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SUMMARY
OF
OUTLINES AND TIME SCHEDULES
FOR
NEBRASKA'S
STATE WATER PLAN
AS OF
JAN. 1, 1968

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STATE SOIL AND WATER
CONSERVATION COMMISSION
Box 94725, State House Sta.
Lincoln, Nebraska 68509

*PREPARED
BY THE
PLANNING DIVISION
OF THE
NEBRASKA
SOIL AND WATER
CONSERVATION COMMISSION*

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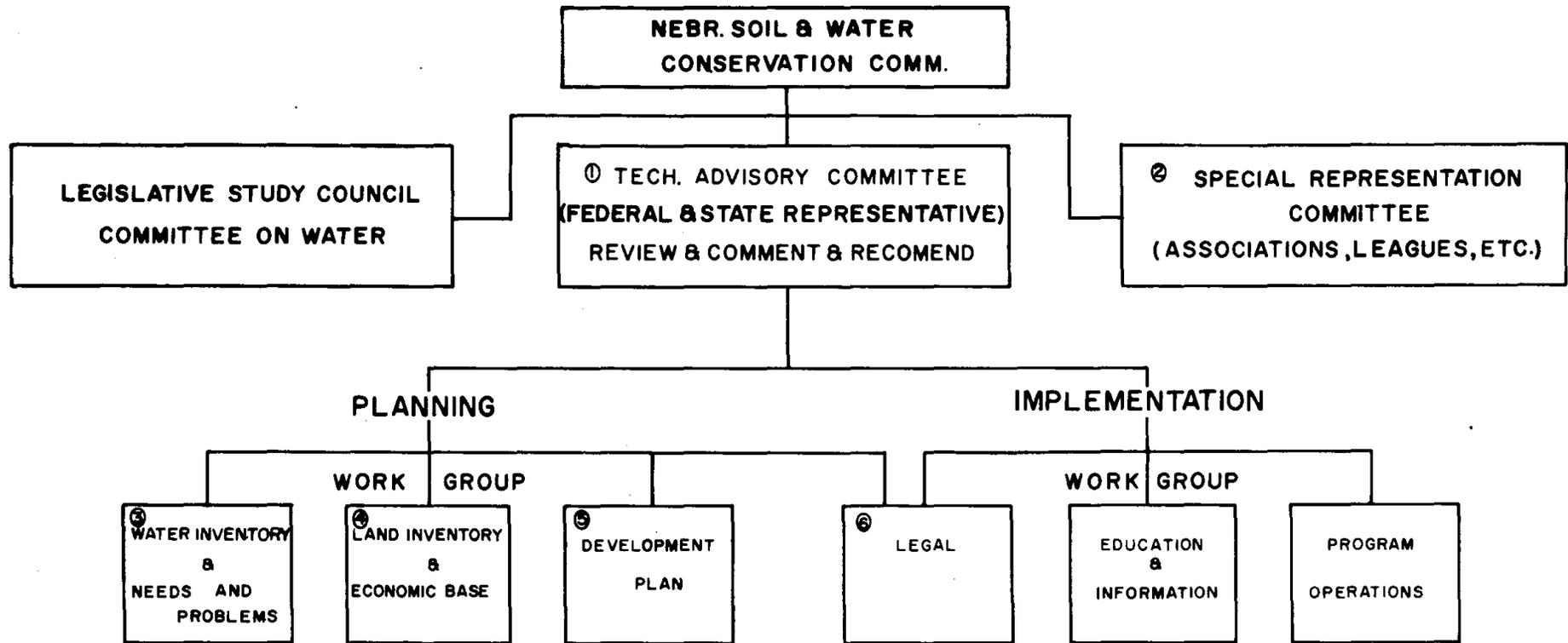
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STATE WATER PLAN



- ① N.S.W.C.C.
 U.S. DEPT. OF AGRICULTURE
 U.S. DEPT. OF DEFENSE
 U.S. DEPT. OF INTERIOR
 NEBR. DEPT. OF ECONOMIC DEVELOPMENT
 NEBR. DEPT. OF HEALTH
 NEBR. DEPT. OF ROADS
 NEBR. DEPT. OF WATER RESOURCES
 NEBR. GAME & PARKS COMM.
 U.O.F.N. BUREAU OF BUSINESS RESEARCH
 U.O.F.N. AG. EXPERIMENT STA.
 U.O.F.N. CONS. & SURVEY DIV.

- ② NEBR. LEAGUE OF MUNICIPALITIES
 NEBR. LEAGUE OF WOMEN VOTERS
 NEBR. RECLAMATION ASSN.
 NEBR. IRRIGATION ASSN.
 NEBR. ASSN. OF COMMERCE & INDUSTRY
 NEBR. ASSN. OF S.W.C.D.'S
 NEBR. FARM BUREAU FEDERATION
 FARMERS UNION OF NEBR.
 STATE GRANGE
 NEBR. PETROLEUM COUNCIL
 NEBR. PRESS ASSOC.
 NEBR. RURAL ELEC. ASSOC.

- ③ U.S. DEPT. OF AGRICULTURE
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 U.O.F.N. COLLEGE OF ENGINEERING
 U.S. DEPT. OF DEFENSE

- ⑥ N.S.W.C.C.
 U.O.F.N. COLLEGE OF LAW
 PRIVATE FIRM
 PRIVATE FIRM
 PRIVATE FIRM

SECTION 1
OF
THE STATE WATER PLAN
THE FRAMEWORK STUDY

STATE WATER PLAN

SECTION 1 -- FRAMEWORK STUDY

		TENTATIVE DATE OF COMPLETION
VOLUME 1	INVENTORY OF LAND RESOURCES	NOVEMBER, 1968
VOLUME 2	INVENTORY OF WATER RESOURCES	DECEMBER, 1968
VOLUME 3	WATER AND LAND RESOURCES PROBLEMS AND NEEDS	JANUARY, 1969
VOLUME 4	ECONOMIC BASE STUDY FOR WATER RESOURCES DEVELOPMENT	FEBRUARY, 1969
VOLUME 5	A PROPOSED PLAN OF WATER AND LAND RESOURCES DEVELOPMENT	APRIL, 1971

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STATE WATER PLAN

Framework Study

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STATE WATER PLAN

Framework Study

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SECTION 2
OF
THE STATE WATER PLAN
THE BASIN PLANNING REPORTS

STATE WATER PLAN

SECTION 2 -- BASIN PLANS

		TENTATIVE DATE OF COMPLETION
VOLUME 1	BIG BLUE	FEBRUARY, 1968
VOLUME 2	ELKHORN	JANUARY, 1969
VOLUME 3	LITTLE BLUE	DECEMBER, 1969
VOLUME 4	NIORARA	NOVEMBER, 1970
VOLUME 5	NEMAHA	JULY, 1971
VOLUME 6	WHITE	1972
VOLUME 7	LOUP	1972
VOLUME 8	MIDDLE PLATTE	1973
VOLUME 9	REPUBLICAN	1974
VOLUME 10	LOWER PLATTE	1975
VOLUME 11	UPPER PLATTE	1975

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PLAN OF WORK
NEBRASKA SOIL AND WATER CONSERVATION COMMISSION
IN COOPERATION WITH
BLUE RIVER WATERSHED PLANNING BOARD
IN THE
BIG BLUE RIVER BASIN, NEBRASKA

(Revised April 23, 1963)

INTRODUCTION

The Blue River Watershed Planning Board, organized by virtue of sections 31-833 to 31-837, R.S. of Nebraska, has requested a basin-wide plan of soil and water resource development for the Big Blue River Basin in Nebraska from the Nebraska Soil and Water Conservation Commission. The State Commission has agreed to develop such a plan within the limits of its resources and they have, to date, requested the assistance of the Bureau of Reclamation, Corps of Engineers, Soil Conservation Service, Conservation and Survey Division of the University of Nebraska, and the State Department of Water Resources. All plans and studies are to be coordinated with and reviewed by the boards of supervisors of all soil and water conservation districts with land in the drainage area.

The Big Blue River drains approximately 2,600,000 acres of land in southeast Nebraska. The head waters of this river begin in Adams and Hall counties and it outlets into the State of Kansas near the town of Barneston, Nebraska, located in Gage County. The Blue joins the Kansas River Basin near Manhattan, Kansas. This river drains all or parts of the following counties in Nebraska: Adams, Hall, Clay, Hamilton, Polk, York, Fillmore, Butler, Seward, Lancaster, Saline, Gage, Jefferson and Pawnee.

Problem and Need for Plan

The Big Blue Valley is a very productive agricultural area in Nebraska. Soil erosion is excessive throughout the watershed. The application of land treatment measures has been very slow to date in the upper reaches. The soil and water conservation program is rapidly progressing in the lower portion of the watershed, with some areas almost 100 percent completed.

The topography of the valley is flat to very gentle rolling in the upper reaches. Much of the head water area is underlain by an excellent supply of ground water. This ground water resource, coupled with a nearly level topography and productive loess soil has precipitated a high concentration of deep well irrigation. This concentrated development is, in some areas, causing a lowering of the ground water level. This situation is of grave concern to the people of the area.

The lower reaches of this basin is located in glacial drift parent-material. It is severely dissected by many drains that are deeply entrenched. This area is susceptible to very frequent and heavy damaging floods. These excessive and damaging floods have been mainly responsible to date for the many watershed applications received from this area by the State Commission.

These projects include: Little Indian, 50,000 acres; Plum, 38,000 acres; Mud, 38,000 acres; Soap, 22,000 acres; Big Indian, 131,000 acres; Bear-Pierce-Cedar, 30,000 acres; Dry, 8,300 acres; West Ulysses, 2,400 acres; Cub, 100,000 acres; Dorchester, 4,800 acres; and Mission, 36,000 acres. Additional watershed protection and flood prevention and flood control programs are needed to protect the unprotected ravaged flood plain property.

The economy of the valley is predominately agricultural. Cattle raising, cattle feeding and crop production are the primary sources of income. Many years crop yields are severely reduced because of dry weather (drought) during the summer months of July and August. The population of the valley has been slowly decreasing during recent years because of the nation-wide trend for larger farm and ranch units.

Considerable study needs to be given to the recharge of ground water especially in the highly concentrated deep well irrigation area. This study needs to include the effect of complete watershed treatment on ground water recharge as well as the effect of increased efficiency of irrigation water use through improved irrigation practices. Special emphasis also needs to be placed on the needed flood control and watershed programs to protect the highly productive rural and urban flood plains areas. The plan should outline a program for the maximum development of the area's soil and water resources - a program, when "carried out", that would insure the maximum future productivity of the stabilized valley. Such a productive agricultural valley with adequate resources, both human and natural, would attract new industry that would encourage and promote a dynamic and prosperous economy.

In connection with this broad study there is an urgent need for a systematic survey or inventory of water and land resources of the Big Blue Valley. There is also a need to study the condition and problems relating to these resources on a basin-wide basis so that the Nebraska Soil and Water Conservation Commission, Blue River Watershed Planning Board, and local soil and water conservation districts can efficiently, effectively and economically coordinate the various programs in the basin.

Principal Features of the Study to be Undertaken

The study and ultimate plan will seek to provide a basis for research, planning and development of coordinated programs for the conservation and utilization of the water and related resources of the Big Blue River Basin. It will be pointed primarily at:

1. Inventory of the soil and water resources including erosion or depletion of the soil resources.
2. Present and future land use. This will include ways and means of improving management of lands, including land treatment practices, land conversion, etc.
3. Flood damage in all reaches of the basin as caused by flood water, poor drainage siltation, scour and stream bank erosion and possible ways of minimizing this damage.

4. Present and past use of water. This will include management of surface waters, stream flows, drainage from agricultural lands, water storage and water rights.
5. Ground water conditions as they relate to return flow, drainage, recharge and availability of ground water supplies.
6. Potential use of water including new ditch irrigation projects and deep well irrigation. This would include improvement in existing irrigation systems on individual farms and prevention of excessive water losses.
7. Availability and potential of water available for industrial and municipal purposes.
8. Recreation and wildlife potential.
9. Stream pollution control.
10. Economic effect or impact on the basin if such a study or plan would be applied.

INVENTORY OF ASSISTANCE AVAILABLE FOR THE STUDY

The Nebraska Soil and Water Conservation Commission during their regularly scheduled board meeting on March 14, 1961, went on record of agreeing to coordinate and develop a total soil and water resource plan and study for the Big Blue in Nebraska. Immediately thereafter, the State Commission requested information from the Bureau of Reclamation, Corps of Engineers, U.S. Department of Agriculture (Soil Conservation Service, Forest Service, Economic Research Service), Conservation and Survey Division (University of Nebraska), and the Department of Water Resources. The State Commission reserves the right to request and receive assistance and cooperation from other local, state and federal agencies as the need arises. The following is a resume of the scope of activities that the above named agencies indicated would be available during this study.

Scope of Bureau of Reclamation Activities

The objective of new reconnaissance investigations in the Big Blue Basin will be to provide a determination of the available water supply, generally delineate the potential needs of the service areas, assess the pattern of local interest and perform the necessary land classification, engineering, economic and financial studies and analyses to analyze the possibilities and current feasibility of development.

The Bureau of Reclamation investigation work will be summarized in a Reconnaissance Report. These reconnaissance investigations propose to accomplish the following items of work in the Big Blue Division.

1. Land Classification Surveys: The reconnaissance land classification done previously will be reviewed and adjusted using new criteria. The classification will be expanded to include other areas. Field work will include sampling from 5- and 15- foot auger holes, as well as surface soil classification. Laboratory analysis of soil samples will be made to determine gradation, salinity, alkalinity, permeability, soil structure and other physical and chemical qualities of the soils, including drainage analyses.

2. Water Supply and Utilization Studies: Available surface and ground-water data will be analyzed to determine the water supply available to the Division. Water requirements of the project lands, municipal and industrial uses will be analyzed. Based on the overall needs and physical plan, river operation studies will be prepared.
3. Sediment Studies: Sediment studies will be made for use in determining sediment problems which might be expected to occur with project development. These studies will be prepared using available data.
4. Flood Studies: Flood studies will be prepared for use in the hydraulic design of dams and cross drainage structures. These studies will be made using available streamflow records.
5. Drainage Studies: Studies will be made to check the effect of project development on the surface and subsurface drainage requirements. Available depth-to-water and ground water contour maps will be supplemented with some subsurface geologic exploration, if required.
6. Geologic Exploration: For this investigation the geological studies will be largely limited to test holes on the dam sites. Because of investigation fund limitation, available data on regional and local geology will be supplemented only as absolutely necessary.
7. Economic Studies: Basic farm data from the local ASC office and county records will be collected and analyzed to determine economic support of any proposals. These data will include information on farm size, land use, tenure of operation, tax data and land values. From the basic data, farm budgets for both the "with" and "without" irrigation conditions will be determined. Repayment capacity and irrigation benefits will be evaluated to complete the economic and financial analysis of the project.
8. Field Surveys: Basic horizontal and vertical control for future surveys will be run through the area. Topographic surveys will be made at the specific structure locations. Reconnaissance field locations will be made for major facilities.
9. Engineering Studies: The engineering studies involve a determination of the immediate and future needs of the basin and a physical and economical plan to fulfill these needs. This means that the need and location for irrigation must be analyzed; similar findings must be made for all other purposes such as hydroelectric power, flood control, municipal and industrial needs, fish and wildlife and recreational opportunities and pollution abatement. Once all of the needs are relatively defined, then an economical engineering plan must be devised--this means the preparation of designs and reconnaissance cost estimates.
10. Cooperative Studies: The above items are always analyzed with other interested agencies of the local, state, and Federal level to assure the development of a coordinated plan.
11. Reports: The results of the above studies will be summarized in a reconnaissance report.

Scope of Corps of Engineers Activities

Basin studies in the Big Blue will be in response to Congressional resolution. Such studies, if conducted, would be of a comprehensive nature and consider all phases of water resource development unless limitations are imposed by the authorizing resolution. Such studies would determine the proper scale and scope of potential developments, the degree of economic justification, and the equitable sharing of costs and responsibility of Federal and non-Federal interests.

Corps of Engineers

1. Climate and stream flow
2. Floods of record
3. Extent and character of flooded area
4. Flood damages
5. Existing and proposed developments by other agencies.
6. Improvements desired by local interests
7. Navigation
8. Power needs
9. Water supply needs
10. Existing and potential irrigation
11. Stream pollution
12. Erosion problems (Principally on major streams)
13. Drainage problems
14. Recreational needs
15. Fish and wildlife needs
16. Existing and potential watershed development

Although the Corps of Engineers study would consider provision of irrigation storage, all irrigation development plans would be made by the Bureau of Reclamation. The Corps of Engineers in this study and plan will also coordinate with, or use the services of other agencies, where advisable - such as the Public Health Service on pollution and water supply problems and the Federal Power Commission for hydro-power developments. The Corps of Engineers will also cooperate with the Soil Conservation Service in the development of watershed plans if the need for such development is indicated. The Soil Conservation Service would develop the watershed plan but it would be coordinated with the Corps of Engineers studies. Examples are the Papillion Creek and Gering Valley studies.

Scope and Responsibility of USDA

Representative sample watersheds in problem areas in soil and water conservation will be selected for surveys and investigations with preliminary investigation type of intensity. Available data and field examinations will provide the basis for expanding data from sample areas to sub-basin water and land resource areas. The inventory, by sub-basin water and related land areas, will include:

1. Identification of a desirable pattern of water and related land use including recreation, management, and development to meet future requirements, provide watershed protection and alleviate flood prevention and agricultural water management problems at justifiable cost;
2. Identification of alternative water and related land uses, management and developments;
3. Identification and evaluation of the major obstacles to attainment of the desirable pattern of water and related land use, management and development;

4. Identification of the manner in which, and an appraisal of the extent to which, USDA programs can contribute to the solution of water and related land problems in the basin with emphasis on project type solutions; objectives; and
5. Outlining additional actions which would air in attaining basin-wide objectives; and
6. Providing information and data in a report.

RESPONSIBILITIES

The survey work of the U.S. Department of Agriculture will be coordinated by a USDA Field Advisory Committee - Big Blue River Basin - which is composed of : C. Dale Jaedicke, Chairman, Soil Conservation Service; James O. Folkestad, Forest Service; and John Muehlbeier, Economic Research Service.

The Field Advisory Committee will be responsible for field coordination of Department survey activities and procedure; arranging for field review of recommendations and reports; arranging for necessary consultation; over-all relationships with the Nebraska Soil and Water Conservation Commission and other interested State and Federal agencies; and arranging for over-all schedules of work. Each member of the Field Advisory Committee will inform his responsible supervisor about progress and effort necessary for timely performance.

Soil Conservation Service

The Soil Conservation Service, in cooperation with other USDA agencies and the State of Nebraska will undertake the following aspects of the survey:

1. Delineate subwatershed areas of 250,000 acres or less in the basin.
2. The review and evaluation of available pertinent basic physical data, published and unpublished, concerning soil and water resources and the collection of additional related basic physical data needed for this survey.
3. Identification of floodwater and sedimentation problems and an inventory of the location, nature and extent of floodwater and sediment damages.
4. Development of information on agricultural water management problems and on the location, nature and extent of existing and potential agricultural water management developments, including upstream water storage opportunities.
5. Evaluation of the effect of reasonably attainable farm irrigation efficiency on water use in the basin.
6. Preparation of summaries of past, current and needed flood prevention and agricultural water management improvements for each tributary, including storage sites, based on available information.
7. A field reconnaissance of potential P.L. 566 projects, a determination of those that are potentially feasible, and a determination of their relationship to other existing and potential water resource developments.
8. Help the State of Nebraska define the water yielding areas and their characteristics.

Economic Research Service

The Economic Research Service in cooperation with other USDA agencies and the State of Nebraska will compile economic data and make economic analysis relating to the agricultural industry and its use of land and water resources. Material of this nature will be developed for the basin as a whole, and for

subdivisions of the basin and in such detail as required for the development of coordinated framework plans for the use, control and development of water and related land resources. The analysis will encompass the following:

1. The compilation of analyses of secondary statistical materials relating to the agricultural economy of the basin, agricultural use of land and water, and the output of agricultural products; including (a) crop acreages, yields and values, (b) production and value of livestock products, (c) capital investment in the agricultural industry, (d) land values, and (e) agricultural markets, etc.
2. Analysis of emerging improvements in agricultural technology, growth of agricultural markets and their composite impact on the agricultural economy and its need for natural resources.
3. Economic analysis of agricultural water problems, their impact on the economy of the area and an appraisal of economic benefits to be derived from their alleviation (including improvements in production efficiency, stabilization of farm production and income and alleviation of unemployment on farms and agricultural trade centers).
4. Development of other types of economic data and methods of analysis designed to facilitate a basin-wide appraisal of beneficial and adverse effects of possible water resource development projects or systems of water control.

Forest Service

The U.S. Forest Service, in cooperation with other USDA agencies and the State of Nebraska, will undertake the following aspects of the study:

1. Review and evaluate available basic physical data, published and unpublished, concerning soil and water resources and the collection of additional related basic data needed for the survey pertaining to the hydrologic aspect of woodlands.
2. Investigate the relationship between the use, management and treatment of woodlands to floodwater, erosion, and sedimentation problems.
3. With the State Forester determine the need for kinds of improvement measures for watershed protection, flood prevention and water pollution prevention on woodlands.

Scope of the Department of Water Resources:

1. Make a determination of the water supply available for future use for domestic, agricultural, industrial, municipal, and other useful purposes.
2. Make a determination of the historical water supply.
3. Develop flow-duration data at various locations in the basins.
4. Determine actual water uses under existing water appropriations.
5. Determine historical stream flow depletions resulting from existing water uses.
6. Determine probable water requirements under projects proposed for the basin.
7. Provide information as to the number of wells, the number of acres irrigated, the amount of ground water used, etc. for each basin and for areas within the basin as may be desired.
8. In cooperation with other state and federal agencies, make a determination of the effect of ground water pumping on the natural stream flow.

Scope of the Conservation and Survey Division:

1. The preparation of surficial and subsurface geologic maps of the area.

2. The preparation of ground water maps of the area including depth to water table maps and water table contour maps and maps showing the availability of ground water in terms of general potential water yields.
 3. Evaluation of the average annual recharge to ground water in the basin based on a combined study of the water table contour maps and total transmissibility of the subsurface materials.
 4. Evaluation of ground water in storage in the basin.
 5. Compilation and evaluation of soil characteristics relating to infiltration, land utilization, erosion characteristics, etc.
- Requests to other local, state, and federal agencies and organizations may be made as deemed appropriate by the Nebr. Soil and Water Conservation Commission.

Coordinating Arrangements of the Nebraska Soil and Water Conservation Comm.

The Nebraska Soil and Water Conservation Commission during their regularly scheduled meeting on July 12, 1962, agreed to accept the assistance offered for this study by the above named agencies. It was obvious, however, that some needless overlapping of responsibility and duplication of effort would develop in the study if major areas of responsibilities were not outlined by the State Commission. For this reason, the Nebraska Soil and Water Conservation Commission on July 12, 1962, approved the following assignment of major responsibility in this study. In addition they submitted a request for assistance to the State Health Department, the Nebraska Game, Forestation and Parks Commission, and the Extension Service of the University of Nebraska.

Bureau of Reclamation

1. Irrigation project development
2. Drainage

Corps of Engineers

1. Flood Control (studies to be limited primarily to urban areas and those reaches of the stream and major tributaries that exceed 250,000 acres.)
2. Erosion Problems (limited primarily to the flood plains, and stream banks on main streams and major tributaries exceeding 250,000 acres in drainage.)
3. Navigation.

Soil Conservation Service

1. Watershed Protection and Flood Prevention. (studies to be limited primarily to delineated watersheds of less than 250,000 acres.)
2. Erosion Problems based on soil surveys.
3. Land treatment as needed on individual farms. (to include land use adjustments, mechanical practices - both for dry and irrigated land, agronomic practices, etc.)

Economic Research Service

1. Economic evaluation of agricultural water problems and benefits from their alleviation.
2. Development of economic data on the beneficial and adverse effect of the basin with appraisal of possible resource development.
3. Compilation of statistical material on the agricultural economy of the basin.
4. Analysis of improvements in agricultural technology, growth of markets and the need for natural resources.

Forest Service

1. Investigate relationship of use, management, and treatment of woodlands to floodwaters, erosion, and sedimentation problems.
2. Determine needed woodland improvements.

Conservation and Survey Division (University of Nebraska)

1. Water quality tests
2. Test drilling
3. Ground water recharge studies
4. Deep well irrigation potential.

Department of Water Resources

1. Water supply inventory
2. Existing water appropriation

Nebraska Game, Forestation and Parks Commission

1. Fish and wildlife potential
2. Park development

State Department of Health

1. Stream pollution

Extension Service (University of Nebraska)

1. Information and education program.

It is the desire of the State Commission that surveys, investigations, economic and financial policies relating to municipal and industrial waters be coordinated as among the Soil Conservation Service, Bureau of Reclamation, and Corps of Engineers; it is also the wish of the Commission that these same items relating to hydroelectric power be coordinated as between the Bureau of Reclamation and the Corps of Engineers.

In the above assignment of major responsibilities, it is assumed by the State Commission that these assignments include necessary surveys, investigations, research, etc. as needed by the various agencies in order to insure a complete study as outlined. In addition, the State Commission recognized that all of these agencies have many other responsibilities authorized to them under existing state and federal laws. For the purpose of this study the Nebraska Soil and Water Conservation Commission requests that the above assignments be respected by all cooperating agencies. These assignments may be revised, amended, and added to during the study as is necessitated by need.

The State Commission shall call meetings as needed (a minimum of two each year during the study period) for the purpose of encouraging an interchange of information and materials from cooperating agencies. Participating agencies are to be encouraged to coordinate their findings whenever convenient and in the public interest to do so. If needed assistance or information is available from some source other than from a participating agency, any cooperating agency should not hesitate in requesting such needed information from the available source.

The following agencies have been suggested by and to the Nebraska Soil and Water Conservation Commission for eventual inclusion in the study. These and other agencies may be invited by the Commission as the need arises.

Federal

1. ~~Department of Health, Education and Welfare~~
2. Fish and Wildlife Service
3. Geological Survey
4. Weather Bureau

State

1. Governor's Office
2. Experiment Station, University of Nebraska
3. Department of Roads
4. Department of Agriculture and Inspection
5. Nebraska Resources Division

Local

1. Soil and Water Conservation Districts
2. Counties
3. Municipalities

RESPONSIBILITY OF THE NEBRASKA SOIL AND WATER CONSERVATION COMMISSION

1. Coordinate the activities of all local, state and federal agencies and organizations requested by the Commission to assist in the study and plan on the Big Blue.
2. Request services of various local, state and federal agencies as needed to complete the proposed study and plan.
3. Cooperate closely with the Big Blue Watershed Planning Board and the local soil and water conservation districts to make certain that the desires and needs of these local organizations are adequately covered in the study and plan.
4. Use the departments available personnel in obtaining survey and other information not available from existing local, state and federal agencies as needed in the development of the overall plan. If available, such state personnel would be available upon request by those agencies developing specific information on programs within their assigned fields.
5. Summarize the findings of the various agencies and print a consolidated basin-wide soil and water resource plan.
6. Disseminate and explain the information derived from the study and included in the plan to local and state individuals and organizations. Such action to be done in cooperation with existing educational agencies.

TIME SCHEDULE FOR STUDY AND PROGRAM

The study, which is already initiated, is scheduled for more intensified study in fiscal years 1963, 1964, and 1965. The compiled report by the State Commission is scheduled for completion and ready for presentation to local people during calendar year 1966. In the meantime local interests are to be encouraged to continue to apply and implement those portions of the overall plan which are available to them.

PLAN OF WORK
NEBRASKA SOIL AND WATER CONSERVATION COMMISSION
IN COOPERATION WITH
ELKHORN VALLEY RESOURCES ASSOCIATION
LOWER ELKHORN WATERSHED PLANNING BOARD
IN THE
ELKHORN RIVER BASIN, NEBRASKA

(Revised April 23, 1963)

INTRODUCTION

The Elkhorn Valley Water Resources Association and the Lower Elkhorn Watershed Planning Board have requested a basin-wide plan of soil and water resource development for the Elkhorn Valley from the Nebraska Soil and Water Conservation Commission. The State Commission has agreed to develop such a plan within the limits of its resources and they have, to date, requested the assistance of the Bureau of Reclamation, Corps of Engineers, Soil Conservation Service, Conservation and Survey Division of the University of Nebraska, and the State Department of Water Resources. All plans and studies are to be coordinated with and reviewed by the boards of supervisors of all soil and water conservation districts with land in the drainage area.

The Elkhorn Valley drains approximately 3,800,000 acres in northeast Nebraska. The head waters of the river begin in Rock County and it outlets into the Platte River in Sarpy County. (The entire drainage is within the boundaries of the State of Nebraska.) It drains all or parts of the following counties: Rock, Holt, Wheeler, Antelope, Boone, Pierce, Madison, Platte, Cedar, Wayne, Stanton, Colfax, Dixon, Cuming, Dodge, Thurston, Burt, Washington, Douglas and Sarpy.

Problem and Need for Plan

The Elkhorn Valley is a very productive agricultural region in Nebraska; however, soil erosion is excessive in the central and lower reaches of the watershed. The application of needed land treatment measures has been very slow to date. A good percentage of the rolling cropland is unprotected. Water control structures are for the most part non-existent and, as a result, the fertile lowlands and towns located in the flood plain are subject to frequent and highly damaging floods.

The economy of the valley is predominately agricultural with very little heavy industry. Cattle raising, cattle feeding and crop production is the primary source of income. Many years crop yields are severely reduced because of dry weather (drought) during the summer months of July and August. The population of the valley has been slowly decreasing during recent years because of the nation-wide trend for larger farm and ranch units.

A basin-wide program of soil and water resource development and utilization in the Elkhorn Basin needs to be planned and applied that will assist in solving the above stated problems. Such a plan should include but not be limited to such programs as: soil and water conservation (land treatment measures); watershed protection and flood prevention; flood control; irrigation (both ditch and deep well); drainage; and water for municipal and industrial purposes. The plan

should outline a program for the maximum development of the area's soil and water resources - a program, when "carried out", that would insure the maximum future productivity of the stabilized valley. Such a productive agricultural valley with adequate resources, both human and natural, would attract new industry that would encourage and promote a dynamic and prosperous economy.

In connection with this broad study there is an urgent need for a systematic survey or inventory of water and land resources of the Elkhorn Valley. There is also a need to study the condition and problems relating to these resources on a basin-wide basis so as the local people and the Nebraska Soil and Water Conservation Commission can efficiently, effectively and economically coordinate the various programs in the basin.

Principal Features of the Study to be Undertaken

The study and ultimate plan will seek to provide a basis for research, planning and development of coordinated programs for the conservation and utilization of the water and related resources of the Elkhorn River Basin. It will be pointed primarily at:

1. Inventory of the soil and water resources including erosion or depletion of the soil resources.
2. Present and future land use. This will include ways and means of improving management of lands including land treatment practices, land conversion, etc.
3. Flood damage in all reaches of the basin as caused by flood water, poor drainage, siltation, scour and stream bank erosion and possible ways of minimizing this damage.
4. Present and past use of water. This will include management of surface waters, stream flows, drainage from agricultural lands, water storage and water rights.
5. Ground water conditions as they relate to return flow, drainage, recharge and availability of ground water supplies.
6. Potential use of water including new ditch irrigation projects and deep well irrigation. This would include improvement in existing irrigation systems on individual farms and prevention of excessive water losses.
7. Availability and potential of water available for industrial and municipal purposes.
8. Recreation and wildlife potential.
9. Stream pollution control.
10. Economic effect or impact on the basin if such a study or plan would be applied.

INVENTORY OF ASSISTANCE AVAILABLE FOR THE STUDY

The Nebraska Soil and Water Conservation Commission during their regularly scheduled board meeting on March 14, 1961, went on record of agreeing to coordinate and develop a total soil and water resource plan and study for the Elkhorn Valley in Nebraska. Immediately thereafter, the State Commission requested information from the Bureau of Reclamation, Corps of Engineers, U. S. Department of Agriculture (Soil Conservation Service, Forest Service, Economic Research Service), Conservation and Survey Division (University of Nebraska), and the Department of Water Resources. The State Commission reserves the right to request and receive assistance and cooperation from other local, state, and federal agencies as the need arises. The following is a resume of the scope of activities that the above named agencies indicated would be available during this study.

Scope of Bureau of Reclamation Activities

The objective of new reconnaissance investigations in the Elkhorn Basin will be to provide a determination of the available water supply, generally delineate the potential needs of the service areas, assess the pattern of local interest and perform the necessary land classification, engineering, economic and financial studies and analyses to analyze the possibilities and current feasibility of development.

The Bureau of Reclamation investigation work will be summarized in a Reconnaissance Report. These reconnaissance investigations propose to accomplish the following items of work in the Elkhorn Division.

1. Land Classification Surveys: The reconnaissance land classification done previously will be reviewed and adjusted using new criteria. The classification will be expanded to include other areas. Field work will include sampling from 5- and 15- foot auger holes, as well as surface soil classification. Laboratory analysis of soil samples will be made to determine gradation, salinity, alkalinity, permeability, soil structure and other physical and chemical qualities of the soils, including drainage analyses.
2. Water Supply and Utilization Studies: Available surface and ground-water data will be analyzed to determine the water supply available to the Division. Water requirements of the project lands, municipal and industrial uses will be analyzed. Based on the overall needs and physical plan, river operation studies will be prepared.
3. Sediment Studies: Sediment studies will be made for use in determining sediment problems which might be expected to occur with project development. These studies will be prepared using available data.
4. Flood Studies: Flood studies will be prepared for use in the hydraulic design of dams and cross drainage structures. These studies will be made using available streamflow records.
5. Drainage Studies: Studies will be made to check the effect of project development on the surface and subsurface drainage requirements. Available depth-to-water and ground water contour maps will be supplemented with some subsurface geologic exploration, if required.

6. Geologic Exploration: For this investigation the geological studies will be largely limited to test holes on the dam sites. Because of investigation fund limitations, available data on regional and local geology will be supplemented only as absolutely necessary.
7. Economic Studies: Basic farm data from the local ASC office and county records will be collected and analyzed to determine economic support of any proposals. These data will include information on farm size, land use, tenure of operation, tax data and land values. From the basic data, farm budgets for both the "with" and "without" irrigation conditions will be determined. Repayment capacity and irrigation benefits will be evaluated to complete the economic and financial analysis of the project.
8. Field Surveys: Basic horizontal and vertical control for future surveys will be run through the area. Topographic surveys will be made at the specific structure locations. Reconnaissance field locations will be made for major facilities.
9. Engineering Studies: The engineering studies involve a determination of the immediate and future needs of the basin and a physical and economical plan to fulfill these needs. This means that the need and location for irrigation must be analyzed; similar findings must be made for all other purposes such as hydroelectric power, flood control, municipal and industrial needs, fish and wildlife and recreational opportunities and pollution abatement. Once all of the needs are relatively defined, then an economical engineering plan must be devised - this means the preparation of designs and reconnaissance cost estimates.
10. Cooperative Studies: The above items are always analyzed with other interested agencies of the local, state, and Federal level to assure the development of a coordinated plan.
11. Reports: The results of the above studies will be summarized in a reconnaissance report.

Scope of Corps of Engineers Activities

Basin studies in the Elkhorn Valley will be in response to Congressional resolution. Such studies, if conducted, would be of a comprehensive nature and consider all phases of water resource development unless limitations are imposed by the authorizing resolution. Such studies would determine the proper scale and scope of potential developments, the degree of economic justification, and the equitable sharing of costs and responsibility by Federal and non-Federal interests.

Corps of Engineers

1. Climate and stream flow
2. Floods of record
3. Extent and character of flooded area
4. Flood damages
5. Existing and proposed developments by other agencies
6. Improvements desired by local interests
7. Navigation
8. Power needs
9. Water supply needs
10. Existing and potential irrigation

11. Stream pollution
12. Erosion problems (Principally on major streams)
13. Drainage problems
14. Recreational needs
15. Fish and wildlife needs
16. Existing and potential watershed development

Although the Corps of Engineers study would consider provision of irrigation storage, all irrigation development plans would be made by the Bureau of Reclamation. The Corps of Engineers in this study and plan will also coordinate with, or use the services of other agencies, where advisable - such as the Public Health Service on pollution and water supply problems and the Federal Power Commission for hydro-power developments. The Corps of Engineers will also cooperate with the Soil Conservation Service in the development of watershed plans if the need for such development is indicated. The Soil Conservation Service would develop the watershed plan but it would be coordinated with the Corps of Engineers studies. Examples are the Papillion Creek and Gering Valley studies.

Scope and Responsibility of USDA

Representative sample watersheds in problem areas in soil and water conservation will be selected for surveys and investigations with preliminary investigation type of intensity. Available data and field examinations will provide the basis for expanding data from sample areas to sub-basin water and land resource areas. The inventory, by sub-basin water and related land areas, will include:

1. Identification of a desirable pattern of water and related land use including recreation, management and development to meet future requirements, provide watershed protection and alleviate flood prevention and agricultural water management problems at justifiable cost;
2. Identification of alternative water and related land uses, management and developments;
3. Identification and evaluation of the major obstacles to attainment of the desirable pattern of water and related land use, management and development;
4. Identification of the manner in which, and an appraisal of the extent to which, USDA programs can contribute to the solution of water and related land problems in the basin with emphasis on project type solutions;
5. Outlining additional actions which would aid in attaining basin-wide objectives; and
6. Providing information and data in a report.

RESPONSIBILITIES

The survey work of the U. S. Department of Agriculture will be coordinated by a USDA Field Advisory Committee - Elkhorn River Basin - which is composed of C. Dale Jaedicke, Chairman, Soil Conservation Service; James O. Folkestad, Forest Service; and John Muehlbeier, Economic Research Service.

The Field Advisory Committee will be responsible for field coordination of Department survey activities and procedure; arranging for field review of recommendations and reports; arranging for necessary consultation; over-all relationships with the Nebraska Soil and Water Conservation Commission and other interested State and Federal Agencies; and arranging for over-all schedules of work. Each member of the Field Advisory Committee will inform his responsible supervisor about progress and effort necessary for timely performance.

Soil Conservation Service

The Soil Conservation Service, in cooperation with other USDA agencies and the State of Nebraska will undertake the following aspects of the survey:

1. Delineate subwatershed areas of 250,000 acres or less in the basin.
2. The review and evaluation of available pertinent basic physical data, published and unpublished, concerning soil and water resources and the collection of additional related basic physical data needed for this survey.
3. Identification of floodwater and sedimentation problems and an inventory of the location, nature and extent of the floodwater and sediment damages.
4. Development of information on agricultural water management problems and on the location, nature and extent of existing and potential agricultural water management developments, including upstream water storage opportunities.
5. Evaluation of the effect of reasonably attainable farm irrigation efficiency on water use in the basin.
6. Preparation of summaries of past, current and needed flood prevention and agricultural water management improvements for each tributary, including storage sites, based on available information.
7. A field reconnaissance of potential P.L. 566 projects, a determination of those that are potentially feasible, and a determination of their relationship to other existing and potential water resource developments.
8. Help the State of Nebraska define the water yielding areas and their characteristics.

Economic Research Service

The Economic Research Service in cooperation with other USDA agencies and the State of Nebraska will compile economic data and make economic analysis relating to the agricultural industry and its use of land and water resources. Material of this nature will be developed for the basin as a whole, and for subdivisions of the basin and in such detail as required for the development of coordinated framework plans for the use, control and development of water and related land resources. The analysis will encompass the following:

1. The compilation of analyses of secondary statistical materials relating to the agricultural economy of the basin, agricultural use of land and water, and the output of agricultural products; including (a) crop acreages, yields and values, (b) production and value of livestock products, (c) capital investment in the agricultural industry, (d) land values, and (e) agricultural markets, etc.
2. Analysis of emerging improvements in agricultural technology, growth of agricultural markets and their composite impact on the agricultural economy and its need for natural resources.
3. Economic analysis of agricultural water problems, their impact on the economy of the area and an appraisal of economic benefits to be derived from their alleviation (including improvements in production efficiency, stabilization of farm production and income and alleviation of unemployment on farms and agricultural trade centers).
4. Development of other types of economic data and methods of analysis designed to facilitate a basin-wide appraisal of beneficial and adverse effects of possible water resource development projects or systems of water control.

Forest Service

The U. S. Forest Service, in cooperation with other USDA agencies and the State of Nebraska, will undertake the following aspects of the study:

1. Review and evaluate available basic physical data, published and unpublished concerning soil and water resources and the collection of additional related basic data needed for the survey pertaining to the hydrologic aspect of woodlands.
2. Investigate the relationship between the use, management and treatment of woodlands to floodwater, erosion, and sedimentation problems.
3. With the State Forester determine the need for kinds of improvement measures for watershed protection, flood prevention and water pollution prevention on woodlands.

Scope of the Department of Water Resources:

1. Make a determination of the Water supply available for future use for domestic, agricultural, industrial, municipal, and other useful purposes.
2. Make a determination of the historical water supply.
3. Develop flow-duration data at various locations in the basins.
4. Determine actual water uses under existing water appropriations.
5. Determine historical stream flow depletions resulting from existing water uses.
6. Determine probable water requirements under projects proposed for the basin.
7. Provide information as to the number of wells, the number of acres irrigated, the amount of ground water used, etc. for each basin and for areas within the basin as may be desired.
8. In cooperation with other state and federal agencies, make a determination of the effect of ground water pumping on the natural stream flow.

Scope of the Conservation and Survey Division:

1. The preparation of surficial and subsurface geologic maps of the area.
2. The preparation of ground water maps of the area including depth to water table maps and water table contour maps and maps showing the availability of ground water in terms of general potential water yields.
3. Evaluation of the average annual recharge to ground water in the basin based on a combined study of the water table contour maps and total transmissibility of the subsurface materials.
4. Evaluation of ground water in storage in the basin.
5. Compilation and evaluation of soil characteristics relating to infiltration, land utilization, erosion characteristics, etc.

Requests to other local, state, and federal agencies and organizations may be made as deemed appropriate by the Nebraska Soil and Water Conservation Commission.

Coordinating Arrangements of the Nebraska Soil and Water Conservation Commission:

The Nebraska Soil and Water Conservation Commission, during their regularly scheduled meeting on July 12, 1962, agreed to accept the assistance offered for this study by the above named agencies. It was obvious, however, that some needless overlapping of responsibility and duplication of effort would develop in the study if major areas of responsibilities were not outlined by the State Commission. For this reason, the Nebraska Soil and Water Conservation Commission on July 12, 1962, approved the following assignment of major responsibility in this study. In addition they submitted a request for assistance to the State Department of Health, The Nebraska Game, Forestation and Parks Commission, and the Extension Service of the University of Nebraska.

Bureau of Reclamation

1. Irrigation project development
2. Drainage

Corps of Engineers

1. Flood Control (studies to be limited primarily to urban areas and those reaches of the stream and major tributaries that exceed 250,000 acres).
2. Erosion Problems (limited primarily to the flood plains, and stream banks on main streams and major tributaries exceeding 250,000 acres in drainage).
3. Navigation

Soil Conservation Service

1. Watershed Protection and Flood Prevention (studies to be limited primarily to delineated watersheds of less than 250,000 acres).
2. Erosion problems based on soil surveys.
3. Land treatment as needed on individual farms (to include land use adjustments, mechanical practices - both for dry and irrigated land, agronomic practices, etc.)

Economic Research Service

1. Economic evaluation of agricultural water problems and benefits from their alleviation.
2. Development of economic data on the beneficial and adverse effect of the basin with appraisal of possible resource development.
3. Compilation of statistical material on the agricultural economy of the basin.
4. Analysis of improvements in agricultural technology, growth of markets and the need for natural resources.

Forest Service

1. Investigate relationship of use, management, and treatment of woodlands to floodwaters, erosion and sedimentation problems.
2. Determine needed woodland improvements.

Conservation and Survey Division (University of Nebraska)

1. Water quality tests
2. Test drilling
3. Ground water recharge studies
4. Deep well irrigation potential

Department of Water Resources

1. Water supply inventory
2. Existing water appropriation

Nebraska Game, Forestation and Parks Commission

1. Fish and wildlife potential
2. Park development

State Department of Health

1. Stream pollution

Extension Service (University of Nebraska)

1. Information and education program.

It is the desire of the State Commission that surveys, investigations, economic and financial policies relating to municipal and industrial waters be coordinated as among the Soil Conservation Service, Bureau of Reclamation, and Corps of Engineers; it is also the wish of the Commission that these same items relating to hydroelectric power be coordinated as between the Bureau of Reclamation and the Corps of Engineers.

In the above assignment of major responsibilities, it is assumed by the State Commission that these assignments include necessary surveys, investigations, research, etc. as needed by the various agencies in order to insure a complete study as outlined. In addition the State Commission recognized that all of these agencies have many other responsibilities authorized to them under existing state and federal laws. For the purpose of this study the Nebraska Soil and Water Conservation Commission requests that the above assignments be respected by all cooperating agencies. These assignments may be revised, amended, and added to during the study as is necessitated by need.

The State Commission shall call meetings as needed (a minimum of two each year during the study period) for the purpose of encouraging an interchange of information and materials from cooperating agencies. Participating agencies are to be encouraged to coordinate their findings whenever convenient and in the public interest to do so. If needed assistance or information is available from some source other than from a participating agency, any cooperating agency should not hesitate in requesting such needed information from the available source.

The following agencies have been suggested by and to the Nebraska Soil and Water Conservation Commission for eventual inclusion in the study. These and other agencies may be invited by the Commission as the need arises.

Federal

1. Department of Health, Education and Welfare
2. Fish and Wildlife Service
3. Geological Survey
4. Weather Bureau

State

1. Governor's Office
2. Experiment Station, University of Nebraska
3. Department of Roads
4. Department of Agriculture and Inspection
5. Nebraska Resources Division

Local

1. Douglas County Rivers and Streams Survey Committee
2. Soil and Water Conservation Districts
3. Counties
4. Municipalities

RESPONSIBILITY OF THE NEBRASKA SOIL AND WATER CONSERVATION COMMISSION

1. Coordinate the activities of all local, state and federal agencies and organizations requested by the Commission to assist in the study and plan on the Elkhorn Valley.
2. Request services of various local, state and federal agencies as needed to complete the proposed study and plan.

3. Cooperate closely with the Elkhorn Valley Water Resources Association, Lower Elkhorn Watershed Planning Board, and the local soil and water conservation districts to make certain that the desires and needs of these local organizations are adequately covered in the study and plan.
4. Use the departments available personnel in obtaining survey and other information not available from existing local, state and federal agencies as needed in the development of the overall plan. If available, such state personnel would be available upon request by those agencies developing specific information on programs within their assigned fields.
5. Summarize the findings of the various agencies and print a consolidated basin-wide soil and water resource plan.
6. Disseminate and explain the information derived from the study and included in the plan to local and state individuals and organizations. Such action to be done in cooperation with existing educational agencies.

TIME SCHEDULE FOR STUDY AND PROGRAM

The study, which is already initiated, is scheduled for more intensified study in fiscal years 1963, 1964, and 1965. The compiled report by the State Commission is scheduled for completion and ready for presentation to local people during calendar year 1966. In the meantime local interests are to be encouraged to continue to apply and implement those portions of the over-all plan which are available to them.

PLAN OF WORK
NEBRASKA SOIL AND WATER CONSERVATION COMMISSION
IN COOPERATION WITH
LITTLE BLUE FLOOD CONTROL AND CONSERVATION ASSOCIATION
IN THE
LITTLE BLUE BASIN, NEBRASKA

April 25, 1963

INTRODUCTION

The Little Blue Flood Control and Conservation Association, an organization composed of soil and water conservation district supervisors, watershed directors and others, has requested from the Nebraska Soil and Water Conservation Commission a basin-wide plan of soil and water resource development for the Little Blue Basin in Nebraska. The membership of the Little Blue Flood Control and Conservation Association is spelled out in detail in the Constitution and By Laws of this organization--a copy of which is on file in the office of the State Commission. The Nebraska Soil and Water Conservation Commission has agreed to develop such a plan within the limits of its resources. The State Commission will invite local, state, and federal agencies and organizations to participate in these studies. All plans and studies are to be coordinated with and reviewed by the Little Blue Flood Control and Conservation Association and the individual boards of supervisors of the soil and water conservation districts within the Little Blue Basin in Nebraska.

The Little Blue drains approximately 1,650,000 acres of land in south central Nebraska. The head waters of this river begins in Kearney County near the town of Minden, Nebraska. This river outlets into the state of Kansas near the town of Steele City, Nebraska. It joins the Big Blue River near Blue Rapids, Kansas. The Little Blue drains all or parts of the following counties in Nebraska: Kearney, Adams, Webster, Clay, Nuckolls, Fillmore, Thayer, Jefferson, Saline, and Gage.

Problem and Need for Plan

The Little Blue Valley is a very productive agricultural area in Nebraska. Soil erosion is moderate to severe throughout the entire drainage area. The application of needed conservation measures has been relatively slow especially in the upper reaches. Some of the tributaries in the lower valley are approaching 50% treatment.

The topography of the valley is flat to very gently rolling in the upper reaches. Most of the head water area (particularly true on the north side of the valley) is underlain by a good supply of ground water. This ground water resource, coupled with a nearly level topography and productive loess soil has precipitated a high concentration of deep well irrigation in certain area. Some concern has been expressed over the eventual lowering of the ground water in these areas of high deep well irrigation development.

The lower reaches of this basin is located in glacial drift parent material. In addition Dakota and Cretaceous formations (limestone and sandstone out crops)

are also evident in the lower valley. This lower valley is severely dissected by many drains that are highly entrenched. This area is susceptible to very frequent and heavy damaging floods. These frequent floods have severely damaged or destroyed much of the once productive flood plain of the valley. The major tributaries do considerable meandering. Stream bank erosion and the cutting of new channels is a serious problem. In addition, thousands of acres of overflow land has been damaged by sand and gravel deposits. This damage to low lying bottomland along with the hazard of crop loss caused by numerous and reoccurring floods has resulted in many acres of this land being abandoned. This abandoned flood plain is now characterized by a growth of willows, cottonwoods, and annual weeds.

As a result of this flood problem, local residents have taken some progressive steps to remedy this situation. They have organized all of their agricultural lands within the confines of soil and water conservation districts. Through the Little Blue Flood Control Association, they are actively supporting a reclamation project on the Little Blue. This program through the Bureau of Reclamation has a proposed structure (flood control and irrigation) located near Angus, Nebraska, on the Little Blue. In addition, four P.L. 566 applications (Watershed Protection and Flood Prevention projects administered by the Soil Conservation Service of the U. S. D. A.) have been received by the Nebraska Soil and Water Conservation Commission. These projects include: Bowman-Spring Branch, 22,850 acres; Buckley Creek, 25,380 acres; Spring Creek, 117,000 acres; and 32-Mile, 60,000 acres.

The economy of the valley is predominately agricultural. Cattle raising, cattle feeding and crop production is the primary source of income. Many years crop yields are severely reduced because of dry weather (drought) during the summer months of July and August. The population of the valley has been slowly decreasing during recent years because of the nation-wide trend for larger farm and ranch units.

Considerable study needs to be given to the recharge of ground water especially in the highly concentrated deep well irrigation area. This study needs to include the effect of complete watershed treatment on ground water recharge as well as the effect of increase efficiency of irrigation water use through improved irrigation practices. Special emphasis also needs to be placed on the needed flood control and watershed programs to protect the highly productive rural and urban flood plains areas. The plan should outline a program for the maximum development of the area's soil and water resources - a program, when 'carried out', that would insure the maximum future productivity of the stabilized valley. Such a productive agricultural valley with adequate resources, both human and natural, would attract new industry that would encourage and promote a dynamic and prosperous economy.

In connection with this broad study, there is an urgent need for a systematic survey or inventory of water and land resources in the Little Blue Valley. There is also a need to study the conditions and problems relating to these resources on a basin-wide basis so that the Nebraska Soil and Water Conservation Commission, Little Blue Flood Control and Conservation Association, local soil and water conservation districts can efficiently, effectively, and economically coordinate the various programs in the basin.

Principal Features of the Study to be Undertaken

The study and ultimate plan will seek to provide a basis for research, planning, and development of coordinated programs for the conservation and utilization of the water and related resources of the Little Blue River Basin. It will be pointed primarily at:

1. Inventory of the soil and water resources including erosion or depletion of the soil resources.
2. Present and future land use. This will include ways and means of improving management of lands including land treatment practices, land conversion, etc.
3. Flood damage in all reaches of the basin as caused by flood water, poor drainage, siltation, scour and stream bank erosion and possible ways of minimizing this damage.
4. Present and past use of water. This will include management of surface waters, stream flows, drainage from agricultural lands, water storage and water rights.
5. Ground water conditions as they relate to return flow, drainage, recharge and availability of ground water supplies.
6. Potential use of water including new ditch irrigation projects and deep well irrigation. This would include improvement in existing irrigation systems on individual farms and prevention of excessive water losses.
7. Availability and potential of water available for industrial and municipal purposes.
8. Power generation potential.
9. Recreation and wildlife potential
10. Stream pollution control.
11. Economic effect or impact on the basin if such a study or plan would be applied.

INVENTORY OF ASSISTANCE AVAILABLE FOR THE STUDY

The Nebraska Soil and Water Conservation Commission during their regularly scheduled meeting on October 3, 1961, went on record of agreeing to coordinate and develop a total soil and water resource plan and study for the Little Blue in Nebraska. The State Commission during their regularly scheduled meeting on April 25, 1963, approved the material included in the Introduction of the Program of work on the Little Blue Basin study outline. In addition, on April 25, 1963, the Commission directed the Watershed Sub-Committee to seek information on the assistance available for this study from the following agencies: Bureau of Reclamation, Corps of Engineers, Soil Conservation Service, Forest Service, Economic Research Service, State Department of Water Resources, Conservation and Survey Division (University of Nebraska), Extension Service (University of Nebraska), State Department of Health and the Nebraska Game, Forestation and Parks Commission. Others may be invited by the State Commission at a later date.

(REVIEW DRAFT)
January 1966

PLAN OF WORK
NEBRASKA SOIL AND WATER CONSERVATION COMMISSION
IN COOPERATION WITH
STATE OF SOUTH DAKOTA
STATE OF WYOMING
AND
NIOBRARA RIVER DEVELOPMENT ASSOCIATION
IN THE
NIOBRARA RIVER BASIN, NEBRASKA

INTRODUCTION

The Niobrara River Development Association has requested a basin-wide plan of soil and water resource development for the Niobrara Valley from the Nebraska Soil & Water Conservation Commission. The State Commission has agreed to initiate and develop such a plan with the help and assistance of the states of Wyoming and South Dakota and in cooperation with various state and federal agencies. The development of such a plan will be kept within the resources of the Nebraska Soil & Water Conservation Commission. As of the present date, the Nebraska Soil & Water Conservation Commission has requested the assistance of the Bureau of Reclamation, Corps of Engineers, Soil Conservation Service, Conservation and Survey Division of the University of Nebraska, Nebraska Department of Water Resources, and the respective departments of the states of Wyoming and South Dakota. All plans and studies are to be coordinated with and reviewed by the boards of supervisors of all soil and water conservation districts with land in the Niobrara drainage area.

The Niobrara Valley drains approximately 8,320,000 acres in Northern Nebraska, Eastern Wyoming and Southern South Dakota. Seventy-five percent or 6,268,800 acres of the basin lies in Nebraska and takes in a total of 13 percent of the entire state of Nebraska. The Niobrara River rises in Niobrara County in Eastern Wyoming, flows in an easterly direction some 375 miles across 12 counties in Northern Nebraska, and outlets into the Missouri River in Knox County. The average width of the drainage area is approximately 30 miles. The elevation of the drainage area varies from 5,300 feet in the uplands to about 1,210 feet at the mouth. The average drop is 9 feet per mile, which makes it a fast moving stream with a great deal of erosion occurring in the valley. The main discharge rate at the mouth is 1,400 second feet with very little fluctuations.

This study is to include Ponca Creek drainage in South Dakota and Nebraska.

PROBLEM AND NEED FOR A PLAN

The Niobrara Valley is a very productive agricultural region. Due to soil formations and topography, erosion and siltation are quite extensive in the basin. As a rule, application of needed land treatment measures has been quite slow to date. Much of the rolling cropland is unprotected. Not too much flooding is evident or frequent, except near the lower reaches. The Niobrara River does carry a great deal of silt but the stream bank erosion is not too evident.

The economy of the valley is predominantly agriculture with little if any commercial industry. Cattle raising is the primary source of income, with some crop production on the upper and lower reaches of the basin. Many years range and crop yields are severely reduced during July and August because of dry weather during the main growing season. There are indications that the population in the basin has slowly been decreasing during recent years because of state and national trend for larger farm and ranch units.

There are some potential water resource problems in this basin. In the upper reaches there are some problems with domestic water as to adequate livestock water. In the middle and lower reaches, domestic or livestock water is not a problem. It is more a water management in many cases.

There are several potential irrigation projects in the Niobrara Basin. The Mirage Flats Irrigation Project has been completed and is now in operation, with a need as of now of supplemental water for the project. The Ainsworth Project is now under construction with water to be utilized from the Snake River, a tributary of the Niobrara. A proposed O'Neill Project is now under review.

The Army Engineers are vitally interested in the siltation problem, primarily in the lower reaches of the Niobrara. This has been a major problem in the Gavins Point Reservoir.

Two P.L. #566 watershed projects are in this area. The Antelope Watershed in Cherry and Sheridan Counties has been completed. Planning has been initiated in Ponca Creek by SCS personnel from South Dakota.

A plan should outline a program for the optimum development of the area's soil and water resources--a program to insure the maximum future productivity of a stabilized basin. This should include but not be limited to: a survey of possible small watershed projects; flood control; maximum irrigation utilization; proper range practices; adequate conservation treatment; water for agricultural, industrial, and municipal purposes; pollution abatement; wildlife conservation; recreation and park development; ground water resource; drainage; etc.

In connection with this broad study there is an urgent need for a systematic survey or inventory of water and land resources in the Niobrara River Valley. There is also a need to study the condition and problems relating to these resources on a basin-wide basis so that the Nebraska Soil & Water Conservation Commission, State Governments of South Dakota and Wyoming, Niobrara River Development Association, and local soil and water conservation districts can efficiently, effectively, and economically coordinate the various programs in the basin.

PRINCIPAL FEATURES OF THE STUDY TO BE UNDERTAKEN

The study and ultimate plan will seek to provide a basis for research, planning and development of coordinated programs for the conservation and utilization of the water and related resources of the Niobrara River Basin. It will be pointed primarily at:

1. Inventory of the soil and water resources including erosion or depletion of the soil resources.

2. Present and future land use. This will include ways and means of improving management of lands, including land treatment practices, land conversion, etc.
3. Flood damage in all reaches of the basin as caused by flood water, poor drainage siltation, scour and stream bank erosion and possible ways of minimizing this damage.
4. Present and past use of water. This will include management of surface waters, stream flows, drainage from agricultural lands, water storage and water rights.
5. Ground water conditions as they relate to return flow, drainage, recharge and availability of ground water supplies.
6. Potential use of water including new ditch irrigation projects and deep well irrigation. This would include improvement in existing irrigation systems on individual farms and prevention of excessive water losses.
7. Availability and potential of water available for industrial and municipal purposes.
8. Recreation and wildlife potential.
9. Stream pollution control.
10. Economic effect or impact on the basin if such a study or plan would be applied.

INVENTORY OF ASSISTANCE AVAILABLE FOR THE STUDY

The Nebraska Soil and Water Conservation Commission during their regularly scheduled board meeting on March 26, 1964, went on record of agreeing to coordinate and develop a total soil and water resource plan and study for the Niobrara River in Nebraska. Preliminary contacts have been made with state officials of South Dakota and Wyoming. State governments will be encouraged to participate in this program to the maximum extent of their resources. The State Commission is presently cooperating with the Bureau of Reclamation, Corps of Engineers, U.S. Department of Agriculture (Soil Conservation Service, Forest Service, Economic Research Service), Conservation and Survey Division (University of Nebraska), Nebraska Department of Water Resources, Nebraska Health Department, the Nebraska Game, Forestation and Parks Commission, and Extension Service in similar studies in the Elkhorn, Big and Little Blue River Basins in Nebraska. It is envisioned that the mechanics of this study will be comparable to the above named investigations. The State Commission reserves the right to request and receive assistance and cooperation from other local, state and federal agencies as the need arises. The following is a resume of the scope of activities that the above named agencies have indicated would be available in similar studies.

U. S. Bureau of Reclamation

The objective of new reconnaissance investigations in the Niobrara River Basin will be to determine, with a minimum expenditure of funds and time, whether

potential developments are worthy of further, more detailed consideration. These reconnaissance investigations will formulate and choose between alternative plans to develop or improve an area, establish the need and justification for development or improvement, and recommend a course of future action.

The Bureau of Reclamation reconnaissance studies on the Niobrara Basin will be summarized in a basin survey report which will be made to evaluate overall basin resources, to appraise the needs for resource development, and to frame a coordinated plan for developing basin resources for multiple use. The principal function of this report will be to inventory the basin's water and related resources. In this manner it will serve to familiarize all interested groups with the long-range potentialities of the basin. It will also provide a comprehensive framework in which to view specific detailed proposals which might be made during ensuing years and against which individual proposals may be appraised to insure that their construction neither prejudices subsequent steps or prevents attainment of the full development sought. To fill in the framework, additional investigations for specific projects may be undertaken.

Feasibility investigations normally are undertaken only after a reconnaissance investigation has indicated probable project feasibility. The feasibility report prepared as a result of the feasibility investigations is the document that supports requests for project authorization. These investigations will develop and define the specific engineering and operating plan and determine whether a proposed development has engineering and economic feasibility and justification under anticipated project conditions.

Any investigation undertaken by the Bureau of Reclamation in the Niobrara Basin will be analyzed concurrently with all interested local, state, and federal agencies to assure maximum development of the basin's land and water potentialities. These investigations propose to accomplish the following items of work in this basin.

1. Land Classification Surveys: The reconnaissance land classification done previously will be reviewed and adjusted using new criteria. The classification will be expanded to include other areas. Field work will include sampling from 5- and 15- foot auger holes, as well as surface soil classification. Laboratory analysis of soil samples will be made to determine gradation, salinity, alkalinity, permeability, soil structure and other physical and chemical qualities of the soils, including drainage analyses.

2. Water Supply and Utilization Studies: Available surface and groundwater data will be analyzed to determine the water supply available to the Division. Water requirements of the project lands, municipal and industrial uses will be analyzed. Based on the overall needs and physical plan, river operation studies will be prepared.

3. Sediment Studies: Sediment studies will be made for use in determining sediment problems which might be expected to occur with project development. These studies will be prepared using available data.

4. Flood Studies: Flood studies will be prepared for use in the hydraulic design of dams and cross drainage structures. These studies will be made using available stream flow records.

5. Drainage Studies: Studies will be made to check the effect of project development on the surface and subsurface drainage requirements. Available depth-to-water and ground water contour maps will be supplemented with some subsurface geologic exploration, if required.

6. Geologic Exploration: For this investigation the geological studies will be largely limited to test holes on the dam sites. Because of investigation fund limitation, available data on regional and local geology will be supplemented only as absolutely necessary.

7. Economic Studies: Basic farm data from the local ASC Office and county records will be collected and analyzed to determine economic support of any proposals. These data will include information on farm size, land use, tenure of operation, tax data and land values. From the basic data, farm budgets for both the "with" and "without" irrigation conditions will be determined. Repayment capacity and irrigation benefits will be evaluated to complete the economic and financial analysis of the project.

8. Field Surveys: Basic horizontal and vertical control for future surveys will be run through the area. Topographic surveys will be made at the specific structure locations. Reconnaissance field locations will be made for major facilities.

9. Engineering Studies: The engineering studies involve a determination of the immediate and future needs of the basin and a physical and economical plan to fulfill these needs. This means that the need and location for irrigation must be analyzed; similar findings must be made for all other purposes such as hydroelectric power, flood control, municipal and industrial needs, fish and wildlife and recreational opportunities and pollution abatement. Once all of the needs are relatively defined, then an economical engineering plan must be devised--this means the preparation of designs and reconnaissance cost estimates.

10. Cooperative Studies: The above items are always analyzed with other interested agencies of the local, state, and federal level to assure the development of a coordinated plan.

11. Reports: The results of the above studies will be summarized in a reconnaissance report.

U. S. Army Corps of Engineers

Basin studies in the Niobrara will be in response to Congressional resolution. Such studies would be of a comprehensive nature and consider all phases of water resource development unless limitations are imposed by the authorizing resolution. Such studies would determine the proper scale and scope of potential developments, the degree of economic justification, and the equitable sharing of costs and responsibility of federal and non-federal interests. The Corps of Engineers will study the following items:

1. Climate and stream flow
2. Floods of record
3. Extent and character of flooded area
4. Flood damages

5. Existing and proposed developments by other agencies
6. Improvements desired by local interests
7. Navigation
8. Power needs
9. Water supply needs
10. Existing and potential irrigation
11. Stream pollution
12. Erosion problems (Principally on major streams)
13. Drainage problems
14. Recreational needs
15. Fish and wildlife needs
16. Existing and potential watershed development

Although the Corps of Engineers study would consider provision of irrigation storage, all irrigation development plans would be made by the Bureau of Reclamation. The Corps of Engineers in this study and plan will also coordinate with, or use the services of other agencies, where advisable - such as the Public Health Service on pollution and water supply problems and the Federal Power Commission for hydro-power developments. The Corps of Engineers will also cooperate with the Soil Conservation Service in the development of watershed plans if the need for such development is indicated.

U. S. Department of Agriculture

The United States Department of Agriculture is authorized under Section 6 of the Watershed Protection and Flood Prevention Act, as amended, Public Law 566 of the 83rd Congress, to cooperate with other federal agencies and state and local agencies in making investigations and surveys of watersheds for the development of coordinated plans.

Representative sample watersheds with various soil and water conservation problems and needs are selected for surveys and investigations of a preliminary investigation type intensity. Available data from sample watersheds and reconnaissance surveys are extrapolated and expanded to other watersheds or sub-basins in order that an entire sub-basin will be covered by the study. The objectives of the study are:

1. Identification of a desirable pattern of water and related land use including recreation, management, and development to meet future requirements, provide watershed protection and alleviate flood prevention and agricultural water management problems at justifiable cost.
2. Identification of alternative water and related land uses, management and developments.
3. Identification and evaluation of the major obstacles to attainment of the desirable pattern of water and related land use, management and development.
4. Identification of the manner in which, and an appraisal of the extent to which, USDA programs can contribute to the solution of water and related land problems in the basin with emphasis on project type solutions.
5. Outlining additional actions which would aid in attaining basin-wide objectives.

6. Providing information and data in a report.

The survey work of the Department will be performed under the direction of the USDA Field Advisory Committee, which is composed of C. Dale Jaedicke, Chairman, Soil Conservation Service; Walter E. Pool, Forest Service; and James C. Atherton, Economic Research Service.

The Field Advisory Committee will be responsible for field coordination of Department survey activities and procedures; arranging for field review of recommendations and reports; arranging for necessary consultation; over-all relationships with the Nebraska Soil & Water Conservation Commission and other interested state and federal agencies; and arranging for over-all schedules of work. Each member of the Field Advisory Committee will inform his responsible supervisor about progress and effort necessary for timely performance.

Soil Conservation Service. The Soil Conservation Service, in cooperation with other USDA agencies and the State of Nebraska will undertake the following aspects of the survey:

1. Delineate subwatershed areas of 250,000 acres or less in the basin.
2. Review and evaluate available pertinent basic physical data, published and unpublished, concerning soil and water resources and collect additional related basic physical data needed for the survey.
3. Identify floodwater and sedimentation problems and inventory the location, nature and extent of floodwater and sediment damages.
4. Develop information on agricultural water management problems and on the location, nature and extent of existing and potential agricultural water management developments, including upstream water storage opportunities.
5. Develop information on non-agricultural water management problems and potential development in upstream watersheds. This includes measures for municipal and industrial water supply, fish and wildlife, and recreation developments, and water quality control or other measures serving other than agricultural purposes.
6. Evaluate the effect of reasonably attainable farm irrigation efficiency on water use in the basin.
7. Prepare summaries of past, current and needed flood prevention and agricultural water management improvements for each tributary, including storage sites, based on available information.
8. Make field reconnaissance of potential P. L. 566 projects, and determine those that are potentially feasible, including a determination of their relationship to other existing and potential water resource developments.
9. Assist the State of Nebraska in defining the water yielding areas and their characteristics.

Economic Research Service. The Economic Research Service in cooperation with other USDA agencies and the State of Nebraska will compile economic data and

make economic analysis relating to the agricultural industry and its use of land and water resources. Material of this nature will be developed for the basin as a whole, and for subdivisions of the basin and in such detail as required for the development of coordinated frame work plans for the use, control and development of water and related land resources. The analysis will encompass the following;

1. The compilation and analyses of secondary statistical materials relating to the agricultural economy of the basin agricultural use of land and water, and the output of agricultural products; including (a) crop acreages, yields and values, (b) production and value of livestock products, (c) capitol investment in the agricultural industry, (d) land values, and (e) agricultural markets, etc.

2. Analysis of emerging improvements in agricultural technology, growth of agricultural markets and their composite impact on the agricultural economy and its need for natural resource development.

3. Economic analysis of agricultural water problems, their impact on the economy of the area and an appraisal of economic benefits to be derived from their alleviation (including improvements in production efficiency, stabilization of farm production and income and alleviation of unemployment on farms and agricultural trade centers.)

4. Development of other types of economic data and methods of analysis designed to facilitate a basin-wide appraisal of beneficial and adverse effects of possible water resource development projects or systems of water control.

Forest Service. The U. S. Forest Service, in cooperation with other USDA agencies and the State of Nebraska, will undertake the following aspects of the study:

1. Review, extend, and interpret Forest Survey and other forest resource data with special reference to the purposes and requirements of the Basin study.
2. Investigate the relationships between use, management, and treatment of woodlands to flood water, erosion and sedimentation and make necessary hydrologic determinations.
3. Appraise the impacts of proposed water resource development projects upon the forest resources and forest based enterprises of the Basin.
4. Appraise the potential of the forest resource in relation to water-based recreation development and wildlife habitat improvement.
5. Develop forest resource aspects for all upstream watershed development proposals.
6. In collaboration with State Foresters, determine the kinds, amounts, and costs of improvement measures needed in woodlands for watershed protection and flood prevention.

Nebraska Department of Water Resources

1. Make a determination of the water supply available for future use for domestic, agricultural, industrial, municipal, and other useful purposes.
2. Make a determination of the historical water supply.
3. Develop flow-duration data at various locations in the basin.
4. Determine actual water uses under existing water appropriations.
5. Determine historical stream flow depletions resulting from existing water uses.
6. Determine probable water requirements under projects proposed for the basin.
7. Provide information as to the number of wells, the number of acres irrigated, the amount of ground water used, etc. for each basin and for areas within the basin as may be desired.
8. In cooperation with other state and federal agencies, make a determination of the effect of ground water pumping on the natural stream flow.

Conservation and Survey Division, University of Nebraska

1. The preparation of surficial and subsurface geologic maps of the area.
2. The preparation of ground water maps of the area including depth to water table maps and water table contour maps and maps showing the availability of ground water in terms of general potential water yields.
3. Evaluation of the average annual recharge to ground water in the basin based on a combined study of the water table contour maps and total transmissibility of the subsurface materials.
4. Evaluation of ground water in storage in the basin.
5. Compilation and evaluation of soil characteristics relating to infiltration, land utilization, erosion characteristics, etc.

Requests to other local, state, and federal agencies and organizations may be made as deemed appropriate by the Nebr. Soil & Water Conservation Commission.

Nebraska Health Department

1. A complete inventory of water works systems serving municipalities.
2. A complete inventory of waste water disposal systems serving municipalities.
3. Basic water quality data for surface waters.
4. A program for development of waste water disposal.

5. A program of development for the disposal of solid wastes which, in many cases, are being discharged into surface waters.
6. Laboratory work relating to the bacteriological and chemical quality of waters.
7. Consulting services to persons developing water works systems and waste water disposal systems.
8. Chemical records of all waters supplied to municipalities both before and after treatment.
9. Within reason, surveys of streams to determine the exact present conditions and estimation of possible effect of discharges of pollution thereon.

Nebraska Game, Forestation & Parks Commission

In cooperation with other states and federal agencies the Nebraska Game, Forestation, and Parks Commission will make a determination of:

1. Demand for fish and wildlife and outdoor recreation resources;
2. Inventory supply of same; and
3. Establish the need for such developments.

The Game Commission will develop an outline of an action program through the Park Development Program, the Land and Water Conservation Fund Act, Federal Aid to Wildlife Restoration Act and any other sources of funds which are available.

Extension Service

1. Provide through educational material the facts about the river basin. The material will consist of:
 - (a) A periodic newsletter about the plans and progress of the river basin development.
 - (b) Circulars and pamphlets on:
 1. Watershed organization and development.
 2. Watershed Educational program.
 3. Conservancy district organization.
 4. Soil and water conservation.
2. Plan and conduct watershed and river basin workshops for County Extension Agents. These workshops will enable them to better understand current developments in their respective river basin and to be able to render valuable assistance to the people of their county in interpreting the facts about the basin.
3. The Extension Service through their state and county staffs will assist federal, state, and local groups to plan and conduct educational programs

on river basin and watershed organization and development throughout the river basin.

State Government of Wyoming (Water Resources Board & Others)

(Undertermined at this date. If State Government of Wyoming is unable to participate, of necessity, the final report will cover only that portion of the Niobrara Basin in Nebraska).

State Government of South Dakota (Water Resources Board & Others)

(Undertermined at this date. If State Government of South Dakota is unable to participate, of necessity, the final report will cover only that portion of the Niobrara Basin in Nebraska).

RESPONSIBILITIES OF COOPERATING AGENCIES

To prevent undue duplication of effort in this study, the sponsoring agencies have made assignments of major responsibilities as outlined below. It is hoped that the cooperating agencies will respect these assignments and inform the sponsoring agencies should these assignments need to be revised, amended, and/or augmented during the course of the study. In making these assignments, the sponsoring agencies wish to encourage the full cooperation of all agencies on exchange of data in order that a fully comprehensive plan can be developed.

Bureau of Reclamation

1. Irrigation project development
2. Drainage project development

Corps of Engineers

1. Flood control (studies to be limited primarily to urban areas and those reaches of the stream and major tributaries that exceed 250,000 acres.)
2. Erosion problems (limited primarily to the flood plains and stream banks on main streams and major tributaries exceeding 250,000 acres in drainage.)
3. Navigation.

Soil Conservation Service

1. Watershed protection and flood prevention measures. (Studies to be limited primarily to delineated watersheds of less than 250,000 acres.)
2. Land damage by erosion.
3. Land treatment as needed on individual farms. (To include land use adjustments, mechanical practices - both for dry and irrigated land, agronomic practices, etc.)

Economic Research Service

1. Compilation of statistical material on the agricultural economy of the basin.
2. Economic evaluation of agricultural water problems and benefits from their alleviation.
3. Analysis of improvements in agricultural technology, growth of markets and the need for natural resource developments.
4. Development of economic data on the beneficial and adverse effects of possible resource development in the basin.

Forest Service

The U. S. Forest Service, in cooperation with other USDA agencies and the State of Nebraska, will undertake the following aspects of the study:

1. Review and evaluate available basic physical data, published and unpublished, concerning soil and water resources and the collection of additional related basic data needed for the survey pertaining to the hydrologic aspect of woodlands.
2. Investigate the relationship between the use, management and treatment of woodlands to floodwater, erosion, and sedimentation problems.
3. With the State Forester determine the need for kinds of improvement measures for watershed protection, flood prevention and water pollution prevention on woodlands.

Conservation and Survey Division (University of Nebraska)

1. Water quality tests
2. Test drilling
3. Ground water recharge studies
4. Deep well irrigation potential

Nebraska Department of Water Resources

1. Water supply inventory
2. Existing water appropriation

Nebraska Game, Forestation and Parks Commission

1. Fish and wildlife potential
2. Park development

Nebraska Department of Health

1. Inventory of water works serving municipalities

2. Water quality data on surface waters

Extension Service (University of Nebraska)

1. Information and educational program

State of Wyoming

1. (Undertermined as of this date)

State of South Dakota

1. (Undertermined as of this date)

It is the desire of the coordinating agencies that surveys, investigations, economic and financial policies relating to municipal and industrial waters be coordinated as among the Soil Conservation Service, Bureau of Reclamation, and Corps of Engineers; it is also the wish of the coordinating agencies that these same items relating to hydroelectric power be coordinated as between the Bureau of Reclamation and the Corps of Engineers.

In the above assignment of major responsibilities, it is assumed by the coordinating agencies that these assignments include necessary surveys, investigations, research, etc, as needed by the various agencies in order to insure a complete study as outlined. In addition, it is recognized that all of these agencies have many other responsibilities authorized to them under existing state and federal laws. For the purpose of this study the above assignments will be respected by all cooperating agencies. These assignments may be revised, amended, and added to during the study as is necessitated by need.

RESPONSIBILITIES OF NEBRASKA SOIL AND WATER CONSERVATION COMMISSION

The Nebraska Soil and Water Conservation Commission, as sponsoring agency, shall call meetings as needed (a minimum of two each year during the study period) for the purpose of encouraging interchange of information and materials from cooperating agencies. Participating agencies are encouraged to coordinate their findings whenever convenient and in the public interest to do so. Functions of the Commission include:

1. Coordinating the activities of all local, state, and federal agencies and organizations requested by the Commission to assist in the study and plan on the Niobrara. (This will be in cooperation with counter-part agencies in Wyoming and South Dakota.)
2. Requesting services of various local, state and federal agencies as needed to complete the proposed study and plan.
3. Cooperate closely with the Niobrara River Basin Development Association and the local soil and water conservation districts to make certain that the desires and needs of these local organizations are adequately covered in the study and plan.

4. Furnishing personnel to obtain survey and other needed information not available from existing local, state and federal agencies. Such state personnel would be available upon request by those agencies developing specific information on programs within their assigned fields.

5. As coordinating agency, approximately five (5) full-time employees from state funds will be assigned and participating at all times in this and similar basin investigations in Nebraska. This personnel will work cooperatively with all participating agencies. If and when funds are available from S. 21 (Water Resources Planning Act) this basin planning staff will be augmented.

6. Summarizing the findings of the various agencies and printing a consolidated basin-wide soil and water resource plan.

7. Disseminating and explaining the information derived from the study to local and state individuals and organizations. Such action to be done in cooperation with existing educational agencies.

TIME SCHEDULE FOR STUDY AND PROGRAM

The study, which is already initiated, is scheduled for more intensified study in fiscal years 1966, 1967, and 1968. The compiled report by the State Commission is scheduled for completion and ready for presentation to local people during calendar year 1969. In the meantime local interests are to be encouraged to continue to apply and implement those portions of the overall plan which are available to them.

PLAN OF WORK
NEBRASKA SOIL AND WATER CONSERVATION COMMISSION
IN COOPERATION WITH
KANSAS WATER RESOURCES BOARD
AND THE
NEMAHA RIVERS WATERSHED ASSOCIATION
IN THE NEMAHA RIVER BASIN, NEBRASKA

INTRODUCTION

The Nemaha Rivers Watershed Association has requested the Nebraska Soil and Water Conservation Commission to assist in the preparation of a basin-wide plan of soil and water resource development for the Nemaha Basin. The Commission, in cooperation with the Water Resources Board of Kansas, has agreed to initiate and sponsor the development of such a plan within the limits of its resources, and have asked for assistance from the U. S. Bureau of Reclamation, U. S. Army Corps of Engineers, U. S. Department of Agriculture, Conservation and Survey Division of the University of Nebraska, Nebraska Department of Water Resources, Nebraska Health Department, Nebraska Game, Forestation and Parks Commission, and Extension Service.

The Nemaha Basin contains about 1,795,200 acres of land of which 78 percent lies in the southeastern corner of Nebraska and 22 percent lies in the northeastern corner of Kansas. The Basin includes the land in Cass, Gage, Johnson, Lancaster, Nemaha, Otoe, Pawnee and Richardson Counties of Nebraska, and Brown, Marshall and Nemaha Counties in Kansas.

The principle streams of the Basin are the Big and Little Nemaha Rivers. Each is a direct tributary of the Missouri River outletting in the Nebraska portion. The drainage areas of a number of minor tributaries of the Missouri between the principle streams are included in the study area.

This is one of the more important agricultural regions of Nebraska. It ranks high in crop production and livestock feeding. New industry primarily associated with agriculture is moving into the area.

The topography ranges from nearly level divides and valleys to steeply rolling hills. The well-rounded upland divides have numerous deeply entrenched drainage-ways in relatively narrow valleys. The flood plains of the principle streams are wide and relatively flat.

PROBLEMS

The principle problems in this basin are flooding and land damage by erosion.

When this area was settled the main valleys lacked adequate drainage for crop production and were frequently flooded. To alleviate this problem, a program of channel enlargement and straightening was started. These activities served their purpose. The increased channel capacity improved the removal of excess water making feasible the fuller utilization of bottomlands for crop production.

However, the increased velocity of the stream flow and the erosiveness of the streambeds brought about a rapid degradation of the watercourse. This resulted in deeply entrenched channels and numerous overfalls. The headcuts worked themselves rapidly upstream destroying farmlands, roads and bridges. In some areas the water tables were lowered considerably causing municipalities and farmers to become concerned about their future water supply. The degraded stream channels and the silt laden flows destroyed most of the fisheries in this basin.

In the lower reaches, the entrenchment has stopped. The streams are starting to meander within the entrenched section seriously eroding the banks. This has brought about a widening and a grading of the channel section resulting in destruction of valuable cropland, severe damage to the road system, and increased flooding.

This unstable channel condition has also slowed the installation of land treatment measures and greatly increased the cost maintenance. This has contributed to the rapid deterioration of watersheds by erosion.

STATUS OF EXISTING SOIL AND WATER RESOURCE PROGRAMS

Watershed development in the Basin is well underway. As a result, a great deal of conservation has been applied on the land. Applications for assistance under the Watershed Protection and Flood Prevention Act have been submitted and approved for the following watersheds: Ziegler, Walnut, Wilson, Upper Bit Nemaha, Rock, Spring, South Fork, South Branch, Upper Little Nemaha, Lower Little Nemaha, Long Branch, and Big Muddy. Of these four have been approved for construction, two are now being planned and the Nebraska Soil and Water Conservation Commission has recommended planning priorities on two more. Construction on Brownell Watershed, a Pilot Watershed Project, has been completed.

The U. S. Army Corps of Engineers has a flood control plan for the Little Nemaha pending in Congress. This plan envisions mainly levee construction on the lower reaches of the Little Nemaha. They are also in the process of developing a plan on the entire Nemaha Basin.

The U. S. Bureau of Reclamation have reconnaissance investigations that have been under way for some time. This report is now in the process of review. Irrigation development at this time is relatively minor in this basin. The 1955-1957 drouth period increased interest in irrigation in this area. The stabilization of irrigation since that time has been partially due to inadequate water supplies but it mostly reflects the recent good rainfall conditions.

OBJECTIVES

The study and ultimate plan will seek to provide an integrated program for the full development of the basin's water and related land resources and to determine the research needs for water and related land resource developments. It will consist of:

1. An inventory of the basin's water and related land resources.
2. The identification of the problems and needs which are preventing the full use and proper management of the basin's water and related land resources.
3. The analysis of the land treatment measures needed to assure the conservation of the soil.
4. The formulation and evaluation of systems of structural measures required to provide for the efficient use and proper management of the basin's resources.
5. A determination of the impact that potential water and related land resource developments will have on the basin's economy.

6. Programs to be studied will include but are not limited to: land treatment, watershed protection and flood prevention, flood control, irrigation project development, stream bank stabilization, municipal and industrial water, ground water, stream pollution abatement, outdoor recreational potential, and wildlife conservation.
7. Preparation of a summary report presenting the inventory of the resources, the solution to problems, opportunities for development, including alternatives, and a suggested order of installation.

INVENTORY OF ASSISTANCE AVAILABLE FOR THE STUDY

The Nebraska Soil & Water Conservation Commission during their regularly scheduled board meeting on February 18, 1965, went on record of agreeing to sponsor and develop a soil and water resource plan for the Nemaha River Basin in the Nebraska portion. Preliminary contacts have been made with state officials of the Water Resources Board in Kansas. State government agencies in Kansas and Nebraska will be encouraged to participate in this program to the maximum extent of their resources. The State Commission is presently cooperating with the Bureau of Reclamation, Corps of Engineers, U. S. Department of Agriculture, Conservation and Survey Division (University of Nebraska), Nebraska Department of Water Resources, Nebraska Health Department, the Nebraska Game, Forestation and Parks Commission, and Extension Service in similar studies in the Elkhorn, Big and Little Blue River Basins in Nebraska. It is envisioned that the mechanics of this study will be comparable to the above named investigations. The State Commission reserves the right to request and receive assistance and cooperation from other local, state and federal agencies as the need arises. The following is a resume of activities that the above named agencies have indicated is available for river basin studies.

U. S. Bureau of Reclamation

The objective of new reconnaissance investigations in the Big and Little Nemaha Basins will be to determine, with a minimum expenditure of funds and time, whether potential developments are worthy of further, more detailed consideration. These reconnaissance investigations will formulate and choose between alternative plans to develop or improve an area, establish the need and justification for development or improvement, and recommend a course of future action.

The Bureau of Reclamation reconnaissance studies on the Nemaha Basin will be summarized in a basin survey report which will be made to evaluate overall basin resources, to appraise the needs for resource development, and to frame a coordinated plan for developing basin resources for multiple use. The principal function of this report will be to inventory the basin's water and related resources. In this manner it will serve to familiarize all interested groups with the long-range potentialities of the basin. It will also provide a comprehensive framework in which to view specific detailed proposals which might be made during ensuing years and against which individual proposals may be appraised to insure that their construction neither prejudices subsequent steps or prevents attainment of the full development sought. To fill in the framework, additional investigations for specific projects may be undertaken.

Feasibility investigations normally are undertaken only after a reconnaissance investigation has indicated probable project feasibility. The feasibility report prepared as a result of the feasibility investigations is the document that supports requests for project authorization. These investigations will develop

and define the specific engineering and operating plan and determine whether a proposed development has engineering and economic feasibility and justification under anticipated project conditions.

Any investigation undertaken by the Bureau of Reclamation in the Nemaha Basins will be analyzed concurrently with all interested local, state, and federal agencies to assure maximum development of the basins' land and water potentialities. These investigations propose to accomplish the following items of work in this basin.

1. Land Classification Surveys: The reconnaissance land classification done previously will be reviewed and adjusted using new criteria. The classification will be expanded to include other areas. Field work will include sampling from 5- and 15- foot auger holes, as well as surface soil classification. Laboratory analysis of soil samples will be made to determine gradation, salinity, alkalinity, permeability, soil structure and other physical and chemical qualities of the soils, including drainage analyses.

2. Water Supply and Utilization Studies: Available surface and groundwater data will be analyzed to determine the water supply available to the Division. Water requirements of the project lands, municipal and industrial uses will be analyzed. Based on the overall needs and physical plan, river operation studies will be prepared.

3. Sediment Studies: Sediment studies will be made for use in determining sediment problems which might be expected to occur with project development. These studies will be prepared using available data.

4. Flood Studies: Flood studies will be prepared for use in the hydraulic design of dams and cross drainage structures. These studies will be made using available streamflow records.

5. Drainage Studies: Studies will be made to check the effect of project development on the surface and subsurface drainage requirements. Available depth-to-water and ground water contour maps will be supplemented with some subsurface geologic exploration, if required.

6. Geologic Exploration: For this investigation the geological studies will be largely limited to test holes on the dam sites. Because of investigation fund limitation, available data on regional and local geology will be supplemented only as absolutely necessary.

7. Economic Studies: Basic farm data from the local ASC Office and county records will be collected and analyzed to determine economic support of any proposals. These data will include information on farm size, land use, tenure of operation, tax data and land values. From the basic data, farm budgets for both the 'with' and 'without' irrigation conditions will be determined. Repayment capacity and irrigation benefits will be evaluated to complete the economic and financial analysis of the project.

8. Field Surveys: Basic horizontal and vertical control for future surveys will be run through the area. Topographic surveys will be made at the specific structure locations. Reconnaissance field locations will be made for major facilities.

9. Engineering Studies: The engineering studies involve a determination of the immediate and future needs of the basin and a physical and economical plan to fulfill these needs. This means that the need and location for irrigation must be analyzed; similar findings must be made for all other purposes such as hydro-electric power, flood control, municipal and industrial needs, fish and wildlife and recreational opportunities and pollution abatement. Once all of the needs are relatively defined, then an economical engineering plan must be devised--this means the preparation of designs and reconnaissance cost estimates.

10. Cooperative Studies: The above items are always analyzed with other interested agencies of the local, state, and federal level to assure the development of a coordinated plan.

11. Reports: The results of the above studies will be summarized in a reconnaissance report.

U. S. Army Corps of Engineers

Basin studies in the Nemaha will be in response to Congressional resolution. Such studies would be of a comprehensive nature and consider all phases of water resource development unless limitations are imposed by the authorizing resolution. Such studies would determine the proper scale and scope of potential developments, the degree of economic justification, and the equitable sharing of costs and responsibility of federal and non-federal interests. The Corps of Engineers will study the following items:

1. Climate and stream flow
2. Floods of record
3. Extent and character of flooded area
4. Flood damages
5. Existing and proposed developments by other agencies
6. Improvements desired by local interests
7. Navigation
8. Power needs
9. Water supply needs
10. Existing and potential irrigation
11. Stream pollution
12. Erosion problems (Principally on major streams)
13. Drainage problems
14. Recreational needs
15. Fish and wildlife needs
16. Existing and potential watershed development

Although the Corps of Engineers study would consider provision of irrigation storage, all irrigation development plans would be made by the Bureau of Reclamation. The Corps of Engineers in this study and plan will also coordinate with, or use the services of other agencies, where advisable - such as the Public Health Service on pollution and water supply problems and the Federal Power Commission for hydro-power developments. The Corps of Engineers will also cooperate with the Soil Conservation Service in the development of watershed plans if the need for such development is indicated.

U. S. Department of Agriculture

The United States Department of Agriculture is authorized under Section 6 of the Watershed Protection and Flood Prevention Act, as amended, Public Law 566 of the

83rd Congress, to cooperate with other federal agencies and state and local agencies in making investigations and surveys of watersheds for the development of coordinated plans.

Representative sample watersheds with various soil and water conservation problems and needs are selected for surveys and investigations of a preliminary investigation type intensity. Available data from sample watersheds and reconnaissance surveys are extrapolated and expanded to other watersheds or sub-basins in order that an entire sub-basin will be covered by the study. The objectives of the study are:

1. Identification of a desirable pattern of water and related land use including recreation, management, and development to meet future requirements, provide watershed protection and alleviate flood prevention and agricultural water management problems at justifiable cost.
2. Identification of alternative water and related land uses, management and developments.
3. Identification and evaluation of the major obstacles to attainment of the desirable pattern of water and related land use, management and development.
4. Identification of the manner in which, and an appraisal of the extent to which, USDA programs can contribute to the solution of water and related land problems in the basin with emphasis on project type solutions.
5. Outlining additional actions which would aid in attaining basin-wide objectives.
6. Providing information and data in a report.

The survey work of the Department will be performed under the direction of the USDA Field Advisory Committee, which is composed of C. Dale Jaedicke, Chairman, Soil Conservation Service; Walter E. Pool, Forest Service; and James C. Atherton, Economic Research Service.

The Field Advisory Committee will be responsible for field coordination of Department survey activities and procedures; arranging for field review of recommendations and reports; arranging for necessary consultation; over-all relationships with the Nebraska Soil & Water Conservation Commission and other interested state and federal agencies; and arranging for over-all schedules of work. Each member of the Field Advisory Committee will inform his responsible supervisor about progress and effort necessary for timely performance.

~~Soil Conservation Service~~ The Soil Conservation Service, in cooperation with other USDA agencies and the State of Nebraska will undertake the following aspects of the survey:

1. Delineate subwatershed areas of 250,000 acres or less in the basin.
2. Review and evaluate available pertinent basic physical data, published and unpublished, concerning soil and water resources and collect additional related basic physical data needed for the survey.
3. Identify floodwater and sedimentation problems and inventory the location, nature and extent of floodwater and sediment damages.

4. Develop information on agricultural water management problems and on the location, nature and extent of existing and potential agricultural water management developments, including upstream water storage opportunities.

5. Develop information on non-agricultural water management problems and potential development in upstream watersheds. This includes measures for municipal and industrial water supply, fish and wildlife, and recreation developments, and water quality control or other measures serving other than agricultural purposes.

6. Evaluate the effect of reasonably attainable farm irrigation efficiency on water use in the basin.

7. Prepare summaries of past, current and needed flood prevention and agricultural water management improvements for each tributary, including storage sites, based on available information.

8. Make field reconnaissance of potential P.L. 566 projects, and determine those that are potentially feasible, including a determination of their relationship to other existing and potential water resource developments.

9. Assist the State of Nebraska in defining the water yielding areas and their characteristics.

Economic Research Service. The Economic Research Service in cooperation with other USDA agencies and the State of Nebraska will compile economic data and make economic analysis relating to the agricultural industry and its use of land and water resources. Material of this nature will be developed for the basin as a whole, and for subdivisions of the basin and in such detail as required for the development of coordinated frame work plans for the use, control and development of water and related land resources. The analysis will encompass the following:

1. The compilation and analyses of secondary statistical materials relating to the agricultural economy of the basin, agricultural use of land and water, and the output of agricultural products; including (a) crop acreages, yields and values, (b) production and value of livestock products, (c) capital investment in the agricultural industry, (d) land values, and (e) agricultural markets, etc.

2. Analysis of emerging improvements in agricultural technology, growth of agricultural markets and their composite impact on the agricultural economy and its need for natural resource development.

3. Economic analysis of agricultural water problems, their impact on the economy of the area and an appraisal of economic benefits to be derived from their alleviation (including improvements in production efficiency, stabilization of farm production and income and alleviation of unemployment on farms and agricultural trade centers).

4. Development of other types of economic data and methods of analysis designed to facilitate a basin-wide appraisal of beneficial and adverse effects of possible water resource development projects or systems of water control.

Forest Service. The U. S. Forest Service, in cooperation with other USDA agencies and the State of Nebraska, will undertake the following aspects of the study:

1. Review, extend, and interpret Forest Survey and other forest resource data with special reference to the purposes and requirements of the Basin study.
2. Investigate the relationships between use, management, and treatment of woodlands to flood water, erosion and sedimentation and make necessary hydrologic determinations.
3. Appraise the impacts of proposed water resource development projects upon the forest resources and forest based enterprises of the Basin.
4. Appraise the potential of the forest resource in relation to water-based recreation development and wildlife habitat improvement.
5. Develop forest resource aspects for all upstream watershed development proposals.
6. In collaboration with State Foresters, determine the kinds, amounts, and costs of improvement measures needed in woodlands for watershed protection and flood prevention.

Nebraska Department of Water Resources

1. Make a determination of the water supply available for future use for domestic, agricultural, industrial, municipal, and other useful purposes.
2. Make a determination of the historical water supply.
3. Develop flow-duration data at various locations in the basins.
4. Determine actual water uses under existing water appropriations.
5. Determine historical stream flow depletions resulting from existing water uses.
6. Determine probable water requirements under projects proposed for the basin.
7. Provide information as to the number of wells, the number of acres irrigated, the amount of ground water used, etc. for each basin and for areas within the basin as may be desired.
8. In cooperation with other state and federal agencies, make a determination of the effect of ground water pumping on the natural stream flow.

Conservation and Survey Division, University of Nebraska

1. The preparation of surficial and subsurface geologic maps of the area.
2. The preparation of ground water maps of the area including depth to water table maps and water table contour maps and maps showing the availability of ground water in terms of general potential water yields.
3. Evaluation of the average annual recharge to ground water in the basin based on a combined study of the water table contour maps and total transmissibility of the subsurface materials.

4. Evaluation of ground water in storage in the basin.

5. Compilation and evaluation of soil characteristics relating to infiltration, land utilization, erosion characteristics, etc.

Requests to other local, state, and federal agencies and organizations may be made as deemed appropriate by the Nebr. Soil & Water Conservation Commission.

Nebraska Health Department

1. A complete inventory of water works systems serving municipalities.
2. A complete inventory of waste water disposal systems serving municipalities.
3. Basic water quality data for surface waters.
4. A program for development of waste water disposal.
5. A program of development for the disposal of solid wastes which, in many cases, are being discharged into surface waters.
6. Laboratory work relating to the bacteriological and chemical quality of waters.
7. Consulting services to persons developing water works systems and waste water disposal systems.
8. Chemical records of all waters supplied to municipalities both before and after treatment.
9. Within reason, surveys of streams to determine the exact present conditions and estimation of possible effect of discharges of pollution thereon.

Nebraska Game, Forestation & Parks Commission

In cooperation with other states and federal agencies the Nebraska Game, Forestation, and Parks Commission will make a determination of:

1. Demand for fish and wildlife and outdoor recreation resources;
2. Inventory supply of same; and
3. Establish the need for such developments.

The Game Commission will develop an outline of an action program through the Park Development Program, the Land and Water Conservation Fund Act, Federal Aid to Wildlife Restoration Act and any other sources of funds which are available.

Extension Service

1. Provide through educational material the facts about the river basin. The material will consist of:

- (a) A periodic newsletter about the plans and progress of the river basin development.

- (b) Circulars and pamphlets on:
1. Watershed organization and development.
 2. Watershed educational program.
 3. Conservancy district organization.
 4. Soil and water conservation.

2. Plan and conduct watershed and river basin workshops for County Extension Agents. These workshops will enable them to better understand current developments in their respective river basin and to be able to render valuable assistance to the people of their county in interpreting the facts about the basin.

3. The Extension Service through their state and county staffs will assist federal, state, and local groups to plan and conduct educational programs on river basin and watershed organization and development throughout the river basin.

State Government of Kansas (Water Resources Board & Others)

(Undetermined at this date. If State Government of Kansas is unable to participate, of necessity, the final report will cover only that portion of the Nemaha Basin in Nebraska).

RESPONSIBILITIES OF COOPERATING AGENCIES

To prevent undue duplication of effort in this study, the sponsoring agencies have made assignments of major responsibilities as outlined below. It is hoped that the cooperating agencies will respect these assignments and inform the sponsoring agencies should these assignments need to be revised, amended, and/or augmented during the course of the study. In making these assignments, the sponsoring agencies wish to encourage the full cooperation of all agencies on exchange of data in order that a fully comprehensive plan can be developed.

Bureau of Reclamation

1. Irrigation project development
2. Drainage project development

Corps of Engineers

1. Flood control (studies to be limited primarily to urban areas and those reaches of the stream and major tributaries that exceed 250,000 acres.)
2. Erosion problems (limited primarily to the flood plains and stream banks on main streams and major tributaries exceeding 250,000 acres in drainage.)
3. Navigation.

Soil Conservation Service

1. Watershed protection and flood prevention measures. (Studies to be limited primarily to delineated watersheds of less than 250,000 acres.)
2. Land damage by erosion.

3. Land treatment as needed on individual farms. (To include land use adjustments, mechanical practices - both for dry and irrigated land, agronomic practices, etc.)

Economic Research Service

1. Compilation of statistical material on the agricultural economy of the basin.

2. Economic evaluation of agricultural water problems and benefits from their alleviation.

3. Analysis of improvements in agricultural technology, growth of markets and the need for natural resource developments.

4. Development of economic data on the beneficial and adverse effects of possible resource development in the basin.

Forest Service

The U.S. Forest Service, in cooperation with other USDA agencies and the State of Nebraska, will undertake the following aspects of the study:

1. Review and evaluate available basic physical data, published and unpublished, concerning soil and water resources and the collection of additional related basic data needed for the survey pertaining to the hydrologic aspect of woodlands.
2. Investigate the relationship between the use, management and treatment of woodlands to floodwater, erosion, and sedimentation problems.
3. With the State Forester determine the need for kinds of improvement measures for watershed protection, flood prevention and water pollution prevention on woodlands.

Conservation and Survey Division (University of Nebraska)

1. Water quality tests
2. Test drilling
3. Ground water recharge studies
4. Deep well irrigation potential

Nebraska Department of Water Resources

1. Water supply inventory
2. Existing water appropriation

Nebraska Game, Forestation and Parks Commission

1. Fish and wildlife potential
2. Park development

Nebraska Department of Health

1. Inventory of water works serving municipalities
2. Water quality data on surface waters

Extension Service (University of Nebraska)

1. Information and educational program

State of Kansas

1. (Undetermined as of this date)

It is the desire of the coordinating agencies that surveys, investigations, economic and financial policies relating to municipal and industrial waters be coordinated as among the Soil Conservation Service, Bureau of Reclamation, and Corps of Engineers; it is also the wish of the coordinating agencies that these same items relating to hydroelectric power be coordinated as between the Bureau of Reclamation and the Corps of Engineers.

In the above assignment of major responsibilities, it is assumed by the coordinating agencies that these assignments include necessary surveys, investigations, research, etc. as needed by the various agencies in order to insure a complete study as outlined. In addition, it is recognized that all of these agencies have many other responsibilities authorized to them under existing state and federal laws. For the purpose of this study the above assignments will be respected by all cooperating agencies. These assignments may be revised, amended, and added to during the study as is necessitated by need.

RESPONSIBILITIES OF NEBRASKA SOIL AND WATER CONSERVATION COMMISSION

The Nebraska Soil & Water Conservation Commission, as sponsoring agency, shall call meetings as needed (a minimum of two each year during the study period) for the purpose of encouraging interchange of information and materials from cooperating agencies. Participating agencies are encouraged to coordinate their findings whenever convenient and in the public interest to do so. Functions of the Commission include:

1. Coordinating the activities of all local, state, and federal agencies and organizations requested by the Commission to assist in the study and plan on the Nemaha. (This will be in cooperation with counter-part agencies in Kansas.)
2. Requesting services of various local, state and federal agencies as needed to complete the proposed study and plan.
3. Cooperate closely with the Nemaha Rivers Watershed Association and the local soil and water conservation districts to make certain that the desires and needs of these local organizations are adequately covered in the study and plan.
4. Furnishing personnel to obtain survey and other needed information not available from existing local, state and federal agencies. Such state personnel would be available upon request by those agencies developing specific information on programs within their assigned fields.

5. As coordinating agency, approximately five (5) full-time employees from state funds will be assigned and participating at all times in this and similar basin investigations in Nebraska. This personnel will work cooperatively with all participating agencies. If and when funds are available from S. 21 (Water Resources Planning Act) this basin planning staff will be augmented.

6. Summarizing the findings of the various agencies and printing a consolidated basin-wide soil and water resource plan.

7. Disseminating and explaining the information derived from the study to local and state individuals and organizations. Such action to be done in cooperation with existing educational agencies.

TIME SCHEDULE FOR STUDY AND PROGRAM

The study, which is already initiated, is scheduled for more intensified study in fiscal years 1966, 1967, and 1968. The compiled report by the State Commission is scheduled for completion and ready for presentation to local people during calendar year 1969. In the meantime local interests are to be encouraged to continue to apply and implement those portions of the overall plan which are available to them.

(ROUGH DRAFT)
May, 1965

PLAN OF WORK
NEBRASKA SOIL AND WATER CONSERVATION COMMISSION
IN COOPERATION WITH
STATE OF SOUTH DAKOTA
AND
NORTH SIOUX WHITE RIVER BASIN AREA
DEVELOPMENT CONSERVATION COMMITTEE
IN THE
WHITE RIVER - CHEYENNE RIVER BASIN, NEBRASKA

INTRODUCTION

The North Sioux White River Basin Area Development Conservation Committee has requested a basin-wide plan of soil and water resource development for the White River - Hat Creek Basin in Nebraska from the Nebraska Soil and Water Conservation Commission. The State Commission has agreed to develop such a plan with the help and assistance of companion organizations of the state of Wyoming and South Dakota within the limits of its resources. The State Commission, to date, has requested the assistance of the Bureau of Reclamation, Corps of Engineers, Soil Conservation Service, Conservation and Survey Division of the University of Nebraska and the State Department of Water Resources. All plans and studies are to be coordinated with and reviewed by the boards of supervisors of all soil and water conservation districts with land in the drainage area.

The White River - Hat Creek area drains approximately 1,384,960 acres in northwest Nebraska. The White River area in Nebraska is approximately 16% of the total area of the basin. 47% of the Hat Creek area lies in Nebraska. The White River area in Nebraska lies in Sioux, Dawes and Sheridan Counties. The Hat Creek area is in Sioux and Dawes Counties. The headwaters of the White River is in the Sioux County near Harrison, Nebraska. The White River flows north and east some 240 miles and empties into the Missouri in South Dakota. The White River in Nebraska lies in a well-entrenched region. The main valley averages about a mile in width. The river has an average drop of 15 feet for its 100 miles length in Nebraska.

The Hat Creek rises about 20 miles south of the Nebraska - South Dakota line in the Pine Ridge eroded tableland of central Sioux County. It flows in a north-eastern direction, eventually emptying in the Cheyenne River below Edgemont, South Dakota. The creek rises at an elevation of 4,500 feet and has an 11-foot per mile drop.

PROBLEM AND NEED FOR A PLAN

The White River - Hat Creek area is classified as an agricultural area, with livestock management the predominant agricultural phase. Only about 2% of the land is actually farmed and much of this is used strictly for the production of cattle feed. Tame hay and ensilage are the principally grown cattle feeds.

Soil erosion is quite excessive throughout the area and the watershed. This is primarily the result of the types of soils in the area plus the factor of the kinds of grasses that grow in the area. Most of the soils in the area are quite tight and impervious, leading to a great deal of run-off.

The application of land treatment measures has progressed quite rapidly in most of the White River - Hat Creek area of Nebraska. Due to a limited rainfall, there is a shortage of water from underground sources. Conservation of soil and water is well along. The Sugarloaf district in the Hat Creek area has nearly 100% conservation applied. The practices are water management and range management.

A P.L. #566 application is pending on the Whitney-Big Cottonwood area of the White River. The Bureau of Reclamation is investigating an irrigation program on the White River in South Dakota which is known as the Slim Butte Project. This investigation is in cooperation with the Indian Service. The Corps of Engineers are now conducting flood control investigations on the Upper Cheyenne.

The topography of these two valleys is quite hilly in the upper reaches with the main stems pretty well entrenched. The valley gradually widens out, leaving a good wide plain for farming. Much feed for livestock is raised in these valleys, particularly tame hay. Much need for irrigation on these crops is evident; however, soil types and lack of adequate water resources has held up this potential. Adequate domestic and livestock water is lacking in many parts of the area, thus leading to a high development of all surface water.

The lower reaches of the White River - Hat Creek area is quite subject to flooding. The creek and river stems are not so well entrenched in the valley, thus leading to flooding. This flooding is further augmented by the fact that the soils are not particularly suitable for irrigation purposes and are thus subject to excessive run-off.

The economy of the area is predominantly agriculture. Cattle raising and wheat farming are the primary sources of income. Many years, due to lack of rain, adequate range is not evident for maximum cattle production. There has been a very slow decrease of population, due to the fact that the farm and range units are quite large.

Considerable study needs to be given to the potential water conserving practices suitable to this area. In this study, much thought should be given to complete watershed treatment and maximum use of surface water available that can't be handled by watersheds. Adequate study should be given to the control of the flood potentials in early spring, thus saving these waters for later use where needed. There are several potential watersheds in the area.

The plan should outline a plan to bring the Whitney Irrigation Project up to its maximum efficiency as a part of the overall plan. Included should be a plan to develop recreation to its maximum. The overall plan should outline a program for maximum development of the area's soil and water resources. One that would insure maximum future stability of the agricultural resources.

In connection with this broad study there is an urgent need for a systematic survey and inventory of the water and land resources of the White River - Hat Creek Basin. There is a need to study the problems relating to the resources on a basin-wide approach. So the Nebraska Soil & Water Conservation Commission, North Sioux White River Basin Area Development Conservation Committee, and local soil and water conservation districts can efficiently, effectively, and economically coordinate the various programs of the basins.

Principal Features of the Study to be Undertaken

The study and ultimate plan will seek to provide a basis for research, planning and development of coordinated programs for the conservation and utilization of the water and related resources of the White and Cheyenne River Basins. It will be pointed primarily at:

1. Inventory of the soil and water resources including erosion or depletion of the soil resources.
2. Present and future land use. This will include ways and means of improving management of lands, including land treatment practices, land conversion, etc.
3. Flood damage in all reaches of the basin as caused by flood water, poor drainage siltation, scour and stream bank erosion and possible ways of minimizing this damage.
4. Present and past use of water. This will include management of surface waters, stream flows, drainage from agricultural lands, water storage and water rights.
5. Ground water conditions as they relate to return flow, drainage, recharge and availability of ground water supplies.
6. Potential use of water including new ditch irrigation projects and deep well irrigation. This would include improvement in existing irrigation systems on individual farms and prevention of excessive water losses.
7. Availability and potential of water available for industrial and municipal purposes.
8. Recreation and wildlife potential.
9. Stream pollution control.
10. Economic effect or impact on the basin if such a study or plan would be applied.

INVENTORY OF ASSISTANCE AVAILABLE FOR THE STUDY

The Nebraska Soil and Water Conservation Commission during their regularly scheduled board meeting on _____, went on record of agreeing to coordinate and develop a total soil and water resource plan and study for the White and Cheyenne River Basins in Nebraska. Preliminary contacts have been made with state officials of South Dakota. State governments will be encouraged to participate in this program to the maximum extent of their resources. The State Commission is presently cooperating with the Bureau of Reclamation, Corps of Engineers, U. S. Department of Agriculture (Soil Conservation Service, Forest Service, Economic Research Service), Conservation and Survey Division (University of Nebraska), Nebraska Department of Water Resources, Nebraska Health Department, the Nebraska Game, Forestation and Parks Commission and Extension Service. In similar studies in the Elkhorn, Big and Little Blue River Basins in Nebraska. It is envisioned that the mechanics of this study will be comparable to the above named investigations. The State Commission reserves the right to request and receive assistance and cooperation from other local, state and federal agencies as the need arises. The following is a resume of the scope of activities that the above named agencies have indicated would be available in similar studies.

Scope of Bureau of Reclamation Activities

The objective of new reconnaissance investigations in the White and Cheyenne River Basins will be to provide a determination of the available water supply, generally delineate the potential needs of the service areas, assess the pattern of local interest and perform the necessary land classification, engineering, economic and financial studies and analyses to analyze the possibilities and current feasibility of development.

The Bureau of Reclamation investigation work will be summarized in a Reconnaissance Report. These reconnaissance investigations propose to accomplish the following items of work in the White and Cheyenne River Basins.

1. Land Classification Surveys: The reconnaissance land classification done previously will be reviewed and adjusted using new criteria. The classification will be expanded to include other areas. Field work will include sampling from 5- and 15- foot auger holes, as well as surface soil classification. Laboratory analysis of soil samples will be made to determine gradation, salinity, alkalinity, permeability, soil structure and other physical and chemical qualities of the soils, including drainage analyses.
2. Water Supply and Utilization Studies: Available surface and ground-water data will be analyzed to determine the water supply available to the Division. Water requirements of the project lands, municipal and industrial uses will be analyzed. Based on the overall needs and physical plan, river operation studies will be prepared.
3. Sediment Studies: Sediment studies will be made for use in determining sediment problems which might be expected to occur with project development. These studies will be prepared using available data.
4. Flood Studies: Flood studies will be prepared for use in the hydraulic design of dams and cross drainage structures. These studies will be made using available streamflow records.
5. Drainage Studies: Studies will be made to check the effect of project development on the surface and subsurface drainage requirements. Available depth-to-water and ground water contour maps will be supplemented with some subsurface geologic exploration, if required.
6. Geologic Exploration: For this investigation the geological studies will be largely limited to test holes on the dam sites. Because of investigation fund limitation, available data on regional and local geology will be supplemented only as absolutely necessary.
7. Economic Studies: Basic farm data from the local ASC office and county records will be collected and analyzed to determine economic support of any proposals. These data will include information on farm size, land use, tenure of operation, tax data and land values. From the basic data, farm budgets for both the 'with' and 'without' irrigation conditions will be determined. Repayment capacity and irrigation benefits will be evaluated to complete the economic and financial analysis of the project.

8. Field Surveys: Basic horizontal and vertical control for future surveys will be run through the area. Topographic surveys will be made at the specific structure locations. Reconnaissance field locations will be made for major facilities.
9. Engineering Studies: The engineering studies involve a determination of the immediate and future needs of the basin and a physical and economical plan to fulfill these needs. This means that the need and location for irrigation must be analyzed; similar findings must be made for all other purposes such as hydroelectric power, flood control, municipal and industrial needs, fish and wildlife and recreational opportunities and pollution abatement. Once all of the needs are relatively defined, then an economical engineering plan must be devised--this means the preparation of designs and reconnaissance cost estimates.
10. Cooperative Studies: The above items are always analyzed with other interested agencies of the local, state, and federal level to assure the development of a coordinated plan.
11. Reports: The results of the above studies will be summarized in a reconnaissance report.

Scope of Corps of Engineers Activities

Basin studies in the White and Cheyenne River Basins will be in response to Congressional resolution. Such studies would be of a comprehensive nature and consider all phases of water resource development unless limitations are imposed by the authorizing resolution. Such studies would determine the proper scale and scope of potential developments, the degree of economic justification, and the equitable sharing of costs and responsibility of federal and non-federal interests.

Corps of Engineers

1. Climate and stream flow
2. Floods of record
3. Extent and character of flooded area
4. Flood damages
5. Existing and proposed developments by other agencies.
6. Improvements desired by local interests
7. Navigation
8. Power needs
9. Water supply needs
10. Existing and potential irrigation
11. Stream pollution
12. Erosion problems (Principally on major streams)
13. Drainage problems
14. Recreational needs
15. Fish and wildlife needs
16. Existing and potential watershed development

Although the Corps of Engineers study would consider provision of irrigation storage, all irrigation development plans would be made by the Bureau of Reclamation. The Corps of Engineers in this study and plan will also coordinate with, or use the services of other agencies, where advisable - such as the Public

Health Service on pollution and water supply problems and the Federal Power Commission for hydro-power developments. The Corps of Engineers will also cooperate with the Soil Conservation Service in the development of watershed plans if the need for such development is indicated. The Soil Conservation Service would develop the watershed plan but it would be coordinated with the Corps of Engineers studies. Examples are the Papillion Creek and Gering Valley studies.

Scope and Responsibility of USDA

Representative sample watersheds in problem areas in soil and water conservation will be selected for surveys and investigations with preliminary investigation type of intensity. Available data and field examinations will provide the basis for expanding data from sample areas to sub-basin water and land resource areas. The inventory, by sub-basin water and related land areas, will include:

1. Identification of a desirable pattern of water and related land use including recreation, management, and development to meet future requirements, provide watershed protection and alleviate flood prevention and agricultural water management problems at justifiable cost;
2. Identification of alternative water and related land uses, management and developments;
3. Identification and evaluation of the major obstacles to attainment of the desirable pattern of water and related land use, management and development;
4. Identification of the manner in which, and an appraisal of the extent to which, USDA programs can contribute to the solution of water and related land problems in the basin with emphasis on project type solutions; objectives; and
5. Outlining additional actions which would air in attaining basin-wide objectives; and
6. Providing information and data in a report.

RESPONSIBILITIES

The survey work of the U. S. Department of Agriculture will be coordinated by a USDA Field Advisory Committee - White and Cheyenne River Basin - which is composed of C. Dale Jaedicke, Chairman, Soil Conservation Service; James O. Folkestad, Forest Service; and John Muehlbeier, Economic Research Service.

The Field Advisory Committee will be responsible for field coordination of Department survey activities and procedure; arranging for field review of recommendations and reports; arranging for necessary consultation; over-all relationships with the Nebraska Soil and Water Conservation Commission and other interested state and federal agencies; and arranging for over-all schedules of work. Each member of the Field Advisory Committee will inform his responsible supervisor about progress and effort necessary for timely performance.

Soil Conservation Service

The Soil Conservation Service, in cooperation with other USDA agencies and the state of Nebraska will undertake the following aspects of the survey:

1. Delineate subwatershed areas of 250,000 acres or less in the basin.
2. The review and evaluation of available pertinent basic physical data, published and unpublished, concerning soil and water resources and the collection of additional related basic physical data needed for this survey.

3. Identification of floodwater and sedimentation problems and an inventory of the location, nature and extent of floodwater and sediment damages.
4. Development of information on agricultural water management problems and on the location, nature and extent of existing and potential agricultural water management developments, including upstream water storage opportunities.
5. Evaluation of the effect of reasonably attainable farm irrigation efficiency on water use in the basin.
6. Preparation of summaries of past, current and needed flood prevention and agricultural water management improvements for each tributary, including storage sites, based on available information.
7. A field reconnaissance of potential P.L. 566 projects, a determination of those that are potentially feasible, and a determination of their relationship to other existing and potential water resource developments.
8. Help the state of Nebraska define the water yielding areas and their characteristics.

Economic Research Service

The Economic Research Service in cooperation with other USDA agencies and the state of Nebraska will compile economic data and make economic analysis relating to the agricultural industry and its use of land and water resources. Material of this nature will be developed for the basin as a whole, and for subdivisions of the basin and in such detail as required for the development of coordinated framework plans for the use, control and development of water and related land resources. The analysis will encompass the following:

1. The compilation of analyses of secondary statistical materials relating to the agricultural economy of the basin, agricultural use of land and water, and the output of agricultural products; including (a) crop acreages, yields and values, (b) production and value of livestock products, (c) capital investment in the agricultural industry, (d) land values, and (e) agricultural markets, etc.
2. Analysis of emerging improvements in agricultural technology, growth of agricultural markets and their composite impact on the agricultural economy and its need for natural resources.
3. Economic analysis of agricultural water problems, their impact on the economy of the area and an appraisal of economic benefits to be derived from their alleviation (including improvements in production efficiency, stabilization of farm production and income and alleviation of unemployment on farms and agricultural trade centers).
4. Development of other types of economic data and methods of analysis designed to facilitate a basin-wide appraisal of beneficial and adverse effects of possible water resource development projects or systems of water control.

Forest Service

The U. S. Forest Service, in cooperation with other USDA agencies and the State of Nebraska, will undertake the following aspects of the study:

1. Review and evaluate available basic physical data, published and unpublished, concerning soil and water resources and the collection of additional related basic data needed for the survey pertaining to the hydrologic aspect of woodlands.
2. Investigate the relationship between the use, management and treatment of woodlands to floodwater, erosion, and sedimentation problems.
3. With the State Forester determine the need for kinds of improvement measures for watershed protection, flood prevention and water pollution prevention on woodlands.

Scope of the Department of Water Resources

1. Make a determination of the water supply available for future use for domestic, agricultural, industrial, municipal, and other useful purposes.
2. Make a determination of the historical water supply.
3. Develop flow-duration data at various locations in the basin.
4. Determine actual water uses under existing water appropriations.
5. Determine historical stream flow depletions resulting from existing water uses.
6. Determine probable water requirements under projects proposed for the basin.
7. Provide information as to the number of wells, the number of acres irrigated, the amount of ground water used, etc. for each basin and for areas within the basin as may be desired.
8. In cooperation with other state and federal agencies, make a determination of the effect of ground water pumping on the natural stream flow.

Scope of the Conservation and Survey Division:

1. The preparation of surficial and subsurface geologic maps of the area.
2. The preparation of ground water maps of the area including depth to water table maps and water table contour maps and maps showing the availability of ground water in terms of general potential water yields.
3. Evaluation of the average annual recharge to ground water in the basin based on a combined study of the water table contour maps and total transmissibility of the subsurface materials.
4. Evaluation of ground water in storage in the basin.
5. Compilation and evaluation of soil characteristics relating to infiltration, land utilization, erosion characteristics, etc.

Requests to other local, state, and federal agencies and organizations may be made as deemed appropriate by the Nebr. Soil & Water Conservation Commission.

Nebraska Health Department

- 1.
- 2.
- 3.

Nebraska Game, Forestation & Parks Commission

- 1.
- 2.
- 3.

Extension Service

- 1.
- 2.
- 3.

State Government of South Dakota

- 1.
- 2.
- 3.

Coordinating Arrangements of the Nebraska Soil and Water Conservation Commission

The Nebraska Soil & Water Conservation Commission in cooperation with comparable agencies in South Dakota will be the coordinators in this study. The following major areas of responsibilities have been assigned.

Bureau of Reclamation

1. Irrigation project development
2. Drainage

Corps of Engineers

1. Flood Control (studies to be limited primarily to urban areas and those reaches of the stream and major tributaries that exceed 250,000 acres.)
2. Erosion problems (limited primarily to the flood plains, and stream banks on main streams and major tributaries exceeding 250,000 acres in drainage.)
3. Navigation.

Soil Conservation Service

1. Watershed Protection and Flood Prevention. (studies to be limited primarily to delineated watersheds of less than 250,000 acres.)
2. Erosion Problems based on soil surveys.
3. Land treatment as needed on individual farms. (to include land use adjustments, mechanical practices - both for dry and irrigated land, agronomic practices, etc.)

Economic Research Service

1. Economic evaluation of agricultural water problems and benefits from their alleviation.
2. Development of economic data on the beneficial and adverse effect of the basin with appraisal of possible resource development
3. Compilation of statistical material on the agricultural economy of the basin.
4. Analysis of improvements in agricultural technology, growth of markets and the need for natural resources.

Forest Service

1. Investigate relationship of use, management, and treatment of woodlands to floodwaters, erosion, and sedimentation problems.
2. Determine needed woodland improvements.

Conservation and Survey Division (University of Nebraska)

1. Water quality tests
2. Test drilling
3. Ground water recharge studies
4. Deep well irrigation potential.

Department of Water Resources

1. Water supply inventory
2. Existing water appropriation

Nebraska Game, Forestation and Parks Commission

1. Fish and wildlife potential
2. Park development

State Department of Health

1. Stream pollution

Extension Service (University of Nebraska)

1. Information and education program

It is the desire of the coordinating agencies that surveys, investigations, economic and financial policies relating to municipal and industrial waters be coordinated as among the Soil Conservation Service, Bureau of Reclamation, and Corps of Engineers; it is also the wish of the coordinating agencies that these same items relating to hydroelectric power be coordinated as between the Bureau of Reclamation and the Corps of Engineers.

In the above assignment of major responsibilities, it is assumed by the coordinating agencies that these assignments include necessary surveys, investigations, research, etc. as needed by the various agencies in order to insure a complete study as outlined. In addition, it is recognized that all of these agencies have many other responsibilities authorized to them under existing state and federal laws. For the purpose of this study the above assignments will be respected by all cooperating agencies. These assignments may be revised, amended, and added to during the study as is necessitated by need.

The Nebraska Soil and Water Conservation Commission shall call meetings as needed (a minimum of two each year during the study period) for the purpose of encouraging an interchange of information and materials from cooperating agencies. Participating agencies are to be encouraged to coordinate their findings whenever convenient and in the public interest to do so. If needed assistance or information is available from some source other than from a participating agency, any cooperating agency should not hesitate in requesting such needed information from the available source.

RESPONSIBILITY OF THE NEBRASKA SOIL AND WATER CONSERVATION COMMISSION

1. Coordinate the activities of all local, state and federal agencies and organizations requested by the Commission to assist in the study and plan on the White and Cheyenne River Basins. (This will be in cooperation with counter-part agencies in South Dakota).
2. Request services of various local, state and federal agencies as needed to complete the proposed study and plan.
3. Cooperate closely with the North Sloux White River Basin Area Development Conservation Committee and the local soil and water conservation districts to make certain that the desires and needs of these local organizations are adequately covered in the study and plan.
4. Use the departments available personnel in obtaining survey and other information not available from existing local, state and federal agencies as needed in the development of the overall plan. If available, such state personnel would be available upon request by those agencies developing specific information on programs within their assigned fields.
5. Summarize the findings of the various agencies and print a consolidated basin-wide soil and water resource plan.
6. Disseminate and explain the information derived from the study and included in the plan to local and state individuals and organizations. Such action to be done in cooperation with existing educational agencies.

TIME SCHEDULE FOR STUDY AND PROGRAM

The study, which is already initiated, is scheduled for more intensified study in fiscal years 1966, 1967, and 1968. The compiled report by the State Commission is scheduled for completion and ready for presentation to local people during calendar year 1969. In the meantime local interests are to be encouraged to continue to apply and implement those portions of the overall plan which are available to them.

SECTION 3
OF
THE STATE WATER PLAN
THE STATUS SUMMARY

The Status Summary has four major purposes.

1. To summarize the status of projects currently being given consideration with attention to the desirability of the project and the actions necessary for its implementation.
2. To preserve a historical record of water resources development in Nebraska.
3. To assemble, in an organized fashion, general information concerning projects with sufficient detail for analysis and use by those with a special interest in water resources.
4. To make available to the general public a summary of general information concerning water resources development.

To accomplish these purposes, three volumes of the Status Summary are proposed.

Volume 1 will be prepared specifically to accomplish the first purpose.

Volume 2 will be prepared to accomplish purposes two and three.

Volume 3 will be extracted from Volume 2 to meet the fourth purpose.

The individual volume outlines follow

The following outline is divided into chapters dealing with the major river basins. Following the volume outline is a typical chapter outline.

OUTLINE FOR VOLUME 1
PROPOSED WATER RESOURCES PROJECTS

INTRODUCTION

PURPOSE
SCOPE
ACKNOWLEDGEMENTS

TABLE OF CONTENTS

PROCEDURES OF CORPS OF ENGINEERS

PROCEDURES OF SOIL CONSERVATION SERVICE

PROCEDURES OF BUREAU OF RECLAMATION

CHAPTER 1 BIG BLUE BASIN

CHAPTER 2 ELKHORN BASIN

CHAPTER 3 LITTLE BLUE BASIN

CHAPTER 4 NIOBRARA BASIN

CHAPTER 5 NEMAHA BASIN

CHAPTER 6 WHITE BASIN

CHAPTER 7 LOUP BASIN

CHAPTER 8 MIDDLE PLATTE BASIN

CHAPTER 9 REPUBLICAN BASIN

CHAPTER 10 LOWER PLATTE BASIN

CHAPTER 11 UPPER PLATTE BASIN

CHAPTER 12 MISSOURI TRIBUTARIES

TYPICAL CHAPTER OUTLINE
FOR
VOLUME 1 OF THE STATUS SUMMARY

Chapter 1 - Big Blue Basin

Basin Map Showing Proposed Projects

Basin Summary Of Proposed Projects

Individual Projects

Project Map
Project Data Table
Project Narrative

This chapter outline would be repeated for each of the twelve basins.

DATA TO BE INCLUDED IN "PROJECT DATA TABLE"
FOR EACH CHAPTER OF VOLUME 1 OF THE STATUS SUMMARY

Construction Agency

Date of Significant Steps Toward Construction Completion (Depends on Agency Procedure)

Reservoir Storage (by structure)

Dead

Sediment

Conservation

Flood Control

Surcharge

Spillway Capacity

Reservoir Area (by structure)

Conservation Pool

Flood Pool

Surcharge Pool

Shoreline Miles of Conservation Pool (by structure)

Total Acres to be Procured (by structure)

Fee

Easement

Total Project Cost

Federal Cost

State Cost

Local Cost

Estimated Annual Operation and Maintenance Cost

Separable Cost (by function)

Taxation in Support of Project

Benefits

Direct (by function)

Indirect

Period of Amortization

b/c Ratio

Water to be Diverted (full development)

Water to be Delivered (full development)

Acres to be Irrigated (full development)

Drainage Area to be Controlled

Number of Structures

Estimated Streamflow Depletion

Estimated Return Flow

Net Depletion

Miles of Lined Channel and Ditch

Miles of Unlined Channel and Ditch

INFORMATION TO BE INCLUDED IN 'PROJECT NARRATIVE'
FOR EACH CHAPTER OF VOLUME 1 OF THE STATUS SUMMARY

Location

Principal Agency

Area Protected

Sponsor

Direct Benefits

Indirect Benefits

Brief Description of Plan Features

Remaining Water Resource Problems and Needs

Financing Arrangements

Provisions for Operation and Maintenance

Adequacy of Project Investigations

Other Existing Resource Developments in Area

Description of Project Area

Physical

Economic

Explanation of Costs

Installation Schedule

Effect on Water Supply

Impact of Project on State Water Plan

Current Status of Project

Remaining Steps to Construction

The following outline is divided into "Parts". Each part will deal with a separate major basin. Following the volume outline is a typical outline for one "part".

OUTLINE FOR VOLUME 2
EXISTING WATER RESOURCES DEVELOPMENT IN NEBRASKA

INTRODUCTION

PURPOSE
SCOPE
ACKNOWLEDGEMENTS

TABLE OF CONTENTS

PART A BIG BLUE BASIN

PART B ELKHORN BASIN

PART C LITTLE BLUE BASIN

PART D NIOBRARA BASIN

PART E NEMAHA BASIN

PART F WHITE BASIN

PART G LOUP BASIN

PART H MIDDLE PLATTE BASIN

PART I REPUBLICAN BASIN

PART J LOWER PLATTE BASIN

PART K UPPER PLATTE BASIN

PART L MISSOURI TRIBUTARIES

Within each "Part" the various facets of water resources development will be treated by "Chapters". An outline typical of a "Part" is shown below.

TYPICAL OUTLINE FOR A "PART"
OF VOLUME 2 OF THE STATUS SUMMARY

Chapter I - Watershed Projects

Procedures of the Soil Conservation Service
Procedures of the Nebraska Soil and Water Conservation Commission
Basin Map Showing Projects
Basin Summary of Status of Watershed Projects Completed or Under Construction
Individual Projects (by date construction began)
 Project Map
 Project Data Table

Chapter II - Other Major Existing Federal Projects

Procedure of Corps of Engineers
Procedure of Bureau of Reclamation
Map of Basin Showing Existing Projects
Basin Summary of Major Federal Projects Completed or Under Construction
Individual Projects (by date construction began)
 Project Map or Maps
 Project Data Table
 Project Narrative

Chapter III - Local Flood Protection Projects

Procedures of Corps of Engineers
Procedures of Nebraska Soil and Water Conservation Commission
Map of Basin Showing Local Flood Protection Projects
Basin Summary of Authorized Projects
Individual Projects (by date construction began)
 Project Maps
 Project Data Table
 Project Narrative

Chapter IV - Resource Development Districts

Irrigation Districts in Basin

Abstract of Enabling Legislation

Basin Map

Basin Summary

Individual Irrigation Districts (by date organized)

District Map

District Data Table

District Narrative

Reclamation Districts in Basin

Abstract of Enabling Legislation

Basin Map

Basin Summary

Individual Reclamation Districts (by date organized)

District Map

District Data Table

District Narrative

Drainage Districts in Basin

Abstract of Enabling Legislation

Basin Map

Basin Summary

Individual Drainage Districts (by date organized)

District Map

District Data Table

District Narrative

Ground Water Conservation Districts in Basin

Abstract of Enabling Legislation

Basin Map

Basin Summary

Individual Ground Water Conservation Districts (by date organized)

District Map

District Data Table

District Narrative

Rural Water Districts in Basin

Abstract of Enabling Legislation

Basin Map

Basin Summary

Individual Rural Water Districts (by date organized)

District Map
District Data Table
District Narrative

Public Power Districts in Basin

Abstract of Enabling Legislation

Basin Map

Basin Summary

Individual Public Power Districts (by date organized)

District Map
District Data Table
District Narrative

Chapter V - Private and Public Ground and Surface Water Development

Procedures of the Nebraska Department of Water Resources

Private Ground Water Development

Abstract of Legislation

Basin Map

Basin Summary

Data Table

Private Surface Water Development

Abstract of Legislation

Basin Map

Basin Summary

Data Table

Municipal Ground Water Development

Abstract of Legislation

Basin Map

Basin Summary

Name

Data Table

Narrative

Municipal Surface Water Development

Abstract of Legislation

Basin Map

Basin Summary

Municipalities

Name

Data Table

Narrative

TYPICAL DATA TO BE INCLUDED IN "PROJECT DATA TABLE"
CHAPTER 1 - WATERSHED PROJECTS
PART - OF VOLUME 2 OF THE STATUS SUMMARY

Location

Area Protected

Brief Description of Plan Features

Number of Structures

Direct Benefits

Indirect Benefits

Significant Dates

Application Received by Commission

Application Approved by Commission

Planning Authorization Received

Preliminary Investigation Completed

Work Plan Completed

Work Plan Accepted

Authorized for Installation

Construction Began

Construction Was Completed

Project Function(s)

Reservoir Storage (by structure) (structures over 30 surface acres or 100 ac.
feet)

Dead

Sediment

Conservation

Flood

Surcharge

Reservoir Area (by structure) (structures over 30 surface acres or 100 ac. feet)

Conservation Pool

Flood Pool

Surcharge Pool

Shoreline Miles (conservation pool) (structures over 30 surface acres or 100 ac. feet)

Present Rate of Siltation

Drainage Area Controlled

Spillway Capacity

Total Acres Procured (by structure)

Fee

Easement

Water to be Diverted (full development)

Water to be Delivered (full development)

Acres to be Irrigated (full development)

Acres Irrigated (present)

Streamflow Depletion

Estimated Return Flow

Net Depletion

Miles of Unlined Channel or Ditch

Miles of Lined Channel or Ditch

Total Project Cost

Federal Cost

State Cost

Local Cost

Expected Average Annual Operation and Maintenance Cost (by structure if available)

Actual Average Annual Operation and Maintenance Cost (by structure if available)

Separable Costs (by function)

Taxation in Support of Project (by years)

Benefits

Direct (by function)

Period of Amortization

b/c Ratio

How Project is Functioning (Remaining Problems and Needs)

Current State of Repair

Sponsors

Who to Contact for Further Information

DATA TO BE INCLUDED IN "PROJECT DATA TABLE"
CHAPTER 11 - OTHER MAJOR EXISTING FEDERAL PROJECTS
PART - OF VOLUME 2 OF THE STATUS SUMMARY

Construction Agency

Date of Significant Steps Toward Construction Completion (depends on agency procedure)

Reservoir Storage (by structure)

Dead

Sediment

Conservation

Flood Control

Surcharge

Reservoir Area (by structure)

Conservation Pool

Flood Pool

Surcharge Pool

Shoreline Miles of Conservation Pool (by structure)

Total Acres Procured (by structure)

Fee

Easement

Total Project Cost

Federal Cost

State Cost

Local Cost

Estimated Annual Operation and Maintenance Cost (by structure)

Actual Annual Operation and Maintenance (by structure)

Separable Costs (by function)

Taxation in Support of Project

Benefits

Direct (by function)

Indirect

Period of Amortization

b/c Ratio

Water to be Diverted (full development)

Water to be Delivered (full development)

Acres Irrigated (full development)

Acres Irrigated (present)

Present Rate of Siltation (by structure)

Drainage Area Controlled (by structure)

Number of Structures

Streamflow Depletion

Estimated Return Flow

Net Depletion

Spillway Capacity (by structure)

Miles of Lined Channel or Ditch

Miles of Unlined Channel or Ditch

INFORMATION TO BE INCLUDED IN "PROJECT NARRATIVE"
CHAPTER II - OTHER MAJOR EXISTING FEDERAL PROJECTS
PART - OF VOLUME 2 OF THE STATUS SUMMARY

Location

Principal Agency

Sponsor

Direct Benefits

Indirect Benefits

Brief Description of Plan Features

How Project is Functioning (remaining problems and needs)

Condition of Project Features

Major Project Improvements

Recreation Use

Who to Contact for Further Information

DATA TO BE INCLUDED IN "PROJECT DATA TABLE"
CHAPTER III - LOCAL FLOOD PROTECTION PROJECTS
PART - OF VOLUME 2 OF THE STATUS SUMMARY

Location

Area Protected

Brief Description of Plan Features

Significant Dates

Investigation Authorized by Public Works Committee

Public Hearing

Project Authorized by Congress

Project Funded by Congress

Construction Began

Constructed Completed

Total Project Cost

Federal Cost

State Cost

Local Cost

Direct Benefits

Indirect Benefits

Period of Amortization

b/c Ratio

Taxation in Support of Project (years)

Estimated Annual Operation and Maintenance Cost

Actual Annual Operation and Maintenance Cost

Miles of Levee

Channel Capacity in Reach Protected (no damage)

INFORMATION TO BE INCLUDED IN 'PROJECT NARRATIVE'
CHAPTER III - LOCAL FLOOD PROTECTION PROJECTS
PART - OF VOLUME 2 OF THE STATUS SUMMARY

Sponsor

How Project is Functioning (remaining problems and needs)

Condition of Project Features

Who to Contact for Further Information

DATA TO BE INCLUDED IN "DISTRICT DATA TABLE"
CHAPTER IV - RESOURCE DEVELOPMENT DISTRICTS
PART - OF VOLUME 2 OF THE STATUS SUMMARY

Number of Farms Included

Number of Persons Included

Date Formed

Date Dissolved

Water Diverted

Water Delivered

Acres Irrigated

Acres Drained

Water Use Efficiency

Service Charge History

Tax History

INFORMATION TO BE INCLUDED IN "DISTRICT NARRATIVE"
CHAPTER IV - RESOURCE DEVELOPMENT DISTRICTS
PART - OF VOLUME 2 OF THE STATUS SUMMARY

Area Included

Purposes

Office Location

Description of Plan Features for Work Undertaken

How District is Functioning

Remaining Water Resources Problems and Needs

Where to Obtain Further Information

DATA TO BE INCLUDED IN "DATA TABLE"
CHAPTER V - PRIVATE AND MUNICIPAL WATER DEVELOPMENT
PART - OF VOLUME 2 OF THE STATUS SUMMARY

Date Formed

Acres Included

Water Withdrawn

Water Returned

Taxation in Support of Project

Acres Irrigated

Total Cost

State Cost

Local Cost

INFORMATION TO BE INCLUDED IN "PROJECT NARRATIVE"
CHAPTER V - PRIVATE AND MUNICIPAL WATER DEVELOPMENT
PART - OF VOLUME 2 OF THE STATUS SUMMARY

Location

Purpose

Condition

Direct Benefits

Indirect Benefits

How Project is Functioning (remaining problems and needs)

Who to Contact for Further Information

OUTLINE OF VOLUME 3
EXISTING WATER RESOURCES DEVELOPMENT

INTRODUCTION

PURPOSE
SCOPE
ACKNOWLEDGEMENTS

TABLE OF CONTENTS

CONSTITUTIONAL PROVISIONS ON WATER

CHAPTER 1 - STATE ABSTRACT OF STATUS SUMMARIES

SMALL WATERSHED PROJECTS

STATE MAP
STATE STATUS SUMMARY

LOCAL FLOOD PROTECTION PROJECTS

STATE MAP
STATE STATUS SUMMARY

OTHER MAJOR EXISTING PROJECTS

STATE MAP
STATE STATUS SUMMARY

PUBLIC POWER AND IRRIGATION DISTRICTS

STATE MAP
STATE STATUS SUMMARY

RECLAMATION AND IRRIGATION DISTRICTS

STATE MAP
STATE STATUS SUMMARY

DRAINAGE DISTRICTS

STATE MAP
STATE STATUS SUMMARY

GROUND WATER CONSERVATION DISTRICTS

STATE MAP
STATE STATUS SUMMARY

RURAL WATER DISTRICTS

STATE MAP
STATE STATUS SUMMARY

GROUND WATER DEVELOPMENT

STATE MAP
STATE STATUS SUMMARY

PRIVATE SURFACE WATER DEVELOPMENT

STATE MAP
STATE STATUS SUMMARY

MUNICIPAL GROUND WATER DEVELOPMENT

STATE MAP
STATE STATUS SUMMARY

MUNICIPAL SURFACE WATER DEVELOPMENT

STATE MAP
STATE STATUS SUMMARY

CHAPTER II - FUNCTIONAL SUMMARY

STATEWIDE SUMMARY

DOMESTIC USE
FLOOD CONTROL
IRRIGATION
FISH & WILDLIFE
RECREATION
MUNICIPAL & INDUSTRIAL
POWER
 HYDRO
 COOLING
DRAINAGE
WATER QUALITY CONTROL
NAVIGATION

SECTION 4
OF
THE STATE WATER PLAN
THE SPECIAL RECOMMENDATIONS

STATE WATER PLAN

SECTION 4 - SPECIAL RECOMMENDATIONS

		TENTATIVE DATE OF COMPLETION
VOLUME 1	FLOOD PREVENTION AND FLOOD DAMAGE REDUCTION	JANUARY, 1967
VOLUME 2	DRAINAGE DISTRICTS	APRIL, 1968
VOLUME 3	MULTIPURPOSE DISTRICTS	JULY, 1968
VOLUME 4	CHANNEL RECTIFICATION	SEPTEMBER, 1968
VOLUME 5	DELEGATION OF COUNTY AUTHORITIES	SEPTEMBER, 1968
VOLUME 6	USE OF MISSOURI RIVER FLOW	FEBRUARY, 1969
VOLUME 7	LEGAL CONSIDERATIONS IN PLANNING	JULY, 1969
VOLUME 8	STATE SPONSORSHIP OF WATER PROJECTS	OCTOBER, 1969
VOLUME 9	TRANSBASIN DIVERSION	JANUARY, 1970
VOLUME 10	MARKETABILITY OF WATER RIGHTS	APRIL, 1970
VOLUME 11	GROUNDWATER REGULATION	JUNE, 1970
VOLUME 12	LAND USE REGULATIONS	OCTOBER, 1970
VOLUME 13	CLASSIFICATION & DEFINITION OF WATER	OCTOBER, 1971

NOTE: PRELIMINARY ONLY -- NOT FOR PUBLIC RELEASE

TIME SCHEDULE AND DESCRIPTION OF SPECIAL RECOMMENDATION

Part 4 Special Recommendations

The purpose of the special recommendation is to give individual treatment and detailed consideration to some of the more complex legal problems faced in development of the State Water Plan. The research and advice for this special recommendation will be developed by Commission counsel, aided by legal consultation as need requires and reviewed by the Lawyer Representative Group appointed by the Governor. A list of the special recommendations, a brief description of each recommendation, and the estimated time of publication is listed below.

Volume 1 - Flood Prevention and Flood Damage Reduction - January 1967

The purpose of this special recommendation is to point out a method of reducing flood damages through proper land use. This recommendation has already been presented to the Governor and the Legislature and, implemented by passage of LB 893 of the 1967 session of the Legislature.

Volume 2 - Transbasin Diversion - March 1968

This recommendation will discuss necessary clarification of state laws and the establishment of new criteria to provide for administrative decisions on transbasin diversion projects on a project-by-project basis.

Volume 3 - Drainage Districts Simplification - September 1968

This article will consider codification and simplification of our district laws.

Volume 4 - Multipurpose Districts - January 1969

This article will consider the creation of a district with authorities and responsibilities to carry out many water resource activities.

Volume 5 - Groundwater Regulation - March 1969

The purpose of this article is to study and reevaluate the state's position on groundwater use.

Volume 6 - Channel Rectification - June 1969

This article will review the different districts and political sub-districts that have authority to widen, deepen, straighten or otherwise change courses.

Volume 7 - Legal Considerations in Planning - July 1969

This volume will supply the legal information for the Framework Plan section of the State Water Plan.

Volume 8 - Delegation of County Authorities - November 1969

The purpose of this article will be to review and suggest needed revisions of the County Flood Control Act which deals with the authorities of cities, municipalities, and counties in various areas of water resource development.