N-6	600
N-7	184
R-3	364*
R-11	256
R-15	430
P-3	730*
P-4-A	454*
P-4-B	354
P-8	308

* UNCONTROLLED DRAINAGE AREA

Appendix B

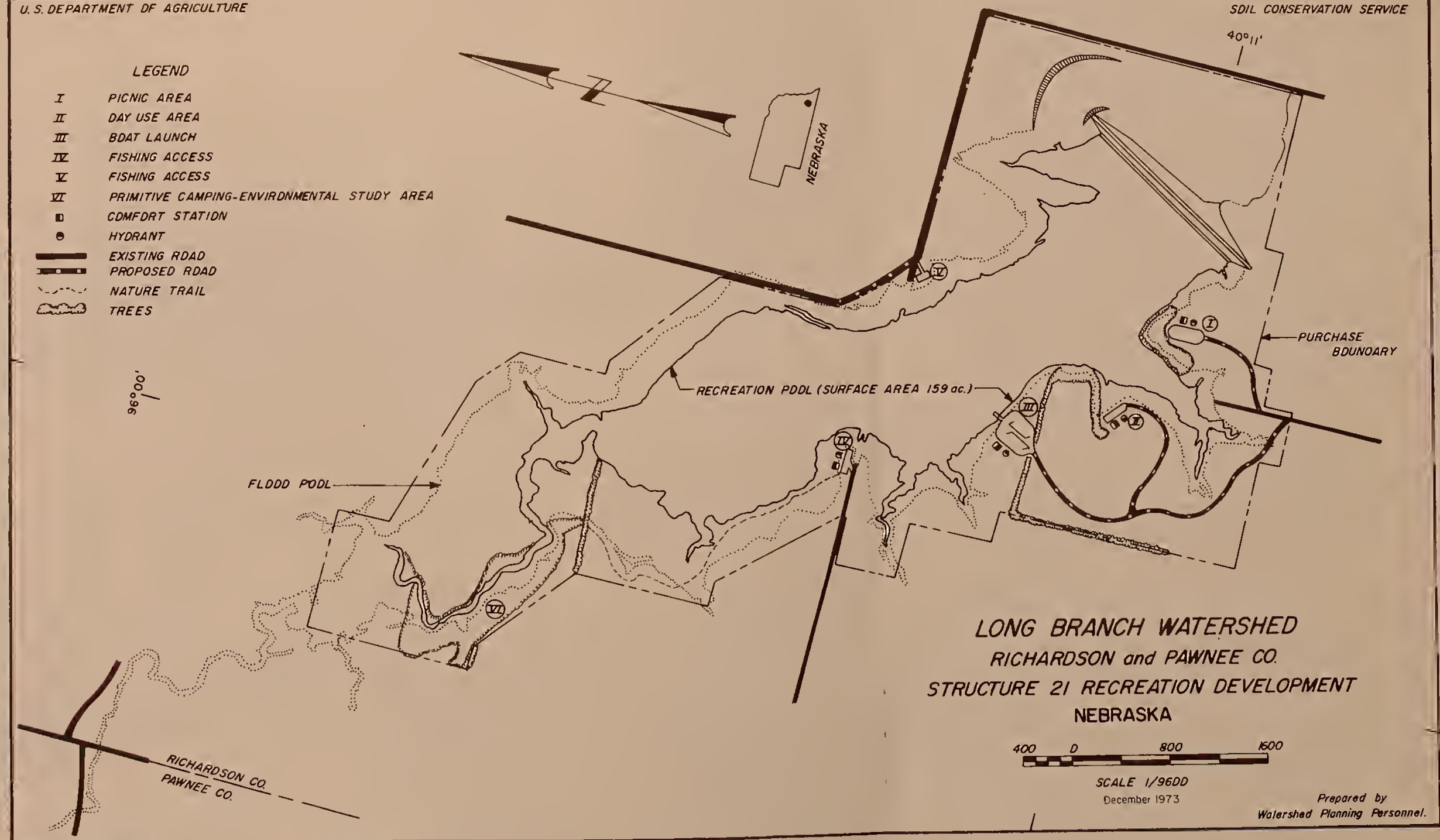

U. S. DEPAR
SOIL CONSERVATION SERVICE
40°11'
I
II
III
IV
V
VI
PURCHASE
BOUNDARY
AREA 159 ac.)
LONG BRANCH WATERSHED
RICHARDSON and PAWNEE CO.
STRUCTURE 21 RECREATION DEVELOPMENT
NEBRASKA
400 0 800 1600
SCALE 1/9600
December 1973
Prepared by
Watershed Planning Personnel.
SOURCE: SC
USDA-SCS-LINCOLN,

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

LEGEND

- I PICNIC AREA
- II DAY USE AREA
- III BOAT LAUNCH
- IV FISHING ACCESS
- V FISHING ACCESS
- VI PRIMITIVE CAMPING-ENVIRONMENTAL STUDY AREA
- COMFORT STATION
- HYDRANT
- EXISTING ROAD
- PROPOSED ROAD
- NATURE TRAIL
- TREES



LONG BRANCH WATERSHED

RICHARDSON and PAWNEE CO.

STRUCTURE 21 RECREATION DEVELOPMENT

NEBRASKA

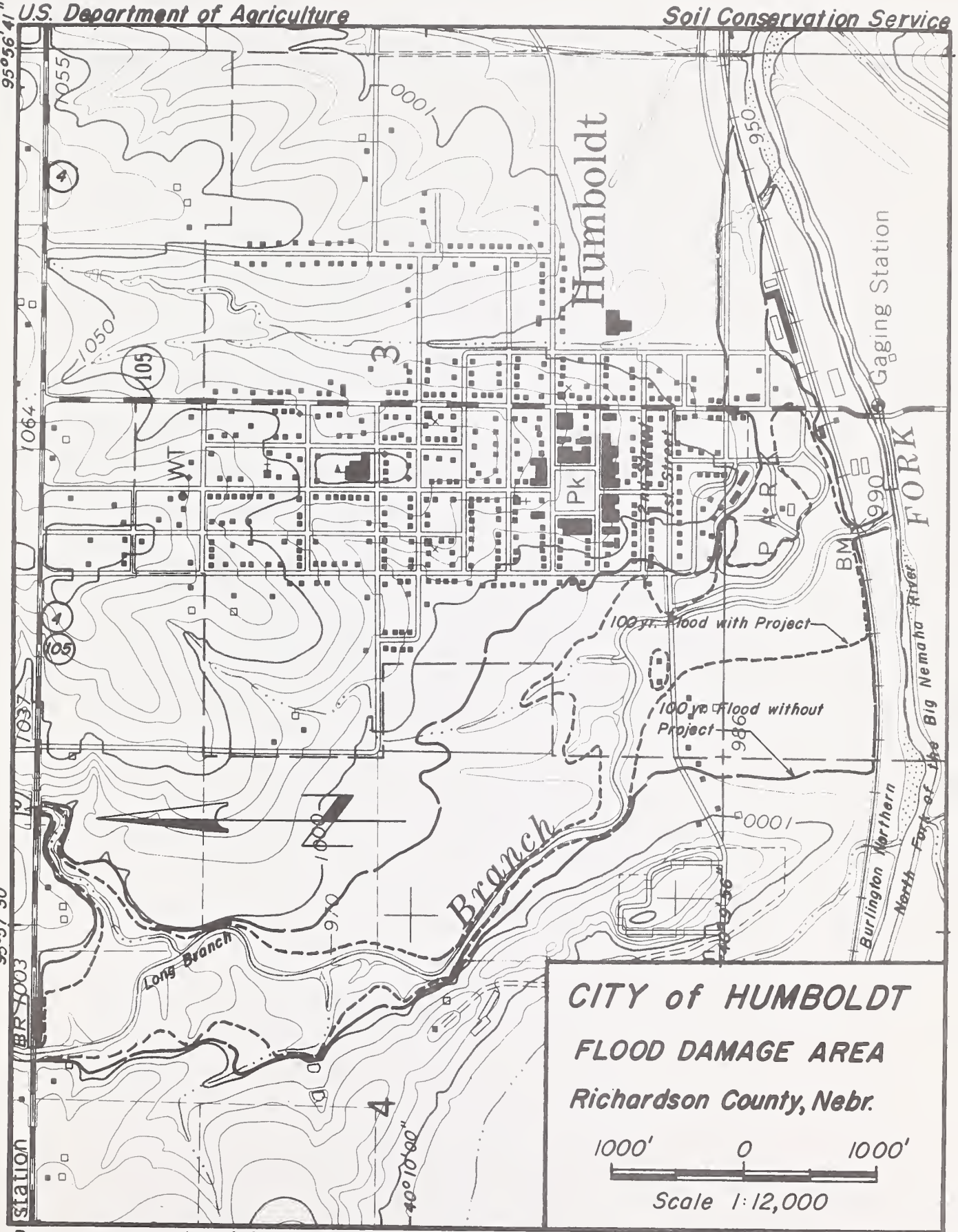
400 0 800 1600

SCALE 1/9600

December 1973

Prepared by Watershed Planning Personnel.

SOURCE: SCS Kelsh Survey.
USDA-SCS-LINCOLN, NEBR. 1973-12



Base map reproduced from U.S.G.S.
7.5 minute Quadrangle - Humboldt, Nebr.
(1965) Polyconic Projection

Contour Interval 10 feet
Additional data furnished by
S.C.S. Field Technicians.

Appendix E - Letters of Comment Received on the Draft Environmental Statement

Advisory Council
On Historic Preservation
1522 K Street N.W.
Washington, D.C. 20005

December 8, 1975

Mr. W. J. Parker
State Conservationist
Soil Conservation Service
Federal Building-U.S. Courthouse
Room 345
Lincoln, Nebraska 68508

Dear Mr. Parker:

This is in response to your request of December 1, 1975, for comments on the environmental statement for the Long Branch Watershed Work Plan, Nemaha, Pawnee, Richardson and Johnson counties, Nebraska. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement appears adequate regarding our area of expertise and we have no further comment to make at this time.

Sincerely yours,

Louis S. Wall
Assistant Director, Office
of Review and Compliance

cc:
Dr. Clement M. Silvestro-Chairman, ACHP
Marvin F. Kivett-NB:SHPO
Zane G. Smith-AG:FLO

DEC 1 0 1975

The Council is an independent unit of the Executive Branch of the Federal Government charged by the Act of October 15, 1966 to advise the President and Congress in the field of Historic Preservation.

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

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 Nebraska State Conservationist of the Soil Conservation Service, by letter of 1 December 1975, requested the views of the Secretary of the Army on the work plan for the Long Branch Watershed, Nebraska.

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

Sincerely,

Charles R. Ford

Charles R. Ford
Deputy Assistant Secretary of the Army
(Civil Works)

BC:
Wilson J. Parker, SCS, Lincoln, Nebraska

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230

February 2, 1976

Mr. W. J. Parker
State Conservationist
Soil Conservation Service
Department of Agriculture
Federal Building-U.S. Courthouse
Room 345
Lincoln, Nebraska 68508

Dear Mr. Parker:

This is in reference to your draft environmental impact statement entitled "Long Branch, Richardson, Nemaha, Pawnee, Johnson Counties, Nebraska." The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving four (4) copies of the final statement.

Sincerely,

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Enclosure - Memo from National Weather Service, December 24, 1975

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE
Silver Spring, Md. 20910

Date : DEC 24 1975

Reply to Attn. of: W2x2/AF

To : Dr. William Aron
Director, Office of Ecology and Environmental Conservation (EE)

From : Dr. George P. Cressman
Director, National Weather Service (W)

Subject: DEIS 7512.21 - Long Branch, Richardson Nemaha Pawnee

On page 4 of the Long Branch Work Plan, it is stated that "rainfall often causes flooding problems" but there is no mention of available NWS forecast services regarding flood warnings from the "high intensity short duration thunderstorms" mentioned on pg 3. Long range weather radar coverage is provided by radars at Grand Island and Kansas City with watches, warnings and forecasts of weather and flood conditions also emanating from these offices as described in the attachment. This info should be reflected in the report.

Atch.

The National Oceanic and Atmospheric Administration (NOAA) National Weather Service provides flood forecasting service for major river basins. This system involves predictions of anticipated stages at a particular gage or gages in the basin. These forecasts are based on observed precipitation and stages at upstream points and anticipated weather conditions. The flood forecast is transmitted to City officials, newspapers, and radio and television stations in the basin. These media disseminate the information to residents of the flood plain in the form of a flood warning. This timely forewarning permits protective measures to be undertaken by industrial plants, public utilities, municipal officials, and individuals with property in the lowlands. Services available are of the following types:

1. Flash Flood: The responsible Weather Service Forecast Office supplies weather forecasts twice daily for the State. In addition to the routine forecasts, special forecasts of severe storms and general flash flood watches for small streams are issued as required. WSR-57 Weather Radar installations have capability for immediate detection and evaluation of rainfall intensity, location, and storm movement. Information is promptly relayed by teletype circuits and telephone to news media and community officials and law enforcement agencies. The Weather Service Office issues Flash Flood Warnings as required for small streams in its area of responsibility.

2. Major Floods: River stage forecasts are based on radar coverage, reports from river and rainfall reporting stations and telemetry in or near the basin. The River Forecast Centers are staffed with professional hydrologists responsible for the preparation of river forecasts based on water equivalent of snow cover, rainfall-runoff relations, streamflow routing, and a working knowledge of anticipated weather conditions. The lead time between distribution of the forecasts and the flood crest may be short; however, lead time normally ranges from 12 hours for rainfall and up to several weeks for snowmelt. Specific crest forecasts are issued as required. River District Offices are responsible for the interpretation and distribution of flood forecasts and the operation of the hydrologic reporting substation network in its area of responsibility.

3. Hydroclimatic Data: Most of the data from the network is published. These records provide the basis for forecasts as well as for the planning and design of protective works and their operation during floods. River and flood forecasting is fundamental in the design and essential in the operation of a levee or reservoir system.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION VII
FEDERAL BUILDING
601 EAST 12TH STREET
KANSAS CITY, MISSOURI 64106

OFFICE OF
THE REGIONAL DIRECTOR

January 28, 1976

Mr. W. J. Parker
State Conservationist
Department of Agriculture
Soil Conservation Service
Federal Building
U.S. Courthouse, Room 345
Lincoln, Nebraska 68508

RE: Draft Environmental Impact Statement
Long Branch - Richardson, Nemaha, Pawnee,
Johnson Counties, Nebraska

Dear Mr. Parker:

Thank you for the opportunity to review the Draft Environmental Impact Statement covering the above referenced project.

We find that the project will have no impact upon programs of the Department of Health, Education, and Welfare, and that the impacts of the proposed actions and the reasonable alternatives have been adequately addressed.

Sincerely,

William H. Henderson
Regional Environmental Officer

cc: Ms. Phyllis Hayes
Mr. Warren Muir

JAN 28 1976

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PEP ER-75/1164

MAR 9 1976

Dear Mr. Parker:

Thank you for the letter of December 1, 1975, requesting our views and comments on the draft environmental statement and work plan for Long Branch Watershed, Richardson, Nemaha, Pawnee and Johnson Counties, Nebraska. Our review indicates that the proposal is adequate as it relates to cultural and mineral resources. However, several additional areas of concern are discussed below.

Work Plan

We believe the discussion of the determination of recreation benefits, on page 75, could be strengthened by providing the justification for assigning a unit day value of $2.25 for a recreation day.

The estimated annual recreation visitation of 25,200 is reasonable.

Environmental Statement

Planned Project

It is stated that "borrow areas resulting from construction of the dam shall be located where they will be permanently inundated, if possible" and "borrow areas located in the normal summer fluctuation zone or outside the reservoir basin will be made self-draining" (page 5, paragraph 7). Measures to minimize erosion of these borrow areas and in turn minimize any increase in siltation of the surface-water regime of the project area should be considered.

Environmental Setting

There is no inventory or description of the fish species present in the portion of Long Branch Creek identified as having a warm-water sport fishery, nor the lower ten miles of Long Branch Creek

which is an important forage fish production area for streams downstream of the watershed.

It was explained on page 22 that sediment deposits following intensive rainfalls affect production of food organisms; however, these organisms were not described. The statement should identify dominate invertebrate species present in such major groups as phytoplankton, zooplankton and macroinvertebrates. These are indicators of water quality necessary for sustaining fishery resources.

To fully evaluate the affects of water quality on the fishery resource, data should be gathered at select stations throughout the stream system and during different times of the year. The statement mentioned only one survey date, March 22, 1974, and all water quality characteristics of the project were based on that one measurement. One sample does not provide sufficient data to reach conclusions because, at the very least, it does not include the effects of "damaging floods", the majority of which occur during the growing season and carry high sediment and agricultural chemical loads. We believe that information on suspended and settled solids should be included in the statement.

Many species of wildlife exist in the watershed, as expressed in the statement on page 21. The statement adequately addressed game and fur-bearing species present, but failed to describe nongame species. This information is necessary to accurately identify all wildlife resources and also as basic information to determine project impacts.

Impacts

This type of project does have an effect upon the natural streamflow regime within its watershed. This is recognized in the impacts chapter (pages 32-42) to some degree, but the effects are not quantified. The terms "indeterminable," "improve," and "benefit," are vague and inadequate. For example, we believe the statement should evaluate impacts of ponds and other impoundments on groundwater levels in adjacent and downstream areas. The document should mention the net effects of flood control on recharge to aquifers and evaluate effects of land treatment on recharge and quality of water, especially in unconfined aquifers. We suggest also that a few more significant details are needed on the occurrence of water in the sand and gravel valley fills (page 13).

The environmental statement indicates that the expected spring and early summer turbidity of reservoir water will suppress the growth of algae and rooted aquatic vegetation and in turn minimize eutrophication (page 29, paragraph 4); however, the effects on eutrophication resulting from nutrient enrichment of spring and early summer runoff draining croplands, pasturelands, and woodlands of the watershed also should be considered.

The statement has described the impact of the land treatment measures on wildlife resources. It also has adequately described the habitat types being destroyed by project construction and the mitigation measures to be undertaken. The statement fails, however, to address the impact on wildlife resources through the period of time it takes for the woodland plantings to mature enough to effectively mitigate losses. In addition, the statement does not discuss the impact on wildlife when natural growing woodlands are replaced with planted rows of shrubs and trees.

There also is a need to discuss the effects of weed control in wildlife habitat plantings.

On page 41 under favorable Environmental Effects, (1) a statement is made that is misleading to the reviewer. The project will not "create . . . prime woody habitat", but will mitigate 218.9 acres of mostly natural growing woodlands by row planting 69 acres of shrubs and trees. This statement should be clarified.

The impact of some operation and maintenance procedures on fish and wildlife resources is inadequately addressed. It is stated on page 29 that one of the limiting factors for fish and wildlife species in the area was determined to be ". . . a lack of wetland areas created by water impoundments". It also was stated that, "Water and the shoreline of additional impoundments is needed to improve the habitat of shorebirds, wood ducks, and all waterfowl species." This is grossly inaccurate since there are no provisions in project features to protect created shorelines.

As an example, unfenced structures in pastures would have the shoreline trampled and grazed by livestock. Also, livestock excrement could have a detrimental effect on water quality and aquatic life. The impact of these types of considerations on fish and wildlife was not described. By fencing the structure and pool, and a 50 feet buffer zone around the pool, credit could be given for benefitting shorebirds, wood ducks, and other waterfowl.

On pages 28 and 29 the statement makes reference to a deficit of outdoor recreation opportunities as outlined in the State Comprehensive Outdoor Recreation Plan (SCORP) of 1968. The most recent SCORP is dated 1973, and although the new SCORP still shows a need for many recreation activities, the Soil Conservation Service should update their recreation figures by referencing from the 1973 SCORP.

What are the interrelationships of the proposed project with other similar projects within the region, water storage projects, and Corps of Engineers flood control projects? The final environmental impact statement should elaborate on the relationships, associated impacts, and provide the decision-makers an assessment of this project's regional ramifications.

Alternatives

Generally, we believe the best alternative was selected; however, an additional measure discussed in alternative 2 should have been included. This measure, floodplain zoning, was discussed only as a separate solution to the watershed's sediment problem. The harmful impact of sediments from agricultural lands to receiving waters was documented on page 28. If zoning were a part of the selected alternative, stream sediment loads would be substantially reduced which would improve water quality.

Floodplain zoning as part of the present plan also would protect the riverine woodlands. It was explained in the statement on page 16 that, "An estimated 60 percent of the woodland acres in the watershed are located along the water courses in narrow bands". There are 1,822 total acres of riverine woodlands. The statement further recognizes that, ". . . conversion of woody pasture to cropland along the floodplain will continue. . . ." with or without the project.

The benefits to fish and wildlife, water quality, and aesthetics through a combination of floodplain zoning and planned structural measures rather than just the latter, are significant.

We hope these comments will be of assistance to you.

Sincerely yours,

Stanley D. Doremus

Acting Assistant Secretary of the Interior

Mr. W. J. Parker
State Conservationist
Soil Conservation Service
Department of Agriculture
Federal Building-U.S. Courthouse
Room 345
Lincoln, Nebraska 68508

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

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

2 FEB 1976

Mr. W. J. Parker
State Conservationist
Soil Conservation Service
Federal Building, Room 345
Lincoln, Nebraska 68508

Dear Mr. Parker:

This is in response to your letter of 1 December 1975 addressed to the Commandant, U. S. Coast Guard concerning a draft environmental impact statement for Long Branch Watershed, Richardson, Nemaha, Pawnee, and Johnson Counties, Nebraska.

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

"The subject statement discusses the proposed construction of 12 flood water retarding structures, 12 grade stabilization structures and 1 multi-purpose flood water retarding recreation structure with recreation facilities at site 21.

"The recreational use of the Lake at site 21 indicates that boater education and boating safety should have a role in the operation of the lake. If boat fueling facilities are to be provided, the need for the prevention and control of oil spills should be considered. Based on the Environmental Protection Agency's present no discharge standard for marine sanitation devices, planning should also consider the need for sewage pump-out facilities for the recreational boats."

"No indication that a copy of the draft EIS was sent to the Boating Supervisor of the Nebraska State Game and Parks Commission. We feel the Boating Supervisor should be informed and consulted concerning this project."

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

The opportunity to review this draft statement is appreciated.

Sincerely,

R. I. PRICE
Rear Admiral, U. S. Coast Guard
Chief, Office of Marine Environment
and Systems

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

REGION VII
1735 BALTIMORE
KANSAS CITY, MISSOURI - 64108

January 30, 1976

Mr. W. J. Parker
State Conservationist
Soil Conservation Service
134 South 12th Street
Lincoln, Nebraska 68508

Dear Mr. Parker

Long Branch Watershed; Richardson, Nemaha, Pawnee and Johnson Counties, Nebraska

We have reviewed the (supplemental) Draft Environmental Impact Statement for the project identified above. The supplemental draft statement is rated LO-2. This rating means the Environmental Protection Agency has no significant objections to the project as proposed. However, we request additional information be included in the final statement. The following are our comments.

Our concern with the lack of adequate reservoir water quality data has been essentially resolved. Analysis of existing water samples and the recently implemented quarterly water sampling program should provide the information needed to ensure the water quality of the recreation reservoir (site 21) will be compatible with the intended uses of the impoundment.

The supplemental draft statement (page 37) indicates there is a potential for the water quality of the recreation reservoir not to meet the Class A standards. We suggest the Soil Conservation Service request the Nebraska Department of Environmental Control to determine if the water in the recreation reservoir will be of a quality to meet the Class A standards. The results of the determination should be included in the final statement.

Thank you for the opportunity to review this supplemental draft statement. Please provide us three copies of the final statement when it is submitted to the Council on Environmental Quality.

Very truly yours,

Edward C. Vest
Environmental Impact Statement
Coordinator

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
11177 West 8th Avenue
P.O. Box 25127
Lakewood, Colorado 80225

3510

January 23, 1976

Mr. Wilson J. Parker
State Conservationist
134 South 12th Street
Room 604
Lincoln, Nebraska 68508

Dear Mr. Parker:

We have reviewed the draft for the Long Branch Watershed Work Plan dated October 1975. We have no comment.

Sincerely,

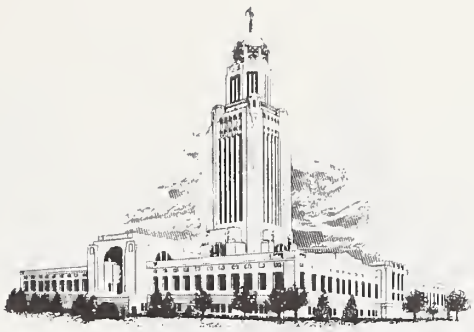
Charles J. Palmer

For CRAIG A. GIFFEN
Staff Director
Area Planning & Development

JAN 27 1976

J. JAMES EXON
GOVERNOR

NORMAN A. OTTO
ADMINISTRATIVE ASSISTANT



STATE OF NEBRASKA

LINCOLN 68509

Mr. Wilson J. Parker
State Conservationist
Soil Conservation Service
100 Centennial Mall North
Lincoln, Nebraska 68508

Dear Mr. Parker:

As requested, the Natural Resources Commission coordinated state review of the Long Branch Watershed Work Plan and Environmental Statement by the appropriate state agencies. Their comments have been considered by the Commission in the formulation of its policy statement on this project.

Enclosed is a copy of Policy Statement XXXII (Revised), adopted by the Nebraska Natural Resources Commission on January 14, 1976, and a copy of a letter containing comments on the Work Plan and Environmental Statement. Please regard this as the official state position and comment on the Long Branch Watershed Project.

Very truly yours,

J. James Exon
Governor

Encl.
cc: Dayle Williamson, NNRC

PROGRAMS:

SOIL & WATER CONSERVATION
WATERSHED PROTECTION
COMPREHENSIVE PLANNING
FLOOD PLAIN MANAGEMENT
DATA BANK
WATER QUALITY PLANNING
DEVELOPMENT FUND

STATE OF NEBRASKA

NATURAL RESOURCES COMMISSION

Seventh Floor
Terminal Building
Lincoln, Nebraska 68508

POLICY STATEMENT XXXII (Revised) (PROJECTS)

LONG BRANCH WATERSHED PROJECT

The Nebraska Legislature has assigned to the Natural Resources Commission the responsibility for planning, developing and encouraging the implementation of a comprehensive program of resource development, conservation and utilization for the soil and water resources of this State in cooperation with other local, state and federal agencies. As part of this program, the Commission is developing a comprehensive State Water Plan based on optimum development and use of the state's water resources. In preparation of this statement the Commission has reviewed the available information on this proposed project, and it has solicited the comments of other state agencies.

The Long Branch Watershed contains about 46,905 acres located in Pawnee, Richardson, Nemaha and Johnson counties. Watershed programs include flooding, erosion, and sediment. Project plans for this watershed include land treatment measures, twelve grade stabilization structures, twelve floodwater retarding structures, and one multiple-purpose floodwater retarding and recreation structure. These works of improvement are expected to reduce floodwater damages by 66 percent and to reduce overbank deposition and scour damages about 84 percent. Overall, average annual flood damages will be reduced about 74 percent.

Estimated cost of project installation is $2,902,020, including land treatment costs of $445,100 and structural costs of $2,456,290. Under Public Law 566, federal funds in the amount of $2,025,970 will be provided for structural costs and $22,000 for land treatment costs. Local interests will provide $430,950 for installation of structural measures and $423,100 for land treatment. Average annual benefits will be $340,640; at 5 5/8 percent interest, average annual costs will be $164,410, giving a benefit-cost ratio of 2.1 to 1; at 6 1/8 percent interest, average annual costs would be $169,830, giving a benefit-cost ratio of 2.0 to 1.

In view of the long standing and serious need for flood and erosion protection in this area and in consideration of the inclusion of recreation and fish and wildlife facilities as part of the project, the Nebraska Natural Resources Commission urges that the project be implemented as soon as possible.

Approved by Unanimous Action of the Commission Members on

January 14, 1976.

Chairman, Nebraska Natural Resources Commission

Attest:

Executive Secretary
Nebraska Natural Resources Commission

PROGRAMS:

SOIL & WATER CONSERVATION
WATERSHED PROTECTION
COMPREHENSIVE PLANNING
FLOOD PLAIN MANAGEMENT
DATA BANK
WATER QUALITY PLANNING
DEVELOPMENT FUND

STATE OF NEBRASKA

NATURAL RESOURCES COMMISSION

Seventh Floor
Terminal Building
Lincoln, Nebraska 68508

January 14, 1976

The Honorable J. James Exon
Governor of Nebraska
State Capitol Building
Lincoln, Nebraska 68509

Dear Governor Exon:

On December 1, 1975, the Soil Conservation Service submitted the final draft of the Long Branch Watershed Work Plan and Environmental Impact Statement for official review and requested that comments be returned by February 1, 1976. In accordance with established procedure, the Natural Resources Commission has coordinated the official State review and considered all comments on the Work Plan and Environmental Statement, including those given below, in developing its policy statement.

Natural Resources Commission

On page 26 of the Work Plan, ALTERNATIVES, item 2, "Accelerated land treatment supplemented by nonstructural measures - flood plain taking" should be changed to read, "Accelerated land treatment supplemented by nonstructural measures - conversion of flood plain cropland to noncrop uses."

Also, the explanation of this alternative at the bottom of page 26 should be changed to read, "This alternative includes the land treatment program of alternative 1 and the conversion of flood plain land from cropland with high potential for damages to grassland or woodland with lesser potential for damages. Such conversions in lieu of the planned project would require monetary compensation to landowners whose farming enterprises are presently geared to crop production on flood plain lands. This plan would cost the community about $319,000 annually, eliminate an annual net income of $161,000 to 147 farms, reduce the production of food and fiber to the economy, forego water-based recreational benefits from structures, and forego beneficial effects from reduced sediment to the stream system. One advantage of this alternative would be the improvement of wildlife habitat in the flood plain. Some other advantages are landbased recreational use, pollution control, grazing use, hay production, and erosion control."

Department of Health

On page 40 of the Impact Statement the following statement appears, "Installation of the structures may create conditions favorable for the development of mosquito breeding areas due to fluctuation of reservoir water levels." I am in complete agreement with this statement, however, I feel that this statement should be repeated on page 42 in the section entitled, "Adverse Environmental Effects". Unless a great deal of care and maintenance is carried out in this project, mosquito breeding could be a serious problem along the 40 miles of shoreline which will be created by the reservoir.

On page 41, in the section entitled "Favorable Environmental Effects", part C, states that there will be improved woodlands as the result of this project and in addition, section L says, "Create 69 acres of prime woody habitat for wildlife." I agree that these are favorable environmental impacts, however, the creation of these woodlands and the woody habitat will also have an adverse environmental factor in that it will increase the wood tick population greatly. Studies in other areas where this has been done have indicated that we experience large increases in the population of the wood tick. I think this must be considered an adverse environmental effect because as we have developed these areas around reservoirs and lakes with resulting increase in wood tick population, we have also increased the amount of Rocky Mountain Spotted Fever which occurs in these areas. We have reached the point that we are now warning people who utilize these areas that they should be aware of the fact that they could contact tick bite and in addition, Rocky Mountain Spotted Fever.

I am enclosing copies of the Natural Resources Commission's Policy Statement XXXII (Revised) which was adopted on January 14, 1976. I am also enclosing a suggested letter to transmit this statement and comments to Mr. Wilson J. Parker as the official State position on this plan.

Very truly yours,

for Dayle Stan

Dayle E. Williamson
Executive Secretary

DEW:JW:KS:ka
Enclosures
cc: Wilson J. Parker
W. Don Nelson
w/encl.

OFFICE
OF
PLANNING
AND
PROGRAMMING

STATE OF NEBRASKA

BOX 94601 · STATE CAPITOL · LINCOLN, NEBRASKA · 68509 · (402) 471-2414

Governor J. James Exon
State Planning Officer

W. Don Nelson
Director

January 2, 1976

W. J. Parker, State Conservationist
U. S. Department of Agriculture
Federal Building and U. S. Courthouse
Lincoln, Nebraska 68508

Dear Mr. Parker:

Project 75 12 02 14
Long Branch Watershed

Under the provisions of OMB Circular A-95, Part II, this office has completed a state level review of the draft environmental statement and watershed work plan for the Long Branch Watershed project.

The proposed plan does not appear to be in conflict with any state level comprehensive plans and does not represent a duplication in the expenditure of state or federal funds.

This letter completes the state clearinghouse review.

Sincerely,

Warren G. White
Natural Resources Coordinator

WGW:np
cc: Bill Kartsonis

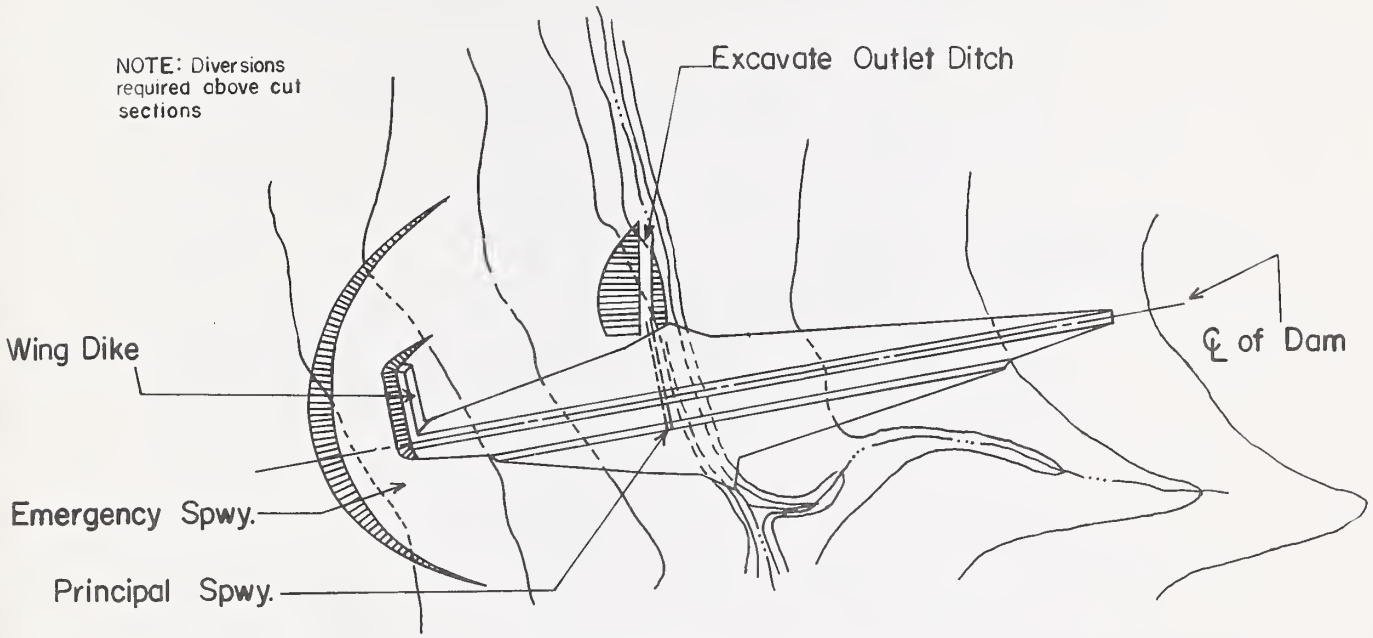
Appendix F - Typical Drawings of Structures Included in this Project

Figure 1 - Typical Drawing of Structures P-3, P-3, N-6, 1-1, N-1, N-5, N-7, R-3, R-11, R-15, P-4-A, and P-4-B

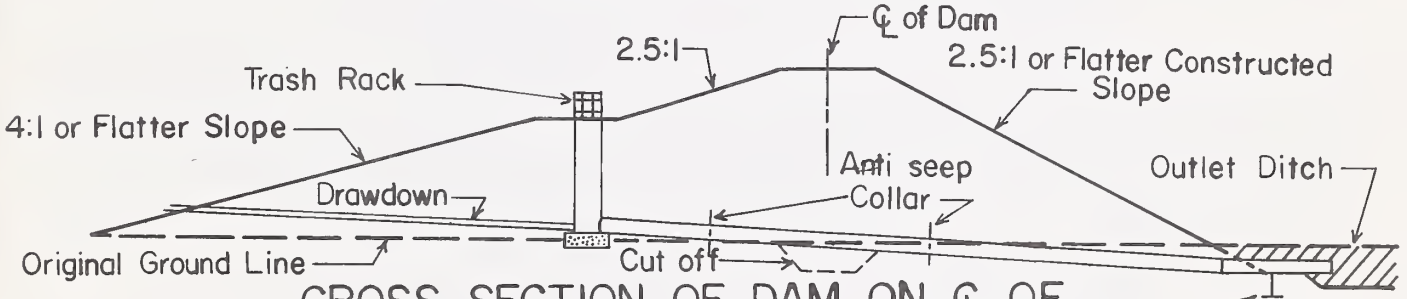
Figure 2 - Typical Drawing of Structures 2, 3, 4, 7, 41, 42, 61, 70, 71, 73, 77, and 91

Figure 3 - Typical Drawing of Structure 21

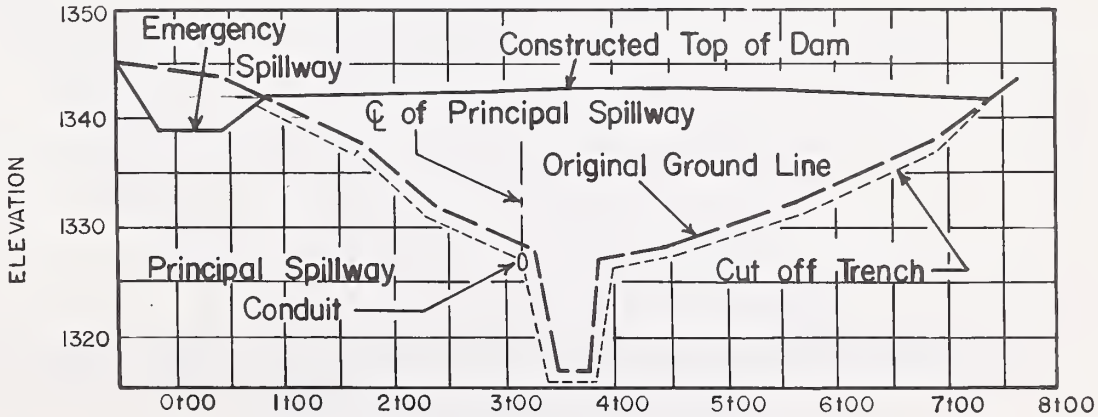
TYPICAL STABILIZING AND SEDIMENT CONTROL STR.



GENERAL PLAN



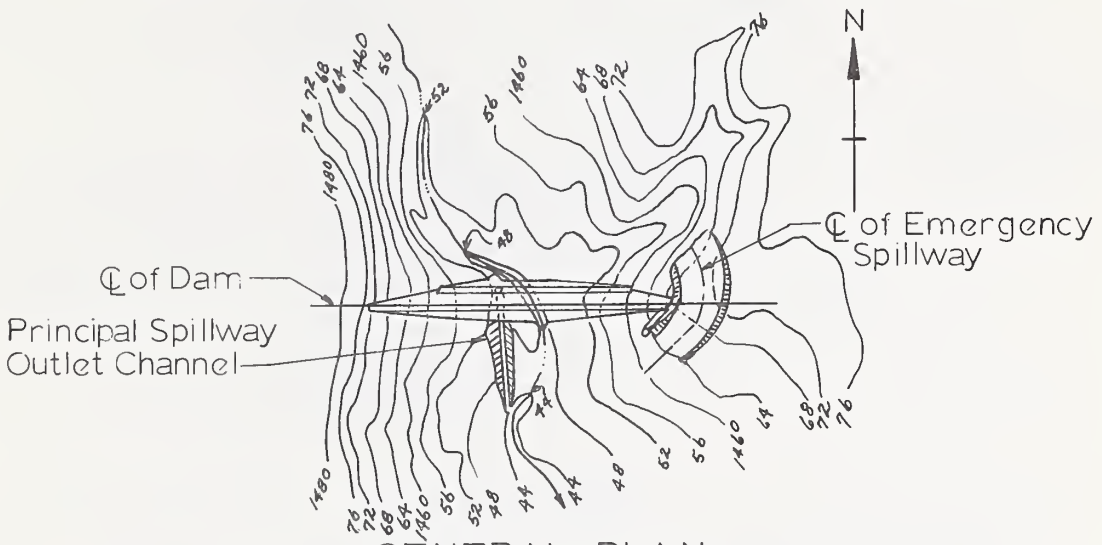
CROSS SECTION OF DAM ON ℄ OF PRINCIPAL SPILLWAY



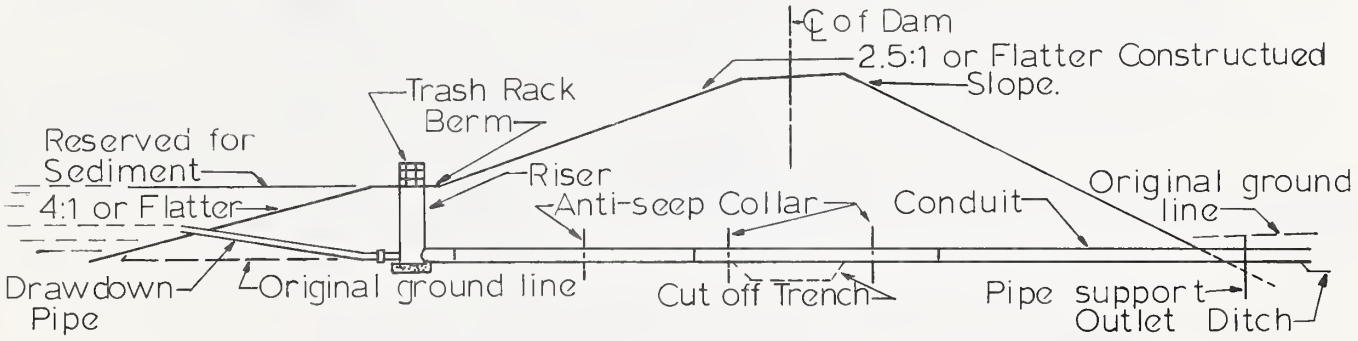
PROFILE ON ℄ OF DAM

Figure 1

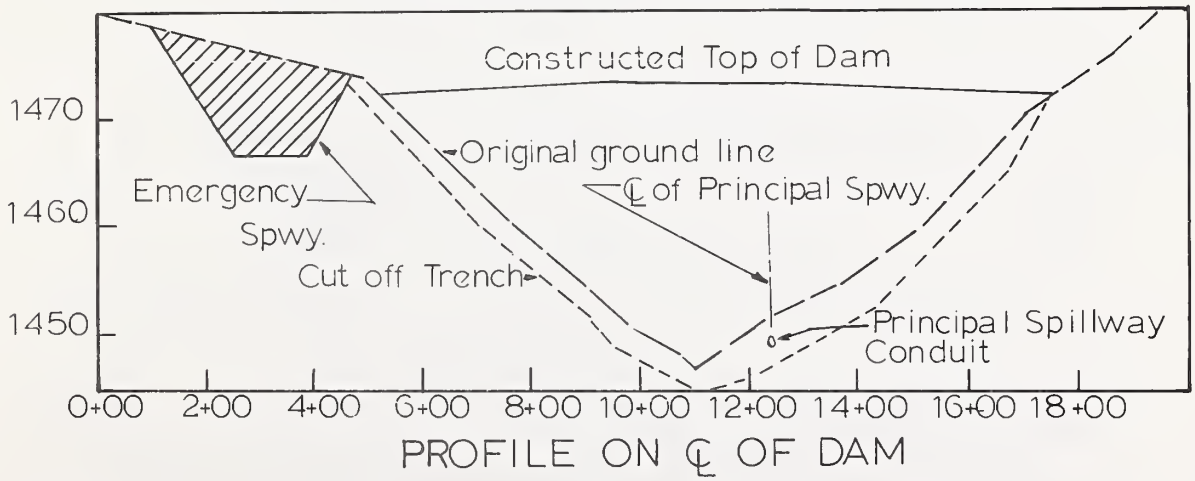
TYPICAL FLOODWATER RETARDING STRUCTURE WITH SINGLE STAGE PRINCIPAL SPILLWAY



GENERAL PLAN



CROSS SECTION OF DAM ON CENTERLINE OF SINGLE STAGE PRINCIPAL SPILLWAY



PROFILE ON ℄ OF DAM

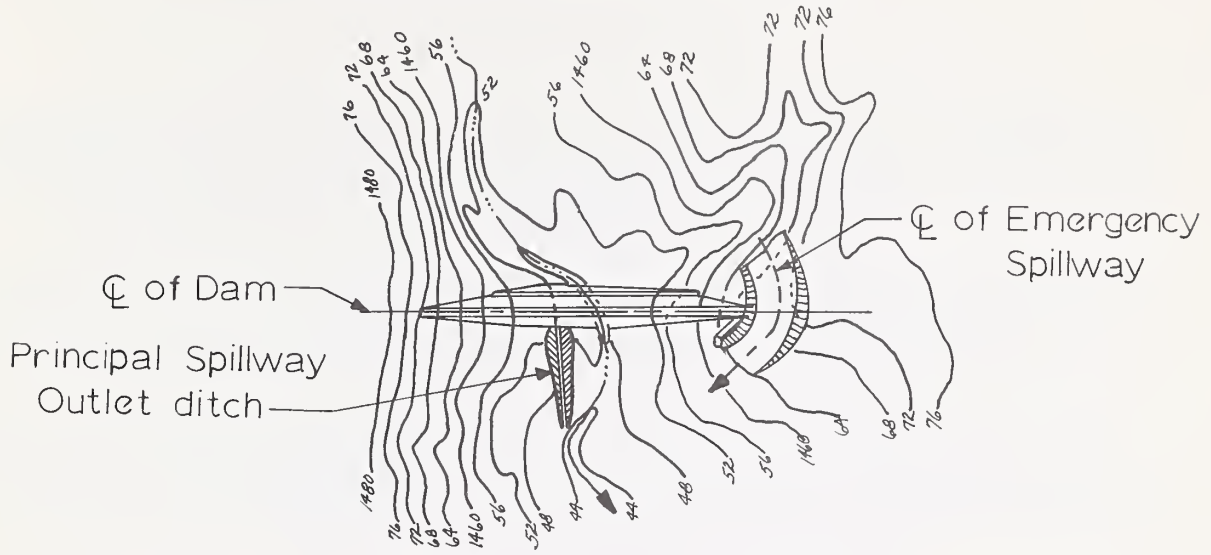
SOURCE:
NEBRASKA S.O.

USDA-SCS-LINCOLN, NEBR. 1972

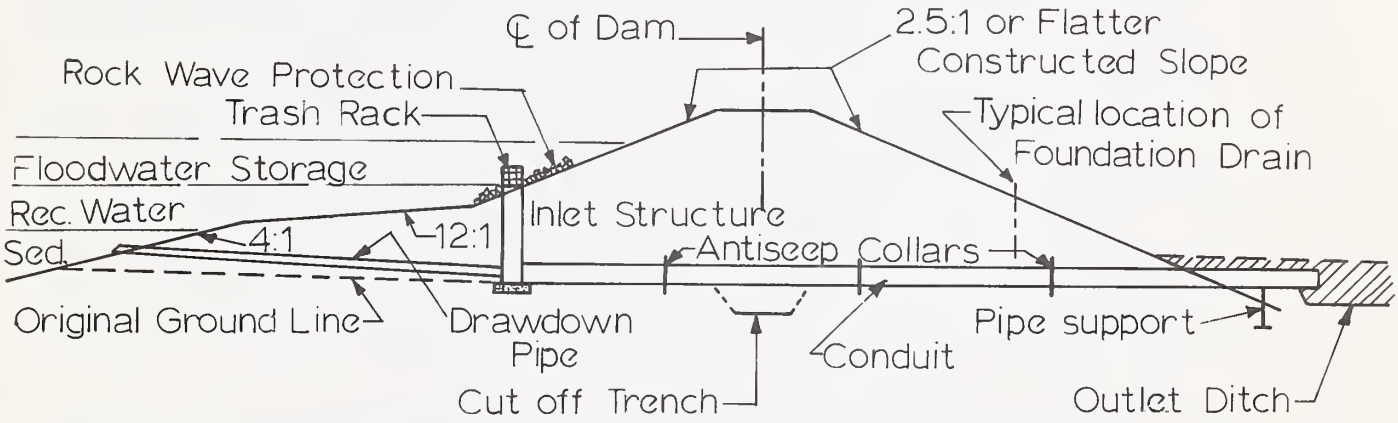
6-9-72
5,L-30448

Figure 2

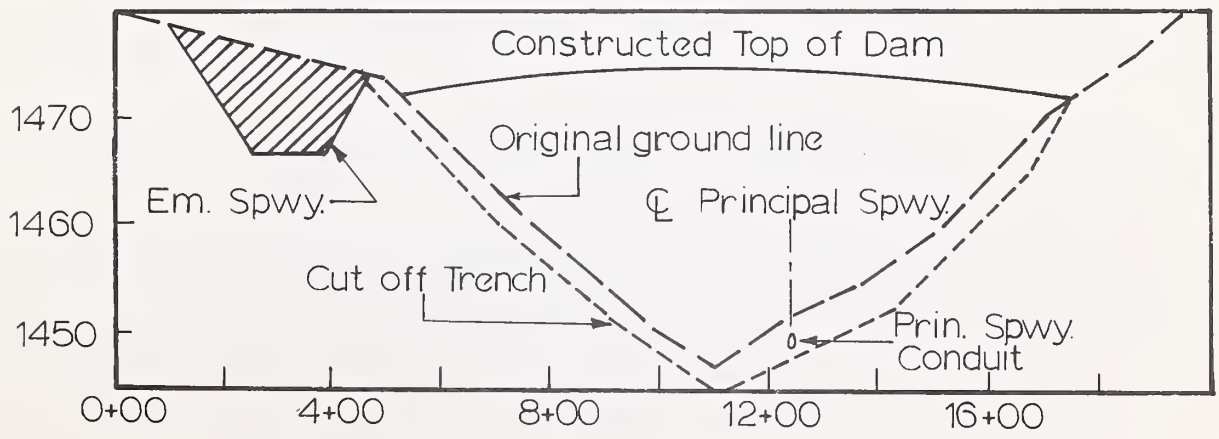
Typical Floodwater Retarding Structure With Recreational Storage



General Plan



Cross Section of Dam on Centerline Single Stage Principal Spillway



Profile on Centerline of Dam

Figure 3

LAND TREATMENT MEASURES

DEFINITIONS

CONSERVATION CROPPING SYSTEM: Growing crops in combination with needed cultural and management measures. Cropping systems include rotations that contain grasses and legumes as well as rotations in which the desired benefits are achieved without the use of such crops.

CONTOUR FARMING: Farming sloping cultivated land in such a way that plowing, preparing land, planting, and cultivating are done on the contour. (This includes following established grades of terraces, diversions, or contour strips.)

GRADE STABILIZATION STRUCTURE: A structure to stabilize the grade or to control head cutting in natural or artificial channels. (Does not include structures used in drainage and irrigation systems primarily for water control.)

TERRACE, BASIN: A form of level terrace with closed ends constructed on noncropland with permeable soils and designed to impound a given amount of runoff from the drainage area above it.

TERRACE, GRADIENT: An earth embankment or a ridge and channel constructed across the slope at a suitable spacing and with an acceptable grade.

TERRACE, LEVEL: An earth embankment or a ridge and channel constructed across the slope at a suitable spacing with no grade.

TERRACE, PARALLEL: An earth embankment or a ridge and channel in parallel constructed across the slope at a suitable spacing and with an acceptable grade.

GRASSED WATERWAY OR OUTLET: A natural or constructed waterway or outlet shaped or graded and established in vegetation suitable to safely dispose of runoff from a field, diversions, terrace, or other structure.

GRAZING CONTROL: Excluding livestock from a woodland area where grazing is not wanted, normally accomplished by fencing.

FIRE PROTECTION: To protect soil, water, and plant resources by preventing damage by fires.

FORESTATION: The establishment of forest crops by planting or sowing on land that has not previously, or not recently, grown tree crops.

WINDBREAK AND SHELTERBELT RENOVATION: Any cultural practice which will improve the density of the windbreak trees and thus present a solid barrier against the wind. (Removing dead and dying trees and replacing them, adding new rows, removing trees with overtopping habit to prevent stagnation of more desirable trees, etc.)

IMPROVED FORESTRY PRACTICES: Improving woodland by removing unmerchantable or unwanted trees, shrubs, or vines and/or pruning desirable trees to increase their value.

STRUCTURES FOR WATER CONTROL: A structure in an irrigation, drainage, or other water management system that conveys water, controls the direction or rate of flow, or maintains a desired water surface elevation. These structures are also for the protection of fish and wildlife and other environmental values, as well as for the protection and management of soils and plants. (Does not include structures for which the primary purpose is to control head cutting and control erosion.)

PASTURE AND HAYLAND PLANTING: Establishing and reestablishing long-term stands of adapted species of perennial, biennial, or reseeding forage plants. (Includes Pasture and Hayland Renovation. Does not include Grassed Waterway or Outlet on cropland.)

PASTURE AND HAYLAND MANAGEMENT: Proper treatment and use of pastureland or hayland.

PROPER GRAZING USE: Grazing at an intensity which will maintain enough cover to protect the soil and maintain or improve the quantity and quality of desirable vegetation.

DIVERSION: A channel with a supporting ridge on the lower side constructed across the slope.

LIVESTOCK PONDS: A water impoundment made by constructing a dam or embankment, or by excavating a pit or "dugout".

LIVESTOCK WELLS: A well constructed or improved to provide water for irrigation, livestock, wildlife, or recreation.

LIVESTOCK TROUGH OR TANK: A trough or tank with needed devices for water control and waste water disposal, installed to provide drinking water for livestock.

CROSS FENCING: Enclosing or dividing an area of land with a suitable permanent structure that acts as a barrier to livestock, big game, or people. (Does not include electric or other temporary fences.)

WILDLIFE HABITAT DEVELOPMENT: Retaining, creating, or managing wildlife habitat other than wetland.

CONSERVATION TILLAGE: Tillage which creates the best possible environment for crop growth, with limited soil disturbance and maximum retention of crop residues on soil surface.

STRUCTURE DATA

Long Branch Watershed, Nebraska

Item	Unit	Structure Number 2	3	4	7
Class of Structure		a	a	a	b
Drainage Area	sq.mi.	2.17	1.22	1.33	2.86
Controlled	sq.mi.	-	-	-	-
Curve No. (1-day) (AMC II)		79	79	79	79
Tc	hrs.	2.10	1.20	1.80	3.00
Elevation Top of Dam	ft. MSL	1207.0	1199.5	1183.0	1144.0
Elevation Crest Emergency Spillway	ft. MSL	1203.0	1195.5	1179.0	1138.4
Elevation Crest High Stage Inlet	ft. MSL	1194.5	1186.5	1170.5	1124.5
Elevation Crest Low Stage Inlet	ft. MSL	-	-	-	-
Maximum Height of Dam	ft.	36	32	33	38
Volume of Fill	1000 cu.yd.	70	44	44	92
Total Capacity	ac.ft.	490	260	305	597
Sediment Submerged	ac.ft.	128	68	88	74
Sediment Aerated	ac.ft.	25	13	17	17
Beneficial Use (Recreation)	ac.ft.	-	-	-	-
Retarding	ac.ft.	337	179	200	506
Between high and low stage	ac.ft.	-	-	-	-
Surface area					
Sediment pool	acres	25	12	15	15 1/
Beneficial use pool (Recreation)	acres	-	-	-	-
Retarding pool	acres	63	31	36	64
Principal Spillway					
Rainfall Volume (areal) (1 day)	in.	5.60	5.60	5.70	6.30
Rainfall Volume (areal) (10 day)	in.	9.10	9.10	9.30	10.10
Runoff Volume (10 day)	in.	4.62	4.62	4.78	5.46
Capacity of Low Stage (Max.)	cfs	-	-	-	-
Capacity of High Stage (Max.)	cfs	33	30	32	62
Frequency operation - Emer. Spillway	% chance	4	4	4	4
Size of Conduit	dia.	18	18	18	24
Emergency Spillway					
Rainfall Volume (ESH) (areal)	in.	5.40	5.40	5.40	7.85
Runoff Volume (ESH)	in.	3.14	3.14	3.14	5.36
Type		----------	----------	Vegetated	----------
Bottom Width	ft.	50	50	50	200
Velocity of Flow (Ve)	ft./sec.	3.2	3.6	3.3	5.5
Slope of exit channel	ft./ft.	.045	.042	.041	.034
Maximum water surface elevation	ft. MSL	1203.1	1195.9	1179.2	1140.0
Freeboard					
Rainfall Volume (FH) (areal)	in.	7.80	7.80	7.90	13.5
Runoff Volume (FH)	in.	5.32	5.32	5.41	10.76
Maximum water surface elevation	ft. MSL	1205.3	1197.7	1181.4	1142.0
Capacity Equivalents					
Sediment Volume	in.	1.32	1.24	1.48	0.60
Retarding Volume	in.	2.91	2.76	2.82	3.32

1/ Structure 7 will have an open port at elevation 1120; therefore, only an 8 acre pool will be created initially.

STRUCTURE DATA (Continued)

Long Branch Watershed, Nebraska

Item	Unit	Structure Number 21	41	42	61 1/
Class of Structure		c	a	a	c
Drainage Area	sq.mi.	7.65	3.97	0.94	1.25
Controlled	sq.mi.	1.62 2/	-	-	-
Curve No. (1-day) (AMC II)		79	79	79	79
Tc	hrs.	7.00	3.00	1.40	1.30
Elevation Top of Dam	ft. MSL	1064.0	1064.0	1068.5	1170.0
Elevation Crest Emergency Spillway	ft. MSL	1058.0	1058.5	1064.5	1165.0
Elevation Crest High Stage	ft. MSL	1048.0	1044.5	1055.0	1163.0
Elevation Crest Low Stage Inlet	ft. MSL	-	-	-	1153.5
Maximum Height of Dam	ft.	56	42	31	35
Volume of Fill	1000 cu.yd.	295	115	49	61
Total Capacity	ac.ft.	3800	793	180	345
Sediment Submerged	ac.ft.	211	142	45	62
Sediment Aerated	ac.ft.	41	28	10	13
Beneficial Use (Recreation)	ac.ft.	1475	-	-	-
Retarding	ac.ft.	2073	623	125	270
Between high and low stage	ac.ft.	-	-	-	208
Surface Area					
Sediment pool	acres	-	26	9	12
Beneficial use pool (Recreation)	acres	159	-	-	-
Retarding pool	acres	265	70	20	38
Principal Spillway					
Rainfall Volume (areal) (1 day)	in.	7.0	5.70	5.70	7.05
Rainfall Volume (areal) (10 day)	in.	11.2	9.30	9.30	11.30
Runoff Volume (10 day)	in.	6.4	4.78	4.78	6.49
Capacity of Low Stage (Max.)	cfs	-	-	-	21
Capacity of High Stage (Max.)	cfs	125	66	32	103
Frequency operation - Emer. Spillway	% chance	1	4	4	1
Size of Conduit	dia.	30	24	18	30
Emergency Spillway					
Rainfall Volume (ESH) (areal)	in.	11.30	5.45	5.40	10.85
Runoff Volume (ESH)	in.	8.63	3.19	3.14	8.20
Type		----------	Vegetated	----------	
Bottom Width	ft.	400	50	50	200
Velocity of Flow (Ve)	ft./sec.	6.0	2.9	3.9	6.0
Slope of exit channel	ft./ft.	.035	.049	.042	.038
Maximum water surface elevation	ft. MSL	1059.9	1058.6	1065.1	1166.8
Freeboard					
Rainfall Volume (FH) (areal)	in.	27.0	7.95	7.90	25.90
Runoff Volume (FH)	in.	24.05	5.46	5.41	22.96
Maximum water surface elevation	ft. MSL	1063.6	1062.0	1066.7	1170.0
Capacity Equivalents					
Sediment Volume	in.	0.62	0.80	1.10	1.12
Retarding Volume	in.	5.08	2.94	2.50	4.05

1/ Structure 61 will have a two-stage inlet.
2/ Grade stabilization structures P-3 and P-8 were routed in series with each other and with structure 21.

STRUCTURE DATA (Continued)

Long Branch Watershed, Nebraska

Item	Unit	Structure Number 70	71	73
Class of Structure		a 1/	b	a
Drainage Area	sq.mi.	1.47	2.44	1.65
Controlled	sq.mi.	0.94 2/	-	-
Curve No. (1-day) (AMC II)		79	79	79
Tc	hrs.	1.50	1.95	1.90
Elevation Top of Dam	ft. MSL	1116.5	1221.0	1088.0
Elevation Crest Emergency Spillway	ft. MSL	1111.0	1215.5	1083.2
Elevation Crest High Stage Inlet	ft. MSL	1099.5	1205.5	1073.5
Elevation Crest Low Stage Inlet	ft. MSL	-	-	-
Maximum Height of Dam	ft.	35	31	36
Volume of Fill	1000 cu.yd.	71	60	69
Total Capacity	ac.ft.	360	580	375
Sediment Submerged	ac.ft.	80	103	104
Sediment Aerated	ac.ft.	16	20	20
Beneficial Use (Recreation)	ac.ft.	-	-	-
Retarding	ac.ft.	264	457	251
Between high and low stage	ac.ft.	-	-	-
Surface Area				
Sediment pool	acres	15	23	17
Beneficial use pool (Recreation)	acres	-	-	-
Retarding pool	acres	34	78	39
Principal Spillway				
Rainfall Volume (areal) (1 day)	in.	6.35	6.30	5.70
Rainfall Volume (areal) (10 day)	in.	10.10	10.10	9.30
Runoff Volume (10 day)	in.	5.46	5.46	4.78
Capacity of Low Stage (Max.)	cfs	-	-	-
Capacity of High Stage (Max.)	cfs	65	60	32
Frequency operation - Emer. Spillway	% chance	2 1/	2	4
Size of Conduit	dia.	24	24	18
Emergency Spillway				
Rainfall Volume (ESH) (areal)	in.	7.90	7.90	5.40
Runoff Volume (ESH)	in.	5.41	5.41	3.14
Type		---------Vegetated---------		
Bottom Width	ft.	100	100	50
Velocity of Flow (Ve)	ft./sec.	5.9	5.6	2.8
Slope of exit channel	ft./ft.	.033	.037	.050
Maximum water surface elevation	ft. MSL	1112.6	1217.2	1083.4
Freeboard				
Rainfall Volume (FH) (areal)	in.	13.60	13.60	7.90
Runoff Volume (FH)	in.	10.85	10.85	5.41
Maximum water surface elevation	ft. MSL	1115.0	1219.7	1085.8
Capacity Equivalents				
Sediment Volume	in.	1.22	0.94	1.41
Retarding Volume	in.	3.37	3.52	2.86

1/ Used Class B hydrologic criteria.
2/ Grade stabilization structure N-6 was routed in series with structure 70.

Long Branch Watershed, Nebraska

Item	Unit	Structure Number 77	91	P-3	
Class of Structure		a	b	a	1/
Drainage Area	sq.mi.	0.76	0.99	1.14	
Controlled	sq.mi.	-	-	0.48	2/
Curve No. (1-day) (AMC II)		79	79	78	
Tc	hrs.	0.90	1.60	1.30	
Elevation Top of Dam	ft. MSL	1128.5	1149.0	1150.0	
Elevation Crest Emergency Spillway	ft. MSL	1124.5	1144.0	1145.0	
Elevation Crest High Stage Inlet	ft. MSL	1117.5	1135.0	1134.0	
Elevation Crest Low Stage Inlet	ft. MSL	-	-	-	
Maximum Height of Dam	ft.	34	34	31	
Volume of Fill	1000 cu.yd.	36	41	43	
Total Capacity	ac.ft.	159	235	300	
Sediment Submerged	ac.ft.	53	73	48	
Sediment Aerated	ac.ft.	10	14	9	
Beneficial Use (Recreation)	ac.ft.	-	-	-	
Retarding	ac.ft.	96	148	243	
Between high and low stage	ac.ft.	-	-	-	
Surface Area					
Sediment pool	acres	10	12	11	
Beneficial use pool (Recreation)	acres	-	-	-	
Retarding pool	acres	20	24	38	
Principal Spillway					
Rainfall Volume (areal) (1 day)	in.	5.7	6.3	6.3	
Rainfall Volume (areal) (10 day)	in.	9.3	10.1	10.2	
Runoff Volume (10 day)	in.	4.78	5.46	5.35	
Capacity of Low Stage (Max.)	cfs	-	-	-	
Capacity of High Stage (Max.)	cfs	37	70	31	
Frequency operation - Emer. Spillway	% chance	4	2	2	1/
Size of Conduit	dia.	18	24	18	
Emergency Spillway					
Rainfall Volume (ESH) (areal)	in.	5.4	7.90	7.9	
Runoff Volume (ESH)	in.	3.14	5.41	5.29	
Type		---------Vegetated---------			
Bottom Width	ft.	50	100	50	
Velocity of Flow (Ve)	ft./sec.	3.0	5.1	4.4	
Slope of exit channel	ft./ft.	.056	.037	.040	
Maximum water surface elevation	ft. MSL	1125.1	1145.5	1146.2	
Freeboard					
Rainfall Volume (FH) (areal)	in.	7.9	13.60	13.60	
Runoff Volume (FH)	in.	5.41	10.85	10.71	
Maximum water surface elevation	ft. MSL	1126.4	1147.4	1148.2	
Capacity Equivalents					
Sediment Volume	in.	1.56	1.65	0.94	
Retarding Volume	in.	2.37	2.80	4.00	

1/ Used Class B hydrologic criteria.
2/ Grade stabilization structures P-3 and P-8 were routed in series with each other and with structure 21.

STRUCTURE DATA (Continued)

Long Branch Watershed, Nebraska

Item	Unit	Structure Number P-8	Structure Number N-6	Totals
Class of Structure		a	a	
Drainage Area	sq.mi.	0.48 1/	0.94 2/	31.26
Controlled	sq.mi.	-	-	
Curve No. (1-day) (AMC II)		78	79	
Tc	hrs.	0.90	0.90	
Elevation Top of Dam	ft. MSL	1193.0	1160.0	
Elevation Crest Emergency Spillway	ft. MSL	1189.0	1156.1	
Elevation Crest High Stage Inlet	ft. MSL	1183.5	1149.0	
Elevation Crest Low Stage Inlet	ft. MSL	-	-	
Maximum Height of Dam	ft.	25	29	
Volume of Fill	1000 cu.yd.	28	34	1,152
Total Capacity	ac.ft.	93	197	9,069
Sediment Submerged	ac.ft.	28	59	1,366
Sediment Aerated	ac.ft.	5	12	270
Beneficial Use (Recreation)	ac.ft.	-	-	1,475
Retarding	ac.ft.	60	126	5,958
Between high and low stage	ac.ft.	-	-	208
Surface area				
Sediment pool	acres	7	12	221
Beneficial use pool (Recreation)	acres	-	-	159
Retarding pool	acres	16	28	864
Principal Spillway				
Rainfall Volume (areal) (1 day)	in.	5.7	5.65	
Rainfall Volume (areal) (10 day)	in.	9.2	9.20	
Runoff Volume (10 day)	in.	4.53	4.70	
Capacity of Low Stage (Max.)	cfs	-	-	
Capacity of High Stage (Max.)	cfs	28	32	
Frequency operation - Emer. Spillway	% chance	4	4	
Size of Conduit	dia.	18	18	
Emergency Spillway				
Rainfall Volume (ESH) (areal)	in.	5.4	5.40	
Runoff Volume (ESH)	in.	3.05	3.14	
Type		------Vegetated-----		
Bottom Width	ft.	50	50	
Velocity of Flow (Ve)	ft./sec.	3.4	3.4	
Slope of exit channel	ft./ft.	.048	.043	
Maximum water surface elevation	ft. MSL	1189.4	1156.6	
Freeboard				
Rainfall Volume (FH) (areal)	in.	7.90	7.90	
Runoff Volume (FH)	in.	5.29	5.41	
Maximum water surface elevation	ft. MSL	1190.5	1158.1	
Capacity Equivalents				
Sediment Volume	in.	1.29	1.42	
Retarding Volume	in.	2.34	2.51	

1/ Grade stabilization structures P-3 and P-8 were routed in series with each other and with structure 21.

2/ Grade stabilization structure N-6 was routed in series with structure 70.

STRUCTURAL DATA

GRADE STABILIZATION STRUCTURES

Long Branch Watershed, Nebraska

Site No. or Station	Drainage Area (Sq.Mi.)	Design Capacity Principal Spillway (cfs)	Assoc. Frequency and Duration of Storm (% chance and hours)	Drop (Feet)	Volume of Fill (Cu.Yds.)	Type of Structure	Surface Areas (Acres) At Riser Crest	Surface Areas (Acres) At Emergency Spillway Elevation
1-1	.33	120	4 - 6	13	16,000	Drop Inlet	1.8	5.5
N-1	.55	83	4 - 6	17	24,000	Drop Inlet	5.4	10.0
N-5	.52	91	4 - 6	24	23,000	Drop Inlet	7.9	12.0
N-7	.29	32	4 - 6	15	24,000	Drop Inlet	4.0	7.0
R-3	.57	126	4 - 6	18	24,000	Drop Inlet	9.0	16.0
R-11	.40	83	4 - 6	20	19,000	Drop Inlet	5.6	9.4
R-15	.67	122	4 - 6	17	26,000	Drop Inlet	5.0	11.5
P-4-A	.71	124	4 - 6	17	22,000	Drop Inlet	8.2	17.0
P-4-B	.55	77	4 - 6	15	22,000	Drop Inlet	6.2	13.0

INVENTORY OF COMMON AND ABUNDANT BIRDS

Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
	Podicipediformes		
Podilymbus podiceps pied-billed grebe	common migrant	aquatic	
	Anseriformes		
Chen hyperborea snow goose	abundant migrant	aquatic	
Anas platyrhychos mallard	abundant migrant resident	aquatic	
Anas acuta pintail	abundant migrant	aquatic	
Anas carolinensis green-winged teal	abundant migrant resident	aquatic	
Anas discors blue-winged teal	abundant migrant	aquatic	
Branta canadensis canada goose	common migrant	aquatic	
Anser albifrons white-fronted goose	common migrant	aquatic	
Chen caerulescens blue goose	common migrant	aquatic	
Anas strepera gadwall	common migrant	aquatic	
Mareca americana american widgeon	common migrant	aquatic	

Inventory of Common and Abundant Birds (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
Spatula clypeata shoveller	common migrant	aquatic	
Aythya affinis lesser scaup	common migrant	aquatic	
Oxyura jamaicensis ruddy duck	common migrant	aquatic	
Mergus merganser common merganser	common migrant	aquatic	
Falconiformes			
Buteo jamaicensis red-tailed hawk	common resident	mixed	stable
Circus cyaneus marsh hawk	common resident	openland marsh	stable
Falco sparverius sparrow hawk	common resident	openland	stable
Accipiter striatus sharp-shinned hawk	common migrant	mixed	
Buteo swainsoni swainson's hawk	common migrant	openland	
Falco mexicanus prairie falcon	common migrant	openland	
Galliformes			
Colinus virginianus bobwhite	common resident	mixed	stable or decreasing
Phasianus colchicus ring-necked pheasant	common resident	mixed	stable

Inventory of Common and Abundant Birds (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
	Ciconiiformes		
Nycticorax nycticorax black-crowned night heron	common migrant	marsh	
Ardea herodias great blue heron	common resident	marsh	stable
Butorides virescens green heron	common resident	marsh	stable
Botaurus lentiginosus american bittern	common migrant	marsh	
	Gruiformes		
Prozana carolina sora	common migrant	marsh	
Fulica americana american coot	common migrant	aquatic	
	Charadriiformes		
Erolia bairdii baird's sandpiper	common migrant	shore	
Erolia minutilla least sandpiper	common migrant	shore	
Micropalama himantopus stilt sandpiper	common migrant	shore	
Ereunetes pusillus semipalmated sandpiper	common migrant	shore	
Steganopus tricolor wilson's phalarope	common migrant	shore	
Actitis macularia spotted sandpiper	common migrant	shore	

Inventory of Common and Abundant Birds (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
Tringa solitaria solitary sandpiper	common migrant	shore	
Charadruis vociferus killdeer	common migrant and resident	shore	stable
Totanus melanoleucus greater yellowlegs	common migrant	shore	
Totanus flavipes lesser yellowlegs	common migrant	shore	
Erolia melanotos pectoral sandpiper	common migrant	shore	
Erolia fuscicollis white-rumped sandpiper	common migrant	shore	
Larus pipixean franklin's gull	abundant migrant	aquatic	
Larus delawarensis ring-billed gull	common migrant	aquatic	
Stera forsteri forster's tern	common migrant	aquatic	
Chlidonias nigra black tern	common migrant	aquatic	
Columbiformes			
Columbia livia rock dove	abundant	openland	increasing
Zenaidura macroura mourning dove	abundant migrant	mixed	

Inventory of Common and Abundant Birds (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
	Cuculiformes		
Coccyzus americanus yellow-billed cuckoo	common migrant	woods brush	
	Strigiformes		
Bubo virinianus great horned owl	common migrant resident	mixed	stable
	Caprimulgiformes		
Chordeiles minor common nighthawk	abundant migrant	openland mixed	
	Apodiformes		
Chaetura pelagica chimney swift	abundant migrant	mixed	
Archilochus colubris ruby-throated hummingbird	common migrant	woods	
	Piciformes		
Colaptes auratus yellow-shafted flicker	common resident	mixed	stable
Centurus carolinus red-bellied woodpecker	common resident	woods	stable
Melanerpes erythrocephalus red-headed woodpecker	common migrant resident	woods	stable or increasing
Dendrocopos pubescens downy woodpecker	common resident	woods	stable

Inventory of Common and Abundant Birds (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
	Passeriformes		
Tyrannus tyrannus eastern kingbird	common migrant	mixed	
Tyrannus verticalis western kingbird	common migrant	mixed	
Sayornis phoebe eastern phoebe	common migrant	mixed	
Contopus virens eastern wood pewee	common migrant	woods	
Myiarchus crinitus great crested flycatcher	common migrant	woods	
Empidonas traillii traill's flycatcher	common migrant	mixed	
Empidonax minimus least flycatcher	common migrant	mixed	
Progne subis purple martin	common migrant	openland	
Hirundo rustica barn swallow	common migrant	openland	
Iripoprocne bicolor tree swallow	common migrant	mixed woods	
Stelgidopteryx ruficollis rough-winged swallow	common migrant	openland water	
Riparia riparia bank swallow	common migrant	openland water	
Petrochelidon pyrrhonota cliff swallow	common migrant	openland	
Sitta canadensis red-breasted nuthatch	common migrant	woods	

Inventory of Common and Abundant Birds (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
Parus atricapillus black-capped chickadee	abundant migrant resident	mixed	stable
Certhia familiaris brown creeper	common migrant	woods	
Telmatodytes palustris long-billed marsh wren	common migrant	marsh	
Troglodytes aedon house wren	common migrant	mixed	
Cyanocitta cristata blue jay	abundant resident	mixed	stable
Corvus brachyrhynchos common crow	abundant resident	mixed	possibly decreasing
Toxostoma rufum brown thrasher	common migrant	woods brush	
Dumtella carolinensis catbird	common migrant	woods brush	
Hylocichla mustelina wood thrush	common migrant locally	woods	
Hylocichla ustulata swainson's thrush	common migrant	woods	
Sialia sialia eastern bluebird	common migrant	mixed	
Hylocichla minima grey-cheeked thrush	common migrant	woods	
Turdus migratorius robin	abundant migrant	mixed	
Polioptila caerulea blue-gray gnatcatcher	common migrant locally	mixed	

Inventory of Common and Abundant Birds (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
Regulus satrapa golden-crowned kinglet	common migrant	woods	
Bombycilla cedrorum cedar waxwing	common migrant	mixed	
Lanius ludovicianus loggerhead shrike	common migrant locally	openland	
Sturnus vulgaris starling	abundant resident	mixed	increasing
Vireo belli bell's vireo	common migrant	woods	
Vireo olivaceus red-eyed vireo	common migrant	woods	
Vireo gilvus warbling vireo	common migrant	woods	
Mniltilta varia black & white warbler	common migrant	woods	
Vermivora peregrina tennesses warbler	common migrant	woods	
Vermivora celata orange-crowned warbler	common migrant	mixed	
Vermivora ruficapilla nashville warbler	common migrant	mixed	
Dendroica petechia yellow warbler	common migrant	woods	
Dendroica coronata myrtle warbler	common migrant	woods	
Geothlypis trichas yellowthroat	common migrant	marsh	

Inventory of Common and Abundant Birds (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
Wilsonia pusilla wilson's warbler	common migrant	woods	
Setophaga ruticilla american redstart	common migrant	woods	
Dendroica striata blackpoll warbler	common migrant	woods	
Passer domesticus house sparrow	abundant resident	mixed	stable
Sturnella magna eastern meadowlark	abundant migrant resident	openland	stable
Sturnella neglecta western meadowlark	abundant migrant resident	openland	stable
Agelaius phoeniceus redwinged blackbird	abundant migrant	marsh openland	
Xanthocephalus xanthocephalus yellow-headed blackbird	common migrant	openland marsh	
Euphagus carolinus rusty blackbird	common migrant	woods	
Icterus spurius orchard oriole	common migrant	mixed woods	
Icterus galbula baltimore oriole	common migrant	woods	
Euphagus cyanocephalus brewer's blackbird	common migrant	mixed	
Quiscalus quiscula common grackle	abundant migrant	mixed	
Molothrus ater brown-headed cowbird	common migrant	openland	

Inventory of Common and Abundant Birds (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
Spiza americana dickcissel	common migrant	openland	
Richmondena cardinalis cardinal	common migrant resident	woods mixed	
Pheuciticus ludovicianus rose-breasted grosbeak	common migrant	woods	
Pipilo erythropthalmus rufous-sided towhee	common migrant	mixed	
Passerculus sandwichensis savannah sparrow	common migrant	openland	
Spinus tristis american goldfinch	common resident	mixed	stable
Ammodramus savannarum grasshopper sparrow	common migrant	openland	
Junco hyemalis slate-colored junco	common migrant	woods	
Spizella pusilla field sparrow	common migrant	openland	
Zonotrichia querula harris' sparrow	common migrant	mixed	
Zonotrichia leucophrys white-crowned sparrow	common migrant	openland shrub	
Melospiza lincolnii lincoln's sparrow	common migrant	thickets	
Melospiza melodia song sparrow	common migrant	thickets	
Pooecetes gramineus vesper sparrow	common migrant	openland	

Inventory of Common and Abundant Birds (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
Chondestes grammacus lark sparrow	common migrant	openland	
Spizella arborea tree sparrow	common migrant	scrubland	
Spizella passerina chipping sparrow	common migrant	mixed	
Spizella pallida clay-colored sparrow	common migrant	openland	
Zonotrichia albicollis white-throated sparrow	common migrant	woods	
Melospiza georgiana swamp sparrow	common migrant	marsh	
Calcarius lapponicus lapland longspur	common migrant	openland	

INVENTORY OF COMMON AND ABUNDANT MAMMALS

Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
	Marsupialia		
Didelphis virginiana virginia oppossum	common	woods	increasing
	Insectivora		
Blarina breviauda short-tailed shrew	common	mixed	stable
Scalopus aquaticus eastern mole	common	mixed	stable
	Chiroptera		
Myotis lucifugus little brown myotis	common	aerial	stable
	Rodentia		
Sciurus niger fox squirrel	abundant	woods	stable
Marmota monax woodchuck	common	mixed	stable
Citellus tridecemlineatus thirteen-lined ground squirrel	abundant	openlands	stable
Geomys bursarius plains pocket gopher	common	openlands	stable
Perognathus hispidus hispid pocket mouse	common	openlands	stable
Reithrodontomys megalotis western harvest mouse	common	openlands	stable

Inventory of Common and Abundant Mammals (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
Peromyscus leucopus wood mouse	common	woods	stable
Peromyscus maniculatus deer mouse	abundant	mixed	stable
Mus musculus house mouse	abundant	dwellings	increasing
Rattus norvegieus norway rat	abundant	dwellings	increasing
Microtus orchogaster prairie vole	abundant	mixed	stable
Ondatra zibethicus muskrat	common	aquatic	stable
Castor canadensis beaver	common	aquatic	increasing
Lagomorpha			
Sylvilagus floridanus eastern cottontail	abundant	mixed	stable
Carnivora			
Canis latrans coyote	very common	mixed	stable
Vulpes vulpes red fox	fairly common	woods	stable
Taxidea taxus badger	common	mixed or openland	fairly stable
Procyon lotor racoon	common	woods or mixed	stable

Inventory of Common and Abundant Mammals (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Dynamic Status
Mustela vison mink	common	aquatic	fairly stable
Mephitis mephitis striped skunk	common	mixed	stable
	Artiodactyla		
Odocoileus virginianus white-tailed deer	common	mixed	stable

INVENTORY OF COMMON REPTILES AND AMPHIBIANS

Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Importance
Ambystoma tigrinum tiger salamander	common	damp areas near water	
Bufo woodhousii rocky mountain toad	common	woods	
Bufo cognatus great plains toad	common	openlands	
Rana catesbeiana bullfrog	common	lakes	human food
Rana pipiens leopard frog	common	all aquatic	bait
Acris crepitans northern cricket frog	common	streambank vegetation	
Hyla versicolor common tree frog	common	woods, trees	
Eumeces septentrionalis prairie skink	common	terrestrial openlands	
Cnemidophorus sexlineatus six-lined racerunner	common	terrestrial openlands	
Diadophis punctatus prairie ring-necked snake	common	woods	
Heterodon platyrhinos eastern hog-nosed snake	common	woods	
Coluber constrictor blue racer	common	mixed	
Elaphe obseleta pilot black snake	common	woods	
Elaphe vulpina western fox snake	common	openlands edges	

Inventory of Common Reptiles and Amphibians (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Importance
Pituophis melanoleucas bull snake	common	openlands	
Lampropeltis getulus speckled king snake	common	mixed	
Lampropeltis calligaster prairie king snake	common	openlands	
Natrix sipedon common water snake	common	aquatic	
Thamnophis radix plains garter snake	common	wet openlands	
Thamnophis sirtalis red-sided garter snake	common	mixed	
Chelydra serpentina common snapping turtle	common	aquatic	human food
Chrysemys picta western painted turtle	common	aquatic	
Trionyx spinifera spiny soft-shelled turtle	common	aquatic	human food
Trionyx mutica spineless soft-shelled turtle	common	aquatic	human food

INVENTORY OF COMMON AQUATIC INVERTEBRATES

Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Importance
	Crustaceans		
Cambarus diogenes	common	marshes	bait, food pest
Orconectes nais	common	aquatic	bait, food
Orconectes immunis	common	aquatic	bait, food
	Unionid Molluscs		
Uniomerus tetralasmus pound-horn mussel	common	ponds and streams	wildlife
Crenodonta peruviana three-ridged mussel	common	streams	wildlife
Lampsilis ouata plain pocketbook mussel	common	streams	wildlife
Lampsilis radiata fat musket mussel	common	muddy ponds	wildlife
Lampsilis anodontoides yellow sand-shelled mussel	common	streams	wildlife
Tritogonia verrucosa buckhorn mussel	common	streams	wildlife
Lasmigona complanata white-headed splitter mussel	common	streams	wildlife
Ligumia substrata common pond mussel	common	small streams and ponds	wildlife
Carunculina parua lilliput mussel	common	mud bottom streams	wildlife
Fusconaia spp.	common	all aquatic	wildlife

Inventory of Common Aquatic Invertebrates (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat	Importance
Anodonta grandis floater mussel	common	most aquatic	wildlife
	Sphaeriid Molluscs		
Pisidium spp.	common	all aquatic	wildlife
Sphaerium spp.	common	all aquatic	wildlife

INVENTORY OF COMMON AND ABUNDANT FISHES

Long Branch Watershed, Nebraska

Species	Abundance	Habitat
Dorosoma cepadianum gizzard shad	0-35 lbs/acre	slow moving rivers
Semotilus atromaculatus creek chub	fairly common	clearer streams
Cyprinus carpio 1/ carp	abundant	all
Phenacobius mirabilis suckermouth minnow	fairly common	stream riffles
Notropis atherinoides emerald shiner	fairly common	sluggish streams
Notropis dorsalis bigmouth shiner	common	most streams
Notropis lutrensis red shiner	abundant	most streams
Notropis stramineus sand shiner	abundant	all
Pimephales promelas fathead minnow	very common	all
Carpiodes carpio river carpsucker	very common 1-5 lbs/acre	deep slow streams
Ictalurus melas black bullhead 1/	common 5 lbs/acre	small streams
Ictalurus punctatus channel catfish 1/	common 5-50 lbs/acre	fast deep streams
Lepomis cyanellus green sunfish	fairly abundant up to 40 lbs/acre	all
Lepomis macrochirus bluegill	fairly common 0-5 lbs/acre	deep pools some ponds

Inventory of Common and Abundant Fishes (Continued)
Long Branch Watershed, Nebraska

Species	Abundance	Habitat
Micropterus salmoides largemouth bass 1/	fairly common 0-5 lbs/acre	clear streams some ponds
Etheostoma nigrum johnny darter	common	riffle pools

1/ Sport fish