WATER RESOURCES OF NEBRASKA

REVISED FEBRUARY 1941

PREPARED BY

NEBRASKA
STATE PLANNING BOARD

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LETTER OF TRANSMITTAL

Lincoln, Nebraska
February, 1941

To His Excellency
The Honorable Dwight Griswold
Governor of Nebraska
Lincoln, Nebraska

My dear Governor:

On behalf of the Nebraska State Planning Board, I have the honor of presenting herewith a copy of WATER RESOURCES OF NEBRASKA - REVISED 1941. This report has been prepared by the staff of the Board with assistance from the many state and federal agencies active in fields concerned with the conservation and utilization of our water resources. The financial assistance of the Work Projects Administration through official project number 465-81-3-155 has made possible the preparation of this report.

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Nebraska Department of Roads and Irrigation

Nebraska Public Power and Irrigation Districts

Public Works Administration

U. S. Army Engineers

College of Agriculture University of Nebraska

Soil Conservation Service

Division of Conservation and Survey, University of Nebraska

Copies of this report will be distributed to public officials, public libraries, educational institutions and interested state and federal agencies.

Very respectfully,

Wardner G. Scott

Wardner G. Scott
State Engineer &
Chairman

STATE OF NEBRASKA

Dwight Griswold, Governor

NEBRASKA STATE PLANNING BOARD

WPA Project 4366 Official Project 465-81-3-155

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PURPOSE

Conservation of Nebraska's water resources is vital to the conservation and preservation of its economic and social resources. General distribution of information concerning the possibilities and methods available for the conservation of our water resources is highly desirable.

The purpose of this very brief summary of the water resources of Nebraska is to present a quick picture of the various methods of conserving those resources and the extent to which they have been put into operation in the state. Among the several official agencies interested in water conservation, particular emphasis has been given to one or another of a number of ways of conserving our moisture, the methods of conservation depending on the statutory purpose for which each particular organization has been set up.

Reference has been made to and material has been drawn from the work of many individuals and agencies in assembling the material in this report. There has been no attempt to work out detailed plans for any development, large or small. That appears to be the job of "action" agencies legally set up for the purpose. It does seem desirable, however, to outline some of the accepted methods of moisture conservation and the extent of the development of the use of those methods in Nebraska.

A SUMMARY OF THE REPORT WITH AN OUTLINE OF A WATER CONSERVATION PROGRAM FOR NEBRASKA

GENERAL DESCRIPTION

Nebraska, as an agricultural state, is dependent upon the conservation of its two basic resources soil and water for its economic security. The cumulative effects of the current devastating drought have threatened this security in some areas of the state, and have sharply decreased the agricultural income in others.

Occupying parts of the regions designated by geographers as sub-humid and semi-arid, Nebraska experiences years when the precipitation in all parts of the state is less than 20 inches. Since 20 inches of precipitation is considered the line of demarcation for the semi-arid region, the entire state, therefore, would fall in the semi-arid category during some periods of drought. Every part of the state at some time or another suffers from either a lack of total supply of moisture or a proper distribution or both.

Under ordinary conditions the amount of precipitation in the eastern third of the state is adequate without supplemental water for profitable agriculture, although there are years of crop shortages and even failures. Generally speaking, until the last few years, the periods of drought in this section of the state have not been of sufficient duration or intensity to cause interest to be aroused in large irrigation projects. In the western two-thirds of the state however, the normal supply of precipitation is inadequate for successful intensive agriculture. The only means of producing profitable yields in areas of specialized farming is through the conservation of the available water supply and its artificial application to crops.

Until comparatively recent years, it was believed by many that irrigation could be practiced successfully only in that portion of the state west of the 100th meridian. At present, as a result of the extenuating drought and with improved engineering and irrigation methods, experts believe that irrigation can be made feasible in every part of the state where the water supply is available and topography and soils are suitable. In fact, large-scale irrigation projects have recently been developed east of the 100th meridian and there are now extensive projects proposed in the extreme eastern part of the state. Generally speaking, local sentiment throughout the state seems to favor the changes in agricultural and farming methods which would be necessary under irrigation.

In the western two-thirds of the state, the paramount problem is providing supplemental water for irrigation in areas meeting all other requirements for successful irrigation. Adjusting land use practices in areas with limited and undependable precipitation is more or less a problem throughout the entire state. The control of flood waters in conjunction with irrigation is of major importance on the Republican River, in the southern part of the state, and in minor drainage basins in the eastern part. The need for abatement of pollution is somewhat localized and is not a major problem from a state-wide viewpoint.

Climate

The wide variation of Nebraska's climate is largely the result of its geographic position. The precipitation is fluctuating and undependable. It decreases from east to west across the state at a fairly constant rate. The records indicate that the annual precipitation varies from 9.47 to 27.48 inches in the western part of the state, and from 20.86 to 50.31 inches in the eastern part. There are a greater number of years with the annual precipitation below the mean than those above, therefore, the departures above the mean are greater than those below it. During June 16 per cent of the total annual precipitation occurs and in January 2 per cent. These are the months when the maximum and minimum amounts occur. About 69 per cent of the annual supply falls during the five months' period from May to September.

During the past 90 years Nebraska has experienced three major droughts with intermediate periods of sub-normal precipitation. These cyclical droughts culminated in the early Sixties, the early Nineties and the late Thirties - the one through which we are now passing. The current drought starting immediately following 1930 with its accompanying adverse economic conditions is considered the most devastating of record. Above normal temperatures and excessive rates of evaporation which usually accompany subnormal precipitation have caused added damage to crops and accentuated drought conditions. Only once, 1938, during this ten-year period was the total annual amount in excess of the mean. Since 1930, Nebraska has a cumulated deficiency of precipitation of 45.2 inches below the mean of 22.7 inches. This deficiency is equivalent to the total precipitation of two normal years.

Interest in irrigation increases proportionately with the decrease in precipitation, and each succeeding drought intensifies interest in developing new irrigation enterprises. This interest in the eastern, and to some extent in central Nebraska, however, has heretofore quickly subsided with the return to heavier precipitation. Past experience, therefore, emphasizes the importance of the proper attitude on the part of those people included within the limits of a proposed project as a factor contributing to the success of that enterprise.

Population Trends

It is doubtful if the settlement in any other state in the union has been more greatly influenced by a fluctuating and undependable water supply for agriculture than has Nebraska. Variable precipitation and inadequate water storage and irrigation facilities have resulted in periods of low agricultural production. Droughts with their accompanying crop failures and a depressed agriculture have caused restless population movements within the state and some migration from the state. Nebraska has shown a population decrease of 4.7 per cent between 1930 and 1940, as compared with an increase of 6.3 per cent between 1920 and 1930. Seventy-seven of the 93 counties showed decreases since 1930. Two of the nine cities in the state of more than 10,000 (Hastings and Norfolk) showed decreases during the past decade. The records reveal a close correlation between changes in precipitation and population. A more stabilized agriculture established on sound water conservation policies is absolutely essential to the maintenance of our present population. Irrigation development on some of these streams not only gave greater use to areas of profitable agriculture which otherwise would be nothing more than grazing land but it also created greater urban communities to serve the rural irrigated areas, thereby increasing the population capacity of those areas.

The size of farm units averages 190 acres in the eastern part of the state and 835 acres in the western part, with a state average of 365 acres. By excluding the irrigated section, the size of farm units in the western part of the state averages 970 acres. About 70 per cent of the 122,543 farms in Nebraska have from 100 to 175 acres. The Bureau of Reclamation indicates that the irrigated area per farm in the Great Plains Region should average about 80 acres, with a rural population of 4 persons and a town population of 8 persons per farm. With a maximum of irrigation development and the resulting readjustment of tenure, Nebraska will be capable of supporting a somewhat larger and more prosperous population.

WATER SUPPLY

Surface Water

The amount of surface water available each year for the state as a whole varies almost proportionately with the precipitation occurring over the drainage area even though some of the streams maintain a fairly constant flow from natural underground supply reservoirs. During the current drought the surface waters have been noticeably depleted. The annual surface inflow to the state averages about 2,000,000 acre-feet from the states of South Dakota, Wyoming, Colorado, and Kansas, through the Niobrara, North and South Plattes and the Republican rivers. Only an insignificant quantity is contributed by South Dakota and the area to the north - the largest contribution is from Wyoming. The outflow is about 6,800,000 acre-feet annually and moves generally in a southeasternly direction, where it ultimately reaches the Missouri River which forms the eastern boundary of Nebraska. Therefore, 4,800,000 acre-feet net originating within the confines of this state have passed out and on to the Gulf of Mexico. Not all of this water was unused, for some was return flow after having served its purpose for both irrigation and power. Upstream development in Wyoming, together with the operation of recently constructed irrigation projects in Nebraska will reduce the quantity of water leaving the state in an amount equivalent to the consumptive use on these projects together with evaporation losses. Ultimate irrigation development in Nebraska will not result in retaining all this outflow, but the additional areas susceptible of being served will utilize part of it.

Ground Water

No other state in the Great Plains has a greater abundance or a better distributed supply of underground water than has Nebraska. It is estimated by geologists that the total underground supply would be sufficient to cover the surface of the state to a depth of 20 feet. The Pleistocene sands and gravels are for the most part water-bearing and, where they can be encountered at relatively shallow depths provide excellent supplies for irrigation pumping. With the exception of certain small areas the largest of which is the glaciated area in the three tiers of counties along the Missouri River in the eastern part of the state, the geology of the state is such as to provide a large storage capacity for underground water in all parts of the state. The direction of movement of the underground water supply is much the same as that of the surface waters. Considerably more underground water leaves the state than enters it.

Groundwater is important not only as a source of supply for pump irrigation, but it is likewise a source for much of our surface supply as well. If it were not for the underground supply seeping into drainage courses, some of the present perennial streams would be only intermittent in character. The replenishment and conservation of the underground supply is therefore of major importance in any state water conservation program.

Streams

In contrast to the deficiency in precipitation, Nebraska is well served by a network of streams originating both outside and within the borders of the state. The Missouri and the Platte rivers which give life to many of the inhabitants of this state have their origins in the snowclad peaks of the continental divide. Other lesser streams such as the Loup, Elkhorn, Niobrara and Frenchman rivers originating in the sandy soils of the state give added security to the population in the areas they traverse, because of the dependability of their water supply. Streams with little or no dependable base flows such as the Republican River and most of its tributaries are dependent more directly upon the erratic precipitation.

IRRIGATION

Gravity

Irrigation practices in Nebraska began in the early Sixties and gradually extended westward along the Platte River system into Colorado and Wyoming with permanent settlement. Irrigation gradually increased from approximately 12,000 acres in 1890 to nearly a million acres at the present time. Developments have now been extended to all the principal water courses.

The most extensive irrigation development in Nebraska has taken place in the North Platte Valley in Nebraska where about 450,000 acres are irrigated. The next largest area is along the main stem of the Platte River east of the city of North Platte where approximately 171,000 acres are under irrigation. An additional 164,000 acres will be included in the section upon completion of the Tri-County project. There are 80,000 acres now under irrigation on the Loups and 29,000 acres on the Republican system in Nebraska. The remaining 106,000 acres under irrigation are distributed along the South Platte, Niobrara, White, Elkhorn and Blue rivers and other less important streams.

The major possibilities for the further development of gravity irrigation in the state are situated in the Republican Valley, the tributaries of the Loup and the Platte totaling approximately 500,000 acres.

Platte River

In general, the water supply of the Platte River Basin above Kearney, Nebraska is fully appropriated, thus leaving no possibilities for appreciable further development. In fact, irrigation has been developed to the point where it has exceeded the dependable water supply available for direct diversion. Below this point there are areas where the topography and soil types meet the requirements for successful irrigation, but the absence of an adequate water supply for direct flow irrigation from this point to the mouth of the Loup River renders the feasibility of additional developments questionable. Much of the land in this section of the basin upon which it is physically possible to conduct water has been included in previously proposed projects, some of which were considered impracticable, while other parts were later incorporated into new potential developments. The appropriation for storage at the Kinglsey Reservoir claims all the residual seasonal and non-seasonal flow at the dam site. The release of storage water from the Kingsley Reservoir for developing downstream hydroelectric power and for delivering water to irrigation projects will result in return flow of sufficient quantity to have a stabilizing effect on the lower river flow so that at least a partial water supply will be provided for some projects which have been without water during recent drought years. In the North Platte Valley and the Platte Valley as far east as Gothenburg, the return flow is largely responsible for stabilizing the river discharge because the entire water supply, except that lost by evaporation and by consumptive use, is retained in the valley by impervious Brule clay and discharged to the middle portion of the river. The water is temporarity stored in the alluvium and returned to the river. Between Gothenburg and Central City the Platte River flows on a sand sheet which extends south to the Republican River. Since this is not a closed section and the direction of movement of the underground supply is definitely to the southeast, naturally large quantities of the Platte River water supply are lost by migrating to the Republican and Blue rivers. Geologists have estimated the annual amount at 200,000 acre-feet.

The Loup River is the source of supply for the proposed Lower Platte project embracing land on the north side of the Platte River between the Loup River on the west and the Elkhorn River on the east in Platte, Colfax, Dodge and Douglas counties. By assuming a diversion duty of 1.54 acre-feet, a total of 284,900 acre-feet would be required to deliver 1.00 acre-foot to the 185,000 acres. This is equivalent to 940 second-feet for the May to September period, or 808 second-feet of direct flow in addition to 40,000 acre-feet of supplemental storage. A study of the records indicates that there is adequate run-off to supply the irrigation requirements of the Lower Platte project over and above that needed for existing and proposed projects in the Loup River Basin.

Loup River

Based on the last ten-year mean of 1,710,262 acre-feet the annual shortage of the Loup River in supplying the Loup River Public Power District with 3,100 second-feet (the capacity of the feeder canal, although the appropriation is 3,500 second-feet) without storage facilities would have been 753,348 acre-feet or 33.5 per cent of the ultimate, while at the same time, there would have been a unattainable run-off of 219,280 acre-feet or 12.8 per cent of the total supply in the form of peak flows which could not have been utilized for power purposes as direct flow diversions. This quantity would have passed down the river unused by this project even if the 3,100 second-feet limit had been maintained. However, during the period of actual operation not all the divertable streamflow has been utilized by the Loup River project. For example, of the total annual run-off of 1,340,441 acre-feet in 1940, 1,211,859 acre-feet or 90.2 per cent were below the 3,100 second-feet limit, although only 760,353 acre-feet or 62.8 per cent of the divertable annual supply was actually diverted by the Loup River Power Project. With increased electric consumption, no doubt, a greater proportion will be used in the future.

A maximum storage capacity of 700,000 acre-feet would have been needed to reduce the discharge for the past ten years to the average of 2,360 second-feet. The development of storage facilities necessary to reduce the discharge to this average does not seem economically justifiable. The inter-connection of the three large hydro plants has a tendency to stress the importance of raising the minimum flow to a certain level rather than to reduce the total supply to an average. However, during the last 5 years, if all the peak discharges in excess of 3,100 second-feet had been stored and released to supplement the natural flow whenever the daily discharge fell below 2,000 second-feet, a storage capacity of only 260,000 acre-feet would have been needed. During the same period, there would even then have been a shortage of 450,000 acre-feet in supplying the 2,000 second-feet minimum. However, without storage facilities the shortage would have been 910,000 acre-feet. The annual flow at a channel reservoir site a short distance below the confluence of the North and Middle Loup rivers near the town of St. Paul averages 1,980 second-feet or 84 per cent of the Loup River discharge at Columbus. Satisfactory control of storage releases for either or both the power plant at Columbus and the potential irrigation project on the Lower Platte could be maintained at the potential St. Paul dam.

The appropriations for project proposals along the Dismal, Cedar, Calamus, and Middle Loup rivers will be junior to the Loup River District. The necessary reservoir capacity to retain all peak discharges in excess of the power district's 3,100 second-feet would make it possible to replace the natural flow diversion by the upstream irrigation districts, both existing and contemplated. Furthermore, the resulting greater uniformity of flow through the power plant at Columbus would enable the Lower Platte irrigation district to operate without a local storage reservoir, and would also be beneficial to other potential developments below the mouth of the Loup River. It is evident therefore that a channel storage reservoir of sufficient capacity above the Columbus project would stabilize the flow of the stream for the benefit of the Columbus Power Plant as well as any other projects developed in the future below the Columbus Power Plant.

The upstream contemplated projects propose to irrigate an additional 95,200 acres. Assuming a diversion duty of 1.54 acre-feet and a net delivery of 1.00 acre-foot per acre to the land, the stream flow would be depleted by 59,000 acre-feet after having credited the return flow as the result of these developments. The maximum daily diversion during July for these contemplated upstream projects would aggregate 680 second-feet which represent 16.3 per cent of the Loup River Power District's appropriation and 33 per cent of the mean discharge at Columbus for the month of July.

Republican River

The mean annual discharge of the Republican River near Hardy, Nebraska during the last eleven years with the flood discharges of May and June, 1935 excluded is 439,600 acre-feet. Above Hardy, Colorado contributes 26.4 per cent of the net water supply with 34.4 per cent of the area, Nebraska 56.5 per cent of the water supply and 43.2 per cent of the area, and Kansas 17.1 per cent of the water supply and 22.4 per cent of the area. The average run-off per square mile of drainage area in Colorado is 14.5 acre-feet, Nebraska 25.1 and Kansas 14.6. Fifty-five per cent of the total annual run-off above Hardy occurs during the May - September period, that is to say, the irrigation season. The annual inflow from the principal tributaries lying in Nebraska approximates 180,000 acre-feet annually. Practically all of this contribution is from the northwest.

Of the total of 37,800 acres now being irrigated in the Republican River Basin, 29,000 acres or 76.7 per cent are in Nebraska. Development on the Frenchman has been more extensive than on any other stream in the Nebraska portion of the basin with 16,000 acres under irrigation. The South Fork and the North Fork of the Republican are the tributaries next in importance with reference to the amount of land now irrigated, their irrigated areas being located in Colorado, Kansas, and Nebraska. If all the available water supply were conserved by means of storage facilities and released when needed for irrigation, the supply would greatly exceed the amount now needed for existing projects. The existing developments have depended almost entirely on direct flow diversion.

The irrigated areas of the Republican River and its tributaries in Nebraska can be expanded considerably if means can be found to provide storage facilities for supplying supplemental water for this acreage when the natural flow is inadequate during the summer months. In other words, it is estimated that there are 100,000 acres of land in the Republican River Basin in Nebraska which meet all the requirements for successful irrigation except available water supply during the irrigation season.

The three states of Colorado, Kansas and Nebraska are negotiating for a compact for the purpose of developing a plan for the allocation of the water supply of the Republican River Basin. Such a compact is essential before any developments for utilizing the water supply of this interstate stream so as not to cause any future conflict among these states in the equitable apportionment of the waters of the basin.

The Army Engineers are reviewing their previous report on a flood control plan for the Kansas River Basin which includes the Republican River in Nebraska in order to consider an alternative plan of development for the entire valley to include a channel reservoir near Republican City, Nebraska, in combination with the upstream tributary reservoirs. They are working in close cooperation with the Bureau of Reclamation for the best possible means of developing irrigation in combination with flood control on the Republican River. The Bureau of Reclamation studies include a determination of the areas that are physically capable of being served by gravity-type irrigation, the soil classifications in these areas, the availability of the water supply, and the best possible methods of conserving and utilizing the surface water supply in each basin.

A channel reservoir near Republican City in conjunction with certain tributary reservoirs is considered to be the most desirable plan of development because it would give some protection to the entire basin and complete protection to half of it. Such a plan is believed feasible, inasmuch as the benefits to irrigation on the Republican and flood control on the Republican and Kansas rivers would be substantially in excess of the costs to be involved. This plan is desirable because the tributary developments are needed in order that the maximum protection may be afforded the entire basin and the maximum use be made for irrigation. The need of the tributary reservoirs as a protective measure is further substantiated by the fact that 61 per cent of all damages suffered and 106 of the 110 lives lost during the 1935 flood occurred above the channel reservoir site.

During the devastating flood of 1935 the crest discharge at the Harlan County reservoir site reached 250,000 second-feet, although the discharge below that point could have been reduced to bank-full state with a reservoir capacity of 350,000 acre-feet. A determination by the Army Engineers of the design flood discharges based on the transposition of the maximum recorded storms in that vicinity which occurred in 1903 and 1935, revealed the need of a reservoir capacity totaling 1,008,000 acre-feet in order to provide complete protection to the area below the Harlan County site.

In the consideration of a basin-wide flood control plan for the Republican River, resources of all the agencies which might contribute under the authority of the Wheeler-Case act should be brought together to make possible the inclusion of the irrigation development in conjunction with flood control which might not be feasible if considered without the possibility of all agencies cooperating in its development. The most favorable reservoir sites for such consideration appear to be as follows: in Colorado, the Wray site on the North Fork of the Republican, Beecher Island on the Arikaree and the Hale on the South Fork of the Republican; in Nebraska the Enders on the Frenchman River and sites on Buffalo, Rock, Red Willow, and Medicine creeks, and the Harlan County on the Republican River. All these sites except the Wray, Buffalo and Rock Reservoirs which are for irrigation only, were selected by the Army Engineers as presenting the most favorable possibilities of development for flood control with reference to the ratio of cost to benefits. The eight tributary reservoirs would provide storage capacity aggregating 356,100 acre-feet of which 237,700 acre-feet could be utilized for flood control. Storage capacity in the proposed Harlan County reservoir could be reduced accordingly if the tributary reservoirs were developed.

Pump

The first pump irrigation, motivated by windmills, started soon after the initiation of gravity type irrigation in the early Sixties, although in 1912 there were only five irrigation wells in operation in the Platte River Valley. The number of well installations has increased in varying degrees, depending on the precipitation, until at present, there are more than 2,000 wells in operation. It is estimated that 100,000 acres are now being served by pump irrigation in 80 counties. The greatest concentration of such enterprises is in Buffalo, Dawson and Hall counties in Central Nebraska. They are located in the beds of Pleistocene deposits extending west from the western border of the till sheet.

Up until the past few years of the present drought, pump irrigation developments have taken place largely along streams with the lower lift and less expense encountered in applying the water, but recently, installations are being made in the Plains Area where the lifts are considerably greater.

Pump irrigation is gaining in popularity, because the areas to be served do not have to be favorably situated along the streams, nor do they have to rely on the uncertain and varying supply of water from those streams. Installations have been successful at many scattered points throughout the western three-fourths of the state.

There is a vast field for developing pump irrigation in Nebraska where hundreds of thousands of acres meet all the requirements for successful irrigation. Practically all of the possibilities for the development of pump irrigation in the state are within areas comprising about 24 per cent of the total area of the state. This area supports 29 per cent of the total rural farm population of the state. Within this 24 per cent of the state's area, there are many areas both large and small which would be susceptible of successful pump irrigation because of favorable soil and topography and the availability of ground water.

Administration

Since the ground waters of Nebraska have not been declared public waters, there are no statutory provisions for their control or use. We have associated the underground water supply with the land for so long that now we regard the ownership of any land as including the underlying water supply as well. If no extensive uses were to be made of this supply, there would be no need of administrative measures. However, the demands made upon the underground water supply have shown a decided increase during recent years. Unregulated uses of this vital natural resource will eventually result in conflicting claims. The successful operation of new or amended laws will be better assured if the rights to use ground water have not become too extensively vested. Appropriate and timely legislation for the regulation of use will help greatly in eliminating probable future difficulties and will help in promoting the best use of this basic resource.

Likewise, according to Commissioner Page of the Bureau of Reclamation, Federal loans are available for pump irrigation only where the individual's right to appropriate the underground water is in accordance with proper statutory requirements for the regulation and protection of appropriators.

Without proper administration, the attempts to utilize the ground water may result in unsuccessful and costly experiments in attempts to irrigate in areas not suited for such enterprises. It may further prove harmful in depleting the supply much needed for domestic and municipal uses.

The successful administration of the ground water is by no means an easy task. In fact, it is one of the most intricate and complicated functions to come within the duties of any state agency. It must be considered in this light and undertaken in the most wholehearted and scientific manner.

With present-day techniques, it is now possible to determine the quantity of water available in any area and to identify such an area, to determine the source of supply, the direction of movement, specific yield, and the ultimate disposal of such water. The geologic factors affecting natural replenishment and depletions in each area must be carefully evaluated. Such a scientific study will reveal the amount of water that can be artifically withdrawn from a certain area without seriously disrupting the balance between inflow and outflow.

Appropriations should limit the quantity of water to be withdrawn in any season, the amounts corresponding with the duty of water in each particular area. The legal requirement for beneficial use in any area should be kept within the limits of the available supply. Provisions should be made to have the authorized state agency prepare annual statements of each well in operation showing elevations of water table, extent of draw-down, quantity and time water was used, methods of use and any other data which would be of assistance in administering effectively the laws relating to underground water. Legislation should prescribe penalties for wasting or contaminating the underground water supply.

Small Water Facilities

Nebraska with its thousands of miles of ravines and intermittent drainage courses has almost unlimited possibilities for developing small-scale water facilities to provide water for supplemental irrigation projects, water for farmsteads, and water for livestock. Water conservation facilities are of paramount importance in this state as a necessary aid to adjusting and improving existing land uses. This work should be undertaken only under the direction of technical assistants and on the basis of developing individual projects which form an integral part of the best plan possible for conserving and utilizing the water supply of the basin. Care should be exercised in order that each individual project will serve the greatest utility to the area involved.

The original approach to controlling and conserving water was to start with it after it had reached the stream channels. The more recent conception of water control in the interest of public welfare is to start where the rain falls - that is, before it has accumulated and while it is still in the controllable stage. The employment of one or more of the available methods of conserving moisture where it falls would materially increase individual farm feed and forage supplies, improve stock and domestic water supplies, and make possible large family gardens. Greater stability in these three items would make it possible for many farm operators to cope successfully with the prolonged droughts occurring in the western two-thirds of the state. Such control would also reduce the likelihood of floods.

Many devices, centuries old, could well be revived to accomplish the objectives listed in the foregoing paragraph. Small single or multiple field irrigation systems constructed on minor drainages, flood irrigation from many normally dry draws, local recharging of ground water supplies to make small pump irrigation projects possible, stock watering ponds, and stock and domestic wells are among the devices available for use in semi-arid regions.

The development of such devices is complicated by the fact that their design and construction often requires experienced or technical assistance not always readily available. As the need and demands for these small water facilities have been evidenced, agricultural agencies have developed organizations for the purpose of meeting the demand in a limited way as far as finances permit.

The early impetus to the development of small water facilities had originated from federal legislation authorizing such work to be undertaken cooperatively in a limited way by the agencies of the Department of Agriculture and through technical assistance furnished in areas included in Soil Conservation Districts. While assistance in areas designated for the small water facilities program is limited generally to those individuals without credit resources, there is no such restriction in the Soil Conservation districts.

FINDINGS AND RECOMMENDATIONS

Nebraska, comprising a part of the Great Plains, experiences all the agricultural risks common to this region. Since the land use problems of this state arise principally from undependable rainfall, thus preventing a secure establishment of agricultural economy, the effective conservation and utilization of the available surface and underground water supply becomes a matter of basic concern. Although individual and cooperative actions have resulted in notable progress during the current drought period, nevertheless, considerably more constructive action remains to be done. Rehabilitation and stabilization of agriculture in Nebraska can be accomplished only by the basic readjustments of the use of our land and water resources.

In general terms, a water conservation program for Nebraska should include:

1. Conserving moisture where it falls by use of the cropping practices developed by research and experience as particularly adapted to our soils and climate.

2. The extensive development of small water facilities with proper technical assistance. Such facilities to include small single or multiple field irrigation systems on minor drainages, flood irrigation from normally dry draws, local recharging of ground water supplies to make small pump irrigation developments possible, stock watering ponds and stock and domestic wells, etc.

3. Development of pump irrigation under statutory provisions to establish an orderly distribution of the underground water supply. Such provisions will insure maximum benefits from the available supply.

4. Construction of large-scale gravity irrigation projects (a) where feasible as to ability to repay total costs, (b) where the difference between the total cost and that portion of the cost which the land might reasonably be expected to repay could be financed by relief agencies under cooperative arrangements, or (c) where in the consideration of all possible phases of development of the water resources in a basin, such as flood control and irrigation, the portion of the total cost chargeable to irrigation is within the land's ability to repay.

5. Flood control dams as a part of a basin-wide plan of development for all water uses, including irrigation.

6. That some state agency be empowered to take an active part in the investigations and detailed planning necessary for the development of a comprehensive coordinated plan for the conservation of all available water wherever feasible.

The determination of the feasibility of large-scale gravity type irrigation projects as listed under item number 4 involves a number of factors some of which can be cleared up in existing records but many require detailed field studies to determine their effect on the feasibility of the project under consideration. The question of available water supply in the stream is generally a matter of record. Such questions as those of the best dam sites, acreage of suitable soils, and the portion with adaptable topography, require rather costly detailed field surveys. Such surveys have been and are being made by the several federal agencies with finances, organization, and legal authorization for such surveys. The conclusions contained in this report have been drawn from the best information available at this time, but, perhaps, further investigations will result in conclusions different from those herein presented.

In further explanation of item 4, it is noted that under the Reclamation law prior to 1939 all costs of reclamation projects were charged to irrigation with power revenues helping to repay the cost of construction and operation. Subsequent to the Reclamation Project Act of 1939, construction costs are alloted to irrigation, power and flood-control on the basis of probable benefits - with irrigation repaying only the amount allotted to it.

Also the Wheeler-Case law of 1939 authorizes the construction of projects with the aid of other Federal Relief agencies, but not to exceed the use of $1,000,000 for each project. This legislation providing for relief labor permits the construction of projects with costs in excess of repayment ability, and brings into the category of feasibility several projects which otherwise lack the necessary repayment ability.

PHYSICAL CHARACTERISTICS

LOCATION AND TOPOGRAPHY

LOCATION

The State of Nebraska is located a little north of the geographic center of the United States. The greater part of the State lies within the Great Plains; a vast eastward-sloping plateau located between the Rocky Mountains and the Central Lowland. In the eastern end of the State, a strip averaging 70 miles in width lies in the Dissected Till Plains section of the Central Lowland Province. This area approximately parallels the Missouri River. In Nebraska there are no well-marked surface features marking the boundary between the glaciated Central Lowland and the Great Plains. Along the eastern border in Nebraska the Great Plains merge into the more humid plains unmarked by any radical differences in altitude, topography, climate, or soil.

BOUNDARIES

The Missouri River is the only natural boundary of the State. It separates Nebraska from Missouri and Iowa on the east, and from South Dakota on the northeast. Political lines mark the boundaries between Nebraska and South Dakota on the north, Wyoming and Colorado on the west, and Colorado and Kansas on the south.

Nebraska extends from the 95th to 104th meridian west longitude and from 40th to 43rd parallel north latitude. The State is approximately 207 miles wide, 460 miles long with an area of about 77,520 square miles. The 100th meridian divides the State into 2 parts, approximately equal in size, and also into 2 different climatic regions.

TOPOGRAPHY

Nebraska has an expansive, gently rolling to rough topography. It is broken in places by low hills, occasional isolated buttes, mesas, "bad lands," ravines and several relatively shallow east-flowing streams. The most important streams of the State are the Missouri, Platte, Niobrara, Loup, Elkhorn, Nemaha, Blue and Republican.

The physical divisions of Nebraska as used in this report are the same as those developed by the United States Geologic Survey and Nevin Fenneman.

The surface of Nebraska slopes gently southeastward. The highest elevation of 5,340 feet is in Banner County, in western Nebraska, and the lowest point of 835 feet is in the extreme southeastern corner of Richardson County. The average decline in elevation from west to east is about 9 feet per mile. The average elevation of Nebraska approximates that of both the United States and the earth. These average elevations follow: (a) Nebraska, 2,547, (b) United States (excepting Alaska) 2,500 feet, and the (c) earth 2,800 feet.

PHYSICAL DIVISIONS

Nebraska lies wholly within a major physiographic division known as the Interior Plains, and is a part of the Great Plains and the Central Lowland provinces within the Interior Plains. Such divisions are based on similarity of surface features. Because of local differences in appearance, the area within the State is further divided into 4 sections known as the Missouri Plateau, the High Plains, and the Plains Border all within the Great Plains Province, and the Dissected Till Plains within the Central Lowlands.

(1) Missouri Plateau

The Missouri Plateau occupies only a small area in Northwest Nebraska amounting to approximately 3,400 square miles, or 4 per cent of the State. This region is so named because it is drained by the Missouri River and its tributaries. The Missouri Plateau has a topography resulting from degradation and extensive fluviatile terraces.

(2) High Plains

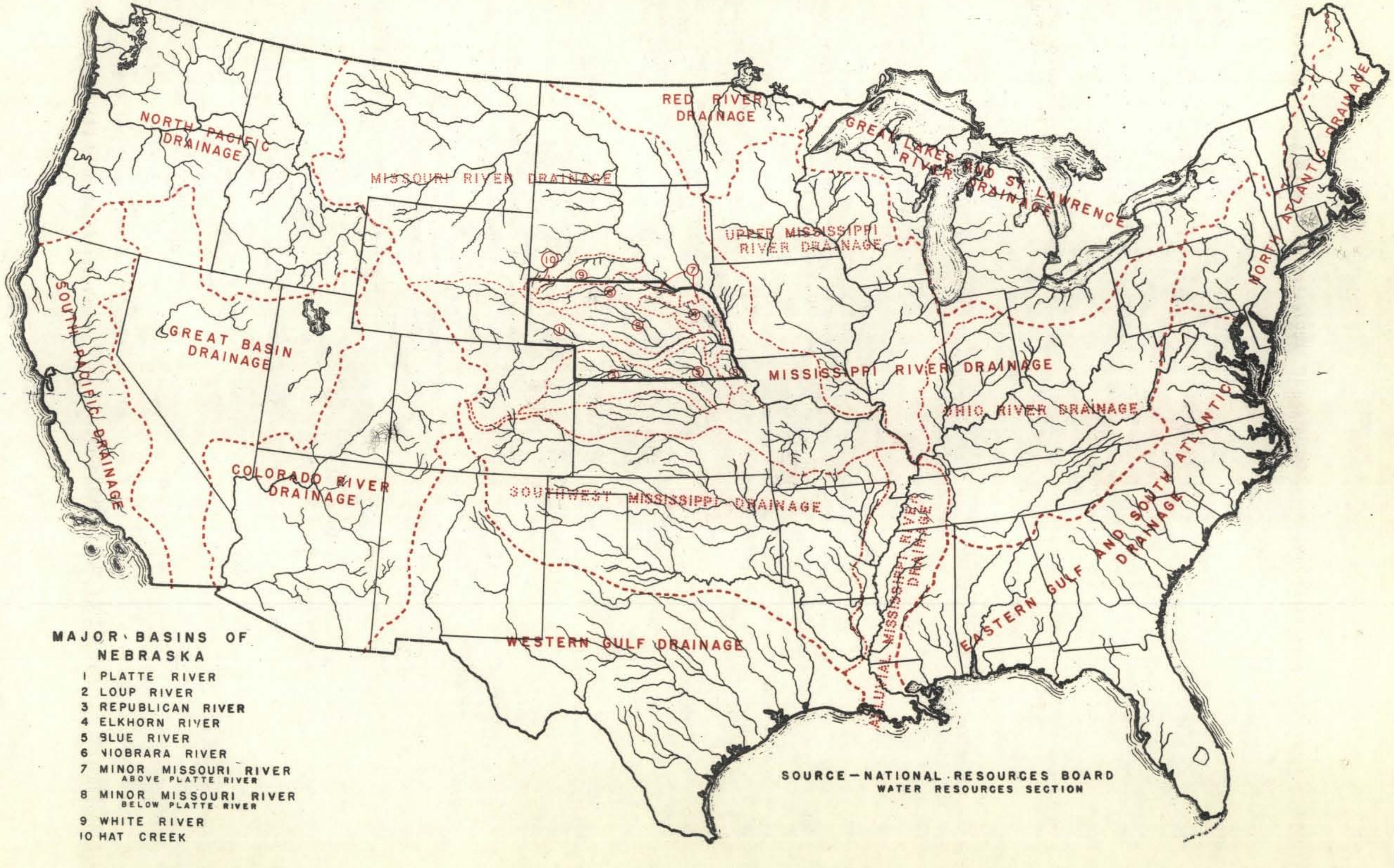
The High Plains Section as herein considered, comprises approximately 57,000 square miles or 74 per cent of the total area of Nebraska. This section extends from the 1,500-foot contour line, which approximately marks the eastern boundary of the Great Plains in Nebraska, to the base of the Rocky Mountains.

In the High Plains Section, flat-topped tablelands dominate the landscape. These are remnants of extensive depositional plains consisting of sands, gravels, and clays laid down by river outwash from the Rocky Mountains. The deposits range in thickness from 400 feet in the west to 100 feet in eastern Nebraska. In places the surface of the High Plains in Nebraska has been severely modified by erosion producing the Sand-Hill region by wind action and the Badlands by water erosion.

In western Nebraska the vertical walls bounding the Platte River Valley have been incised by tributary streams producing a series of promontories that project into the valley. Several such isolated buttes are known as Scotts Bluff, Chimney Rock, and Jail Rock. On the boundary between Wyoming and Nebraska, the North Platte River has widened its valley into a basin 20 to 30 miles across. This basin, surrounded by rather vertical walls, is known as Goshen Hole.

The Pine Ridge, a sandstone escarpment, forms a portion of the northern boundary of the High Plains. The abrupt drop to the north starts near Douglas, Wyoming and extends eastward for some 300 miles.

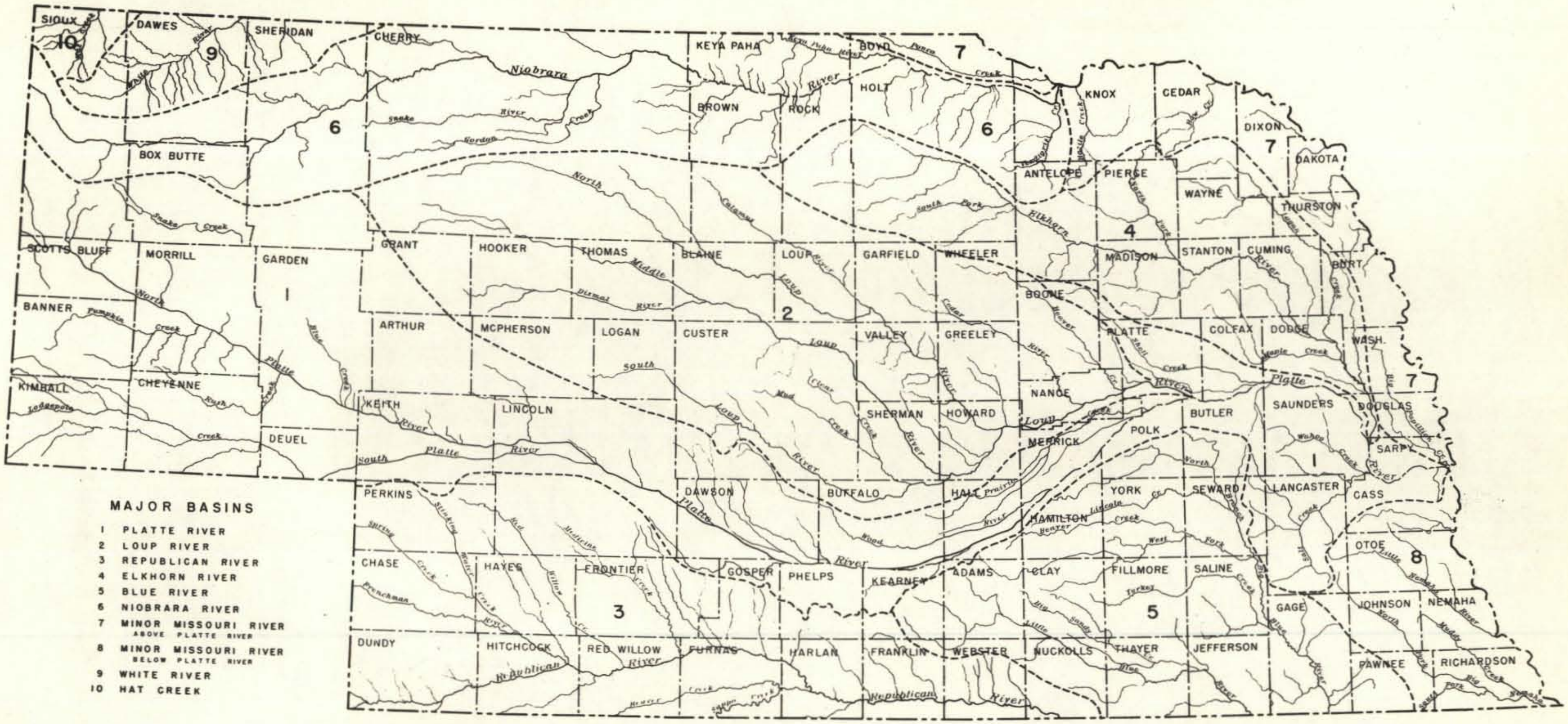
MAJOR DRAINAGE BASINS
NEBRASKA AND UNITED STATES



NEBRASKA STATE PLANNING BOARD

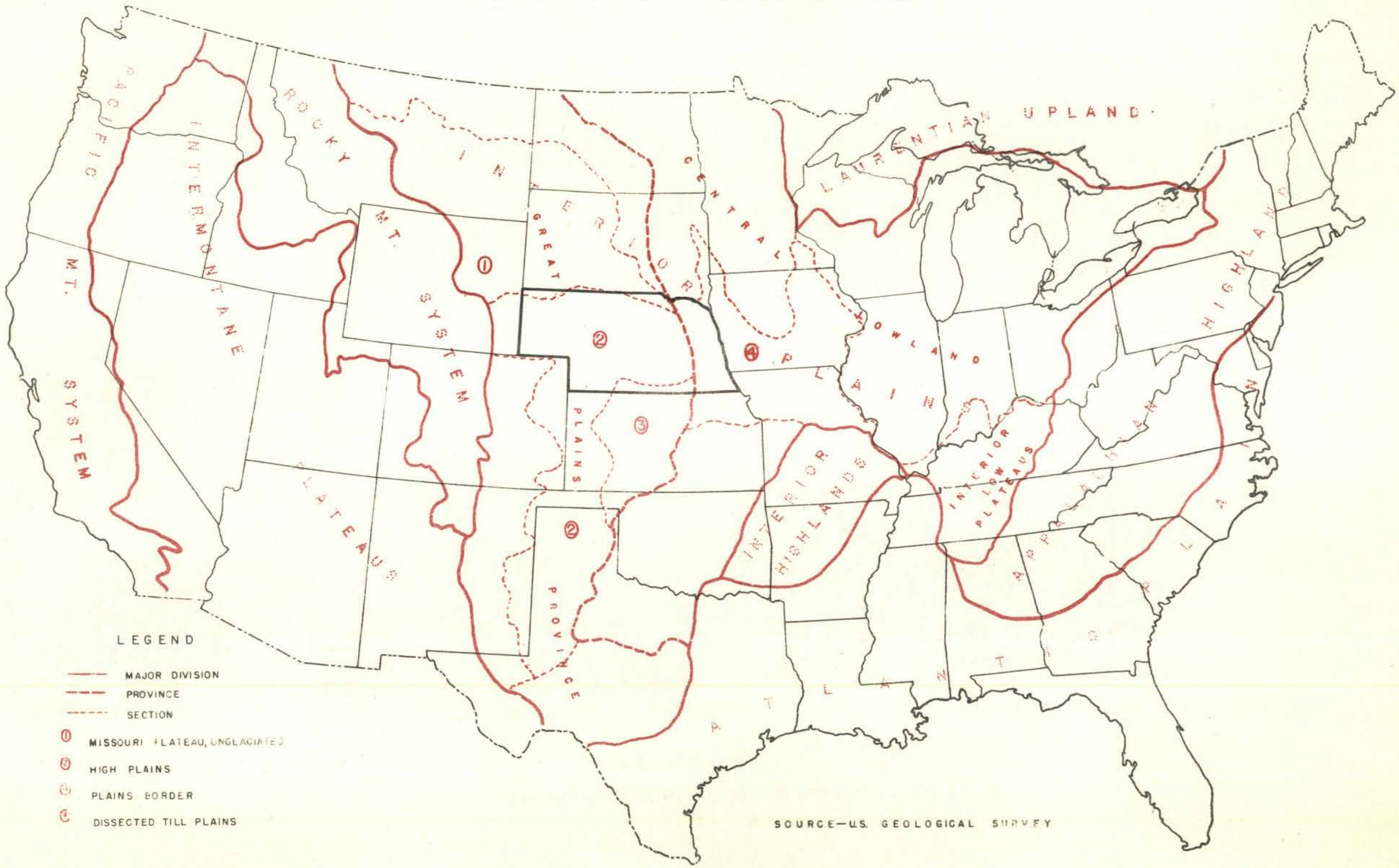
W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

MAJOR DRAINAGE BASINS
NEBRASKA

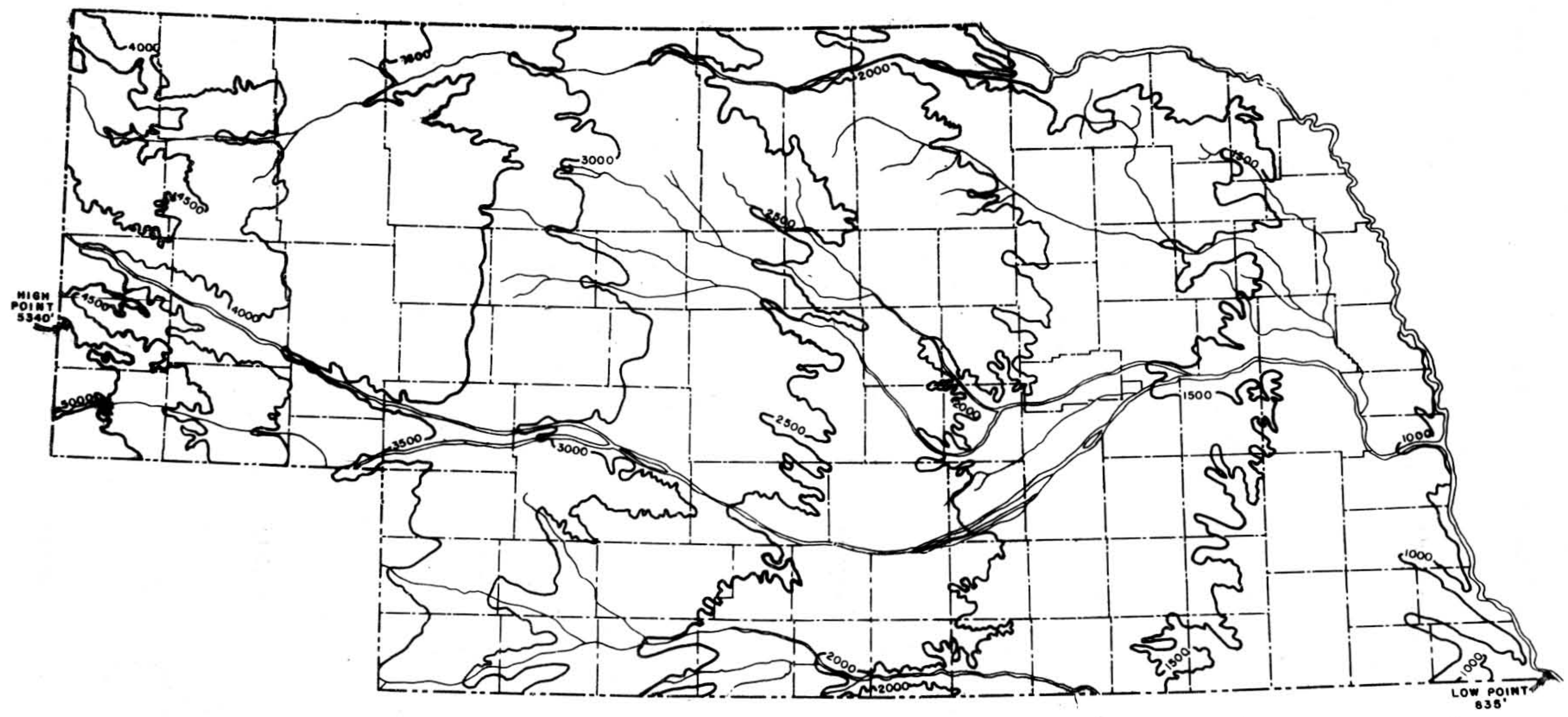


SOURCE: DRAINAGE BASIN DIVIDES AND STREAMS PLOTTED FROM U.S.D.A. AERIAL SURVEYS

PHYSIOGRAPHIC DIVISIONS
NEBRASKA AND UNITED STATES



CONTOUR MAP OF NEBRASKA



SOURCE – DIVISION OF CONSERVATION AND SURVEY
UNIVERSITY OF NEBRASKA

From Pine Ridge to the Platte River the High Plains are comparatively level, except for valleys of secondary streams and sand hills. In north-central Nebraska the High Plains include an area of approximately 20,000 square miles of dunesand. The main surface features of the region are sand hills, small basins, dry valleys, wet valleys, marshes, and lakes. The sand hills were formed locally by the wind erosion of the sandy underlying bedrock and sandy mantlerock. They vary in height from 25 to 100 feet or more. The finer material was carried farther east by the wind, making loess deposits often 100 feet in thickness in eastern Nebraska, Kansas, and western Iowa.

The High Plains, from the Platte River to the southern boundary of the State, are gently rolling throughout. On the eastern margin they merge imperceptibly into the Central Lowlands with occasional exceptions. The western edge of the Central Lowlands is continually being pushed westward by the erosion of the eastern margin of the High Plains.

(3) Plains Border

A relatively small part amounting to 3,900 square miles, or 5 per cent, in southeastern Nebraska lies within the Plains Border. This area consists of a strip of rough country lying between the High Plains on the west and the broadening Central Lowlands on the east. It is an area from which the Tertiary Mantle has generally been removed by erosion, and which is now dissected but not reduced to the low, flat relief which characterizes the Central Lowland.

(4) Dissected Till Plains

Glaciation greatly influenced the geography of eastern Nebraska. Thick layers of glacial drift were deposited east of a line extending south of Boyd to York and Thayer counties coextensive with the drift of the Kansan and Nebraskan glaciers. These deposits occupy about 13,220 square miles or 17 per cent of the total area of the State.

The Dissected Till Plains were so named because they are chiefly occupied by hills formed in glacial drift. Some of these hills are thinly strewn with boulders and some are deeply gullied, but generally their surface is comparatively smooth.

The surface of the Dissected Till Plains is modified by numerous creeks and rivers and by uplands and hills capped with loess. Among the valleys which break the topography are those of Wahoo, Salt, and Weeping Water creeks, the Little Nemaha and Big Nemaha rivers, the lower courses of the Big Blue and Little Blue rivers in southeastern Nebraska and the Elkhorn River and Logan Creek in Northeastern Nebraska.

TOPOGRAPHIC UNITY

Although the topography of Nebraska shows considerable diversity, it presents marked geographic unity in compactness of area, general geologic structure, efficiency of rainfall, and utilization of the land. In these respects the different sections of the region have more similarities than dissimilarities.

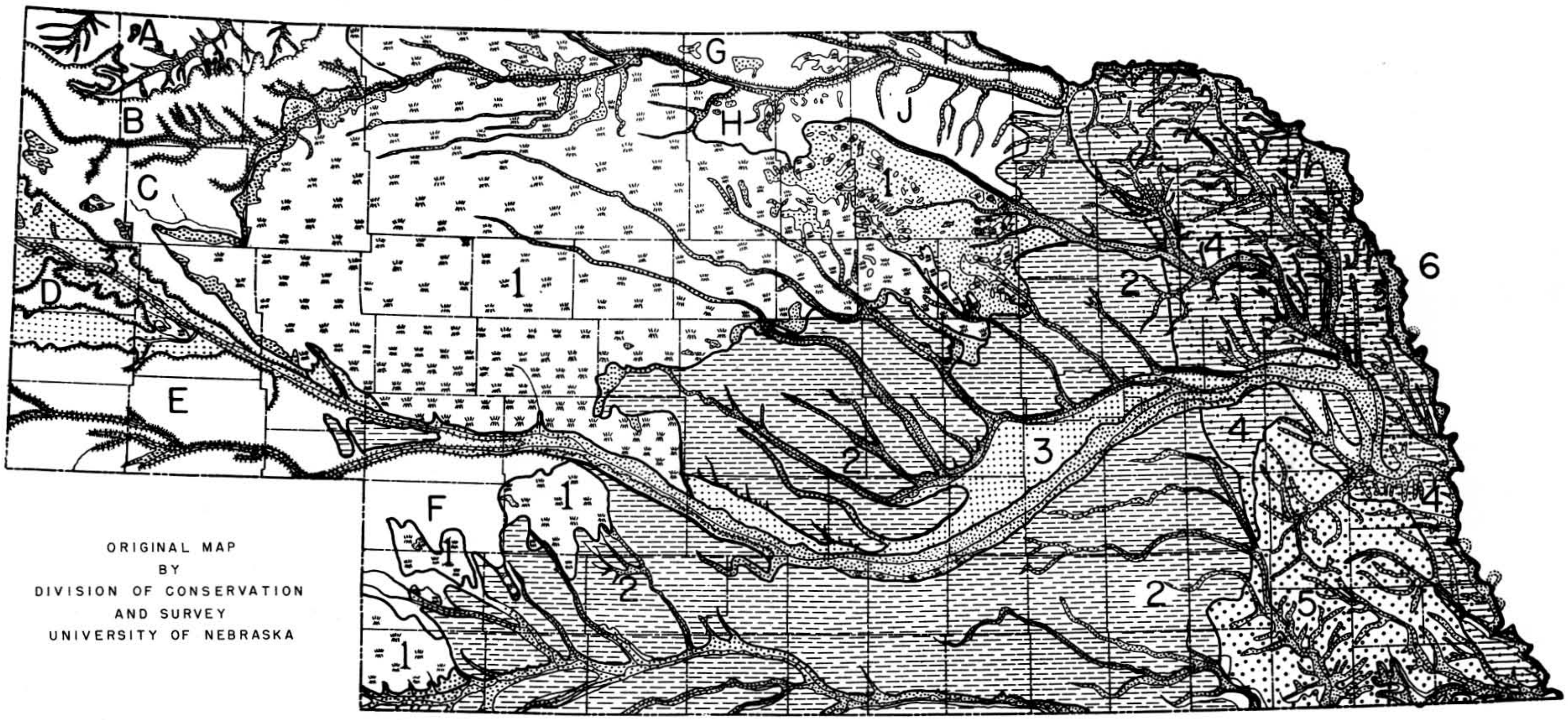
GENERAL GEOLOGY

A comparatively thick layer of mantlerock occurs over much of the State of Nebraska. Exposures of bedrock are limited to the tablelands and to the valleys of streams which have cut through the overlying mantlerock exposing the bedrock. The mantlerock, Pleistocene and recent in age, consists of relatively unconsolidated to loosely consolidated sedimentary material. During the Pleistocene Age eastern Nebraska was twice overridden by ice sheets; the first being known as the Nebraskan glacier and the second as the Kansan glacier. These ice sheets, upon melting and retreating northward, deposited the load of material which they had accumulated in their southward advance. The material thus deposited is a mixture of clay, silt, sand, and boulders known as till.

West of the area covered by ice, thick sands and gravels accumulated during the period of ice invasion. This accumulation was the result of increased precipitation, rapid erosion in the higher lands to the west, and deposition on the sloping plains of central Nebraska. The eastward-flowing streams were dammed by the advancing ice sheets, causing deposition of their load of sand and gravel. Subsequent to the second glacial advance, wind erosion increased during the dry periods of the Pleistocene resulting in the formation of the Loveland and Peorian loesses, which are accumulations of wind-blown dust. These extend over much of the area south and east of the Sand Hills. At the same time the dunesand of the Sand Hills was formed by the weathering and reworking of the sandy Tertiary bedrock and earlier Pleistocene sands and gravels.

The bedrock forms the platform upon which the mantlerock has been laid. The exposed bedrock includes, from oldest to youngest; the Permo-Pennsylvanian limestones and shales, the Dakota group of sandstones and shales, Graneros shale, Greenhorn limestone, Carlile shale, Niobrara chalk formation, Pierre shale, and Fox Hills-Laramie sandstones and shales. The above belong to the Cretaceous Age. The following bedrock formations; Brule-Chadron clays, Gering-Arikaree sandstones, and the Ogallala group limy sandstones, are of Tertiary Age.

MANTLE ROCK FORMATIONS
NEBRASKA

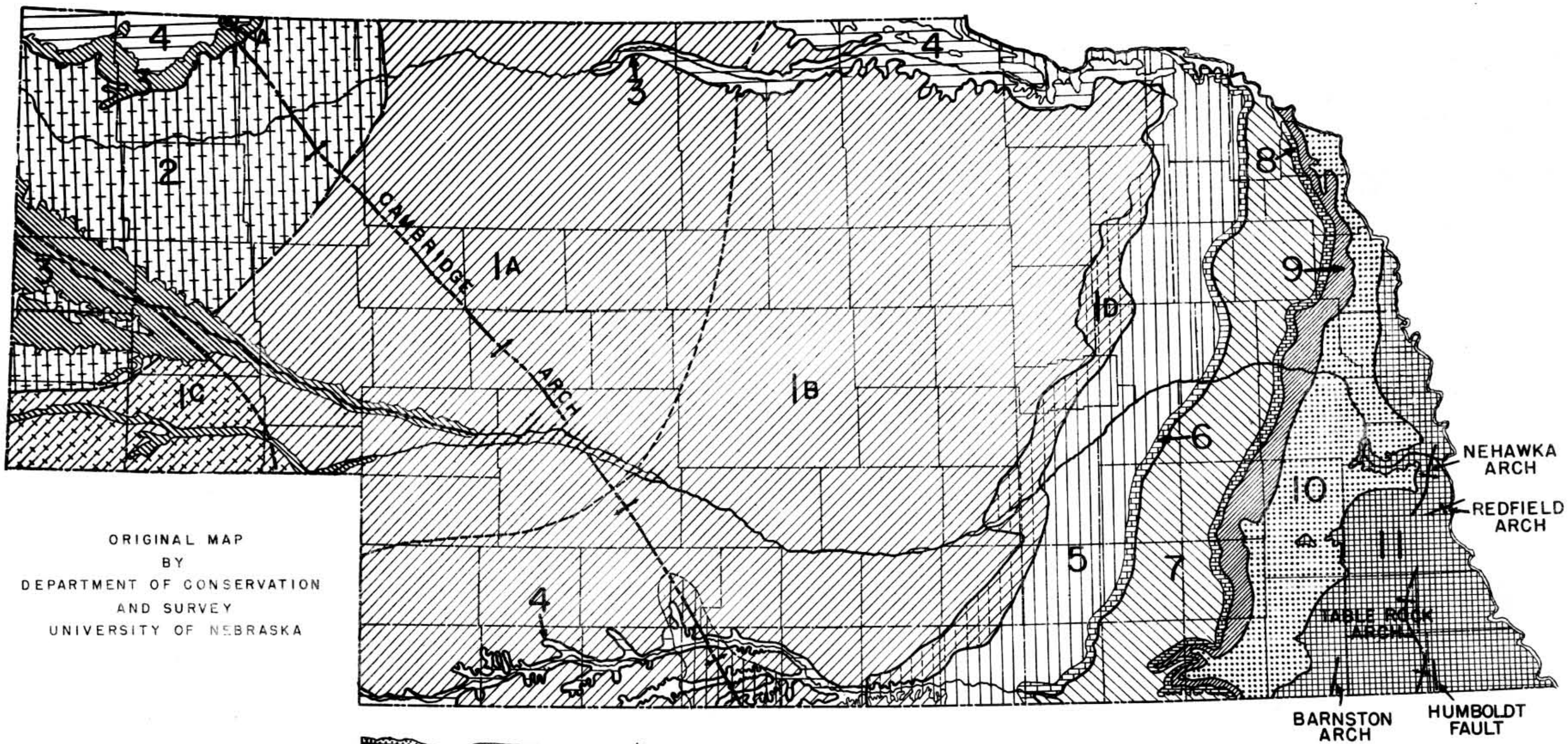


ORIGINAL MAP
BY
DIVISION OF CONSERVATION
AND SURVEY
UNIVERSITY OF NEBRASKA

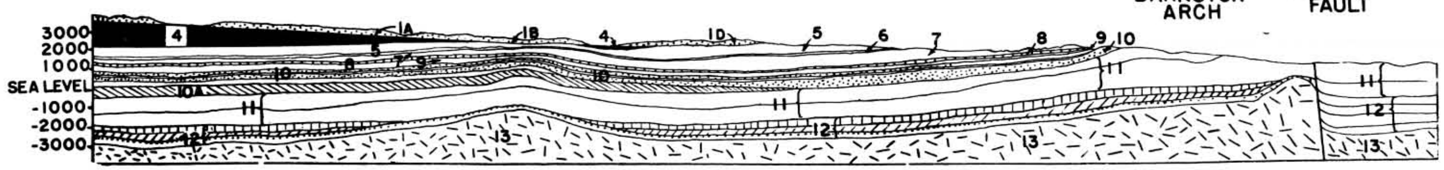
A-J AREAS OF LITTLE MANTLE ROCK: A-WHITE RIVER AND HAT CREEK BASINS, B-PINE RIDGE TABLE, C-BOX BUTTE TABLE, D-WILDCAT RIDGE, E-CHEYENNE TABLE, F-PERKINS TABLE, G-CROOKSTON-SPRINGVIEW TABLE, H-AINSWORTH TABLE, I-BOYD PLAIN, J-HOLT TABLE.

1-6 MANTLE ROCK AREAS: 1 DUNESAND AND SAND, 2-LOESS, 3-ALLUVIUM AND LOESS CAPPED TERRACES OF PLATTE VALLEY, 4-LOESS ON DRIFT, 5-DRIFT, 6-MISSOURI BOTTOMLAND ALLUVIUM.

BED ROCK MAP OF NEBRASKA



ORIGINAL MAP
BY
DEPARTMENT OF CONSERVATION
AND SURVEY
UNIVERSITY OF NEBRASKA



SECTION ON KANSAS—NEBRASKA LINE

NEBRASKA STATE PLANNING BOARD

W. P. A. O.P. NOS. 165-81-6999 AND 465-81-3-155

MAJOR SOILS OF NEBRASKA

The earliest soil survey in Nebraska was made in 1903 by the Federal Division of Soils, now known as the Bureau of Chemistry and Soils. In 1912 the first appropriation was made by the Nebraska Legislature for use in classifying and mapping the soils of the State, by counties, in cooperation with the Federal Bureau. To date all of the counties are mapped in detail except 8 in the sand-hill region which have been covered by a soil reconnaissance and in which detailed work is now in progress.

As soil surveying is a relatively new science, it had to be learned step by step. The topographic relations, the great variety of parent soil materials, and the climate and vegetation, all of which affect the character of the soil, had to be evaluated as they were encountered in the field and the whole system of soil classification and mapping was perfected gradually. Some of the earlier surveys were rather general and are being revised. The recent work is on a sound scientific basis.

In the county surveys the soils are classified (1) according to their various characteristics such as color and depth of topsoil, lime content, texture, consistence or degree of compaction, moisture retaining capacity, and infiltration rate and other features which have a bearing on their productivity, use suitabilities, and cultural requirements. Areas of the different kinds of soil are delineated on soil maps which also show the location of cultural and drainage features.

The soil map is accompanied by a report which includes information concerning the topography, drainage, and climate of the county, the agricultural development, and the character of the soils. Information on relative productivity, management requirements, suitability for different crops, and susceptibility to erosion of each soil is also included in so far as determined by field experiments and observations.

In making a soil survey it is necessary to group the soils into mapping units on the basis of their external and internal features. The three principal units are: (1) series; (2) types; and (3) phase. In places 2 or more of these may occur in such a mixed pattern that they cannot be clearly shown separately on a map but must be mapped as (4) a complex. In addition there are areas of land, such as dunesand, river wash, et cetera, which have no true soil and are called (5) miscellaneous land types.

The most important of these units is the series which includes soils that have developed from similar, although not necessarily identical kinds of parent material and that have the same genetic horizons arranged alike in the soil profile. Thus, a series includes soils having essentially the same color, structure, and other important internal characteristics and the same natural drainage conditions and range in relief. The texture (2) of that portion of the soil commonly plowed may vary within a series. The series are given geographic names taken from localities near which they were first identified. Marshall, Carrington, Holdrege, and Crete are the names of important soil series in Nebraska.

Within a soil series are 1 or more soil types defined according to the texture in the upper part of the soil. usually to about the plow depth. The name of the soil texture to this depth. such as silt loam, clay loam, sand or fine sandy loam, is added to the series name to give the complete name of the soil type. For example, Marshall silt loam and Carrington fine sandy loam are soil types within the Marshall and Carrington series, respectively. The soil type is the principal unit of mapping, and because of its specific character is usually the unit to which agronomic data are definitely related.

A phase of a soil type is a soil which differs from the type in some minor feature, generally external, that may be of special importance in land use. Unusual variations in the relief or in the amount of stone on the land may necessitate the recognition of rolling, hilly, or stony phases of any given soil type.

To date, about 425 different kinds of soil, representing soil types and phases of 64 soil series, are recognized in Nebraska. In addition, several miscellaneous land types are mapped. These include badlands, dunesand, marsh, river wash, rough-broken land, and rough-stony land, all of which influence the agriculture in the localities of their occurrence.

The Generalized Soil Map of Nebraska, Plate VII, shows the general distribution of the more extensive soil series in the State. In the following paragraphs brief descriptions of these series are given and a few crop adaptions are explained.

BOYD SERIES

The Boyd soils have developed on bluish-gray, dense-clay shales of the Pierre formation over large areas in South Dakota and tracts of considerable size in northeastern and north-central Nebraska. They occupy areas ranging from nearly level to hilly and broken, but most of them, in this State, are on steep valley sides where run-off is rapid and erosion is severe. These soils receive enough precipitation to support a mixture of plains and prairie grasses and produce rapid vegetal decay but the moisture does not penetrate the ground deeply.

The soil section is composed mainly of heavy intractable clay although the surface layer, which averages about 8 inches in thickness, has an abundance of decomposed grass remains in the smoother areas where it is almost black. Its high organic-matter content makes this layer quite friable when moderately supplied with moisture. When extremely wet or dry, the Boyd soils are difficult to handle. Most of them are immaturely developed and rest on the parent shale within a depth of 3 feet. They are limy below 12 inches, and, except in severely eroded areas, there is a noticeable zone of lime accumulation in the subsoil. Their water-holding capacity is high but they absorb moisture slowly and the greater part of the precipitation runs off or evaporates without materially benefiting the vegetation.

Owing to their generally unfavorable surface features, slow moisture absorbing rate, and to their intractable nature except under favorable moisture conditions, most of these soils are better suited for the production of pasture and hay grasses than for cultivation. They contain variable quantities of selenium which is highly toxic to animals and which in some areas is taken up by plants in amounts injurious to livestock. Corn, oats, millet, and sorgo are grown on the smoother tracts where they do fairly well in seasons of normal or above normal precipitation, but the land is rather droughty and crop yields are lower than on more friable soils.

BUTLER, FILLMORE, AND SCOTT SERIES

These soils, only the larger areas of which are indicated on the accompanying map, owe their features mainly to poor or imperfect drainage. They are principally in small shallow basins, locally known as "buffalo wallows" or "lagoons", scattered throughout the finer textured and more nearly level-lying soils of the uplands and terraces. They have developed on loess, a light-colored floury silt, which has or formerly had, some lime. The Scott soils are also developed on limy clays and fine-grained sandstones. They have the poorest drainage of any soils on the uplands or terraces in Nebraska. Storm water collects in the basins where they occur and often remains on the surface for several weeks, disappearing slowly through seepage and evaporation. The Fillmore soils are in poorly drained basins but have not been subjected to such prolonged inundations as have the Scott. The Butler soils are mostly in barely perceptible basins, and on nearly level areas where drainage is imperfect but where water stands on the land only at places and for short periods. In eastern Nebraska some of the Butler soils are on slight slopes where surface drainage, although good, is slow.

Differences in the drainage conditions have caused marked differences especially in the subsoil layers of these soils. All of the subsoils have a well developed claypan due to the downward translocation of clay by percolation waters. In the Scott types the claypan is very thick, is bluish-gray and is thoroughly leached of lime, whereas in the Fillmore and Butler types it is much thinner, is almost black and has a well-developed zone of lime accumulation near its base. The surface soils of the Scott and Fillmore types are dark and mellow, especially in the upper part, and at most places rest on the claypan within depths of 6 and 8 inches respectively. The surface layers of the Butler types average about 15 inches thick, and are separated from the claypan by several inches of friable subsoil material. They contain an abundance of silt and are friable throughout.

Most areas of Scott or Fillmore soils are unsuited for cultivated crops on account of poor drainage and the shallow depth to the claypan. They are chiefly suitable for native pasture and hay land.

The Butler soils, as a whole, are well suited for the production of all crops commonly grown in the State. Their general productivity may be somewhat reduced in dry years by the relatively impervious claypan layer, but most of them are in southeastern Nebraska where the precipitation is sufficient to largely offset the deleterious effect of this layer.

CARRINGTON AND SHELBY SERIES

The Carrington and Shelby soils are on strongly rolling to hilly uplands in southeastern and northeastern Nebraska where they have developed from the weathered surface of glacial drift. They also occur in Iowa, Missouri, and Minnesota. The drift is extremely variable in texture but generally contains considerable amounts of coarse material including gravel and boulders of various sizes mixed with its more abundant silt and clay constituents. It was left by the ice during glacial times and was later covered by Peorian loess. The loess was subsequently removed over considerable areas by erosion, exposing the drift to weathering and soil development.

All areas occupied by Carrington and Shelby soils have adequate surface drainage. On most of the steeper slopes rapid run-off has caused considerable erosion in cultivated fields. The Carrington soils are in the less steeply sloping areas. They have maturely developed profiles including very dark, granular, and friable surface soils from 10 to 15 inches thick, underlain by brownish, moderately heavy subsoils which rest on weathered drift at about a 4-foot depth. The entire soil section has been leached of its lime. These soils are suited to any crop commonly grown in eastern Nebraska. Nearly all of them are under cultivation, chiefly for corn. They have a higher clay content and slower infiltration rate than some of the associated more friable soils developed on loess. However, they are in the highest precipitation belts of the State where moisture is sufficient for satisfactory yields, even on the heavier soils, except during the driest years. At places their surface layers are slightly acid.

The Shelby soils are on the steeper slopes and sharper hill and ridge-tops where rapid run-off has prevented the development of mature soils or has subsequently removed much of the developed soil material. They are everywhere immature with thin-dark to light-colored surface layers. At most places they rest on drift within a depth of 2 feet. Locally the drift is exposed. These soils are not well suited for cultivated crops owing chiefly to their shallow nature, unfavorable surface features, and rather low organic-matter content. Locally, they contain an abundance of coarse glacial gravel and boulders. They erode rapidly under tillage unless carefully managed but are well suited for pasture land.

CRETE SERIES

The Crete soils are on nearly level tablelands mainly in south-central Nebraska and the adjoining part of Kansas. They have developed on Peorian loess under the influence of a moderate precipitation, slow surface and under-drainage and a mixture of plains and prairie grasses. They have almost black, silty, and friable surface soils, from 12 to 14 inches thick. The upper part of the subsoil is a brownish, almost impervious claypan produced by fine mineral material released mainly from the overlying layer and carried down by percolating water. The lower part of the subsoil, a zone of lime enrichment, consists of friable silt or silty clay containing an abundance of lime. It rests at a depth of about 40 inches on the parent loess, which may or may not be limy.

Within areas of Crete soils are numerous shallow, poorly drained basins occupied by Scott, Fillmore, and Butler soils. Small undulating areas of Hastings soils and narrow steeply sloping strips of Colby soils are too small for differentiation on the accompanying map.

Prior to 1923 areas now known to be occupied by Crete soils were shown on the county soil maps as Grundy soils which are no longer recognized in Nebraska.

Although the Crete types include a claypan in their subsoils, they are in a region where the precipitation is sufficient for satisfactory yields of most crops and practically all of them are under cultivation. Wheat and corn are the principal crops. Wheat usually does better than corn because it matures earlier in the summer while the moisture stored above the claypan from winter and spring precipitation is sufficient to maintain normal or near-normal growth. The claypan and underlying layers of this soil probably do not supply much moisture to grain crops.

DAWES AND DUNLAP SERIES

The Dawes and Dunlap soils are on nearly level to gently sloping areas and in shallow sags or basins, scattered over the uplands in western Nebraska. They have developed under the influence of a low precipitation, short plains grasses, and slow surface and under-drainage, mostly from limy Tertiary sandstones and clays. Some of them have developed, in part at least, from wind-blown silts deposited since Tertiary times.

The surface layers of these soils are dark brown, being somewhat lighter in color than those of soils on similar relief farther east. They are everywhere friable, are composed at most places mainly of silt and range from 9 to 12 inches in thickness. The subsoils in the Dunlap types are thick and moderately heavy with a friable zone of lime enrichment beginning at about a 3-foot depth. Those in the Dawes soils are thin with a heavy claypan layer in the upper part and the friable lime zone begins at about a 2-foot depth.

Practically all areas of these soils are under cultivation. The Dunlap types, which are chiefly in the northwestern part of the State, are among the most productive dry-farming soils of the uplands in that region. They are used chiefly for growing winter wheat, rye, oats, and potatoes, which yield profitably except in the driest years. The Dawes soils, chiefly located in southwestern Nebraska, are used mainly for corn and winter wheat production, but to some extent for growing sorgo. Their heavy claypans limit the storage of readily available moisture largely to the surface soils which may become too dry for profitable corn yields in seasons of subnormal precipitation. Where they occupy depressions, however, the Dawes soils seldom dry out sufficiently to cause total corn failures. They are only slightly inferior to the Dunlap soils for wheat production and are well suited for growing sorgo.

DUNESAND AND THE VALENTINE, GANNETT, AND ANSELMO SERIES

Dunesand and the soils of the Valentine, Gannett and Anselmo series, collectively, occupy several thousand square miles in the vast sand-hill region of north-central and southwestern Nebraska and adjacent part of South Dakota and Colorado. Throughout this region the land is mantled with sand or extremely sandy soil absorbs practically all of the precipitation as rapidly as it falls. Despite the coarse texture of its surface this land is not droughty. The sandy materials act as highly efficient reservoirs for the storage of moisture for plants. They not only absorb the precipitation but permit little moisture to be lost through evaporation, and in the climatic region of their occurrence, are able to hold most of the absorbed water until it is needed by the vegetation. Even the most sandy material of the region can hold at least 6 inches of water within a depth of 6 feet where it is accessible to the roots of most plants. Since this material continually delivers moisture to the vegetation during the growing season, a close balance is maintained between the amount of water taken in from precipitation and the amount removed by plants. Thus, not much of the moderate rainfall can seep to the water table during that season. Most of the water reaching surface drainage in the sand hills percolates below the reach of plant roots when the vegetation is dormant. Were it not for their unstable nature under tillage and low supply of plant nutrients, many of the soils in this region would be better suited for cultivated crops than are most "hard-land" soils which lose more than half of the precipitation through run-off and evaporation even on the smoother areas.

Dunesand, although not a soil, is far more extensive than any of the soils in the sand-hill region. It consists of a monotonous succession of irregularly distributed hills and ridges which are composed entirely of gray sand or are thickly capped with this material. The higher intervening sand valleys, pockets, and swales are occupied by the Valentine soils, and the lower and moister ones by the Gannett soils which lie at or near the level of the water table. The Anselmo soils are in the broad well-drained valleys mostly between the sand-hill and loess regions, where they have developed on mixtures of sand and loess.

Owing largely to the resistance of their sandy parent materials, none of these soils have well developed zones or layers of true soil character. Aside from the Gannett types they are low in lime, have accumulated little organic matter, and have thin, light-brown surface soils. The subsoils in the Valentine types consist of incoherent gray sand, whereas the corresponding layers in the Anselmo soils are composed of light-brown fine, sandy loam to loamy sand. The Gannett types have developed under excessive moisture, and the rapid growth and decay of tall grasses, rushes, and sedges. These types have thick, highly organic and almost black surface layers overlying water-logged sand subsoils in which occurs a thin greenish-blue layer of sandy clay at or near the top of the water table. They are faintly limy in most places.

Except locally, the region occupied by dunesand and associated sandy soils is better suited for pasture and hay land than for the production of cultivated crops. The largest cattle ranches of the State are located in this region. The utilization of dunesand and the greater part of the Valentine soils depends almost entirely upon preservation of the grass cover. When cultivated, the sand drifts and the land becomes useless even for grazing purposes. The Sand Hills are well grassed at present, except locally. They include some of the most dependable grazing land in Nebraska.

The Gannett soils are too wet for cultivation but rank among the most productive for native hay in the plains region. They supply most of the hay used for carrying cattle through the winter months in the Sand Hills.

The greater part of the Anselmo soils is fairly stable under cultivation and is used chiefly for growing corn. These soils give profitable yields even in the drier years. They usually occupy only a small part of the ranches on which they occur.

EPPING AND ORELLA SERIES

The Epping and Orella soils are in northwestern Nebraska and adjacent parts of Wyoming and South Dakota where they occur over limy Tertiary clays and silty clays; chiefly in undulating to rolling areas. Many of them are on steep and gentle slopes. A part of the Orella soils in Wyoming are in valley-like situations. All types of these series are developing under a low precipitation, short plains grasses, and slow vegetal decay. The Epping soils are on the more silty and less variegated beds of the Brule and Chadron formations; whereas, the Orella types are mostly on the more variegated (gray, green, and red) clay and sandy clay beds of the Chadron formation which underlies the Brule.

These soils are very immature with thin grayish-brown to dark grayish-brown, silty to clayey surface soils that are low in organic matter and rest on the parent formations usually within a depth of 9 inches. They have slow infiltration rates and the greater part of the precipitation runs off or evaporates without greatly benefiting the vegetation. Most of them erode easily and the areas include exposures of the underlying parent material which give the land surface a spotted dark and light appearance. They are developing on the same formations from which the badlands of South Dakota have eroded and at places include patches of incipient badlands in Nebraska.

None of the Epping and Orella soils are well-suited for dry-land farming, chiefly on account of the thin surface soil and slow infiltration rate. Many tracts are too gullied for cultivation. Some of the smoother areas are used for growing wheat and rye but satisfactory yields of these crops are obtained only in years of high precipitation. The greater part of the land is still covered with buffalo and grama grasses and is included in pastures. The grazing value of the range on the Epping is slightly higher than that on the Orella soils. In Goshen County, Wyoming some of the lower and more nearly level-lying Orella types are used for growing sugar beets under irrigation.

HASTINGS SERIES

The soils of the Hastings series are transitional in character between the Crete and Holdrege soils. They are on the nearly level to undulating loess-mantled uplands in east-central Nebraska where they have developed under an annual precipitation of from 24 to 28 inches, good external drainage, and a vegetal cover consisting chiefly of prairie grasses.

The surface soils, which average about 14 inches in thickness, have accumulated much organic matter through the decay of grass roots, which makes them almost black. They are very friable. The silt loam texture predominates. The upper part of the subsoil has received considerable clay, carried down from the surface layer by percolating water. It is heavier than the corresponding layer of the Holdrege types but is not as dense as the claypan in the Crete soils. It is easily penetrated by air, moisture, and crop roots. The lower part of the subsoil, beginning at an average depth of 4.5 feet, is a zone of lime enrichment. It consists of light-gray, friable and highly-calcareous silt or silt loam which merges into the parent Peorian loess at about a 6-foot depth.

The Hastings types rank among the most productive soils on the uplands of Nebraska for corn, wheat, oats, alfalfa, and other crops commonly grown in the eastern and central parts of the State. Their silty stone-free nature, high organic-matter content, good drainage, and, except locally, their freedom from excessive wind or water erosion combine to make them well suited for general farming purposes.

HOLDREGE AND COLBY SERIES

The soils of these series occupy most of the loess-mantled uplands in central and south-central Nebraska, and cover large areas in Kansas. The Holdrege types are on the nearly level to gently rolling areas where conditions have been favorable for normal soil development. In most characteristics they are similar to the Hastings soils. The precipitation, however, is slightly lower, the grass growth is a little less luxuriant, and vegetal decay, although sufficiently rapid to supply an abundance of organic matter, is somewhat slower than in the Hastings soil region. As a result of these differences, the surface soils of the Holdrege types, although almost as black as those of the Hastings, are a trifle thinner, averaging only about 12 inches in depth. The subsoils have received less clay and are more friable than those of the Hastings soils and the zone of lime enrichment lies higher in the soil section, usually between depths of 36 and 48 inches. The Holdrege soils rest on limy Peorian loess similar to that on which the Hastings soils have developed.

The Colby soils of this State are mostly within larger areas of Holdrege soils, but occupy steeply sloping areas where rapid surface run-off removes the products of soil development almost as fast as formed, and keeps the raw, limy loess at or near the surface of the ground. In Nebraska, the Colby soils are chiefly in hilly areas adjacent to deeply entrenched streams and on the steeper slopes of valleys and canyons which have extended through headward erosion into the Holdrege soil areas. Their surface layers are silty but very thin and at most places are light colored. They rest, usually within a depth of 6 inches, on the parent loess. Many of the steeper slopes within areas of these soils, are characterized by short vertical breaks, known as "cat steps", caused by soil slipping.

In Kansas, the Colby soils, although formed on loess, are in a more westerly and drier region than they are in Nebraska, and on smoother terrain. There they are fully developed and owe their features more to the semiarid climate than to erosion.

The Holdrege and Colby soils of Nebraska, although closely associated, differ widely in use capabilities. The Holdrege types are well suited for general farming. They are as productive as any of the soils on the uplands in the climatic region of their occurrence and are used for growing all the staple crops commonly produced in the State. They give somewhat lower yields than are obtained on the best soils of upland areas farther east, but this is owing more to the lower precipitation in the Holdrege region than to any deficiency in the soils.

The Colby soils are not well suited for cultivation chiefly because of unfavorable relief, low organic-matter content, and susceptibility to erosion. Most areas of these soils are included in pastures, although hay and cultivated crops are produced on the more gradual slopes.

HOLT SERIES

The Holt soils are on soft, light-colored, and limy sandstone of the Ogallala formation in northeastern and north-central Nebraska and adjacent parts of South Dakota. They occupy uplands ranging from undulating to steeply sloping or hilly. In this State most of them are in areas of rolling to strongly rolling relief. The precipitation under which they have developed has been sufficient to support a mixture of prairie and plains grasses, and to promote moderately rapid vegetal decay.

The Holt soils are everywhere friable. In their more nearly level distribution, their surface layers are thick, well supplied with organic matter, and very dark. Loam, or one of the sandy-loam textures predominate in most places. The subsoils, which are rather thin, consist of light-colored, fine sandy loam to sandy loam with a pronounced zone of lime enrichment in the lower part. They gradually become coarser downward and at about 3 feet merge with the underlying sandstone, fragments of which may occur throughout the soil section.

In their more steeply sloping or hilly distribution the surface layers of these soils, although dark, are thin; the subsoils are rather poorly developed with barely perceptible zones of lime enrichment, and the sandstone bedrock is usually within a depth of 2 feet.

All types of this series absorb the precipitation readily. Considering their shallow profiles, they have high moisture-holding capacities. On the more nearly level areas they are admirably suited for general farming and practically all these areas are under cultivation. Corn is grown chiefly. The rougher areas are suitable mainly for pasture land. In some of them the surface soils are rather sandy and have a tendency to drift when the protective grasses are destroyed.

KEITH AND COLBY SERIES

The Keith soils are on the most westerly part of the smooth loess-mantled uplands in Nebraska; and occur extensively in western Kansas. They resemble the Holdrege soils in many respects but have developed under the influence of a drier climate, less abundant vegetation consisting mainly of short plains grasses, and slower vegetal decay. The rather low precipitation of from 18 to 20 inches, has not penetrated the ground deeply. As a result of these influences the surface soils, which average about 10 inches in thickness, are dark brown instead of almost black as in the Holdrege types. The silt-loam texture predominates. The upper part of the subsoil is composed of brownish-gray friable silt loam. The lower part; as in all normally developed soils of central and western Nebraska, is the zone of lime enrichment. It begins usually at about a 30-inch depth, consists of grayish-white limy and floury silt and extends downward 8 or 10 inches where it rests on the parent Peorian loess.

The Keith types are among the best dry-farming soils on the uplands in the western parts of Nebraska and Kansas. Nearly all the area occupied by them is used for growing corn, wheat, and oats. Some sorgo is also produced. The yeilds vary in proportion to the amount of available moisture, which is the chief farming hazard in this region. These soils have sufficient nutrient reserve to permit higher crop yields than the precipitation can maintain. In years of normal or subnormal rainfall they are considerably less productive than the Holdrege soils, which are farther east. In wet years, crops on the Keith types may produce more than double their average yields.

The soils of the Colby series bear the same relationship to both the Keith and the Holdrege soils. They occupy the rougher, more severely eroded parts of the loessial uplands in both the Holdrege and Keith soils areas, and are described in connection with Holdrege soils.

MARSHALL AND KNOX SERIES

The Marshall and Knox soils are mainly in eastern Nebraska and western Iowa where they have developed, or are developing, on upland areas of Peorian loess in a region of rather high precipitation and rapid vegetal decay--the Marshall under prairie grasses and the Knox under both grass and forest growth. A modified form of the Marshall types occurs locally in north-central Nebraska on unusually thin loess deposits overlying sand.

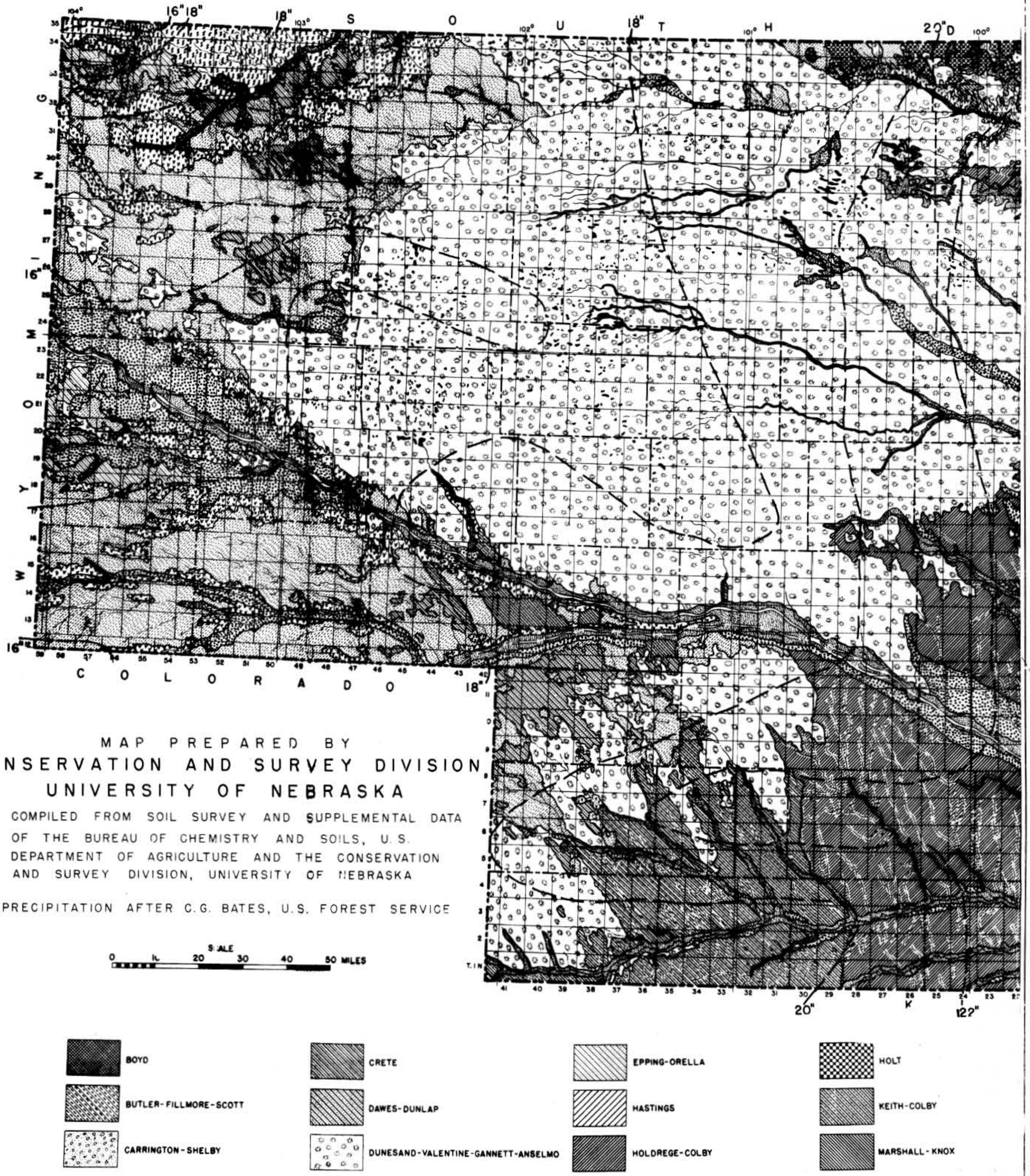
The relief in areas of these soils ranges from nearly level to extremely rough and broken. The Marshall types are in undulating to rolling areas where water run-off has not prevented the accumulation of organic matter. They are everywhere well drained. In many of the cultivated fields they are subject to considerable erosion. The surface soils range from about 10 to nearly 20 inches in thickness, the depth depending on the erosion conditions both during and subsequent to their development. They have accumulated an abundance of organic matter, are nearly black and are granular and friable throughout. The silt-loam texture predominates. The upper part of the subsoil is brown, and although less granular than the overlying layer, is very friable. It rests on light-brown silt loam of the lower subsoil which merges with grayish-white floury silt of the parent Peorian loess at depths ranging from 4 to 6 feet.

The Marshall soils are rather low but not deficient in lime. In most areas of these soils there are places where part of the lime, formerly present in the parent loess still remains in the lower part of the soil section.

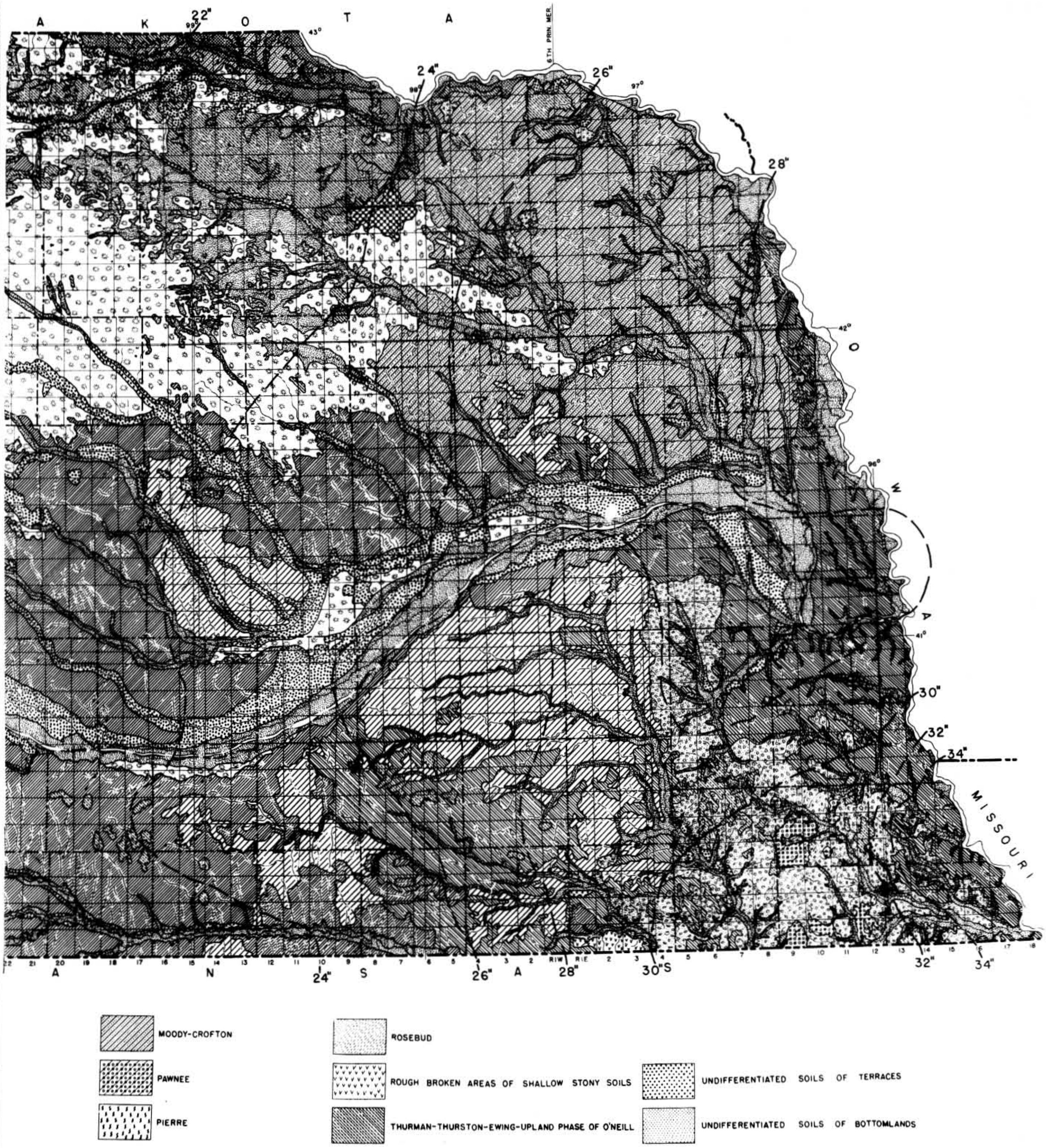
The Marshall soils are commonly regarded as the best general farming soils of the uplands in Nebraska. Most of the area occupied by them has been under cultivation since early settlement. They are well suited for growing all the staple crops commonly produced in the State.

The Knox soils occupy those parts of the loess-mantled upland where erosion has prevented the development of Marshall soil or has removed all or part of the Marshall profile subsequent to its development. They are chiefly in steeply sloping and rough and broken areas bordering deep drainage ways. Some of the largest developments are in the blufflands along either side of Missouri River. These soils are mostly timbered, although some areas in cultivated fields formerly supported a grass cover. They consist mainly of slightly oxidized, brownish-colored floury silt, the top 4- to 6-inch layer of which may or may not be darkened by organic matter. Most of the Knox soils are limy to or near the surface of the ground.

GENERALIZED
NEBR



SOIL MAP
ASKA



The greater part of the Knox soil area is included in pastures and woodlands although a large percentage is under cultivation or in orchards. These soils are highly productive considering their shallow character and low organic-matter content. Under careful management, designed to retard erosion and supply nitrogen, they are well suited for growing the staple farm crops wherever the land is not too steeply sloping for cultivation. They are admirably suited for apple and grape production.

MOODY AND CROFTON SERIES

The Moody soils have developed under mixed plains and prairie grasses from unusually limy loess deposits and are very dark and friable. They occupy nearly level to strongly rolling uplands over most of northeastern Nebraska and the adjacent parts of Iowa, Minnesota, and South Dakota. All of them have good surface and under-drainage, the former being rather rapid and causing considerable erosion in places. These soils have almost black surface layers and are somewhat similar to the Holdrege soils of south-central Nebraska and northern Kansas but differ from them in having slightly thinner surface soils and more limy subsoils. Their outstanding feature, and the one which serves to distinguish them from most other loess-derived soils, is a subsoil zone, which is unusually rich in small lime concretions. This zone, which is very light-colored, rests on extremely limy loess at about a 30-inch depth. The loess has few or no lime concretions.

The Moody soils are well suited for all the staple crops of the region with the possible exception of wheat, which seems to be more frequently injured by rust in northeastern Nebraska than elsewhere in the State. This probably is due to climatic influences rather than to the character of the soil. Nearly all the Moody soils are used for growing corn, oats, and alfalfa which yield about the same as on the Marshall soils, or only slightly lower.

The Crofton soils occupy severely eroded tracts within the Moody soil areas. They are simply Moody soils from which erosion has removed all or most of the upper soil material keeping the concretionary zone on or near the top of the ground. Any surface soil which may be present is silty, friable, almost black and does not ordinarily exceed 5 inches in thickness. The zone of lime concretions serves to distinguish the Crofton from the closely associated, but more severely eroded, Knox soils in which no concretionary zone occurs.

The Crofton soils are not very extensive. Most of them are on the steeper parts of cultivated fields. They grow the same crops as the surrounding Moody soils but require more careful management than the Moody and are not quite as productive. They can be profitably farmed if means are taken to curtail erosion and maintain an adequate nitrogen supply. Some of these soils in the blufflands along Missouri River are on slopes too steep for cultivation and are included in pasture land.

PAWNEE SERIES

The Pawnee series includes claypan soils on the weathered surface of glacial drift in southeastern Nebraska and northeastern Kansas. These soils occupy undulating to rolling areas in which the drift is composed mainly of clay with relatively small admixtures of sand and gravel. Surface drainage is everywhere good, and on some of the more rolling areas rapid run-off has caused considerable erosion in cultivated fields. Internal drainage is imperfect owing to slow infiltration through the claypan. The precipitation has been sufficient for prairie grasses and rapid vegetal decay. Most of these soils have accumulated an abundance of thoroughly decomposed organic remains. The surface soils average about 10 inches in thickness, and, except on the steeper slopes, are almost black. They are very granular but their clay content makes them less friable than the surface layers of most loess-derived soils. The silt loam, loam, and clay-loam textures predominate. The upper part of the subsoil is dark grayish-brown, heavy clay loam. This rests abruptly at a depth ranging between 14 and 20 inches on the claypan, which consists of almost impervious brown to dark-brown gritty clay from 8 to 15 inches thick. The claypan is underlain by a moderately friable, light-colored zone of lime enrichment which merges with the parent drift, usually within a 5-foot depth.

The Pawnee soils absorb water slowly, losing much of it through run-off. Their rather heavy surface layers make cultivation difficult except under a narrow range of soil-moisture conditions. In places these layers have been so thoroughly leached of lime that they are becoming injuriously acid for crops requiring a high lime content. The soils are not deficient in plant nutrients. Their location in a region of sufficient precipitation prevents them from becoming droughty except in occasional years. Under careful management they are almost as productive of the staple crops as are the most friable soils of the smooth, loess-mantled uplands. Some lime is needed to counteract acidity in places, especially if alfalfa is grown. The more rolling areas of these soils are best suited for pasture land.

PIERRE SERIES

The Pierre soils differ from those of the Boyd series mainly in having lighter-colored surface layers and thinner profiles. They have developed on bluish-gray, dense, clay shales of the Pierre formation as have the Boyd soils but are in a region of lower precipitation, shorter grasses, and a slower vegetal decay. They occupy well-drained, rolling to hilly uplands in the White River and Hat Creek drainage basins of Nebraska, and cover much of South Dakota west of Missouri River.

These soils, like those of the Boyd series, consist mainly of dense, almost impervious clay from the surface downward. They are limy to or near the top of the ground but do not have a well-developed zone of lime enrichment even on the smoother areas. The surface layers have accumulated only a little organic matter and are dark grayish-brown instead of nearly black as in the Boyd soils. The profile rests on the parent shale, usually within a depth of 2 feet. On some of the steeper slopes the shale is exposed.

The Pierre soils are unsuited for cultivated crops except where they receive supplemental water through run-off from higher levels or through irrigation. The native vegetation on them consists largely of western wheat grass which grows too sparsely to have a high grazing value but is one of the most nutritious hay grasses in the High Plains region.

ROSEBUD SERIES

The soils of this series have developed on parent materials, weathered in situ, from light-gray, soft, limy sandstones (Gering, Arikaree, and Ogallala formations) of Tertiary age. They occupy extensive areas of nearly level to strongly-rolling uplands in western Nebraska, and the adjacent parts of adjoining states. The Sidney soils, mapped in one of the earlier county surveys, are now included in the Rosebud series.

The Rosebud soils differ from those of the Holt series which are farther east in a region of higher precipitation, taller grasses, and more rapid vegetal decay, mainly in having lighter-colored and thinner surface layers. They have good external and internal drainage, and are not subject to destructive erosion, except on the steeper slopes where water run-off is rapid and in some cultivated fields where wind erosion has become serious. Within areas of these soils are numerous patches and narrow strips where the limy sandstone is at or near the surface of the ground. These patches are occupied by the severely eroded Canyon soils which are not sufficiently extensive to be indicated on the accompanying map.

The surface soils of the Rosebud types average about 10 inches in thickness. They are very friable, but have not accumulated much organic material, and are dark grayish-brown instead of nearly black as in the Holt soils. The principal textures are silt loam, loam, and very fine sandy loam, although coarser textures are common in some areas. The upper subsoil layer is grayish-brown. The lower one, the zone of maximum lime enrichment, is almost white. At most places it rests on partially disintegrated sandstone within a depth of 2 feet. On parts of the Dalton Table in Cheyenne County, Nebraska, the bedrock is below a 5-foot depth.

All the Rosebud soils are friable and absorb moisture readily. The infiltration rate is more rapid on the sandy than in the silty types but the former are rather unstable under cultivation and are used mainly for pasture and hay land. The silt loam, loam, and very fine sandy loam types of this series occupy probably 90 per cent of the dry-farming land in the "panhandle" section of the State. They are the chief wheat soils of western Nebraska although corn, oats, rye, and barley are also produced. The crop yields on these soils compare favorably with those obtained on the best soils of the uplands in this region.

ROUGH BROKEN AREAS OF SHALLOW STONY SOILS

These areas include rough stony land that is topographically unsuited for farming except on included strips of alluvium and in small tracts on the uplands which have escaped destructive erosion. Only the larger areas, such as Pine and Wild Cat ridges and the wider broken and stony strips on valley slopes along Niobrara, Platte, and Republican rivers, can be legibly indicated on the accompanying map. Numerous patches and narrow strips, too small to be shown on this map, are in the bluffs along Missouri River and along many of the drainage ways in the southeastern, western, and north-central parts of the State. Stone-free tracts of broken land developed on loess are not included.

Within these areas most of the soils, where sufficiently developed to be classed as such, are stony and extremely shallow. Throughout the western part of the State, the broken stony land has been carved mainly from Tertiary sandstone formations on which the Canyon soils represent the first states of soil development. In the southeastern and eastern parts, this land is occupied chiefly by Permian or Pennsylvanian limestones on which the shallow and stony Sogn soils occur and by exposures of Dakota sandstone where Lancaster soils are beginning to develop.

The rough, broken areas of shallow, stony soils are used chiefly for grazing land, although hay is cut in places and some of the more gradual slopes are under cultivation. None of the soils in these areas give high yields of grain or tame-hay crops, except in the most favorable seasons. Nearly all of them are subject to severe erosion when the native vegetation is destroyed. On some holdings, however, they occupy the only tracts that can be farmed.

THURMAN, THURSTON AND EWING SERIES AND UPLAND PHASES OF THE O'NEILL SERIES

The soils of these series have dark and moderately thick surface layers and sand or gravel subsoils. They are intricately associated on the smooth to gently rolling uplands of north-central Nebraska, where they collectively occupy large areas. They have developed on sand or water-worn gravels which were deposited in the region during Pleistocene times, forming broad sand-gravel plains west of the Kansan Glacier. The gravel and some of the sand came partly as inwash from westerly regions and partly as outwash from the glacial debris. Windblown material from disintegrating Tertiary sandstones probably contributed to the sand deposits.

Differences in the soils throughout this region are due mainly to local differences in the texture of parent materials and in drainage conditions. The soils of the Thurman and Thurston series have developed under good drainage from parent material composed largely or entirely of sand. In the Thurman soils the surface layers have accumulated an abundance of organic matter, are very dark and from 8 to 14 inches thick, whereas in the Thurston soils they have a lower organic content, are brown to dark brown, and exceed 8 inches in thickness only locally. The upper part of the subsoils of types belonging to these series contains enough silt and organic matter to produce a brownish color, and slight coherence. The lower part consists of incoherent gray sand.

Some of the areas mapped as Thurston soils in early surveys are on exposures of typical Kansas drift and would not be included with Shelby soils.

The soil types belonging to the Ewing series and the upland phases of the O'Neill series have very dark surface layers ranging from 8 to 14 inches in thickness. The subsoils are composed mainly of brownish, incoherent sand-gravel mixtures. In the Ewing types, however, which occupy slightly depressed areas where drainage is imperfect, the coarse material in the upper part of the subsoil is cemented with silt and clay and is moderately compact. The remainder of the subsoil is incoherent. The subsoils of types belonging to the upland phases of the O'Neill series are loose, gravelly, and incoherent throughout.

The soils of all these series are low in lime but do not seem to be lime-deficient so far as the vegetation is concerned. Many of them have such sandy and unstable surface layers or such porous and droughty subsoils that they are unsuited for cultivation, and remain in native pasture or hay land. Each of the series includes some types which give larger returns when used for growing corn, rye, and sweet clover than can be obtained from the native grasses. Part of the types are within or near larger areas of dunesand and, although not well suited for cultivation, must be farmed in order to produce grain for the work animals and to supplement the hay ration of cattle during the winter. The Thurman, Thurston, and Ewing soils are not droughty. Those having the finer-textured topsoils are highly productive under cultivation, if wind erosion is controlled.

UNDIFFERENTIATED SOILS OF TERRACES

The areas shown as undifferentiated soils of terraces, on the accompanying map, include the larger developments of terrace or bench lands in Nebraska. They lie at several different levels and were formed before the streams, along which they occur, became so deeply entrenched. Most of the older and higher terraces are from 40 to 100 feet above the present field plains. Several of them, in the eastern part of the State, are capped by windblown silts and only their basal portions are water-laid. The lower terraces, few of which are more than 20 feet above the flood plains, are entirely alluvial.

All the benches lie nearly level, except for a gentle slope down-valley and toward the trunk streams. The surfaces of the more silty ones are modified, here and there, by small, shallow depressions in which storm water accumulates, but the bench land as a whole is well drained. None of it is subject to overflow from the main streams. Some of the more sandy benches have wind-roughened surfaces at places but local differences in elevation do not ordinarily exceed 2 feet.

The terraces or benches in this State are occupied by soils of eight series; Waukesha, Hall, Tripp, Yale, O'Neill, Sioux, Sparta, and Cheyenne. The first four series named include soils which have developed on silty terraces and which are relatively fine-textured throughout. The last four include relatively coarse-textured soils with incoherent sand or gravel subsoils and substrata.

The Waukesha, Hall, O'Neill, and Sioux soils have accumulated an abundance of organic matter and have almost black surface layers from 10 to 14 inches thick. Most of them are in eastern Nebraska, although the Hall types are in the central part of the State. The Tripp, Yale, and Cheyenne soils are in western Nebraska, where they have developed under a rather low precipitation and slow vegetal decay. Their surface layers are only moderately supplied with organic remains and are dark grayish-brown. The soils of the Sparta series have very light-colored surface layers with practically no organic matter. They consist of gray almost pure sand or mixtures of sand and gravel. This series includes all soils formerly mapped in Nebraska under the name Plainfield.

An abundance of lime occurs in the Hall, Tripp, Cheyenne, and Yale soils. The last named have rather heavy upper subsoil layers. The other soils on the benches do not have much lime or unusual compaction in any part of the profile.

The finer textured soils of the terraces include some of the most valuable crop land in Nebraska. The Waukesha soils hold first place in the eastern part of the State for general farming purposes. They produce a little less corn and alfalfa than the best soils of the flood plains but are suited for a wider variety of crops and give higher yields of all crops than are obtained on any soils of the uplands. The Hall soils rank first for general farming throughout central Nebraska and the Tripp soils hold first place in the western part of the State. Most of the Tripp and a large part of the Hall soils are under irrigation; the former are used mainly for corn and sugar beets; the latter for corn and alfalfa.

Of the coarser textured soils on the terraces those of the O'Neill and Sioux series give the highest yields. All except the most sandy types of these soils are used chiefly for growing corn and alfalfa for which they are well suited, if care is taken to control wind erosion. The extremely sandy Sparta soils and the gravelly Cheyenne soils are included mainly in pasture land.

UNDIFFERENTIATED SOILS OF BOTTOMLANDS

The soils on the bottomlands or flood plains of the State are developing from a variety of recent stream sediments under conditions of restricted drainage. They lie only a few feet above the beds of the drainage ways and are subject to overflow during periods of unusually high water. The terrain is practically level except for a barely preceptible slope down the valleys and for minor irregularities caused by old and active stream channels, slight elevations, and shallow depressions.

The character of the soil at any particular place on the bottomlands is governed largely by the character of the sediment on which it is developing. Since the streams carry sediment of many textures, the recent alluvial material is naturally complex. The coarser materials are deposited near the channels and the finer farther back, owing to the assorting power of currents of varying velocities. In places, fine material is found near the stream. This is caused by a comparatively recent change in the position of the channel, which may also result in sand being deposited over clay or vice versa. Strata of widely varying textures may thus overlie one another, dependent upon the course of the stream and the character of its load at the time of deposition. At places, light-colored material may overlie a dark surface soil. Subsequent accumulations of decomposed grass remains have changed most of the sediments into productive soils.

The finer textured bottomland deposits in this State are classed with types of the Wabash, Lamoure, Laurel, Minatare, Genesee and Ray soil series; the sandy deposits with types of the Cass and Sarpy series. The Wabash, Lamoure, and Cass soils have accumulated an abundance of organic matter and have very dark surface layers. In the Wabash and Lamoure types the dark color continues to a considerable depth. In the Cass soils it gives way to gray, usually below 8 or 10 inches. The Laurel and Minatare types have dark-brown surface layers, whereas, the Genesee, Ray, and Sarpy soils are very light colored at the surface. The subsoils, are friable and silty in the Laurel and Genesee soils, moderately heavy in the Wabash and Lamoure, and very heavy and clayey in the Minatare soils. They consist of incoherent sand or mixtures of sand and gravel in all types of the Cass and Sarpy soils. The Ray soils are simply Wabash soils which have been covered by light-colored sediment, ranging from a few inches to about 2 feet in thickness. They are of local occurrence in Nebraska. Aside from types of the Lamoure, Laurel, and Minatare series, which are highly calcareous, the soils of the bottomlands in Nebraska contain little or no lime.

In the broader stream valleys of the State, the greater part of the soils on bottomlands have sufficient natural or artificial drainage for cultivation. In the narrower valleys most areas of these soils are either so poorly drained, or so dissected by stream meanders, that they are of value chiefly for pasture or hay land. Where adequately drained, the Wabash and Lamoure soils give higher yields of corn and alfalfa than can be obtained without amendments on any other soil in Nebraska. Well-drained areas of Laurel, Ray, and the finer textured types of Cass soils also give high yields of corn and alfalfa. A large part of the Laurel and Minatare soils are under irrigation and used for the production of sugar beets. In places these and the Lamoure soils are too alkaline for cultivated crops. The Genesee and Sarpy soils are too low in organic matter to be highly productive without amendments. Most of them, in this State, are either poorly drained or covered with forest growth, or both. They are used chiefly for pasture land and hay production. The soils of the bottomlands, as a whole, are not as well suited for small grain crops as for corn and alfalfa. Small grains thrive on most of the better drained and finer textured types of these soils but the abundant moisture supply tends to produce rank vegetative growth at the expense of the grain, and delays maturity. The abundant moisture also promotes the development of long, rather weak stems which may break and fall in windy weather.

(1) For a more comprehensive explanation of methods of classifying and mapping soils the reader is referred to the chapter "Soil Survey Methods and Definitions" in the later reports on county soil surveys, published by the Bureau of Chemistry and Soils, United States Department of Agriculture.

(3) Texture refers to the relative proportion of the various size groups of individual soil grains; silt, sand, clay, etc. This and other soil terms are defined in "A Glossary of Special Terms Used in the Soils Yearbook" pp. 1162-1180. Yearbook of Agriculture, 1938; United States Department of Agriculture.

EROSION

THE EFFECT OF EROSION IN NEBRASKA

When the white men first explored Nebraska, they found little erosion taking place. They found the hills, particularly in eastern Nebraska, covered with a dense growth of grass, underlain with a thick mat of decaying debris. The valleys were even more densely covered with grasses and sedges. The soil underneath the prairie was black and spongy, the result of centuries of accumulating humus. The valleys bordering the streams were boggy and abounded with springs. Clear water flowed constantly in the streams. The upland draws in the more favorable parts of the State were heavily covered with the big bluestem and slough grasses. Springs occurred in many of the draws.

This abundance of water, springs, and marshy flat lands was the natural result of the prairie cover. The tall grass with its underlying debris provided a condition of utmost effectiveness for rapid absorption of rainfall and for holding winter snows. Under these conditions, run-off could occur only from extremely heavy rains of more than usual duration. As a consequence, the deep subsoils of eastern Nebraska were filled to capacity with water throughout their entire depth. Excess water in the upper profile drained toward the draws and the valley land, thus creating springs and providing a constant and even source of water for streams.

After 40 to 60 years of farming, road construction and drainage, the native vegetative covering has been considerably changed. Only in a few scattered areas over the State can the original type of prairie now be found. It has been replaced by grain, forage crops, weeds, and grasses of introduced species. There has been imposed upon the land an intensive use through modern methods of cultivation and through heavy grazing of the lands left in native grass. The conventional methods of land cultivation have been conducive to rapid run-off and water erosion which, in many areas, has carried away a great portion of the dark topsoil. Deep gullies have formed in many of the once heavily-grassed draws and wind erosion is becoming an increasingly serious problem in some of the sandier areas. The resulting greater run-off carried away increasing quantities of topsoil. Rainfall, beating upon eroded and exposed soil, puddles its surface, seals its pores, and creates a condition conducive to maximum run-off.

The history of erosion in Nebraska for the past 40 to 60 years, indicates that unless control measures are used many now fertile fields will sooner or later be unfit for tillage. The history of farming has been that little attention is paid to erosion control until damage is so great that the original productiveness of the soil cannot be reclaimed. This has already happened on some fields in Nebraska and, since erosion accelerates itself, the rate of destruction can be expected to increase year by year.

EROSION PREVENTION AND CONTROL

The most effective methods of preventing erosion, practiced by a few farmers, consist of leaving grass and permanent vegetation in drainageways and on steep slopes. However, the number of farmers who have done this is relatively small. A few demonstrations were established by County Agents and the

Extension Service, by constructing brush dams and an occasional drop-inlet earth dam for gully control, and establishing a few terracing demonstrations. The CCC Camps, under the Forestry Service, established numerous farm demonstrations chiefly showing how to control gully erosion by temporary dams, permanent structures and tree planting.

The greatest impetus to soil conservation work in Nebraska was given by creation of the Soil Conservation Service by Congress in 1935. Twenty-three CCC Camps were assigned to the Soil Conservation Service to establish complete erosion control demonstrations in 1935. The demonstrations hold the rain on the slopes, insofar as possible, by practices that are fitted to the physical features of each farm such as degree of erosion and topography, and yet make the best use of the land. Moisture is conserved and sheet erosion is controlled by the use of crop rotations, farming on the contour, strip cropping, terracing, re-grassing and reforesting steep or severely eroded fields. Gully erosion in cultivated fields is being controlled by seeding the drainageways to a mixture of grasses and legumes. Erosion in pastures is being reduced by deferred and judicious grazing, contour furrowing and terracing, with the gullies fenced and in many cases, planted to trees.

Wind erosion has been controlled on areas lacking cover due to drouth or grasshoppers, by mechanical means such as contour, basin, or blank listing in the fall. Crop residues, such as straw, stubble, and cornstalks have been left on the fields to demonstrate wind-erosion control with a good cover.

In 1940 this type of demonstration was being carried on in 11 camp areas, 3 demonstration areas and a number of Soil Conservation Districts. Twenty-one Soil Conservation Districts have been voted upon favorably for organization under the law of the Nebraska Soil Conservation District. Landowners in such legally constituted Soil Conservation Districts, through the Soil Conservation Service of the United States Department of Agriculture, may obtain technical assistance in planning and putting into operation complete erosion control programs. Approximately 3,000 farm demonstrations have been established by the above-mentioned organization.

An educational program has been conducted cooperatively by the Soil Conservation Service and Extension Service, consisting of field tours, observing demonstrations.

Work has started under the Water Facilities program in 8 counties, which enables the farm operators to construct facilities designed to utilize supplemental water supplies. Complete surveys and conservation plans are developed in conjunction with the utilization of facilities established under this program. Such facilities consist of flood-spreading structures, retention, detention, and diversion dams, small reservoirs, stock-watering ponds, and irrigation pumps. A few demonstrations in 10 additional counties are contemplated during the year. This program is administered through the established agencies of the Soil Conservation Service, the Bureau of Agricultural Economics, and the Farm Security Administration.

Although precipitation has been abnormally low during the period of years the conservation demonstrations have been in operation, in many instances crop yields have been increased by soil conservation practices in addition to the saving of topsoil.

During 1938 there were more acres of contour planted and tilled crops, more contour strip cropping, and more successful seedings of adapted grasses on eroded lands than in any previous year.

CLIMATE

The climate of Nebraska results from its geographic location near the center of a large continent in the eastern rain shadow of the Rocky Mountains, its distance from the Atlantic Ocean and Gulf of Mexico, and its position in the general west-east path of cyclonic storms. Nebraska has two rather well-defined climatic belts; subhumid east of the 100th meridian, and semiarid west of it, with an intermediate or transitional zone between them. The climate is characterized by comparatively short, hot summers, by long, cold winters, and by fluctuating rainfall.

SUNSHINE

Nebraska has the high percentage of sunshine essential to crop development. Injury to crops usually occurs when there is a lack of moisture in the soil. When the soil is moist the sun evaporates a part of the moisture, thus cooling the soil proportionately.

TEMPERATURE

Nebraska experiences wide diurnal and annual temperature variations. These partially result from the rapid heating and cooling of the land surface. January is usually the coldest month, and July the warmest. Winter temperatures frequently drop to 25 degrees below zero. A few coldest winter temperatures fall to 40 degrees below zero. Temperatures of 100 degrees or more are registered during the hottest days of summer. The temperature in the greater part of Nebraska does not limit the growth of crops common to the temperate zone. In the north-central and northwestern sections of the State low, variable rainfall and a shorter growing season somewhat limit productiveness.

The mean temperature of the State decreases northward with latitude and westward with altitude. The following table shows the mean annual temperatures for four parts of the State:

Mean Temperatures in Degrees

Section of State	January	July	Annual
Northwestern	21	71	46
Northeastern	20	74	48
Southwestern	26	75	50
Southeastern	25	77	52

The average temperature of the State is 48.5 degrees. The highest mean temperature, 52 degrees, occurs in the southeastern portion of the State at an elevation of 900 feet. The temperature decreases westward along the southern border to 50 degrees in Dundy County at an elevation of 3,000 feet. However, the mean annual temperature is about 51 degrees in most of the southern tier of counties. The temperature decreases northward about one degree for each 38 miles throughout most of the State. The decrease is more rapid in the northwestern section and less rapid near the Missouri River in the northeastern section. Temperatures range from nearly 48 degrees in the northeast to less than 45 degrees in the northwest where the elevation reaches 1,300 feet and 3,700 feet, respectively.

GROWING SEASON

The growing, or frost-free season, is comparatively long in Nebraska, decreasing in length from about 175 days in the southeast to 125 days and more in the northwest portion. Records reveal that the first fall frost in Nebraska may be any time from early September to as late as November 5th. Fifty per cent of the time the last killing frost of spring may occur any time from April 25th in the southeast to May 15th in the northwest.

PRECIPITATION

Nebraska lies in the general path of the low-pressure storm area that moves across the United States from west to east. These large cyclonic eddies, 500 to 2,000 miles in diameter, bring the greater share of the precipitation to Nebraska. They move with an average speed of 600 miles in 24 hours. Each storm causes an average of 1 or 2 rainy days as it passes eastward, when the center of the storm is near enough to Nebraska.

There is an average of 2 of these storms passing across the country each week with fair weather between. If the center of the storm passes over the State, the change in weather conditions is rather rapid. However, if the center is some distance north or south of the State, the change in weather conditions is less rapid and less pronounced.

The precipitation of Nebraska is deficient and fluctuating. It decreases from east to west across the State at a fairly constant rate. The mean annual precipitation is generally less than 20 inches west of the 100th meridian and more than 20 inches east of it. Records show that the annual precipitation varies from 9.47 inches to 27.48 inches in western Nebraska, and from 20.86 inches to 50.31 inches in eastern Nebraska.

Rainfall records in Nebraska cover a period of more than 60 years. Fragmentary records are available for longer periods. Existing evidence indicates that the wet and dry years alternate in approximately regular cycles. However, factors determining these cycles and predictions are highly speculative.

There are years during which every part of the State suffers from deficient moisture, although the territory east of the 100th meridian usually has sufficient precipitation for profitable agricultural production. Long-time precipitation records reveal a greater number of years having deficient departures than those having excess departures. Therefore, the departures above the mean are greater than those below the mean. The records also show that dry and wet periods tend to alternate, resulting in a series of minor cycles within the major hydrologic cycles.

DISTRIBUTION OF RAINFALL

The amount of rainfall in Nebraska increases from early springtime to June, during which month it is the heaviest. It decreases gradually until December. The average rainfall of June is over 5 inches in the southeastern part of the State and slightly less than 3 inches in the extreme western part.

About 69 per cent of the rainfall occurs during the five-month growing period beginning with April and ending with August.

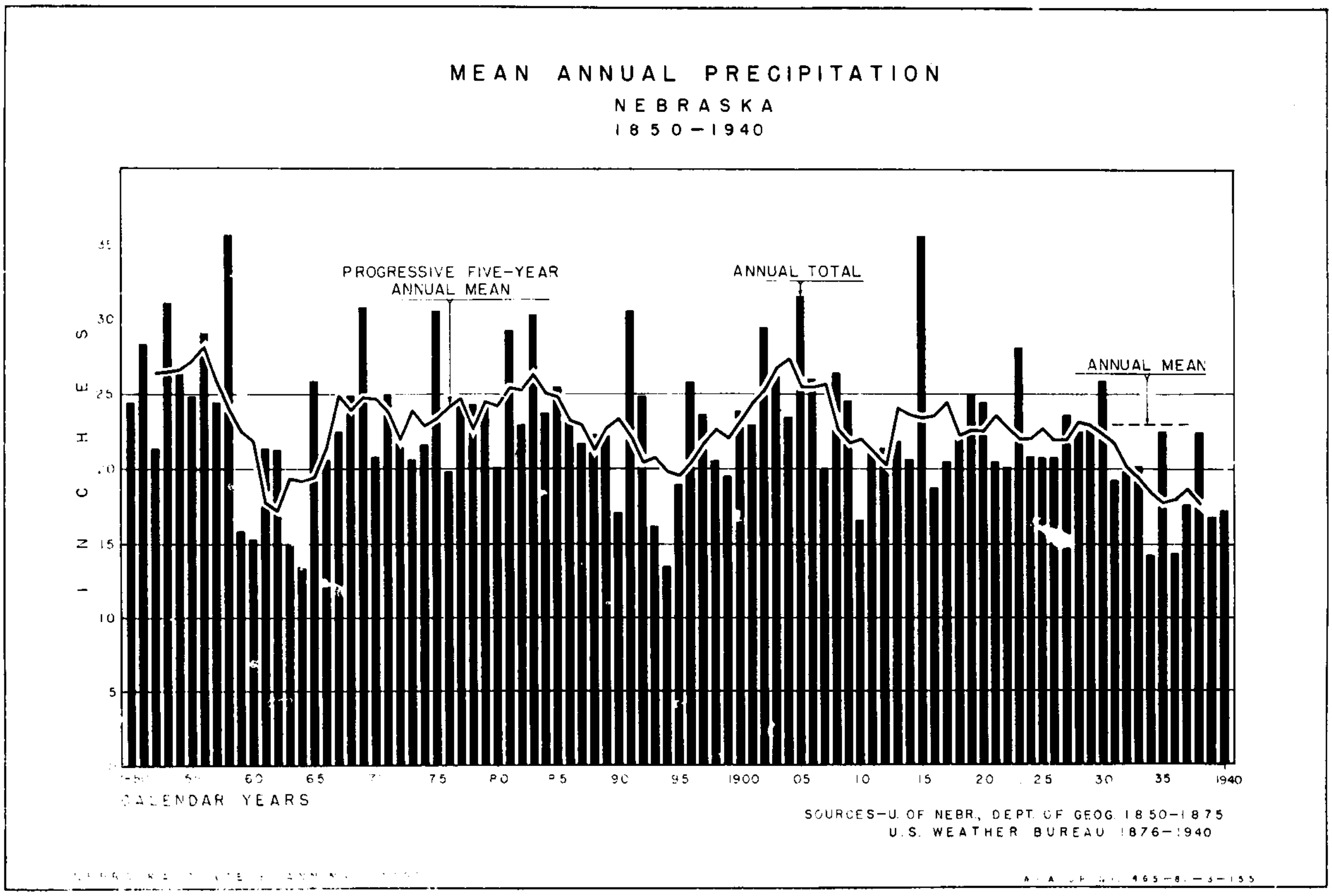
Many practices may be followed which will increase the effectiveness of the rainfall and reduce the hazards associated with unfavorable weather conditions. Continued research and planning in this field are imperative. In addition more extensive weather reports should be obtained. New drought-resistant crops such as soy beans could be introduced in Nebraska. Research in climatology should be encouraged.

DROUGHTS

Droughts in Nebraska usually occur during the summer and fall months. There have been 3 severe droughts in Nebraska and in adjacent states during the past 80 years. Less severe ones have come at relatively regular intervals. The fundamental cause of droughts has not yet been established. Scientists agree that the chief elements are low relative humidity, hot winds, high soil temperature, excessive evaporation, and deficient rainfall; the last being the dominant factor. The following summary shows the precipitation deficiencies in Nebraska during the recent drought period:

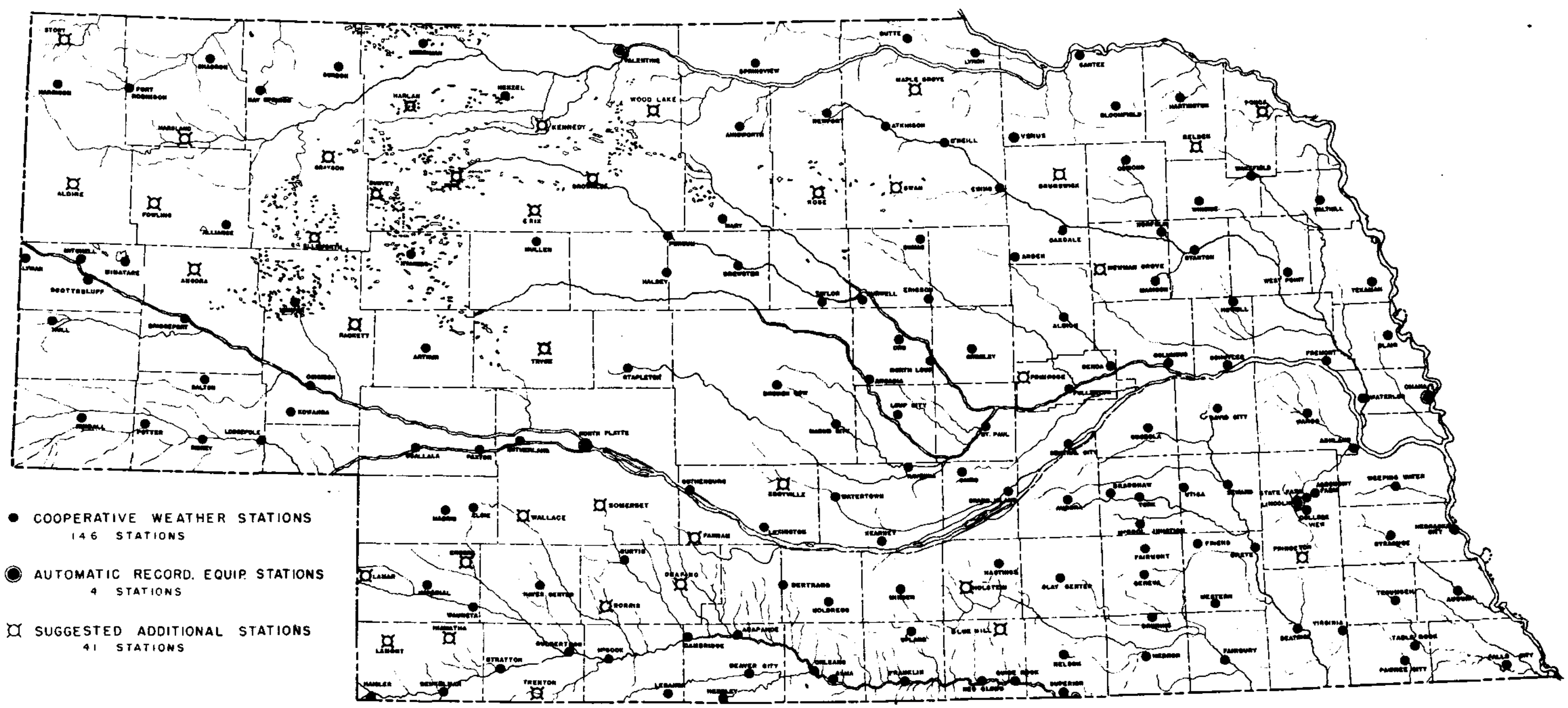
Year	Annual	Departure From Mean	Per Cent Deficiency
1931	19.27	3.63	15.9
1932	20.54	2.36	10.3
1933	20.23	2.67	11.7
1934	14.31	8.59	37.5
1935	22.64	.26	1.1
1936	14.42	8.48	37.1
1937	17.66	5.24	22.9
1938	22.23	.67	2.9
1939	16.28	6.62	29.0

Deficient rainfall is the principal cause of the current devastating drought. Insufficient precipitation and other associated unfavorable weather elements influence the soil moisture and water supplies generally. The consideration of the effects of drought is imperative in any long-time program for the conservation of the water supply. Past records justify the prediction that future decades will experience the usual irregular fluctuations in precipitation of dry and wet years.



VIII

EXISTING AND PROPOSED WEATHER BUREAU STATIONS NEBRASKA JUNE 1939

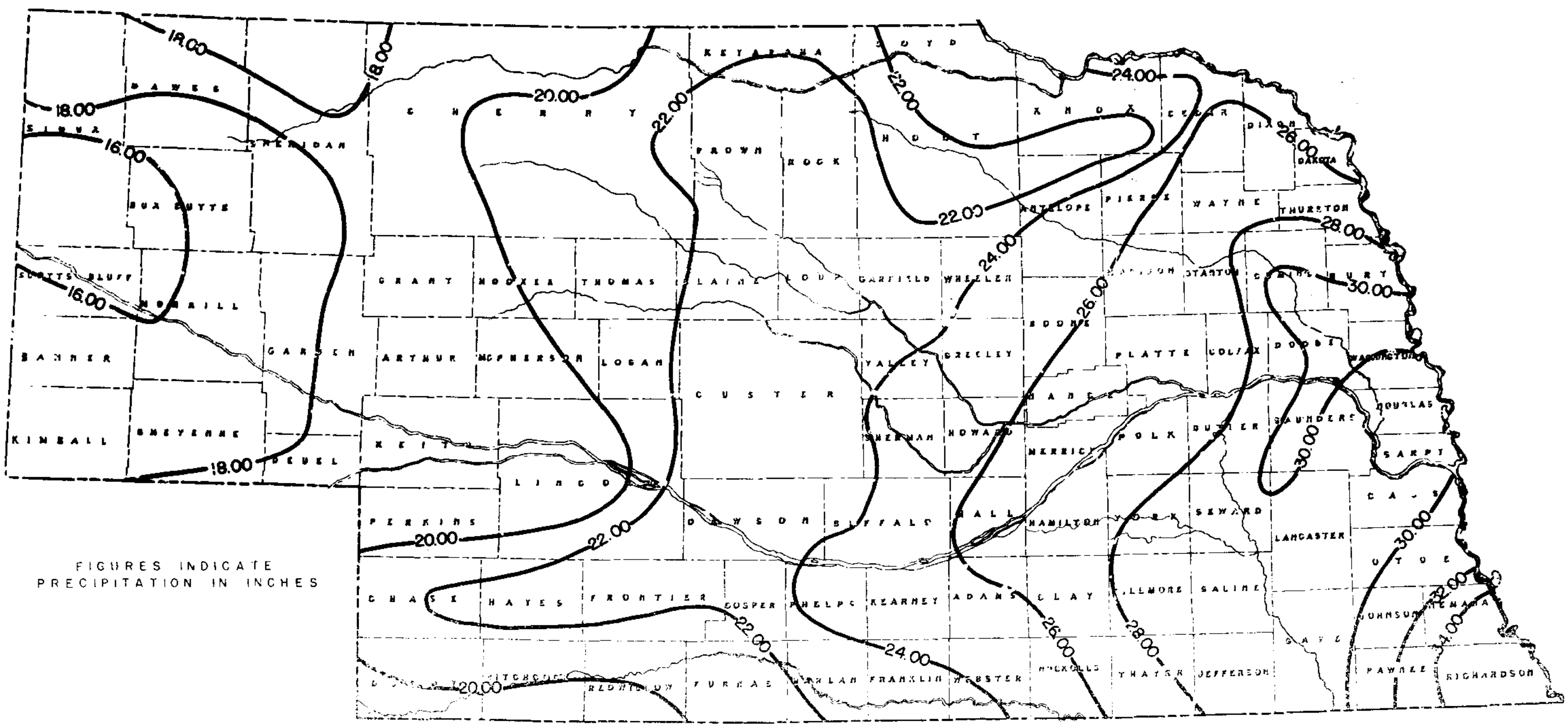


COMPILED FROM U. S. WEATHER BUREAU "CLIMATIC SUMMARY OF THE UNITED STATES" FOR YEARS INDICATED

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

NORMAL ANNUAL PRECIPITATION
BASED ON 35 YEAR PERIOD, 1898–1932
NEBRASKA



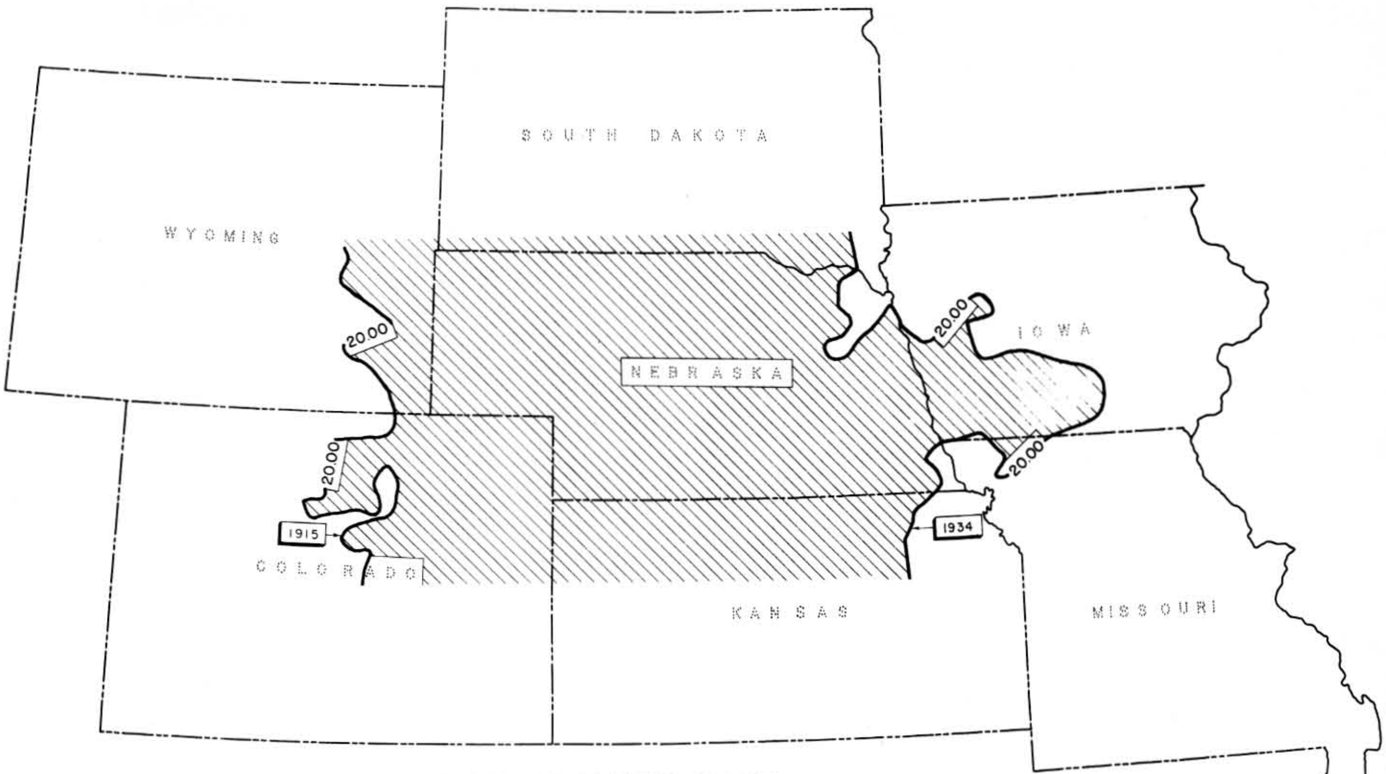
FIGURES INDICATE PRECIPITATION IN INCHES

COMPILED FROM U. S. WEATHER BUREAU "CLIMATIC SUMMARY OF THE UNITED STATES" FOR YEARS INDICATED

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NOS. 165–81–6339 AND 465–81–3–155

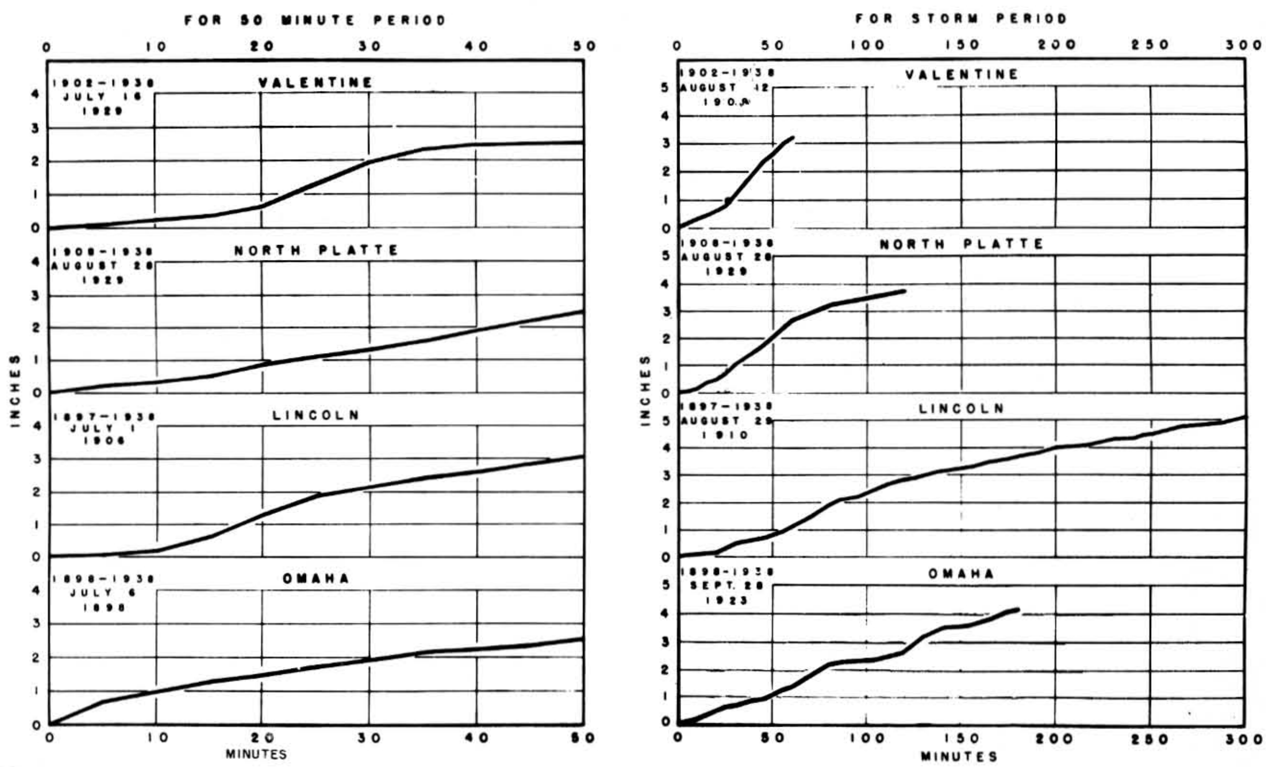
EXTREME POSITIONS OF ISOHYETAL LINE FOR 20 INCHES ANNUAL PRECIPITATION 1876-1939



SOURCE— PUBLISHED RECORDS U. S. WEATHER BUREAU

XI

MAXIMUM EXCESSIVE PRECIPITATION
FOR STATIONS WITH SELF-RECORDING GAGES
NEBRASKA



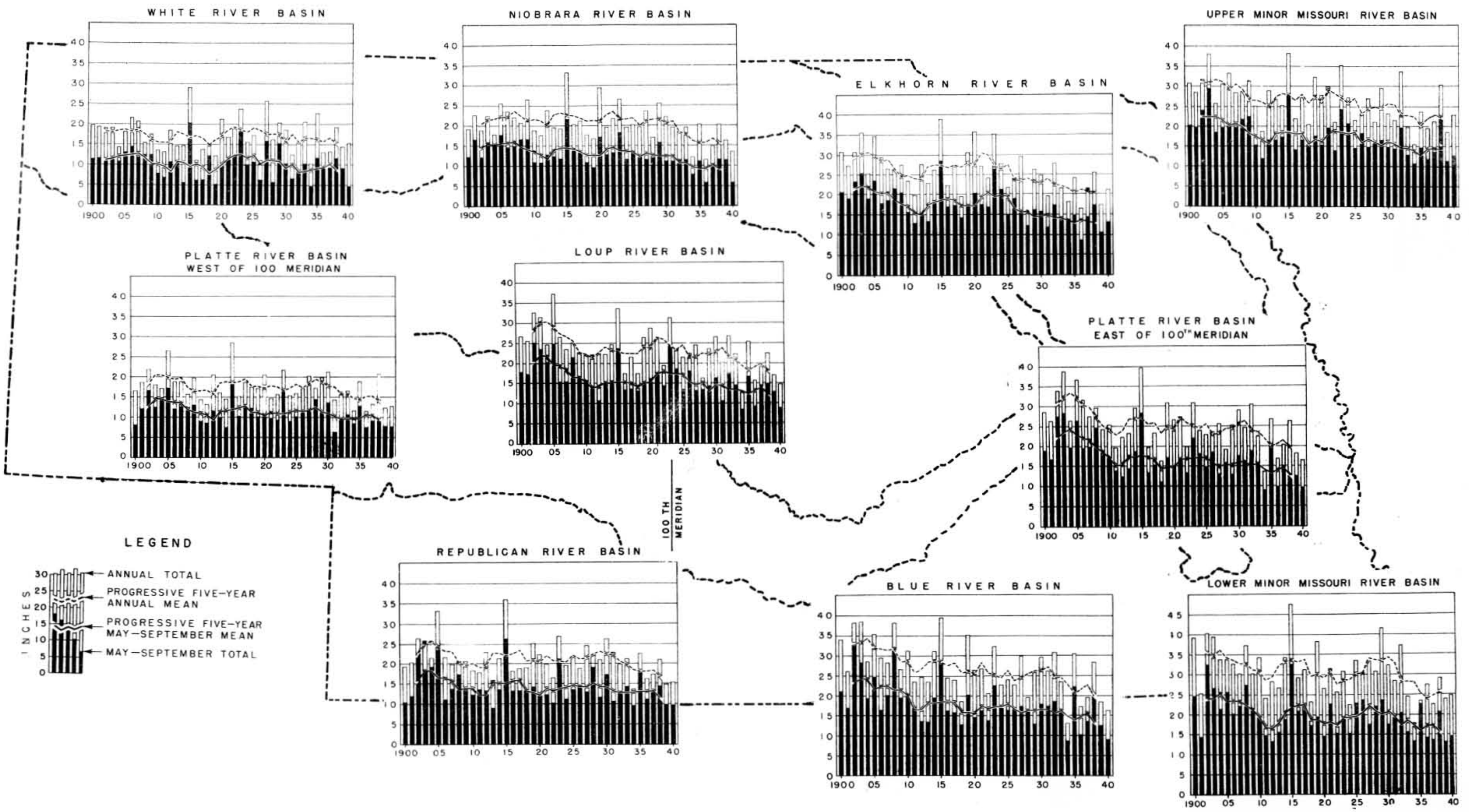
STORMS DURING WHICH THE RATE OF FALL EQUALED OR EXCEEDED 0.25 INCH IN ANY FIVE MINUTES OR .80 INCH IN ONE HOUR. ACCUMULATED AMOUNTS FOR FIVE MINUTE INTERVALS.

SOURCE — UNPUBLISHED RECORDS U. S. WEATHER BUREAU

NEBRASKA STATE PLANNING BOARD

WPA PROJECT OP. NO. 465-81-3-155

SEASONAL AND ANNUAL PRECIPITATION
BY DRAINAGE BASINS
NEBRASKA
1900-1940



NEBRASKA STATE PLANNING BOARD

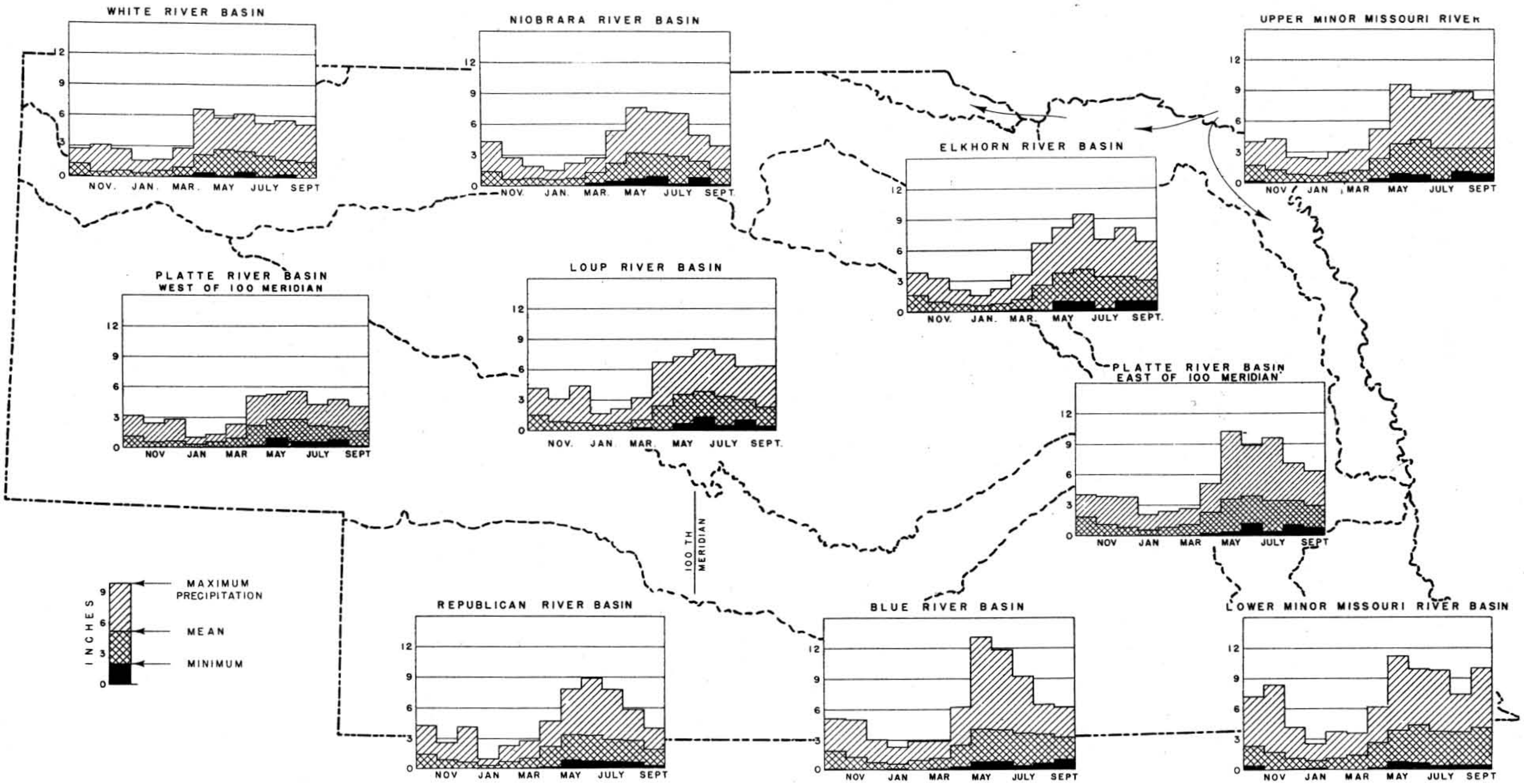
W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

MONTHLY MAXIMUM, MEAN AND MINIMUM PRECIPITATION

BY DRANIAGE BASINS

NEBRASKA

1900—1938



COMPILED FROM U. S. WEATHER BUREAU "CLIMATIC SUMMARY OF THE UNITED STATES" FOR YEARS INDICATED

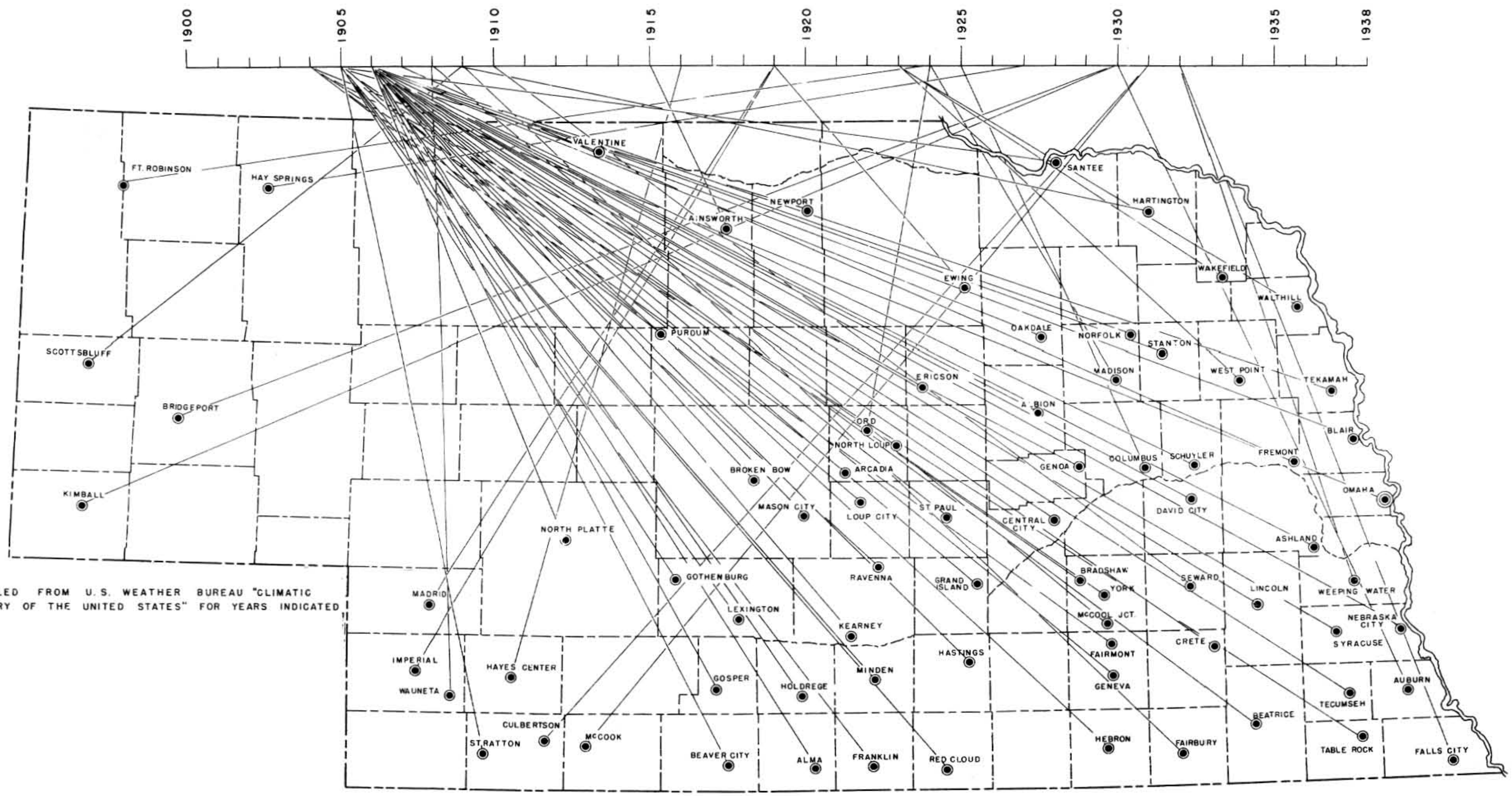
NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NOS. 165-81-

YEAR ENDING FIVE YEAR PERIOD OF MAXIMUM PRECIPITATION

LONG TIME WEATHER BUREAU STATIONS

1900—1938

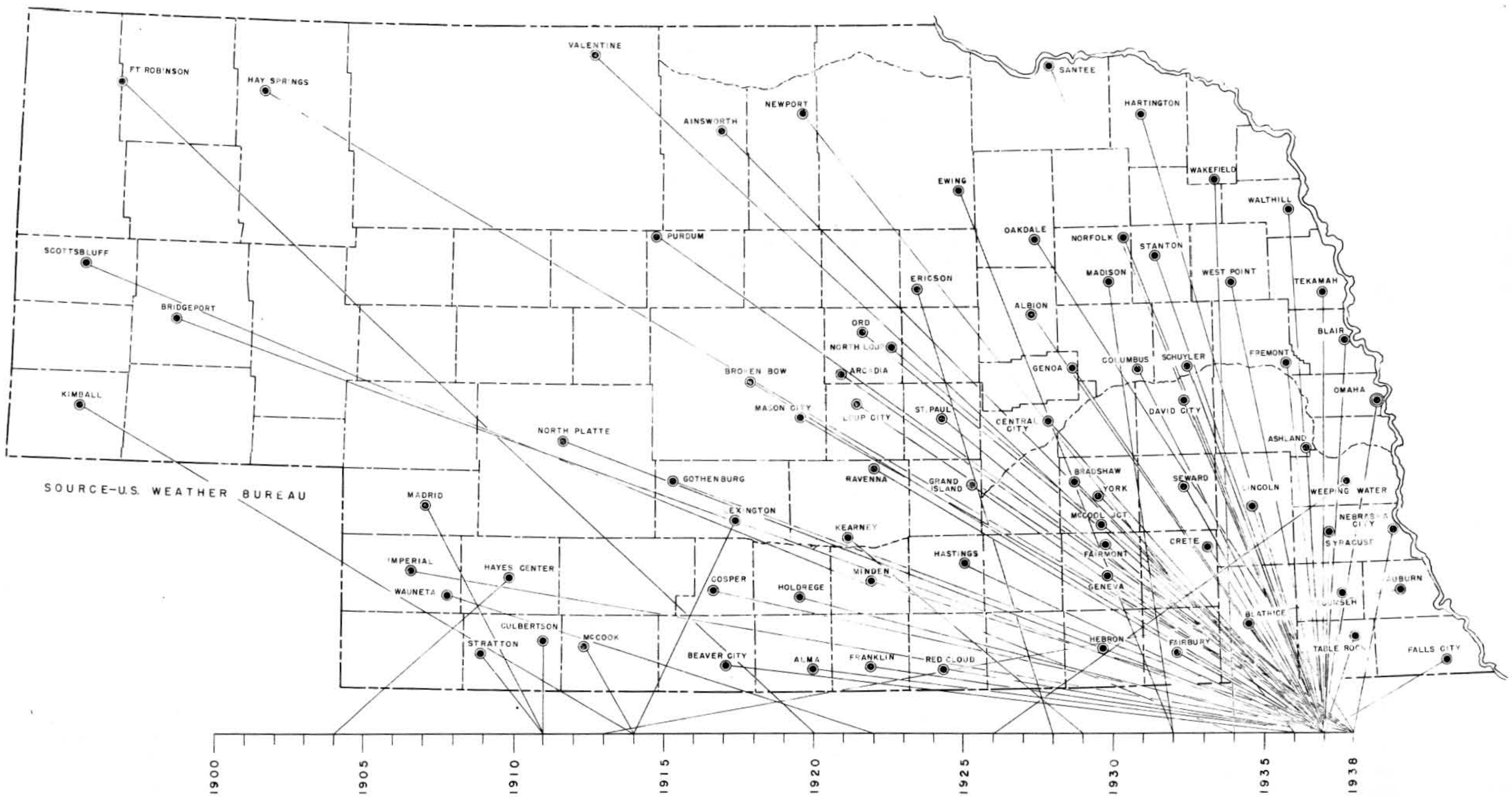


COMPILED FROM U. S. WEATHER BUREAU "CLIMATIC SUMMARY OF THE UNITED STATES" FOR YEARS INDICATED

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NO. 465-81-3-155

YEAR ENDING 5-YEAR PERIOD OF MINIMUM PRECIPITATION
LONG-TIME WEATHER BUREAU STATIONS, 1900-1938



NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NO. 465-81-3-155

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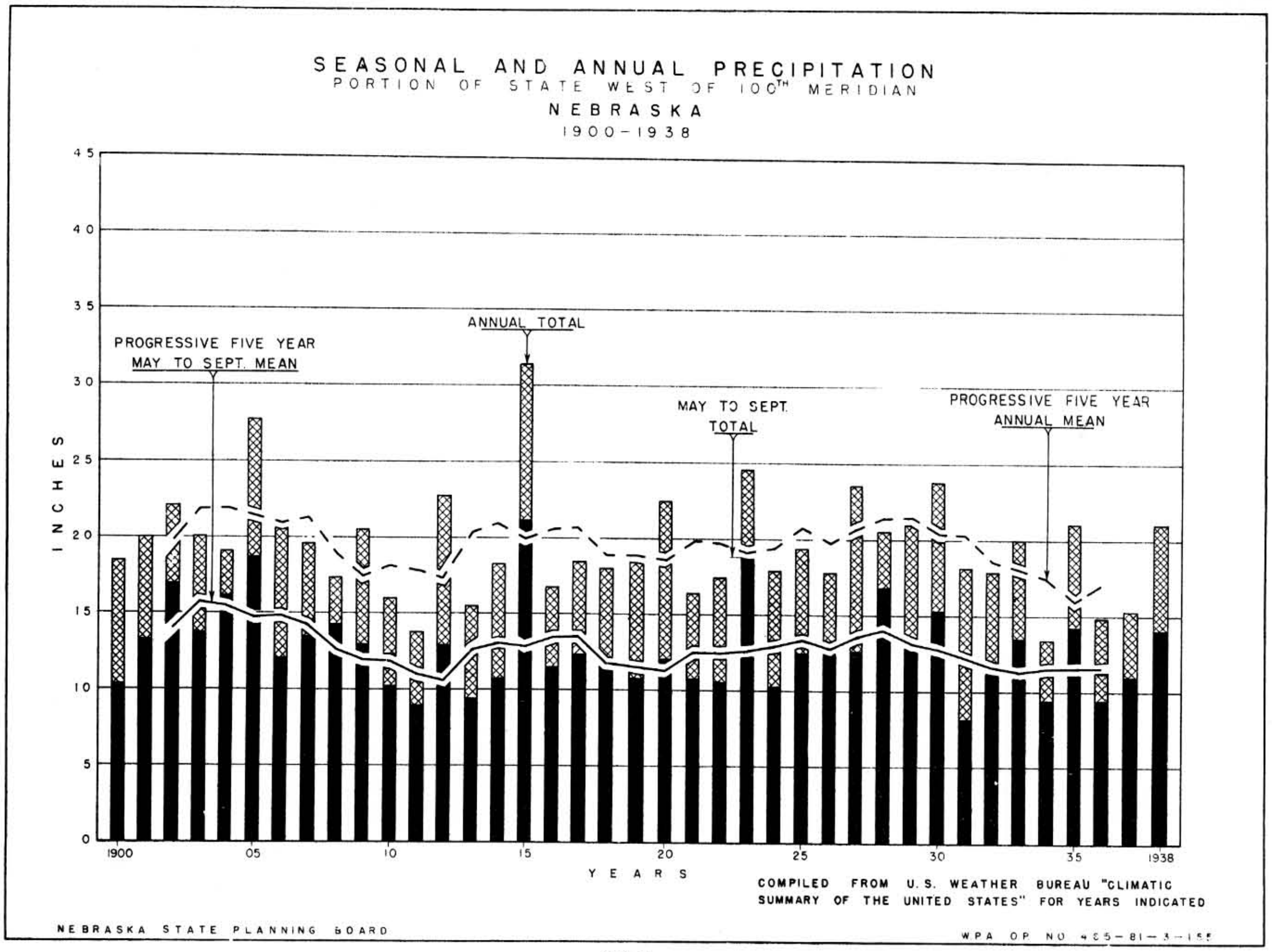
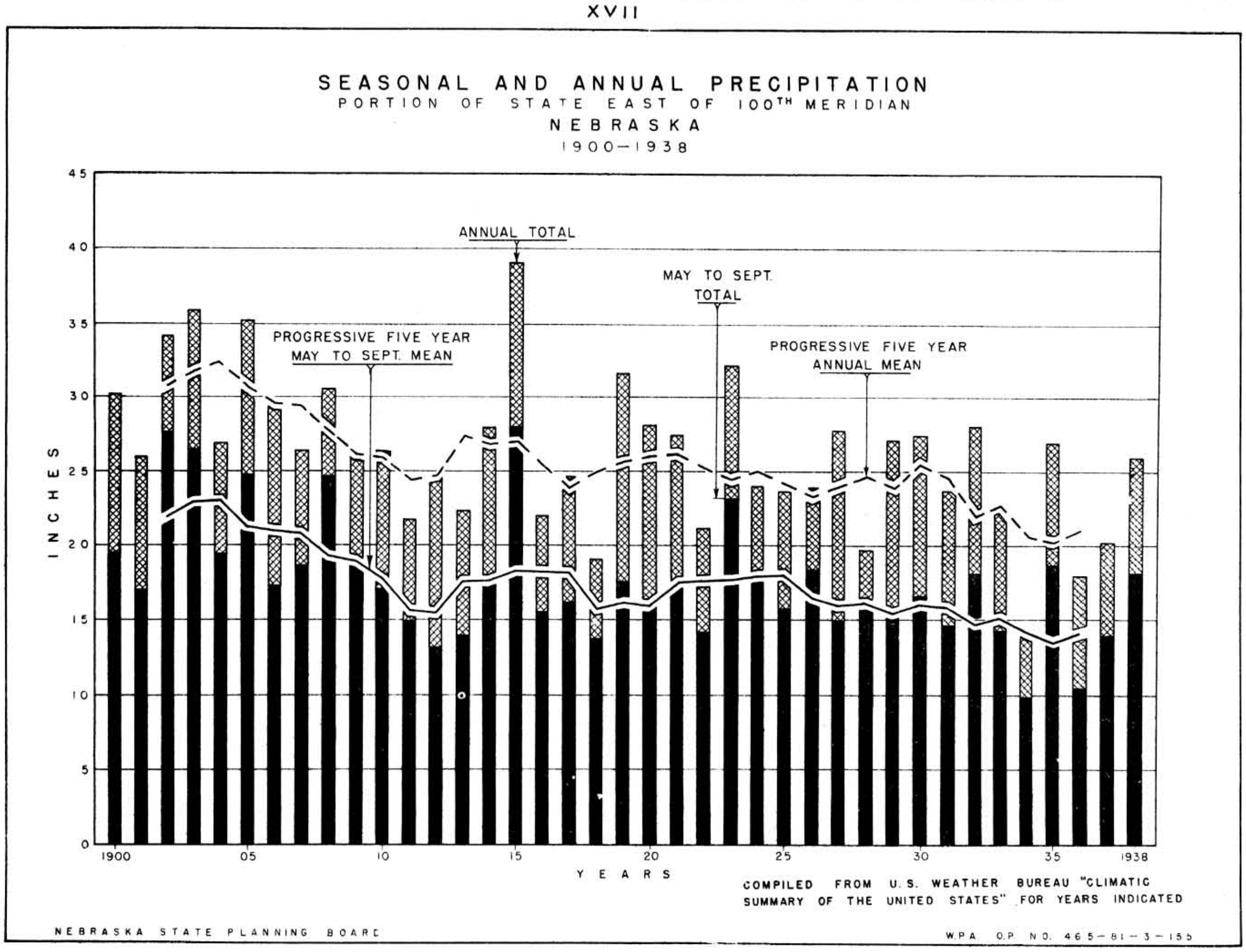
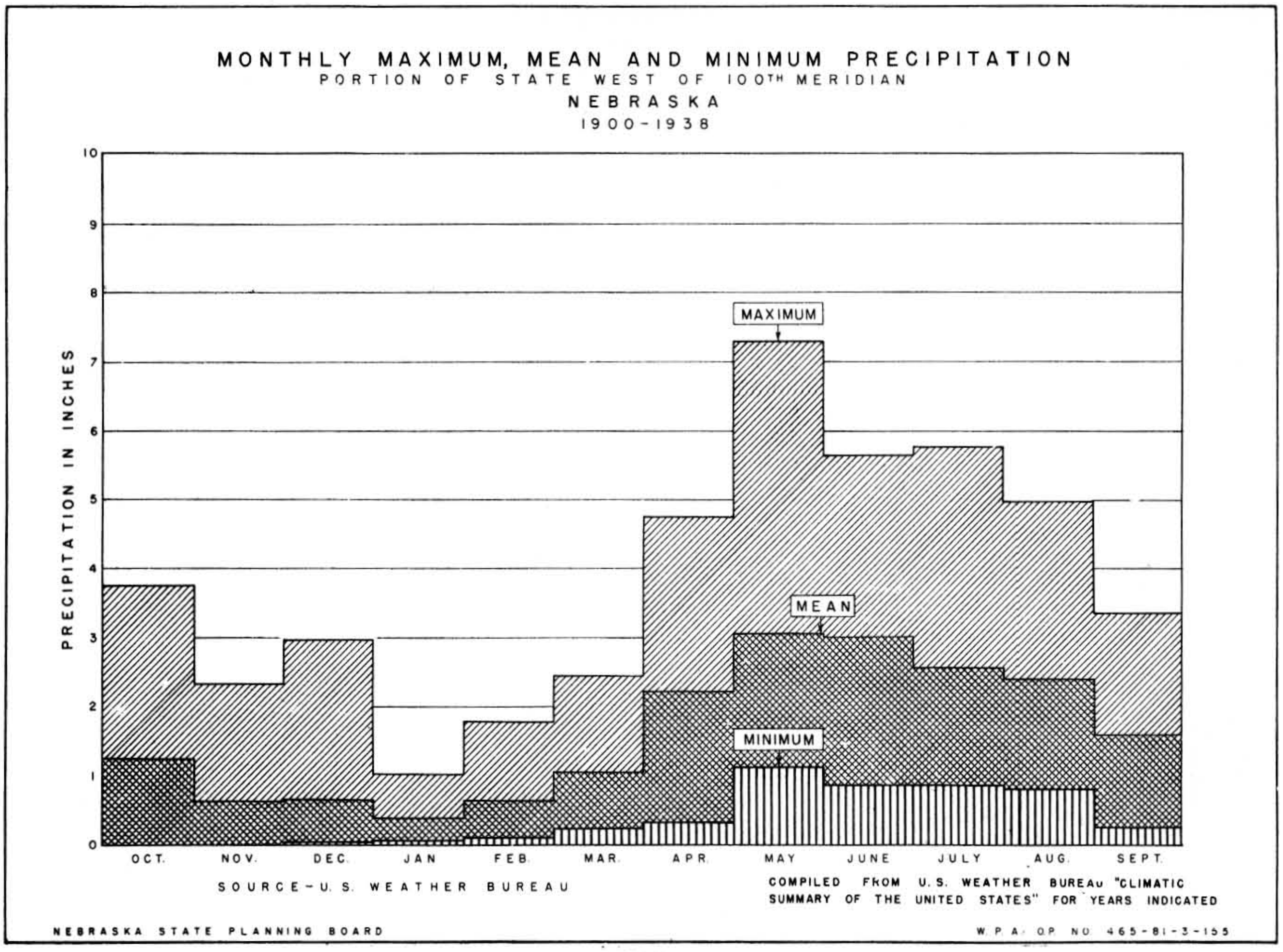

SEASONAL AND ANNUAL PRECIPITATION
PORTION OF STATE WEST OF 100TH MERIDIAN
NEBRASKA
1900-1938
INCHES
YEARS
ANNUAL TOTAL
PROGRESSIVE FIVE YEAR MAY TO SEPT. MEAN
MAY TO SEPT. TOTAL
PROGRESSIVE FIVE YEAR ANNUAL MEAN
COMPILED FROM U. S. WEATHER BUREAU "CLIMATIC SUMMARY OF THE UNITED STATES" FOR YEARS INDICATED
NEBRASKA STATE PLANNING BOARD

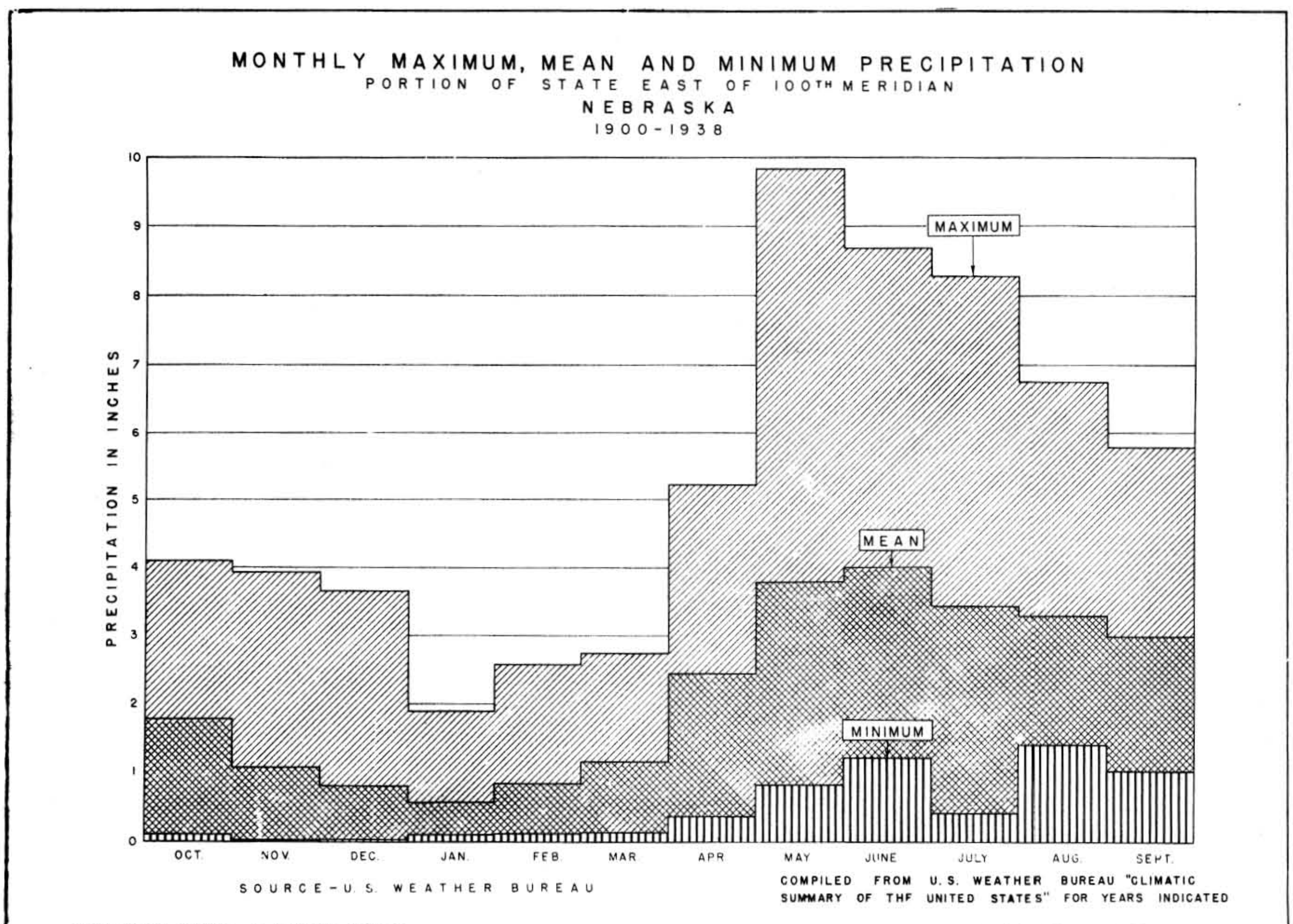
XVII


SEASONAL AND ANNUAL PRECIPITATION
PORTION OF STATE EAST OF 100TH MERIDIAN
NEBRASKA
1900-1938
INCHES
YEARS
ANNUAL TOTAL
MAY TO SEPT. TOTAL
PROGRESSIVE FIVE YEAR MAY TO SEPT. MEAN
PROGRESSIVE FIVE YEAR ANNUAL MEAN
COMPILED FROM U. S. WEATHER BUREAU "CLIMATIC SUMMARY OF THE UNITED STATES" FOR YEARS INDICATED
NEBRASKA STATE PLANNING BOARD
W.P.A. O.P. NO. 465-81-3-155

XVIII


MONTHLY MAXIMUM, MEAN AND MINIMUM PRECIPITATION
PORTION OF STATE WEST OF 100TH MERIDIAN
NEBRASKA
1900-1938
PRECIPITATION IN INCHES
10
9
8
7
6
5
4
3
2
1
0
MAXIMUM
MEAN
MINIMUM
OCT.
NOV.
DEC.
JAN
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
SOURCE-U. S. WEATHER BUREAU
COMPILED FROM U. S. WEATHER BUREAU "CLIMATIC SUMMARY OF THE UNITED STATES" FOR YEARS INDICATED
NEBRASKA STATE PLANNING BOARD
W. P. A. OP. NO. 465-81-3-155

XIX


MONTHLY MAXIMUM, MEAN AND MINIMUM PRECIPITATION
PORTION OF STATE EAST OF 100TH MERIDIAN
NEBRASKA
1900-1938
PRECIPITATION IN INCHES
10
9
8
7
6
5
4
3
2
1
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MAXIMUM
MEAN
MINIMUM
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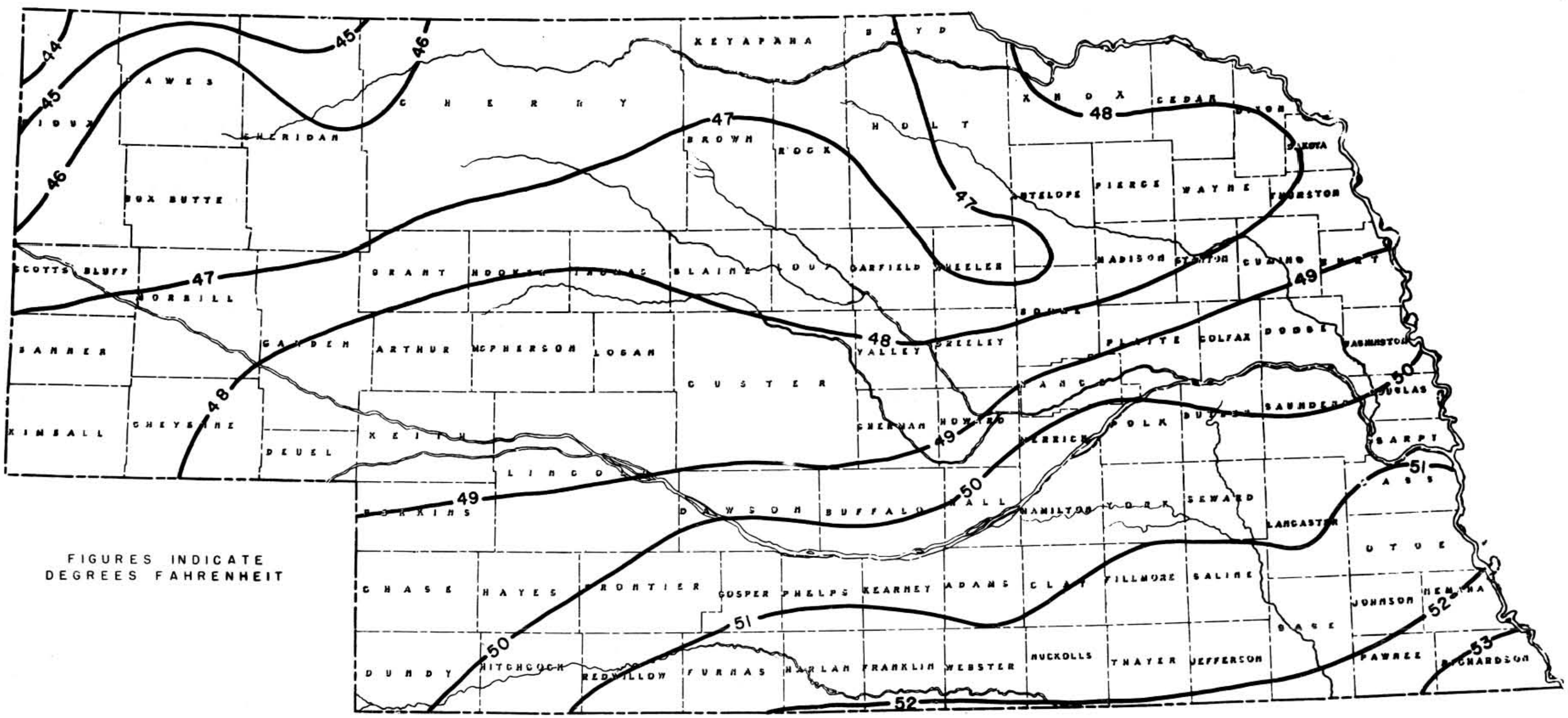
SOURCE-U. S. WEATHER BUREAU
COMPILED FROM U. S. WEATHER BUREAU "CLIMATIC SUMMARY OF THE UNITED STATES" FOR YEARS INDICATED
NEBRASKA STATE PLANNING BOARD
W. P. A. OP. NO. 465-81-3-155

XX

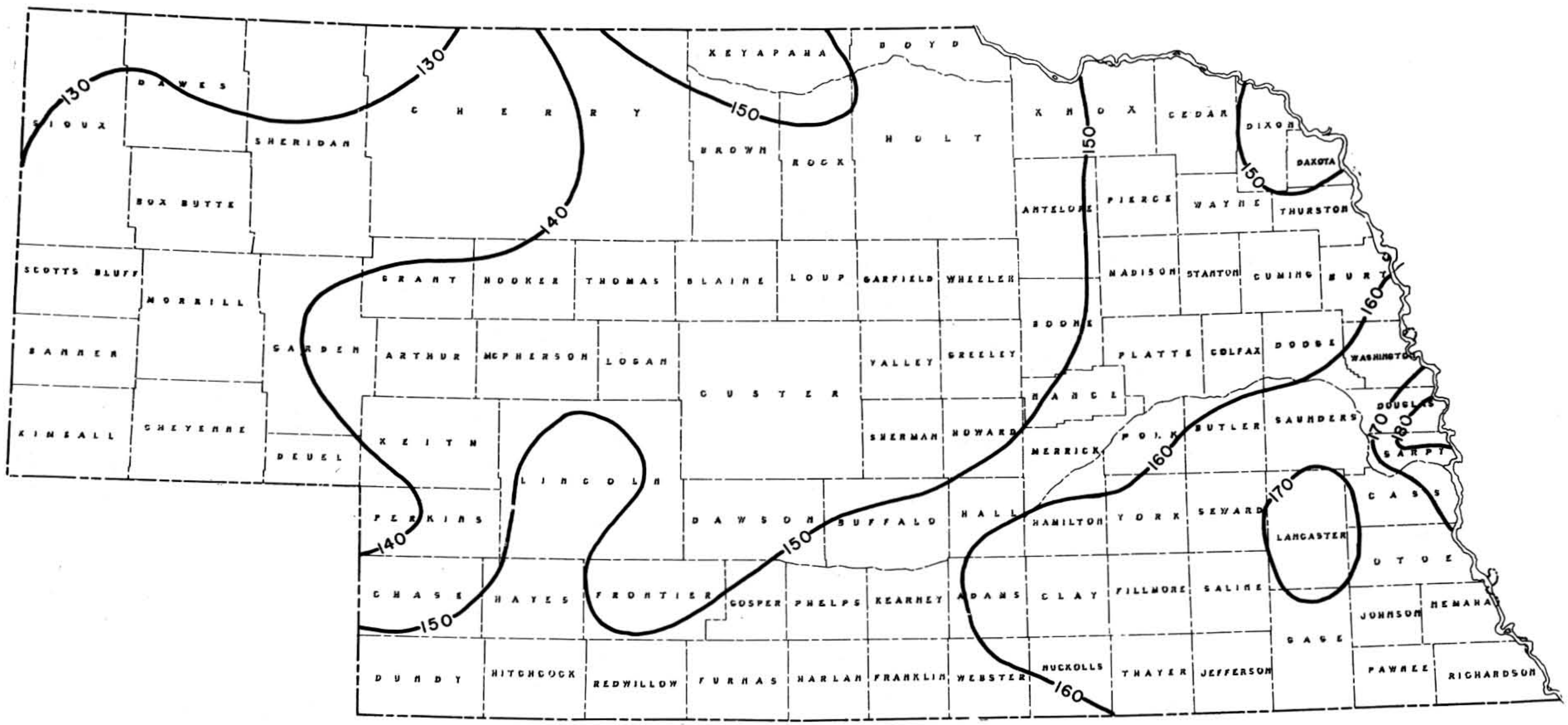
NORMAL ANNUAL TEMPERATURE
NEBRASKA



FIGURES INDICATE
DEGREES FAHRENHEIT

COMPILED FROM U.S. WEATHER BUREAU
"CLIMATIC SUMMARY OF THE UNITED STATES"

AVERAGE DAYS WITHOUT FROST
NEBRASKA

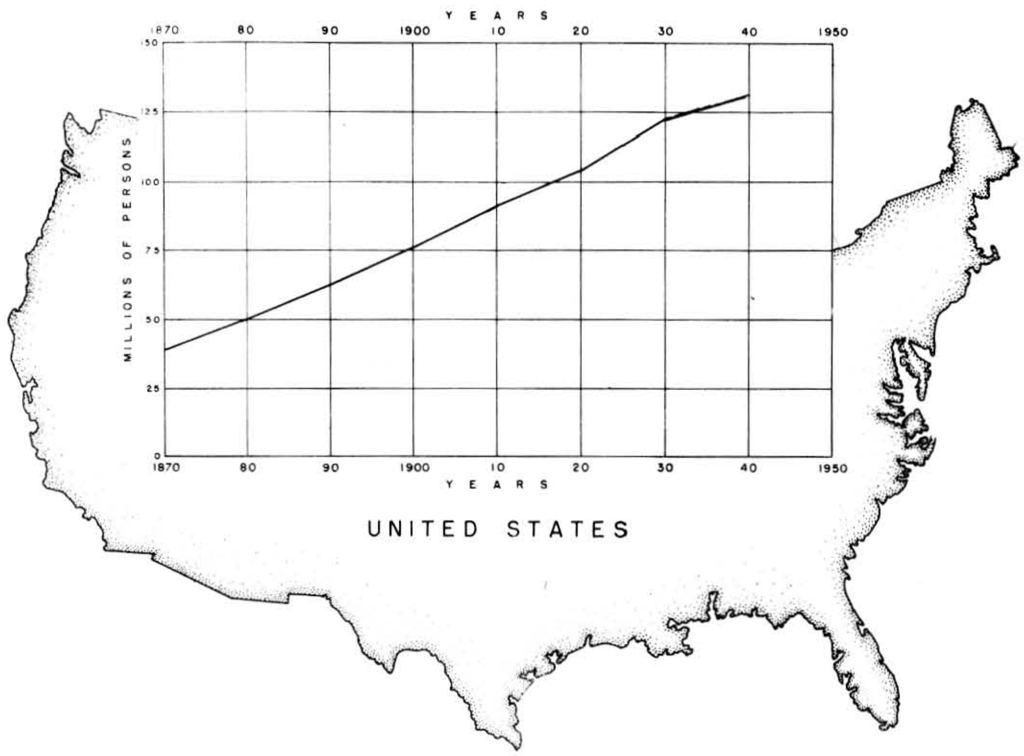


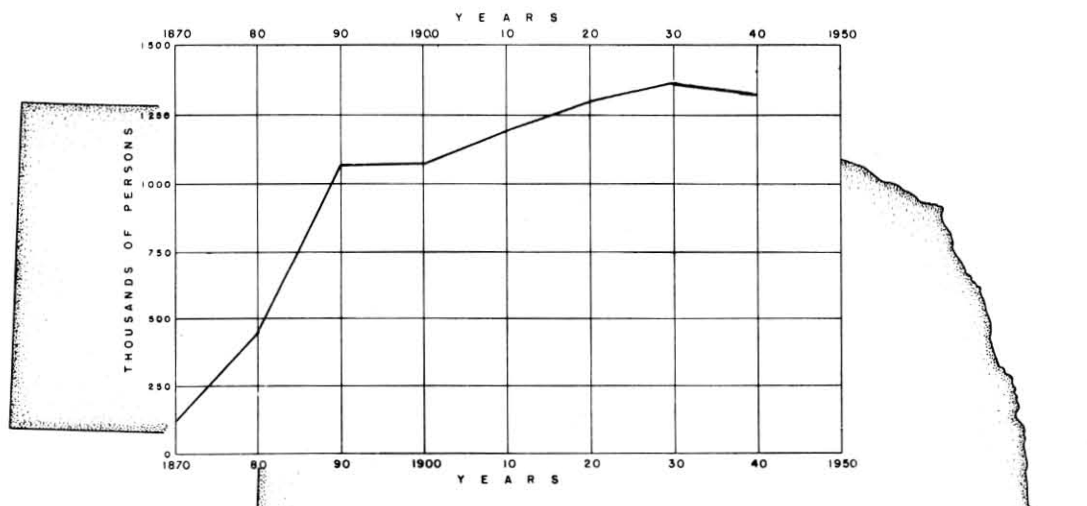
COMPILED FROM U.S. WEATHER BUREAU
"CLIMATIC SUMMARY OF THE UNITED STATES"

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

GROWTH OF POPULATION
UNITED STATES AND NEBRASKA
1870 – 1940





SOURCES—1870–1940, UNITED STATES CENSUS

POPULATION

INFLUENCE OF CLIMATIC CONDITIONS ON SETTLEMENT

Nebraska has a heterogeneous population. The native-born population of Nebraska consists chiefly of people whose ancestors came from the New England, Middle Atlantic, and East North Central states. The foreign-born population of the State came from various European countries, although there are representatives of nearly every civilized country included in that group

Perhaps the settlement of no other State has been more greatly influenced by an undependable water supply for crop production than Nebraska. Variable precipitation and drought caused fluctuating agricultural production. The ebb and flow of the migrating population were directly related to poor and good crop yields. Abundant harvest resulted in periods of prosperity and encouraged immigration. Drought, crop failure, and a depressed agriculture caused a number of settlers to emigrate from the State. Slow growth or a static population followed such periods of crop failure and "hard times."

The following losses to the farm population are shown by the United States census for the years listed:

Year	Population	Change Per Cent
January 1, 1910	631,467	
January 1, 1920	584,172	7.5
January 1, 1930	581,300 (Estimated)	0.5
January 1, 1935	580,694 (Estimated)	0.1

These restless movements reflect faulty and unsound adjustments of the population to the land. A more stabilized agricultural production might have been assured and much suffering alleviated, had the early settlers realized that agricultural methods and crops adapted to the subhumid or humid climates from which they came were not suited to their new semiarid environment. Crop failure due to droughts, practically unknown in eastern United States, came too often in Nebraska.

The long, slow process of experimentation to develop agricultural methods and crops suited to semiarid climatic conditions begun by the early pioneers still continues. The conservation of water by all available means for Nebraska farm crops occupies a place of major importance in local, county, and State planning today. A variable water supply, resulting in a varying agricultural production, still profoundly influences the mobility of the population of the State.

The census records show a rapid growth in population in Nebraska up to 1890. For the next 40 years population increased slowly. The 1940 census indicates a 4.7 per cent decrease since 1930.

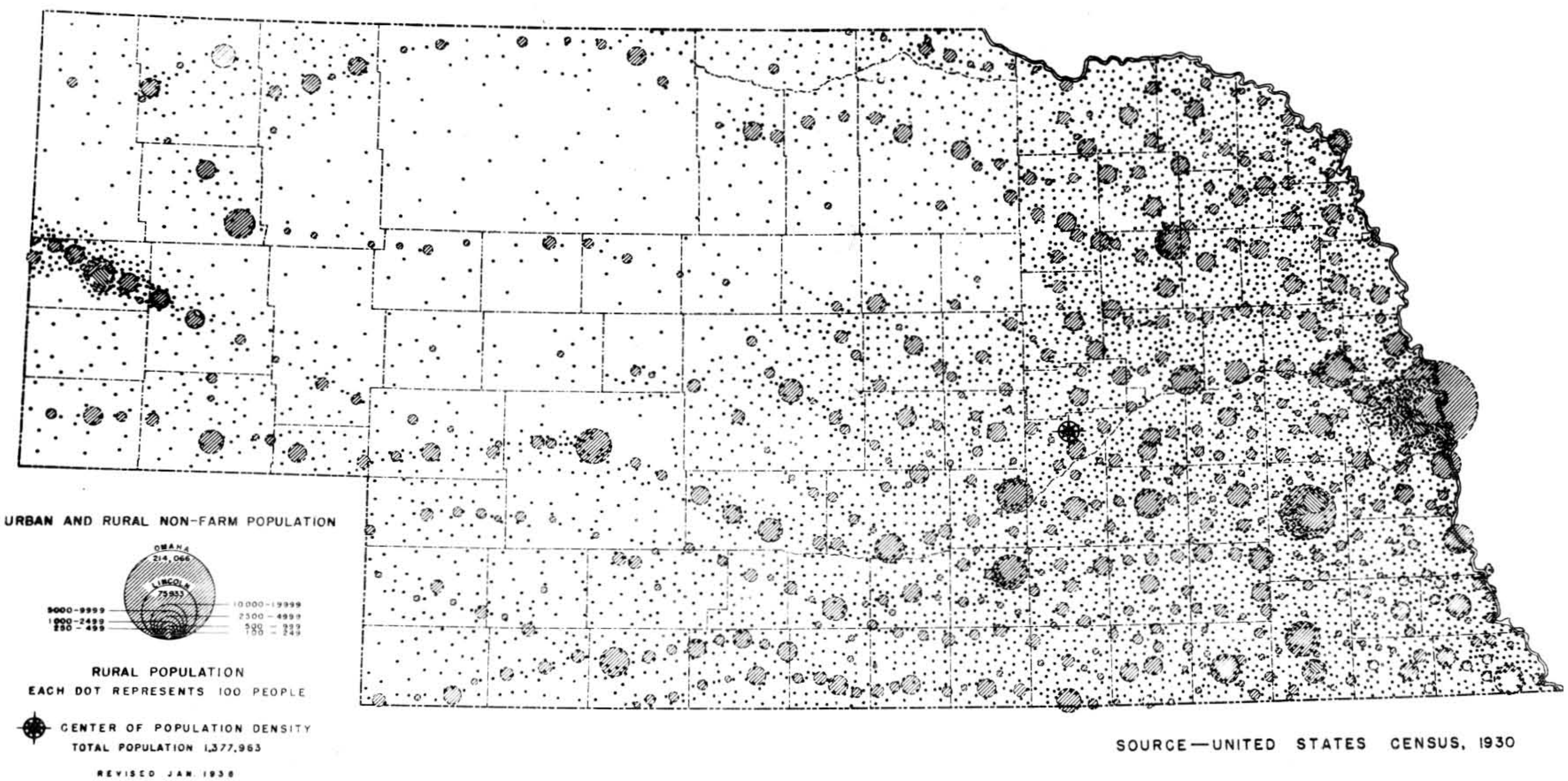
1910	1920	1930	1940
1,192,214	1,296,372	1,377,963	1,313,468

There has been a steady increase in the proportion of native-born Nebraska population which amounted to 70.4 per cent of the white population in 1930. Other percentages for the same year are listed as follows: 19.5 born in other states and outlying possessions, 8.4 foreign-born whites, and 1.0 negroes. The remaining 0.7 per cent were composed of various colored races. Nearly 60 per cent of the native-born white population came from the neighboring states of Kansas, Missouri, Iowa, and Illinois. The 479,853 persons of foreign parentage were classified in 1930 according to the following percentages:

Germans	35.1	Irish	5.5
Czechs	10.8	English	4.9
Swedes	10.4	Canadians	3.9
Danes	7.0	Polish	3.4
Russians	6.6		
Mixed And Other Nationalities			12.4

The trend toward urbanization has been steady since 1900. In 1900, 24 per cent of the population were classified as urban and this figure increased to 35 per cent in 1930. The 1930 census lists 35 towns with populations over 2,500 and 8 over 10,000. (See table in appendix for population and percentages by river basins.)

POPULATION DISTRIBUTION AND CENTER OF DENSITY NEBRASKA 1930

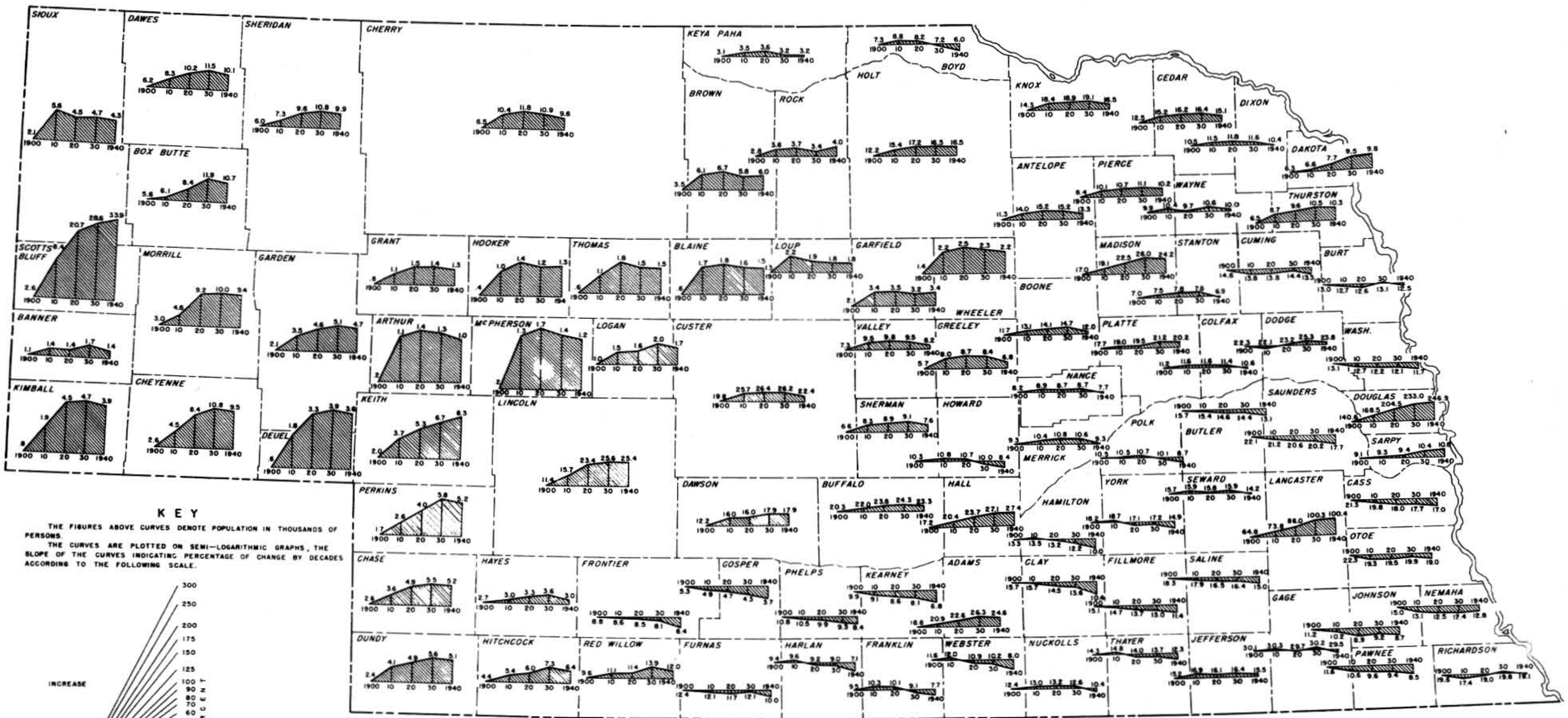


SOURCE—UNITED STATES CENSUS, 1930

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

POPULATION TREND BY COUNTIES
NEBRASKA 1900–1940



KEY

THE FIGURES ABOVE CURVES DENOTE POPULATION IN THOUSANDS OF PERSONS.

THE CURVES ARE PLOTTED ON SEMI-LOGARITHMIC GRAPHS, THE SLOPE OF THE CURVES INDICATING PERCENTAGE OF CHANGE BY DECADES ACCORDING TO THE FOLLOWING SCALE.

INCREASE
DECREASE
PERCENT
300
250
200
175
150
125
100
90
80
70
60
50
40
30
20
10
0
10
20
30

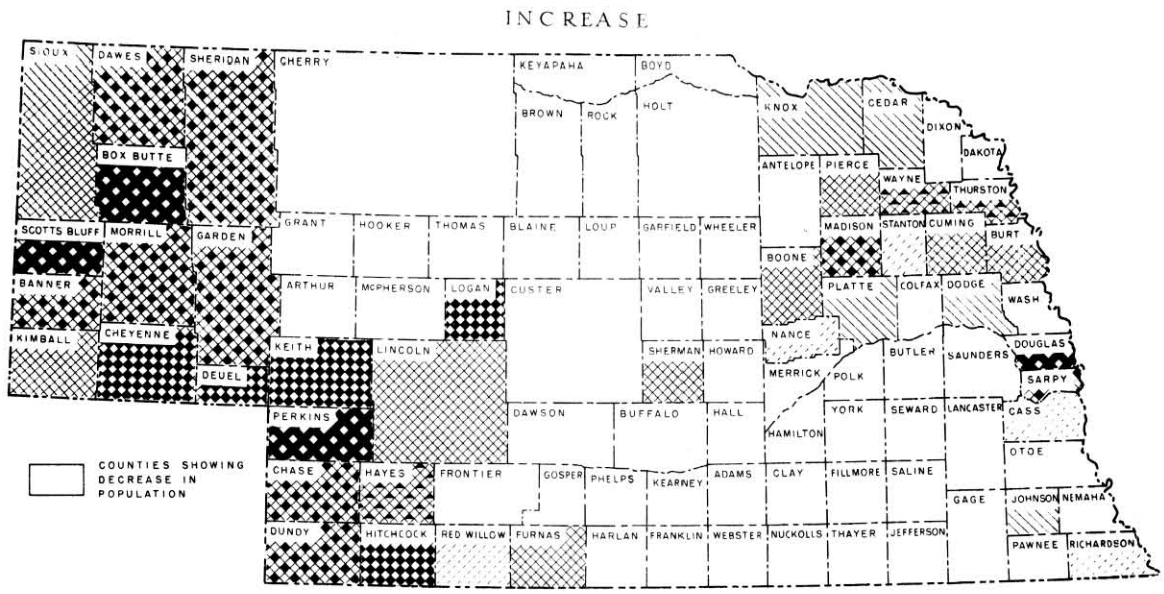
TOTAL	POPULATION
1900	1,066,300
1910	1,192,214
1920	1,296,372
1930	1,377,963
1940	1,313,440

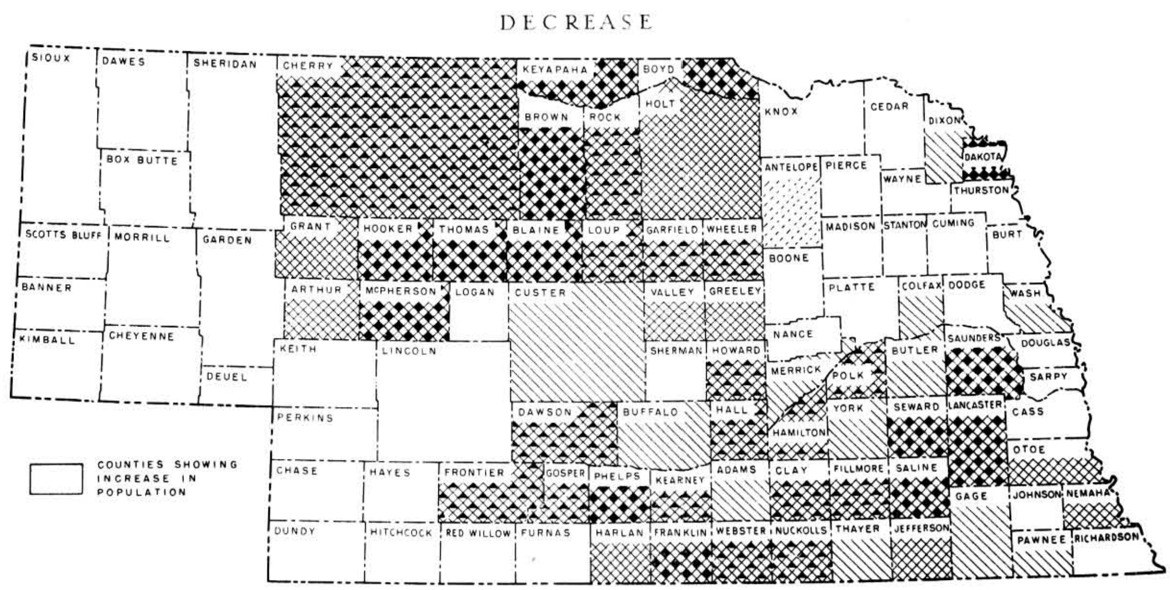
SOURCE—UNITED STATES CENSUS 1900–1940

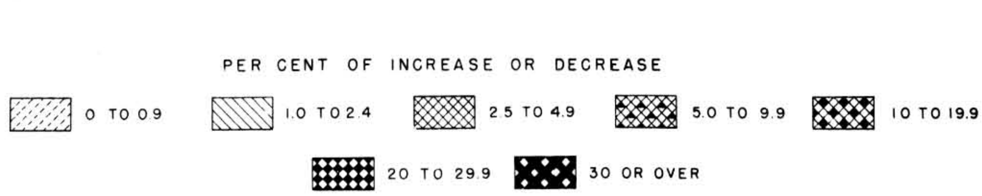
NEBRASKA STATE PLANNING BOARD.

W. P. A. O. P. NOS.-465-31-3-36 AND 665-81-3-60.

RURAL POPULATION
PERCENTAGE OF INCREASE AND DECREASE
BY COUNTIES 1920 – 1930

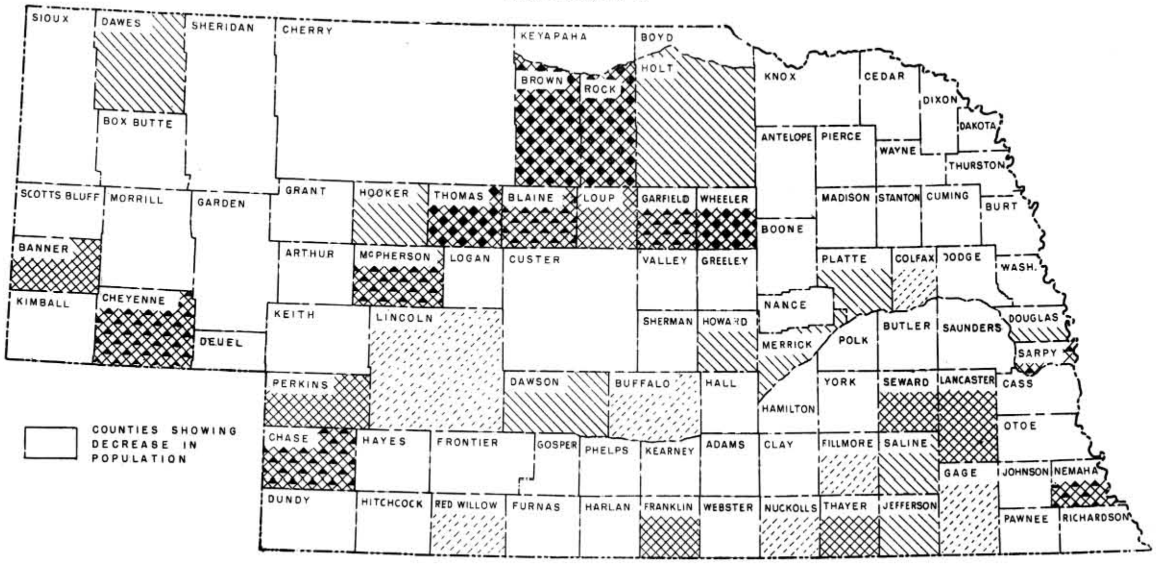




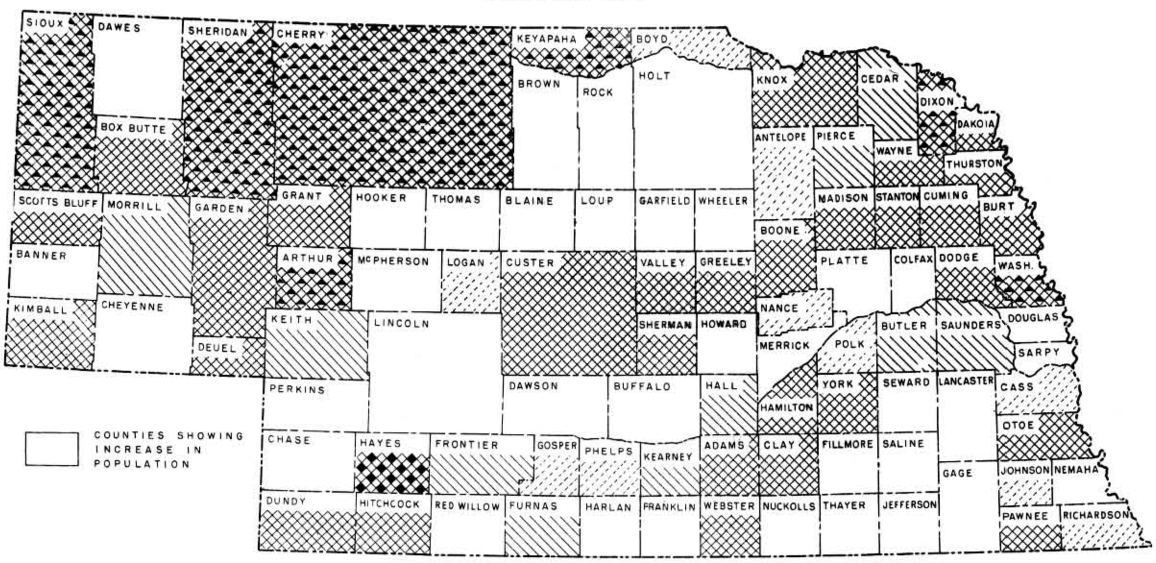


RURAL FARM POPULATION
PERCENTAGE OF INCREASE AND DECREASE
BY COUNTIES 1930-1935

INCREASE



DECREASE



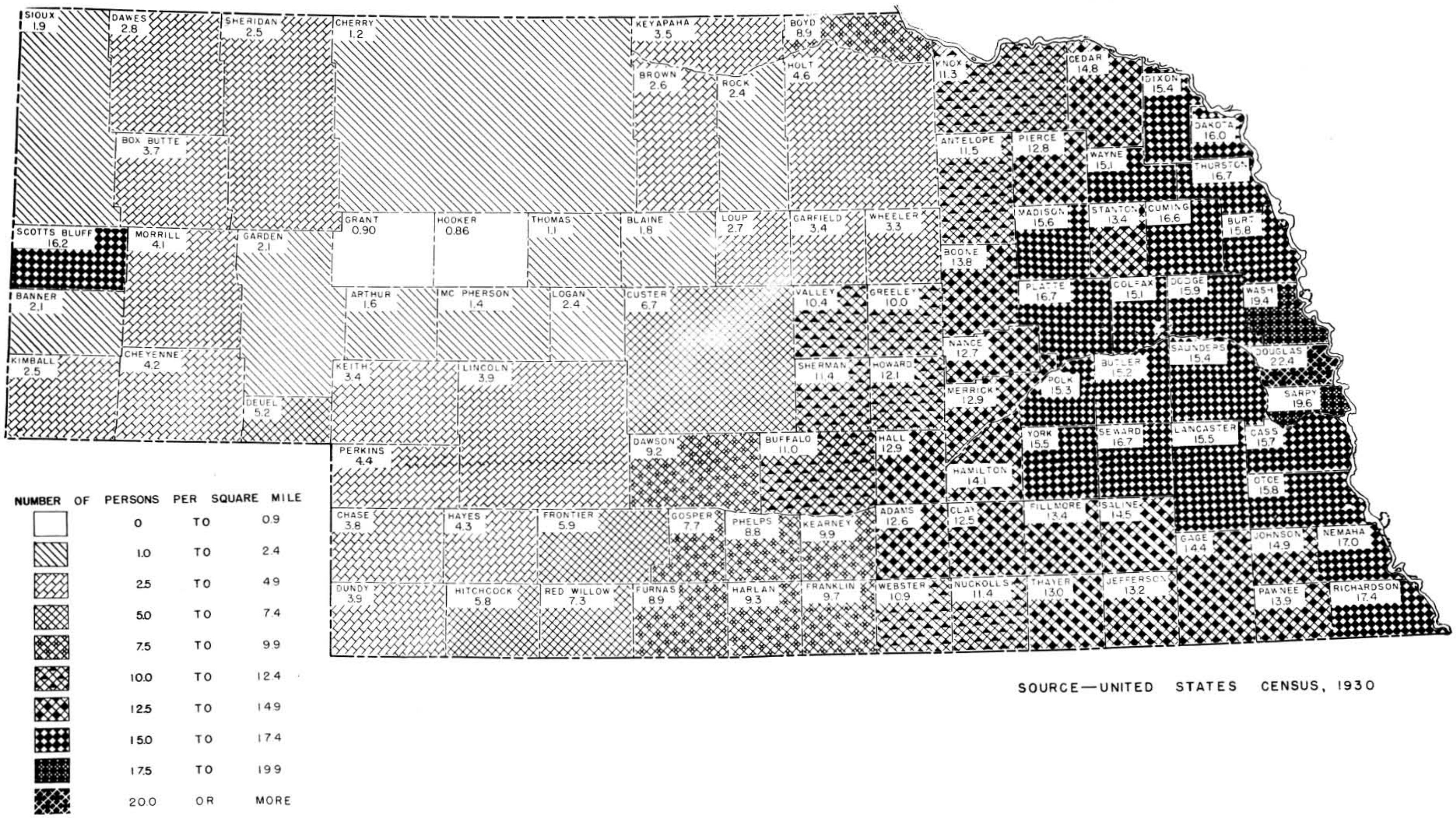
PER CENT OF INCREASE OR DECREASE

0 TO 0.9 | 1.0 TO 2.4 | 2.5 TO 4.9 | 5.0 TO 9.9 | 10. OR OVER

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

DENSITY OF RURAL FARM POPULATION
NEBRASKA 1930



SOURCE—UNITED STATES CENSUS, 1930

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

AGRICULTURE

Nebraska is primarily an agricultural State. According to the United States Agricultural Census for 1935 approximately 95 per cent or 46,615,762 acres of the land area of the State was in farms. Of the land in farms, approximately 44 per cent was in cultivated crops, 53 per cent in pasture and native meadows, and 3 per cent in other use.

According to the 1930 census 39 per cent of all persons gainfully employed in the State were engaged in agriculture. The Department of Agriculture estimates the corresponding per cent for 1935 as 38. Of those gainfully employed in manufacturing and mechanical industries, in trade and service occupations, the majority was engaged in handling and processing farm products, or in giving service to those engaged directly or indirectly in agricultural production. Thus, it is evident that a large majority of the Nebraska population is dependent upon agriculture for a livelihood.

CLIMATE AND CROP YIELDS

Variable climatic conditions influence agricultural production in Nebraska more than any other factor. Precipitation, temperature, length of growing season, and evaporation govern, to some extent, the choice of the cropping system. The annual and seasonal distribution of the precipitation determine, in a large measure, the crops and agricultural practices.

The years of extreme maximum and minimum precipitation for the 39-year period, 1900 to 1938, occurred in 1915 and 1934 respectively and are shown on Plate XI. The line of 20-inch precipitation generally accepted as differentiating the subhumid and semiarid belts, lies west of Nebraska during years of abnormally high precipitation. For example, in 1915, the year of maximum precipitation, the 20-inch line was in eastern Colorado, and Wyoming. In 1934, the year of minimum precipitation, this line receded eastward touching only a few places in eastern Nebraska. Even the average or normal annual precipitation may be so poorly distributed or of such a type as to result in crop failures. Periods of heavy precipitation may be followed by extended droughts.

Precipitation also tends to run in cycles. For several years the total annual may deviate from the long-time average. For example, from 1910 to 1930 there was a general upward trend, reaching 25.63 inches in 1930. During this period the annual precipitation exceeded its normal only 6 times but an outstanding departure occurred in 1915 when the average precipitation of the State reached a record point of 35.60 inches. In 1914 the precipitation was only 20.78 inches, and in 1916 it dropped back to 19.08 inches. The latter remained the low point until 1934.

Following 1930 the general trend has been downward with 7 successive years of subnormal precipitation beginning with 1931. Weather Bureau records show a general similarity of trend in each of the 3 major drought periods, namely: 1864, 1894, and 1934. Each period was preceded by nearly a decade wherein the general trend was downward but was interrupted by isolated years of sharply increased precipitation. In each period the recovery from the low point was marked by a sharp rise in precipitation. Both 1865 and 1894 were followed by oscillations on gradually rising levels for a decade or longer. The fluctuations which have occurred in the past may be considered as typical and, therefore, may be expected to recur in the future.

The most significant fact about the precipitation in Nebraska is that it varies widely about a critical point. In the subhumid belt the average precipitation is sufficient if properly distributed to produce good yields of the common crops, and high yields in especially favorable years. In these areas, however, the crops may fail in years of subnormal or of poorly distributed precipitation. Even in the semiarid belt profitable crops can be produced in years of normal or above normal precipitation if well distributed, but generally yields are more variable and not as high as in the subhumid belt.

ADAPTATION OF AGRICULTURAL CROPS AND PRACTICES TO CLIMATE

Early settlers found that the natural relationships existing between plant, animal, and Indian life were closely associated with environmental factors. The kinds, distribution, and growth of grasses, shrubs, trees, and animals were long-time indices of natural land and water use, and climatic influence. The native vegetation in the State shows a definite adaptation to the precipitation, temperature, growing season, and soils. This relationship indicates the inherent agricultural possibilities of the different areas. Only within recent years have these relationships been generally recognized and applied. The introduction of farm crops and methods from regions generally unlike those in Nebraska proves hazardous and sometimes unsuccessful. Such crops and practices are generally either discontinued or modified.

The results from agricultural experiment stations and related agencies have been the basis for crop and animal improvement and production practices. The several agricultural associations of the State are furthering the cultural methods and farm enterprises that are best suited to the climatic conditions and needs of Nebraska. Experience and technical information have established a background for the practical application of conservation principles, which are essential to continued agricultural development.

AGRICULTURAL EXPANSION

Optimism, local pride, and commercial interests promote the settlement and development of a new land. Such influences frequently tend to bring about more intensive land use with its accompanying commercial and social development than the soils and climatic conditions will justify even during the more favorable years. Successive favorable years create the widespread opinion that climatic conditions have become permanently dependable. As a result, more intensive land use is stimulated, land prices rise, range lands are overstocked, and large farms and ranches are subdivided into smaller units. Crop acreage is expanded indiscriminately on both good and poor land. New business enterprises are established and roads and schools are built to serve the growing demand, all on inflated values.

High wheat prices and the patriotic appeal during the World War urged increased wheat production and exerted an important influence on the agriculture of the State. An influence greater than war prices was the tractor, the combine, and the large-scale plowing and planting machines introduced during and after the War. As a result, thousands of acres were plowed, which should have been left in permanent grass.

Inevitably, drought years recur with dismaying regularity, as illustrated during the period since 1930, and severe losses are experienced, especially where agriculture has been overextended and insufficient reserves provided. Crops, pastures, and water supplies dry up, and stock is rushed to market. Strong winds loosen, lift, and carry such quantities of the dry, light topsoil that the sky is darkened with dust. With the dwindling farm income, principal and interest payments and taxes become delinquent, and mortgages are foreclosed. Local governmental units find it difficult to raise sufficient revenue to continue operation. The federal government is called upon to make emergency feed and seed loans. Local business enterprises fail, and many families are forced to move to go on relief.

In 1930, 44,708,565 acres or 91 per cent of the total land area of the State was reported in farm land. Of this area 43 per cent of the land in farms was under cultivation, 53 per cent in wild hay and permanent pasture, and 4 per cent in other uses.

In 1935, 46,615,762 acres or approximately 95 per cent of the total land area of the State was reported as farm land. Much of the farm land of the State, however, because of unfavorable relief or soil, is held in permanent grazing or meadow land.

For the State as a whole, 44 per cent of the land in farms was under cultivation in 1935; 53 per cent was wild-hay land and permanent pasture; and 3 per cent was in other uses. In the eastern and southern parts of the State and other arable farming areas, from 50 to 90 per cent of the farm land within individual townships is commonly found to be under cultivation. In the sand-hill area of northern Nebraska and similar areas, where the land is used mainly for grazing and production of wild hay, many townships report less than 5 per cent of the farm land under cultivation.

It is rather generally believed that most of the land well suited to cultivation physically, and considerable that is poorly suited has already been brought into cultivation. The cultivation of marginal land which may prove profitable only under favorable conditions is a questionable practice.

Of the cultivated land, approximately 50 per cent is normally planted to corn; 36 per cent to small grains; 8 per cent to tame hay; and 6 per cent to all other crops.

TYPES OF FARMING

In every farming area there are fairly well-defined reasons for the development of the particular type of agriculture found there. Although the progress in any particular direction may not always prove profitable, it indicates that farmers have attempted to adapt their methods to the conditions confronting them and to secure maximum returns from the resources at their command.

As a result, farmers in various areas of the State follow different lines of production. They make an effort to adjust their crop production and methods to prevailing physical and economic conditions. This adjustment has proceeded to the point where the agriculture of the State can be divided into areas of rather distinct types of farming.

The various types of farming result from two general groups of factors. One of these includes that large body of factors, physical and biological, such as soil, topography, drainage, precipitation, evaporation, insect pests, diseases, and adaptation of plants and animals. The other group consists of economic factors such as availability of labor and capital, relative prices of farm products, relative costs of the items needed for production, and changes in technique.

INTENSIVE AND EXTENSIVE AGRICULTURAL METHODS

Crop production varies from relatively intensive production of corn and other feed grains in the eastern part of the State and crops in irrigated areas, to extensive production of grass and hay in the range areas of the sand hills. The eastern half of the State is devoted principally to the production of corn, small grains, alfalfa, hogs, and cattle. Sugar beets and potatoes are important crops in the irrigated sections of the west.

Livestock production ranges from intensive meat production in the eastern part of the State, and whole milk production near urban centers, to extensive production of range livestock in the sand hills and other range areas. Sheep production is an important livestock enterprise in the irrigated areas of western Nebraska, and the production of hogs in eastern Nebraska. For the entire State, hogs rank first and cattle second in importance. The only means of using pasture land is through the grazing of livestock. Furthermore, livestock usually provides the most economic means of utilization of much of the feed, grain, and forage crops which occupy such a large proportion of the arable areas of Nebraska. With the exception of wheat, only a small proportion of the most important crops of Nebraska are marketed in their original form.

FARM SIZE AND TENANCY

In 1930 there were 129,458 farms in Nebraska with a combined area of 44,708,565 acres, or an average of 345 acres per farm. In 1935, there were 133,616 farms with an average size of 349 acres. The

1937 Agricultural Census estimated that Nebraska has 134,000 farms, averaging 349 acres. The farms in the ranching and small grain areas in western Nebraska average much larger than this, whereas the farms in eastern Nebraska average considerably less.

The change in the size of farms has been more pronounced in some parts of the State than in others. During the period from 1900 to 1935 the number of Nebraska farms of less than 3 acres decreased while the number from 3 to 99 increased. There was practically no change in the number having from 100 to 174 acres. This latter group is the most common size, constituting 70 per cent of all farms. Excluding the irrigated sections, the farms in the western part of the State are much larger than those in the eastern part. Many of the farms in the west are from 500 to 1,000 acres, or even larger. There is a tendency for individual holdings in the Sand Hills to increase in size. From 1930 to 1935, farms ranging in size from 175 to 500 acres in some other sections of the State increased at the expense of those of 1,000 acres or over. In the irrigated areas the trend was toward a small acreage. From 1930 to 1935, farms from 175 to 500 acres in size gained in number, while the number in the 80 and 640 groups decreased.

Slightly less than 50 per cent of the farms in the State were operated by tenants in 1935. In addition, another 20 per cent of the farms consisted of land which was in part owned and in part leased. In some counties the proportion of farm tenancy was over 55 per cent, with the proportion of land operated by tenants running much higher. The increase in farms operated by tenants has been fairly steady during the past 25 years.

FARM INCOME

During the period from 1923 to 1934, 71 per cent of the Nebraska agricultural income came from livestock and livestock products, and 29 per cent from the sale of crops. Gross farm income has advanced steadily since 1932, the low point of the depression. Gross farm income for 1935 amounted to $252,449,000 as compared with $166,905,000 in 1932. However, gross income for 1935 was not much more than 60 per cent of the 1925-29 average. The severe drought of 1934 and the short corn crop in 1935 prevented the gross farm income from reaching higher totals. The failure of the corn crop in 1934 necessitated a drastic reduction in hog production, which is one of the leading sources of Nebraska farm income. Had production been near normal, the farm income during 1936 would have approximated the 1925-29 average,even with prices somewhat lower than those prevailing. Sugar beets and potatoes provide the western irrigated portions of the State with the largest cash income, although sales from sheep and cattle are important in the areas where feed is available. In the eastern part of the State,hogs and cattle provide a large percentage of the farm income with wheat as the principal cash crop. Some oats and barley are also sold.

CROPPING SYSTEM

Nebraska does not have a large number of important crops. Her crop production is confined mainly to the staple grain and forage crops. Corn, wheat, oats, alfalfa, and wild hay were of such importance that each occupied more than a million acres on Nebraska farms in 1937. In that year, which was not an unusual year, 49 per cent of the cultivated area of the State was occupied by corn, 20 per cent by wheat, 14 per cent by oats, 7 per cent by alfalfa, and 10 per cent by minor crops. The acreage of wild hay, which is not classed as a cultivated crop, was nearly two and one-half times that of alfalfa. More than 45 per cent of all land in farms was pasture land. This percentage has not changed materially since 1924. The most economical way of utilizing pasture land, forage and feed crops is through livestock. Consequently, the major part of such crops moves to market in the form of livestock or livestock products.

GRAIN CROPS

The grain crops of Nebraska include corn, wheat, oats, barley, rye, emmer (spelt), and the grain sorghums. The value of the annual production of these crops in the State averages about $247,000,000.

Corn

Corn occupies more than twice the area devoted to any other cultivated crop,and it has a gross value greater than that of any other crop. Nebraska is normally third in the United States in corn production with an average harvest of 224,000,000 bushels. It is in the western part of the great corn belt which extends from central Nebraska to central Ohio. Because of soils, relief, climate, and other conditions corn is not of equal importance in all sections of the State.

The largest area of concentrated corn production is in northeastern Nebraska, extending westward from the Missouri River, with the greatest density near the river. In this area several of the counties have from 50 to 60 per cent of their farm land in corn and a much larger number have from 40 to 50 per cent. Other areas of the State having high concentration of corn production are the east-central in the lower Platte River Valley, the north and east-central part, and along the Missouri River in the southeastern part. The north-central and western parts of the State have the lowest percentage of farm area in corn. This is largely accounted for by the small percentage of land under cultivation or that it ranks less important than the small grains in these arable areas.

The number of bushels of corn grown and its value vary greatly from year to year. (See table in appendix). The 5-year average from 1926 to 1930 was 9,010,000 acres yielding 24.79 bushels per acre, and the total production, 223,399,000 bushels. The average price was 64 cents per bushel; the value of the average crop $142,152,000 per year. The price of corn decreased markedly during the depression years of 1931, 1932, and 1933.

Wheat

Wheat is the leading cash crop in Nebraska. The State is second in the production of winter wheat, and third in all wheat, producing on the average 56,000,000 bushels annually. Wheat is largely grown on the hard lands of the plains and tablelands. About 92 per cent of the total wheat acreage is winter wheat. There is considerable spring wheat in the northwestern counties, but elsewhere in the State winter wheat is much more important, because it is a more certain and productive crop.

On the average about 85 per cent of the crop moves out of the county where grown and smaller portions are sold direct to local mills. A small part of the crop is utilized on the farm for other purposes than seed. Experiments show ground wheat to be equal, pound for pound, in value to corn, for fattening livestock. Only in cases of abnormally narrow spreads between prices of wheat and feed grains is much wheat used for livestock feed in Nebraska.

Wheat is essentially a southern and western Nebraska crop. It is confined largely to the "panhandle" and to the territory south of the Platte River. The principal area of concentrated wheat production is in the southern tier of counties of the "panhandle" section and in the adjacent counties to the east. The second area of important wheat production is in the counties just south of the Platte River in south-central Nebraska.

Hard winter wheat is the prevailing type grown in Nebraska, except in the northern counties of the "panhandle" where red spring wheat is important. In 1930 Nebraska ranked second among the states in production and value of winter wheat, and eleventh in spring wheat. Nebraska in 1923 ranked eighth for winter wheat and tenth for spring wheat. For the 5-year period, 1926-1930, its rank was: fifth in winter wheat in 1926, and second for the next 4 years. In 1930 winter wheat production reached an all-time high of 71,934,000 bushels. The production decreased for the next 4 years reaching a low point in the drought year of 1934. Since that time production has been gradually approaching normal.

Oats

Oats follow corn and wheat in importance as a grain crop in Nebraska. In 1927, oats occupied 14 per cent of the cultivated land and 5 per cent of the farm area of the State. Production of oats is of most importance in the eastern third of the State with the area of concentrated production in northeastern Nebraska where corn is the leading crop. Oats are rotated with corn, sweet clover or alfalfa, and are used principally as stock feed.

Barley

During the past few years, barley has increased in acreage especially in western Nebraska. In 1925, the barley crop occupied 233,000 acres; in 1927, 259,000 acres; in 1928, 430,000 acres; and in 1929, 688,000 acres.

There are two areas of concentrated barley production in Nebraska. The one is in the irrigated area of the North Platte Valley, centered in Scotts Bluff County; the other is in the southern tier of counties of this region.

Rye

Rye is better adapted to sandy land than are wheat, barley, and oats. In a belt bordering the sand-hill section of Nebraska, rye is rather important, occupying as high as 10 to 14 per cent of the farm area in a few townships in Holt and Antelope counties. Rye is one of the most profitable crops that can be grown on soils of light texture or low fertility.

Spelt and Grain Sorghums

Spelt and grain sorghums are grown in the southwestern and western counties for stock feed. The first is of minor importance whereas grain sorghums are increasing in importance.

Production and Value of Minor Grain Crops

The production and value of oats, rye, barley, spelt, and grain sorghums in 1930, when the prices were relatively low were as follows:

	Acres	Bushels	Value
Oats	2,485,000	80,017,000	22,405,000
Barley	725,000	22,330,000	7,816,000
Rye	333,000	4,995,000	1,898,000
Spelt (emmer)	43,000	1,006,000	382,000
Grain (sorghum)	17,000	340,000	272,000
Total Value			32,773,000

Forage Crops

The more important forage crops of Nebraska are the native pasture grasses, wild hay, alfalfa, sweet clover, red clover, timothy, sudan grass, millet, and forage sorghums.

Native Grasses

Nebraska is well supplied with native forage plants, especially in the sand-hill region and on wet bottom lands. These plants form our permanent pasture lands and native hay meadows which support extensive cattle raising in different parts of the State.

Wild hay occupies more than twice the acreage of alfalfa, but in tonnage it is less important. From the standpoint of feeding value, wild hay is about three-fourths as valuable as alfalfa. More than 3,000,000 acres of our native prairies are cut annually, yielding more than 2,600,000 tons of hay with a value of $16,200,000 or more. Cherry, Holt, Rock, and Lincoln counties lead in this production. The Prairie Plains country, the hay flats of the Sand Hills, and the wet bottom lands of the Platte, and other valleys in the State are the main sources of this hay. The principal area of concentrated wild hay production is in the north-central part of Nebraska. This is an area of light soils, where it is highly essential to maintain a grass covering to prevent wind erosion and the development of "blow-outs". Such conditions necessitate a system of agriculture that will utilize to best advantage the native vegetation. This is done by grazing and cutting the native grass hay.

The largest centers for the production and shipment of native hay are at Newport, Bassett, Atkinson, O'Neill, and Ewing. Some of this hay is shipped to Wisconsin, Minnesota, Iowa, and Missouri, but most of it is fed to livestock within the State.

Alfalfa

The two outstanding leguminous forage crops in Nebraska are alfalfa and sweet clover, the former used mainly for hay and the latter for pasture.

Alfalfa is the leading hay crop of the State from the standpoint of tonnage produced. The main use of alfalfa and other hay crops in Nebraska is feed for livestock. For the 5-year period, 1923-1927, slightly less than 4 per cent of the hay crop of the State was reported as marketed. The greater part of the alfalfa crop went to livestock feeders within the State. The largest area of concentrated alfalfa production is in the Platte Valley of central Nebraska, where much of the land is subirrigated. In eastern Nebraska where precipitation is less a limiting factor heavy crops of alfalfa are grown on the upland, especially until the deeper seated subsoil moisture is exhausted.

For a few years, Nebraska ranked second among the states in the acreage and value of alfalfa. It is now first in acreage. From the 1,135,000 acres in this crop in 1930, about 2,973,000 tons of hay were cut, an average of 2.12 tons per acre. In addition, a large amount of pasturage was provided and from 30,000 acres, 84,036 bushels of seed were harvested. The value of the crop in 1930 was $25,130,211 for hay, and $997,420 for seed. The leading counties for seed production were Sioux, Dawes, Cherry, and Dawson, whereas the leading county for alfalfa-hay production was Scotts Bluff.

Sweet Clover

Sweet clover is rapidly increasing in acreage on the uplands where it fits into systems of rotation. The greatest value of sweet clover is for pasture and soil improvement. In 1930 there were 1,126,000 acres of sweet clover in the State. Much of this was pastured to cattle and other animals. From 21,000 acres of sweet clover 90,300 bushels of seed were harvested, and a considerable acreage was cut for hay.

Value of Hay

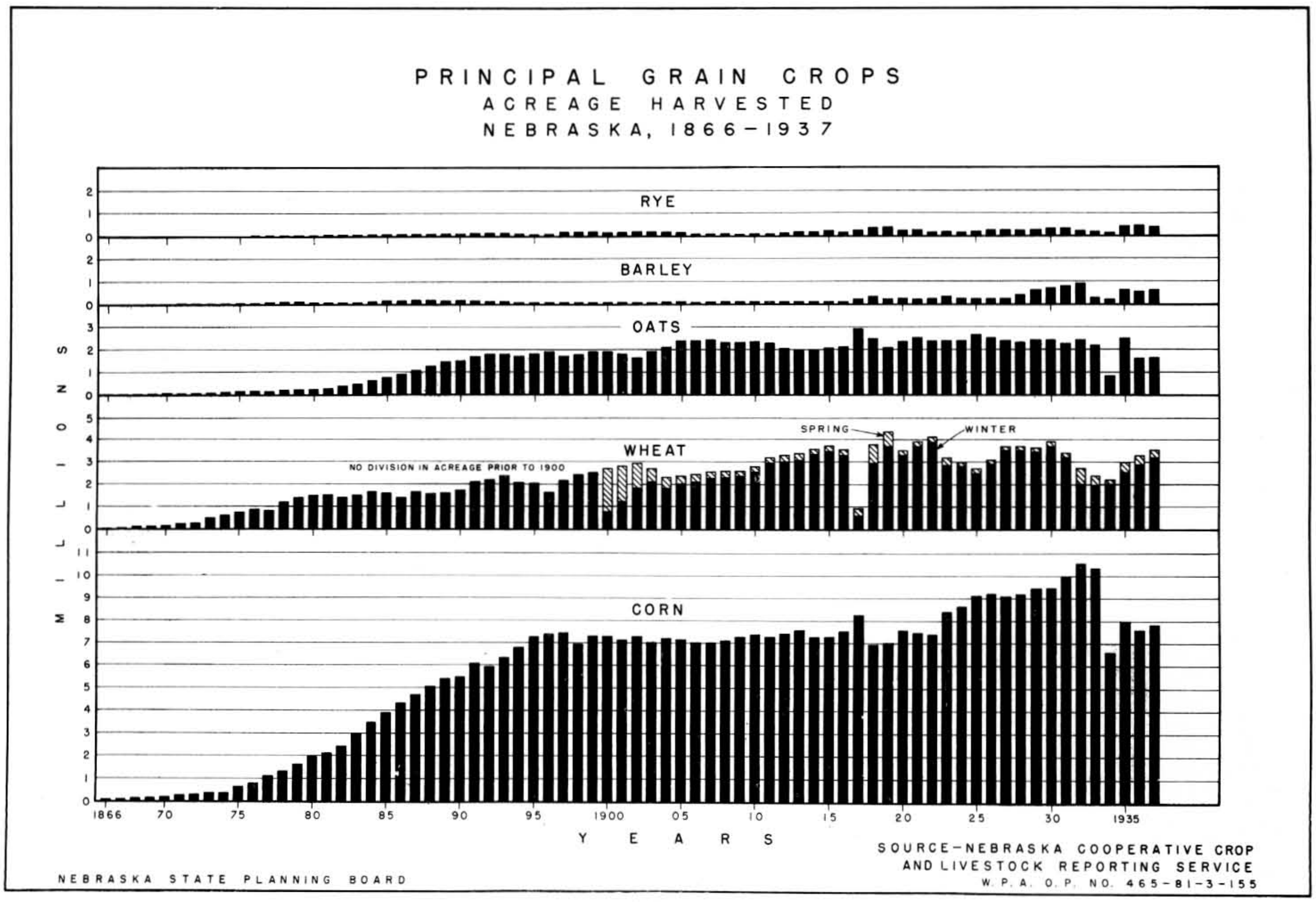
The total value of the annual hay production of Nebraska is about $50,000,000 of which alfalfa, wild hay, and sorghum lead in the order named.

Sugar Beets

The growing of beets in Nebraska for sugar production is confined largely to the irrigated areas of Scotts Bluff, Morrill, Dawson, Lincoln, Sioux, Garden, and Kimball counties.

There are seven sugar beet factories in Nebraska. These are located at Grand Island, Bayard, Minatare, Scottsbluff, Gering, Mitchell, and Lyman. With the exception of Grand Island the factories are all in the irrigated areas of the North Platte valley. They are operated for about three months of the year.

The production of beet sugar has advanced year after year in Nebraska until the combined annual output of the seven factories is now about 2,750,000 sacks or 275,000,000 pounds. Part of the Nebraska-made sugar is consumed within the State, but much of it is shipped in carload lots to out-state markets.



According to the census, the 1930 production and value of sugar beets in Nebraska were as follows: acres under cultivation, 81,000; average yield, 14 tons per acre; total tons, 1,132,000; value of crop, $7,924,000. Although the yield was increased, there was a reduction from the 1929 acreage.

The 1930 value of beets in the leading counties was: Scotts Bluff $5,100,000; Morrill $1,059,282; Dawson $315,567; Lincoln $194,164; Sioux $179,305; Garden $164,682; Kimball $115,388.

Potatoes

Potatoes are raised in gardens or in small fields in every county in Nebraska. They are grown commercially, principally in the western counties and in the central counties along the Platte River. The counties leading in the commercial production of food potatoes are Scotts Bluff, Sioux, Morrill, and Kimball, located in the irrigation districts. Those leading in the production of seed potatoes are: Box Butte, Sheridan, and Dawes. Scotts Bluff leads in the value of food potatoes, and Box Butte in production and value of seed potatoes.

Production in 1930 was as follows: acreage-94,000; average yield-100 bushels per acre;production 9,400,017 bushels; value- $7,990,017. The leading counties in the value of potato production in 1930 were;Scotts Bluff- $1,471,138; Box Butte- $1,367,711; Sioux- $666,830;Sheridan- $485,813;Kimball $440,813; Dawes- $362,957.

Combination of Crops and Livestock

The true significance of each crop becomes more apparent when considered in relation to other enterprises. The different crops are fitted together to make up the cropping system. Certain factors such as climatic conditions,soils,relative yields,variability of yields, labor requirements, and relation to livestock enterprises have an important influence on the choice of crops and their relative importance.

LIVESTOCK

Livestock holds an important place in Nebraska agriculture. As an average for the 5-year period 1923-1927, 75 per cent of the gross farm income of Nebraska farmers was derived from livestock and livestock products.

Long distances to markets make it desirable to convert much of the bulky farm products into products of less volume in proportion to value in order to reduce transportation costs. This process is partially accomplished through livestock.Livestock enterprises, however, are not of equal importance in all parts of the State. There are distinct differences in the geographical distribution and type of production of the several classes of farm animals.

Cattle

Beef cattle and dairy cattle play an important part in the agriculture of Nebraska. A favorable climate, abundant supply of clean water, and good marketing conditions make beef and dairy-cattle industries important factors in the life of the State.

Beef cattle are almost as important a source of gross income of Nebraska farmers as are hogs. For the 5-year period, 1923-1927, sales of cattle and calves make up 28 per cent of the income as compared with 30 per cent from hogs. Plate LIX shows the distribution of cattle in Nebraska in 1935.

The leading phases of the beef cattle industry in Nebraska are cattle breeding, raising,feeding, and slaughtering, and meat packing.

The heavy concentration of beef cattle is in northeastern Nebraska where the number of hogs per section is also highest. Another area of concentration of beef cattle lies to the west of north-central Nebraska. The most specialized cattle raising area is in the sand-hill region, because of its abundant grass for grazing and hay, its water supply, and because other forms of agriculture are poorly suited to the sandy soils of this area. The areas showing the fewest cattle per section are the southern"panhandle" and southwestern sections of the State where there is relatively little pasture and hay, and the proportion of land in feed grains is relatively small.

The kind and quantity of the feed grains,forage, and pasture largely determine the type of cattle enterprise - whether it is the production of feeding cattle, the raising and finishing of market cattle, or commercial feeding.

The cattle are trailed to shipping points and sent principally to Omaha, Kansas City, St. Joseph, and Sioux City as feeders or for slaughter. Other markets include Chicago and Denver, and small local markets. In 1930 there were 2,312,000 cattle of the beef type in Nebraska. Of these, 1,357,501 beef cattle and calves were marketed with a value of $114,707,838. Nebraska is not an important dairy state, although dairying is an important supplement to the general farming system. For the 5-year period, 1923-1927, receipts from the sale of dairy products made up about 8 per cent of the gross income of Nebraska farmers. The dairy enterprise has been gaining in importance. In 1935 it ranked next to hogs and cattle among the livestock enterprises and provided 11 per cent of the gross farm income. The highest concentration of milk cows is in counties adjacent to the large cities, especially in Douglas, Washington, and Lancaster counties.

Aside from the counties named above, the distribution of milk cows is fairly uniform in the eastern third of the State. The areas of low concentration are the north-central, southwestern, and western counties (excepting Scotts Bluff County), the lowest being in the sand-hill section.

Butterfat is the chief form in which dairy products are sold. Production of fluid milk is of major importance only near Omaha and Lincoln. Cheese manufacture is a growing industry in the North Platte Valley particularly in Scotts Bluff County. Throughout the State cream is separated from the milk on the farm and sold on the butterfat basis. In some localities where dairying is important, the butterfat is manufactured into butter. Omaha makes more butter than any other city in the world, averaging over 30,000,000 pounds annually. Nebraska has 108 creameries with an average annual production of 85,000,000 pounds of butter.

Hogs

Hog production is the most important livestock enterprise in Nebraska when measured in terms of gross farm income. For the 5-year period, ending in 1935, 26 per cent of the gross farm income of Nebraska farmers was derived from hogs. Plate LX shows that the distribution of hogs in the State coincides quite closely with the distribution of the corn acreage. Northeastern Nebraska is the most important area of hog production with Burt County having had 327 head of hogs per section of land in 1928, and 4 other nearby counties over 250 head per section. The Sand Hills and western and southwestern Nebraska have the fewest hogs per section. The sand-hill region has a large percentage of hay and pasture land and low production of feed grains. Western and southwestern Nebraska have more feed grain available, but the types of hay and pasture are more suitable for cattle production than for hog production. In eastern Nebraska where production of slaughter hogs is the prevailing practice, a large proportion of the hogs on hand are being fattened for market.

Sheep

Sheep are of importance in only limited areas of the State. For the 5-year period ending in 1935 about 2 per cent of the gross farm income of Nebraska farmers was derived from this source. The most important phase is feeding for market. Sheep are shipped into certain feeding areas largely from western range states and are finished for market. They are put into the feed lots in the fall and disposed of in late winter and early spring. Scotts Bluff, Merrick, and Sarpy counties are the most important feeding centers. Hall, Nance, and Burt counties also have large commercial feeding centers.

Commercial sheep feeding furnishes a means of marketing surplus feeds, usually to good advantage. Beet sugar by-products in the western, and alfalfa in the central and eastern Nebraska feeding sections, respectively, are the basic rations.

General purpose flocks are found most often in eastern and central Nebraska, and less often in the sand-hill area.

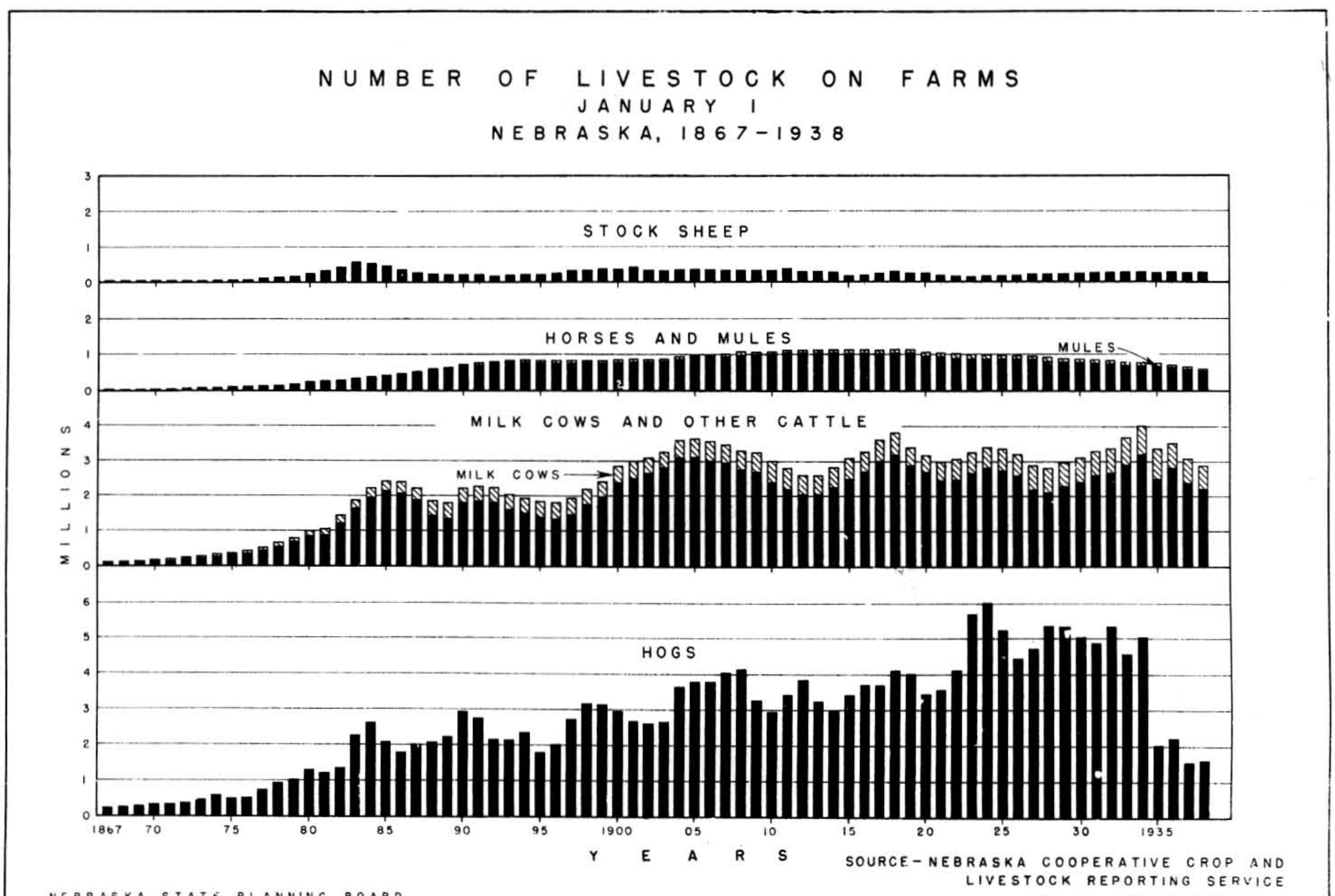
Poultry

Poultry ranked next below hogs and beef cattle as a source of livestock income during the 5-year period 1923 to 1927. The poultry industry is now surpassed by dairying. For the 5-year period, 1923 to 1927, sales of poultry products provided 6.5 per cent of the gross income of Nebraska farmers. Commercial poultry farms are relatively unimportant in Nebraska. The bulk of poultry products is produced on farms where the enterprise is handled as a side line.

The chief concentration of poultry is in southeastern and east-central Nebraska and the number per section decreases rather rapidly northward and westward across the State. The greater number of farms, the larger feed supply, and the better markets are factors accounting for more poultry in eastern and southern Nebraska.

AGRICULTURAL PROGRAMS

During the past few years a great deal of attention has been given to the organization of agricultural programs. The ultimate objective of these programs, whether on a county, state, or national



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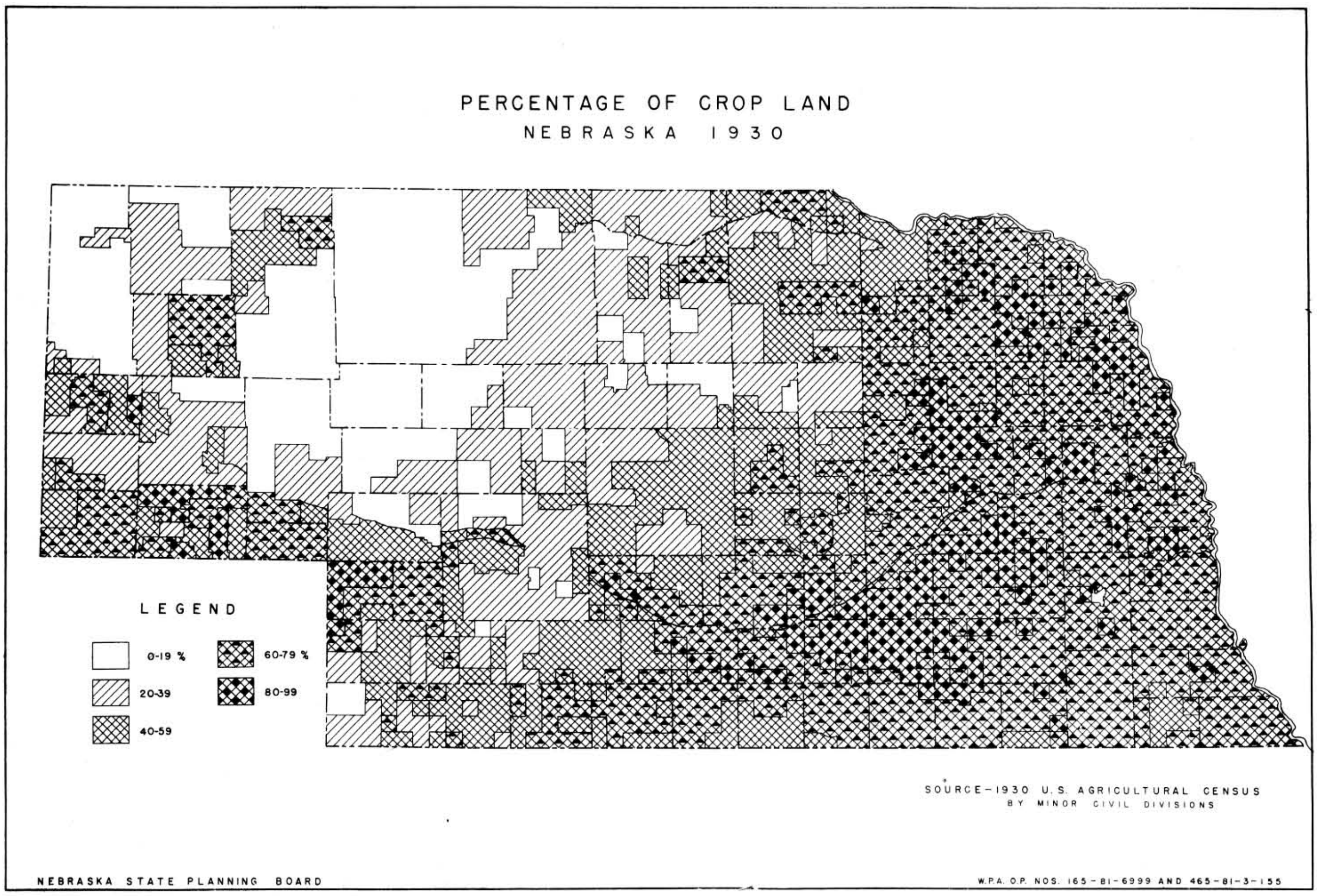
basis, is to aid farmers, both as individuals and as groups, to adopt practices and systems of farming which will conserve the resources more adequately and increase farm income. This is true whether the particular program be soil or moisture conservation, better crop rotations, improved varieties of crops, disease control, better feeding practices, or adjustments to market outlooks. Before much progress can be made in this direction, it is necessary to know what the situation is in each area of the county, state, and region and not only to obtain more accurate information on yields, production, and feeding practices, but also to determine what farming systems are best suited to the various situations in different areas.

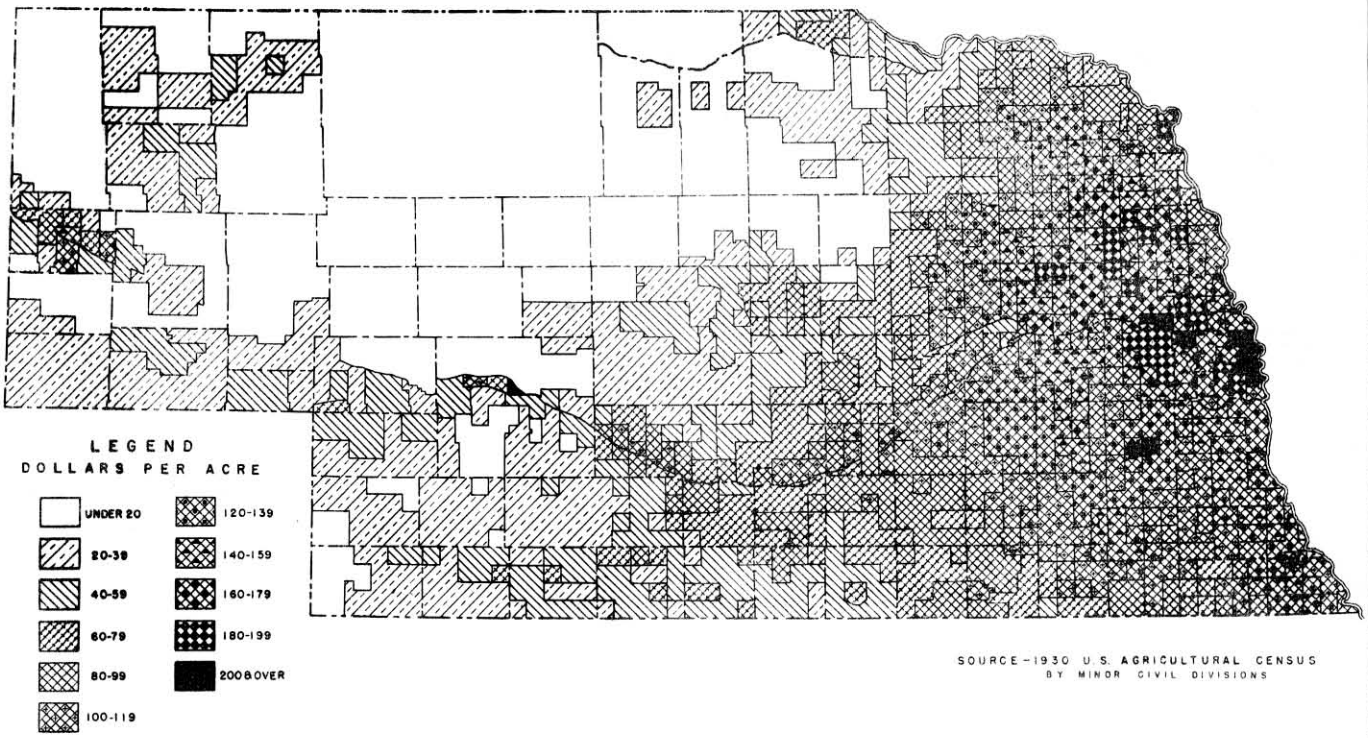
Generalized recommendations have limited value and may be misleading. However, it is possible to make significant recommendations when farming systems are analyzed in terms of more specific conditions.

A farmer cannot stop with the selection of a fixed system of farming since it may not prove profitable to follow rigid production standards over a period of years. Because it is impossible to control production and prices, some short-time adjustments in the general plan are often desirable. As prices change, the returns to be expected from different organizations likewise change. If a farmer is to follow his economic advantage, he must take changing price and production relationships into account in making his plans for any particular year.

Studies made with the view of determining standards of performance, yields, and production practices, will be more reliable and trustworthy if confined to type areas in which there is a fairly high degree of uniformity of these factors. Likewise, income studies would be more realistic and suggestive if the results were analyzed from the standpoint of type-of-farming areas and further restricted to show returns from farms of the same size and type.



VALUE OF FARM LAND AND BUILDINGS
NEBRASKA 1930



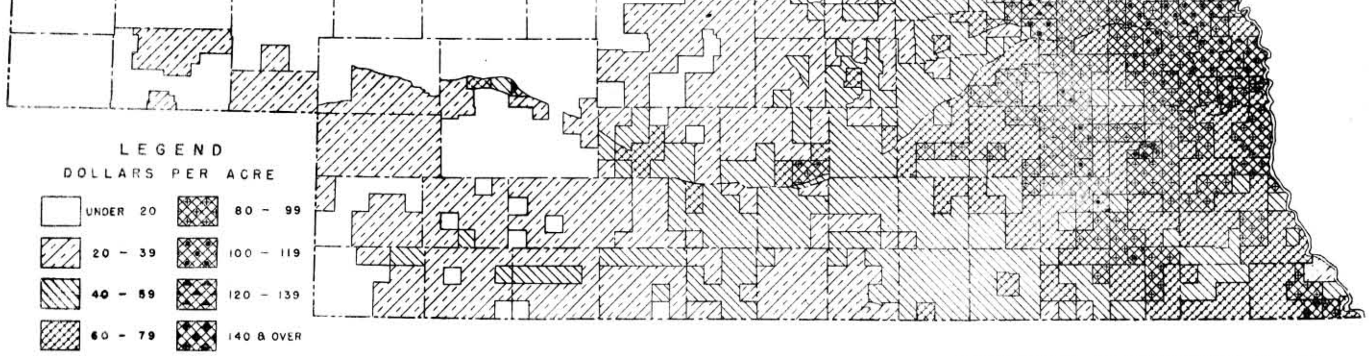
SOURCE—1930 U.S. AGRICULTURAL CENSUS BY MINOR CIVIL DIVISIONS

NEBRASKA STATE PLANNING BOARD

WPA OP NOS. 165-81-6999 AND 465-81-3-155

XXXII

VALUE OF FARM LAND AND BUILDINGS
NEBRASKA 1935



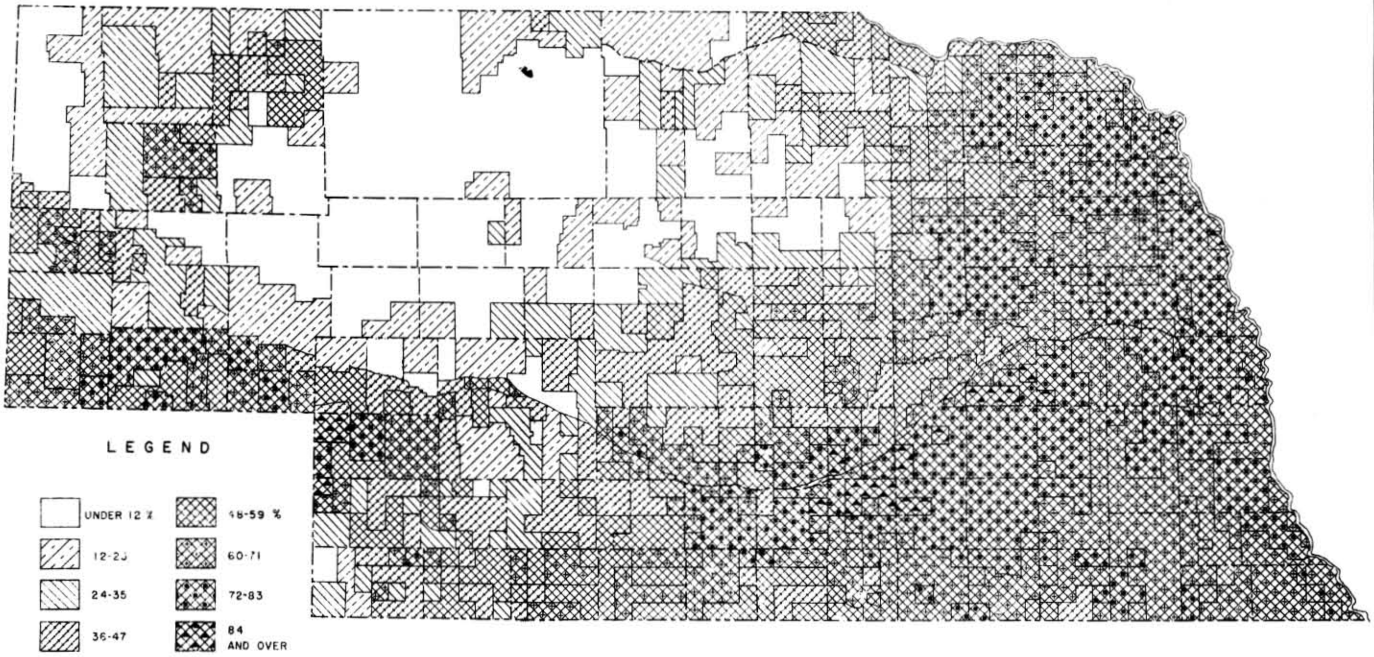
SOURCE—1935 U.S. AGRICULTURAL CENSUS BY MINOR CIVIL DIVISIONS

NEBRASKA STATE PLANNING BOARD

WPA OP NOS. 165-81-6999 AND 465-81-3-155

XXXIII

PERCENTAGE OF FARM LAND IN CULTIVATION
NEBRASKA 1929

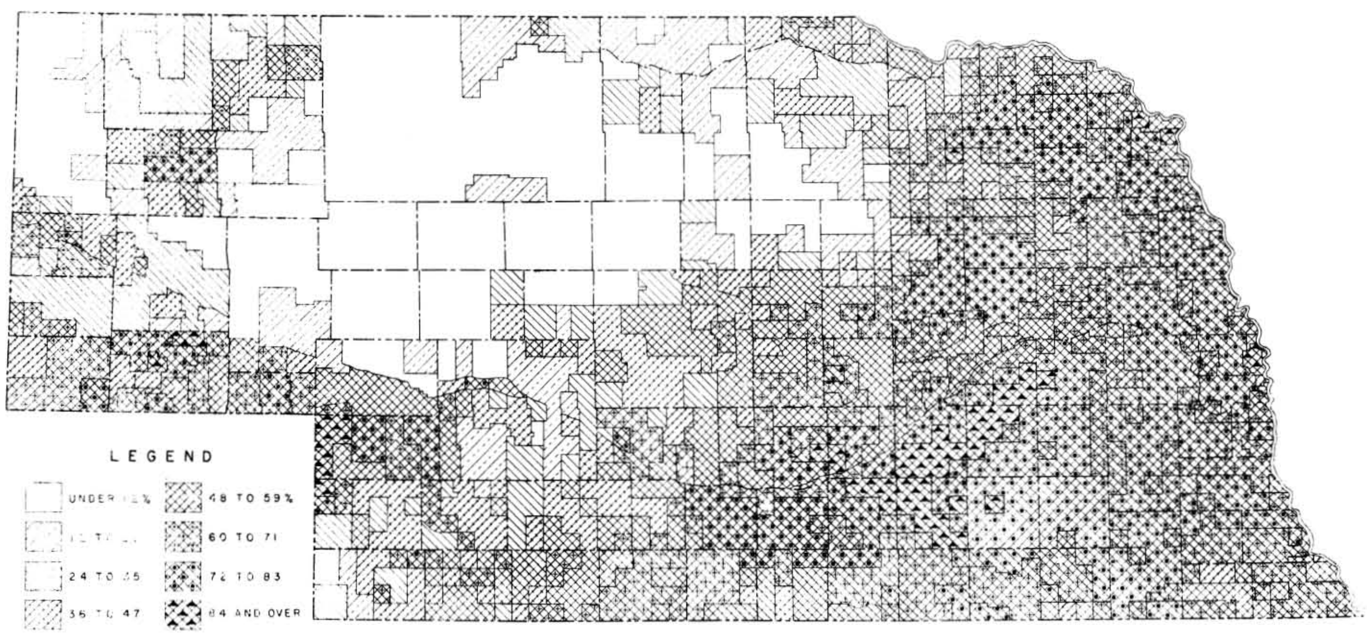


SOURCE - 1930 U.S. AGRICULTURAL CENSUS
BY MINOR CIVIL DIVISIONS

NEBRASKA STATE PLANNING BOARD

WPA OP NOS 165-81-6999 AND 465-81-3-155

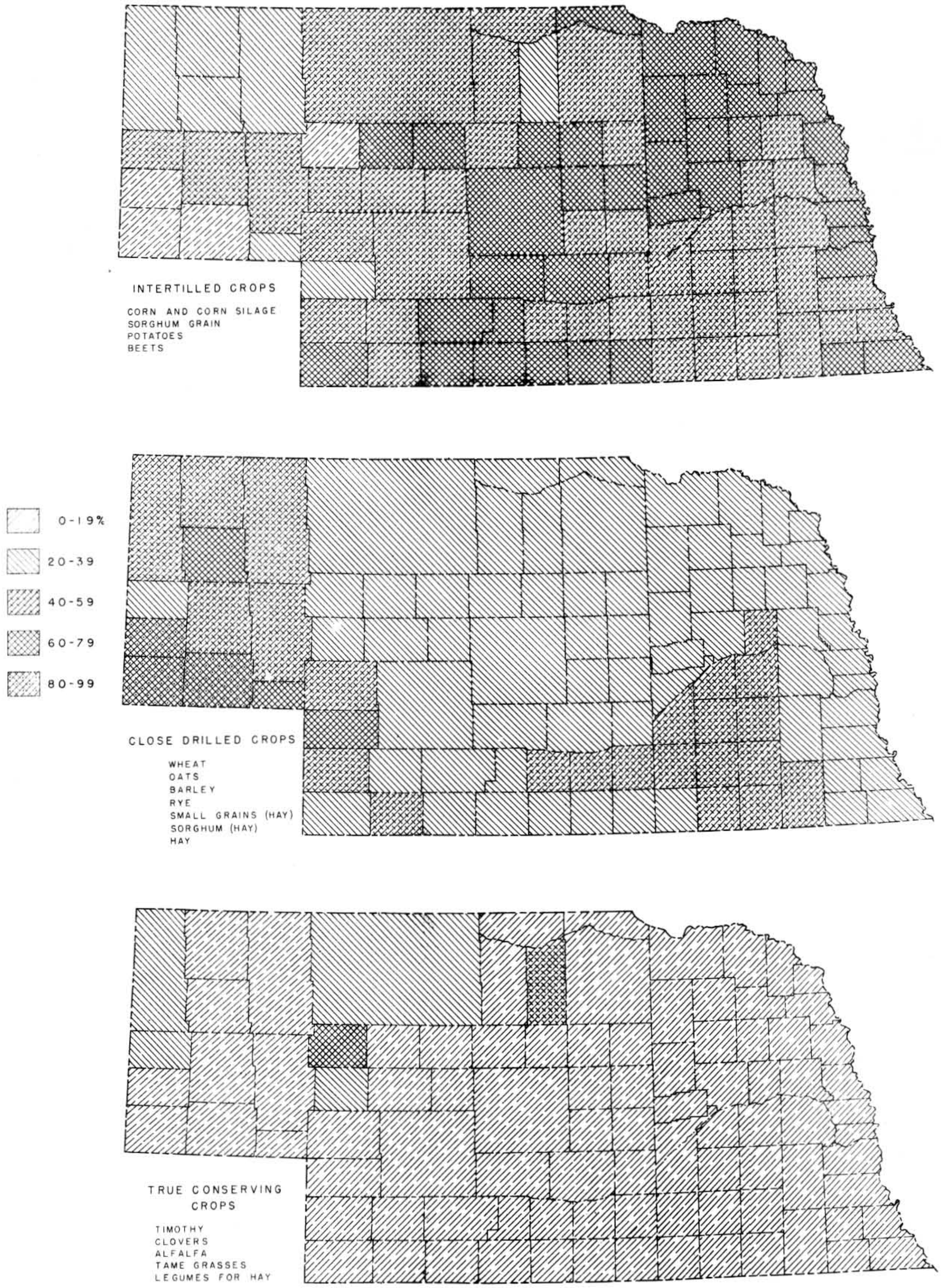
PERCENTAGE OF FARM LAND IN CULTIVATION
NEBRASKA 1934



BY MINOR CIVIL DIVISIONS

NEBRASKA STATE PLANNING BOARD

PERCENTAGE OF CROP LAND IN INTERTILLED, CLOSE DRILLED AND TRUE CONSERVING CROPS
NEBRASKA 1929



SOURCE – 1930 U.S. AGRICULTURAL CENSUS BY COUNTIES

NEBRASKA STATE PLANNING BOARD

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AVERAGE SIZE OF FARMS
TRENDS BY COUNTIES
NEBRASKA 1920-1935

COMPILED FROM PUBLISHED RECORDS U.S.
BUREAU OF AGRICULTURAL ECONOMICS

NEBRASKA STATE PLANNING BOARD

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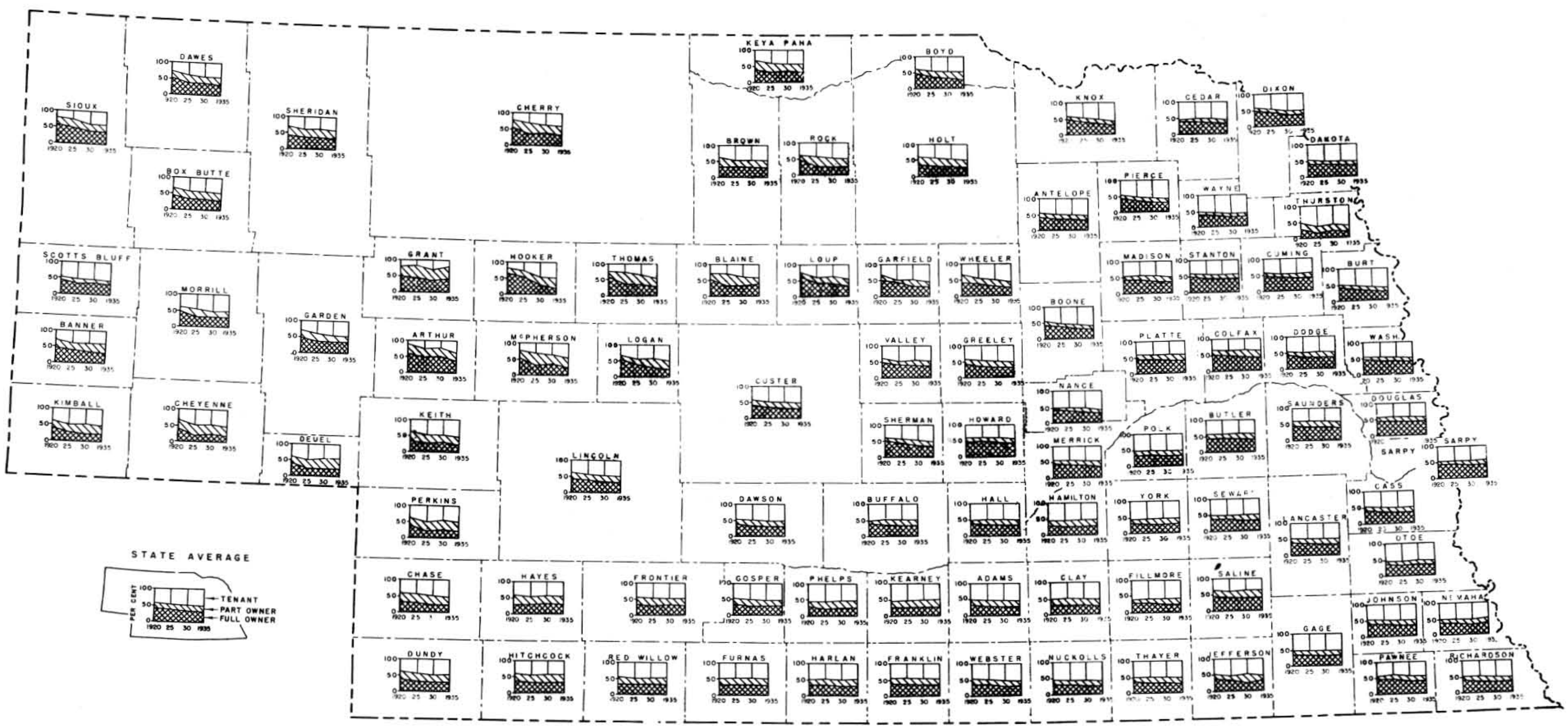
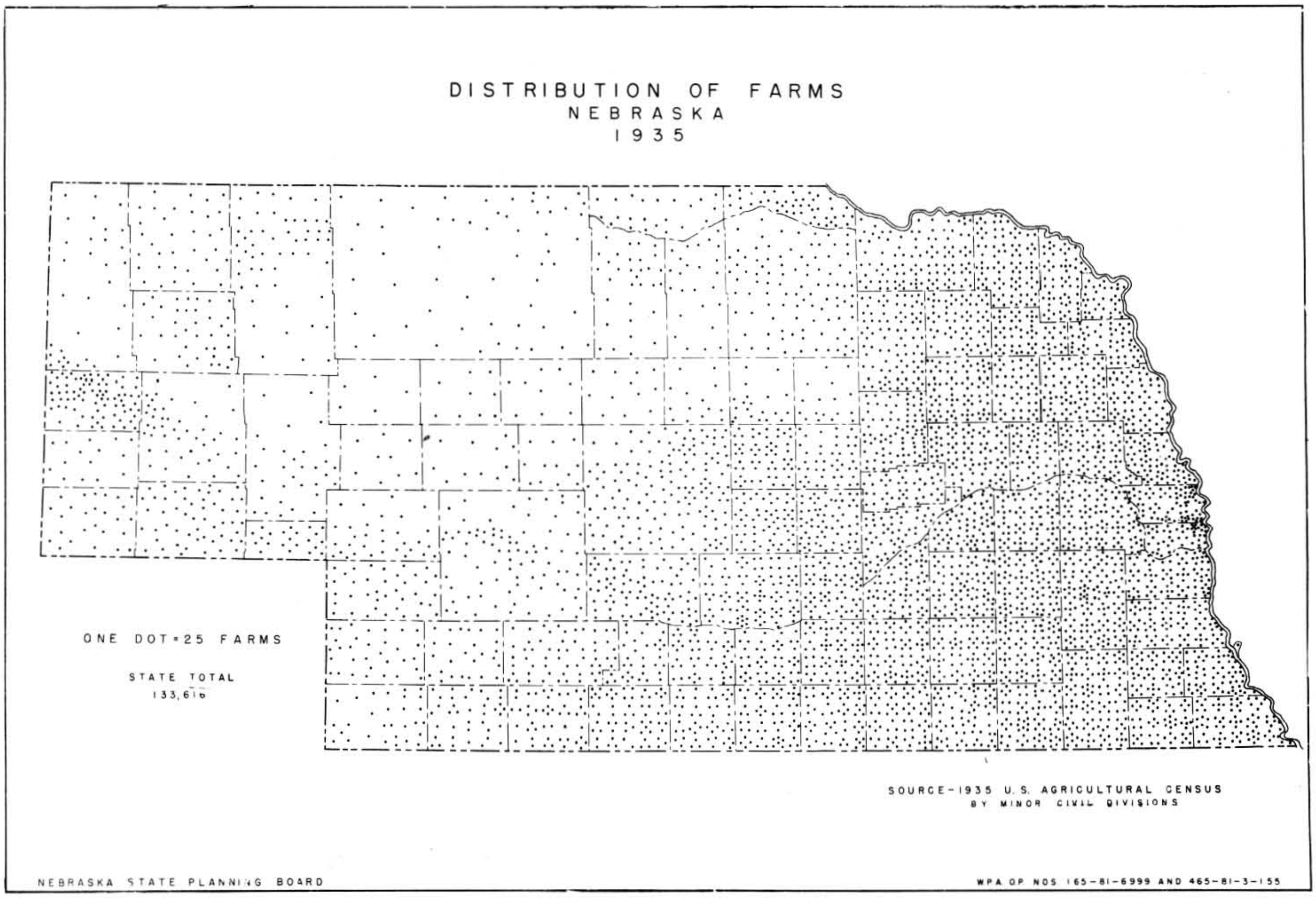
TRENDS IN TYPES OF FARM TENURE
NEBRASKA 1920-1935

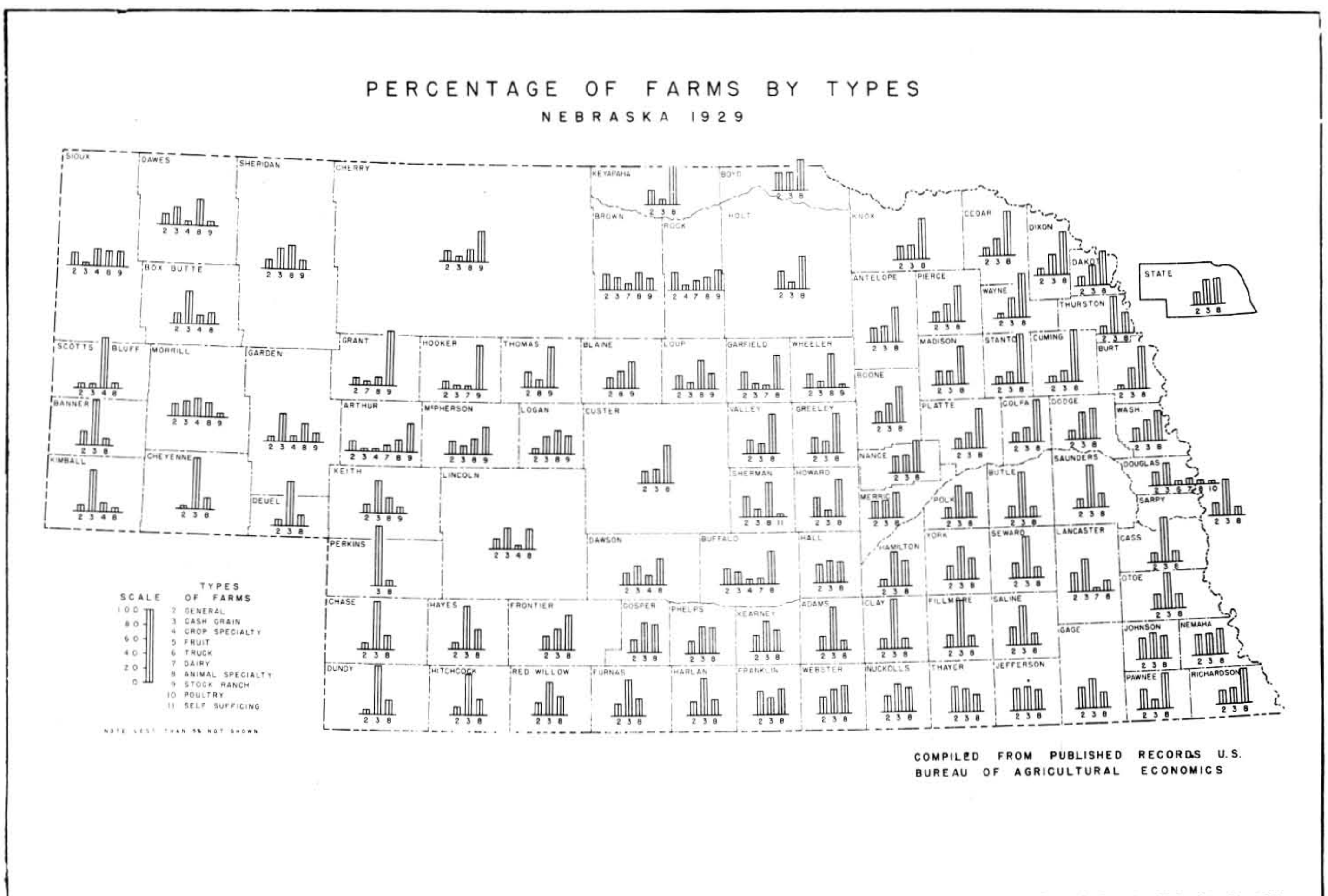


COMPILED FROM PUBLISHED RECORDS U.S. BUREAU OF AGRICULTURAL ECONOMICS

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

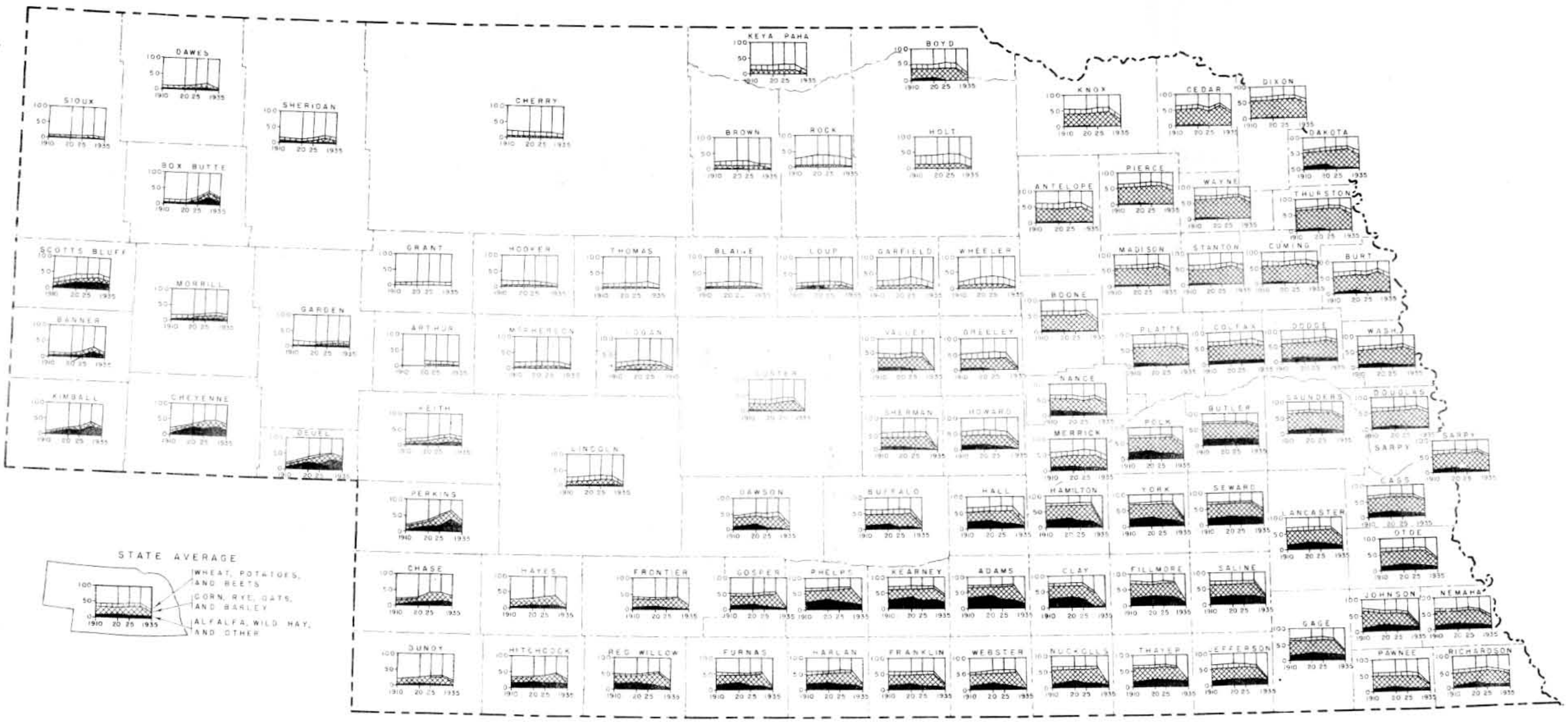

DISTRIBUTION OF FARMS
NEBRASKA
1935
ONE DOT = 25 FARMS
STATE TOTAL
133,616
SOURCE - 1935 U. S. AGRICULTURAL CENSUS
BY MINOR CIVIL DIVISIONS
NEBRASKA STATE PLANNING BOARD
WPA OP NOS 165-81-6999 AND 465-81-3-155


PERCENTAGE OF FARMS BY TYPES
NEBRASKA 1929
SCALE
100
80
60
40
20
0
TYPES OF FARMS
2 GENERAL
3 CASH GRAIN
4 CROP SPECIALTY
5 FRUIT
6 TRUCK
7 DAIRY
8 ANIMAL SPECIALTY
9 STOCK RANCH
10 POULTRY
11 SELF SUFFICING
STATE
COMPILED FROM PUBLISHED RECORDS U.S.
BUREAU OF AGRICULTURAL ECONOMICS
NEBRASKA STATE PLANNING BOARD
W. P. A. O. P. NO. 465-81-3-155

PERCENTAGE OF FARM LAND IN PRINCIPAL CLASSES OF CROPS

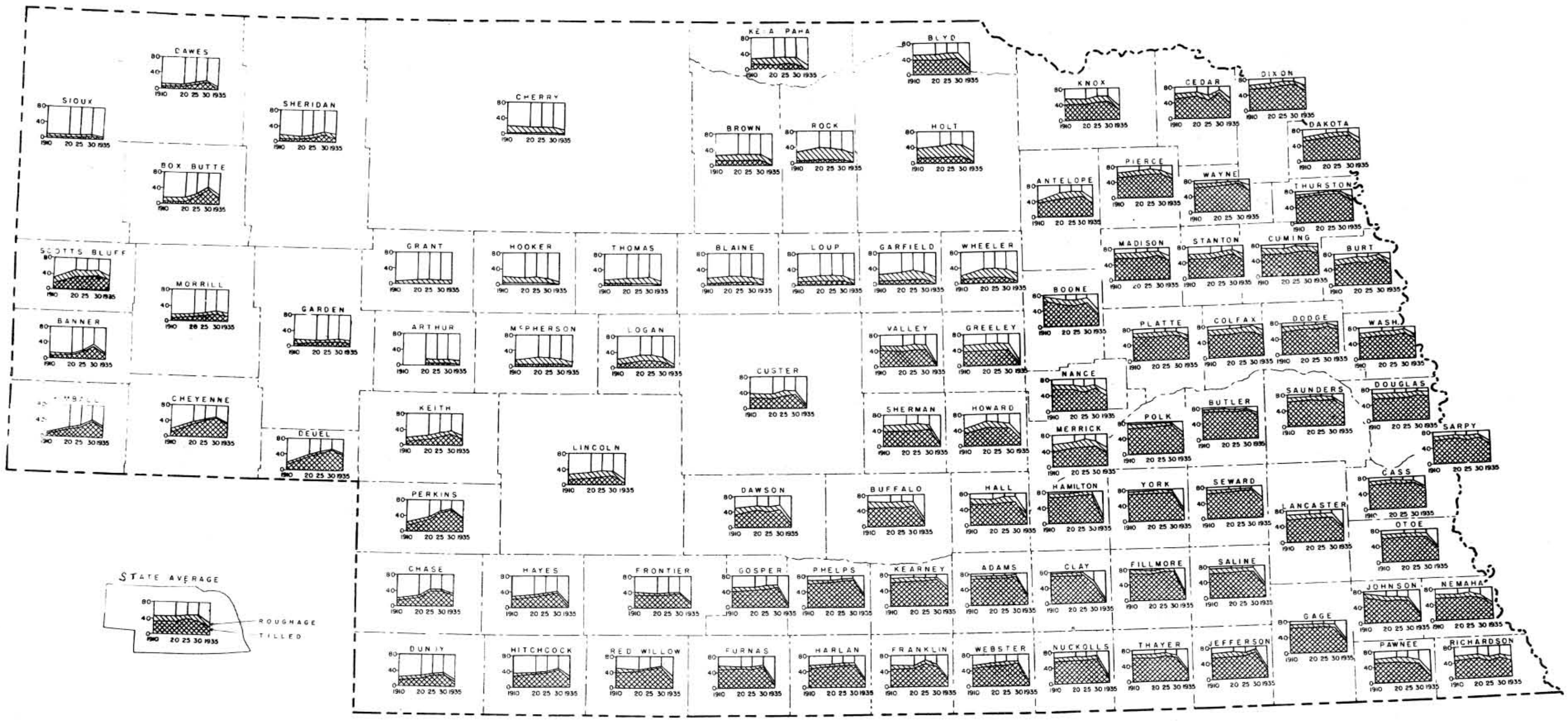
TRENDS BY COUNTIES

NEBRASKA 1910 - 1935



COMPILED FROM PUBLISHED RECORDS U.S.
BUREAU OF AGRICULTURAL ECONOMICS

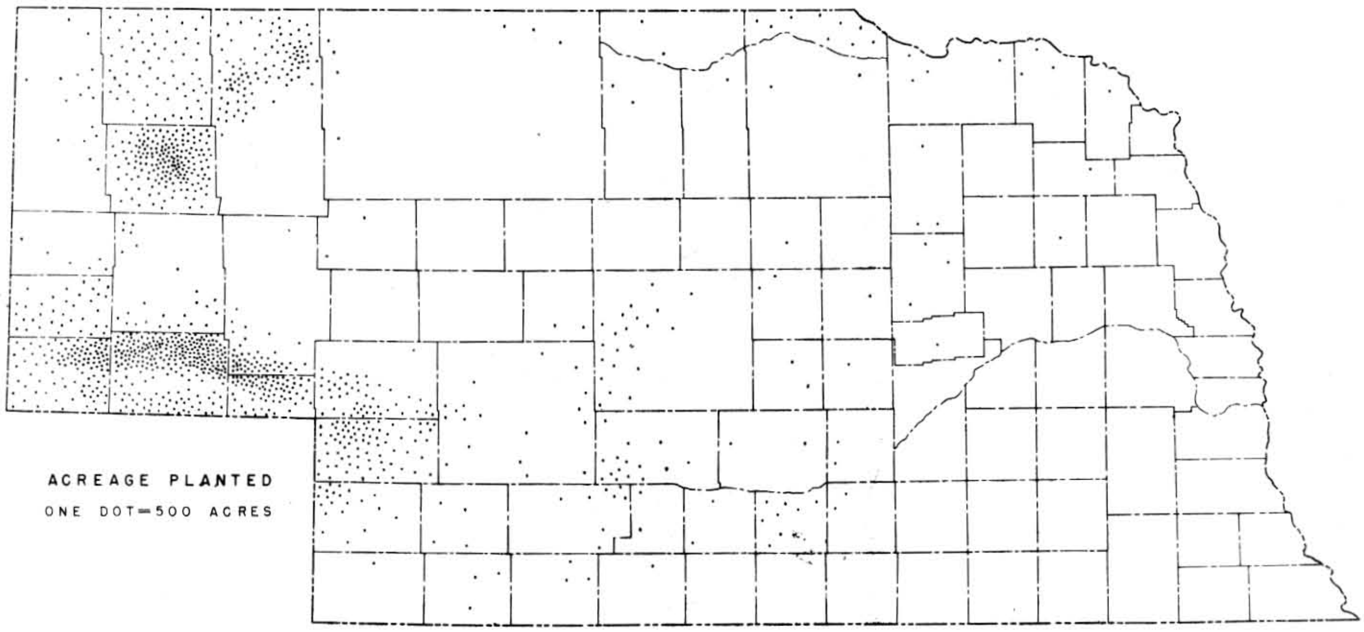
TREND OF PRINCIPAL CROPS BY COUNTIES
TILLED AND ROUGHAGE IN ACRES
NEBRASKA 1910-1935



NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

DISTRIBUTION OF SPRING WHEAT
NEBRASKA
1937



ACREAGE PLANTED

ONE DOT = 500 ACRES

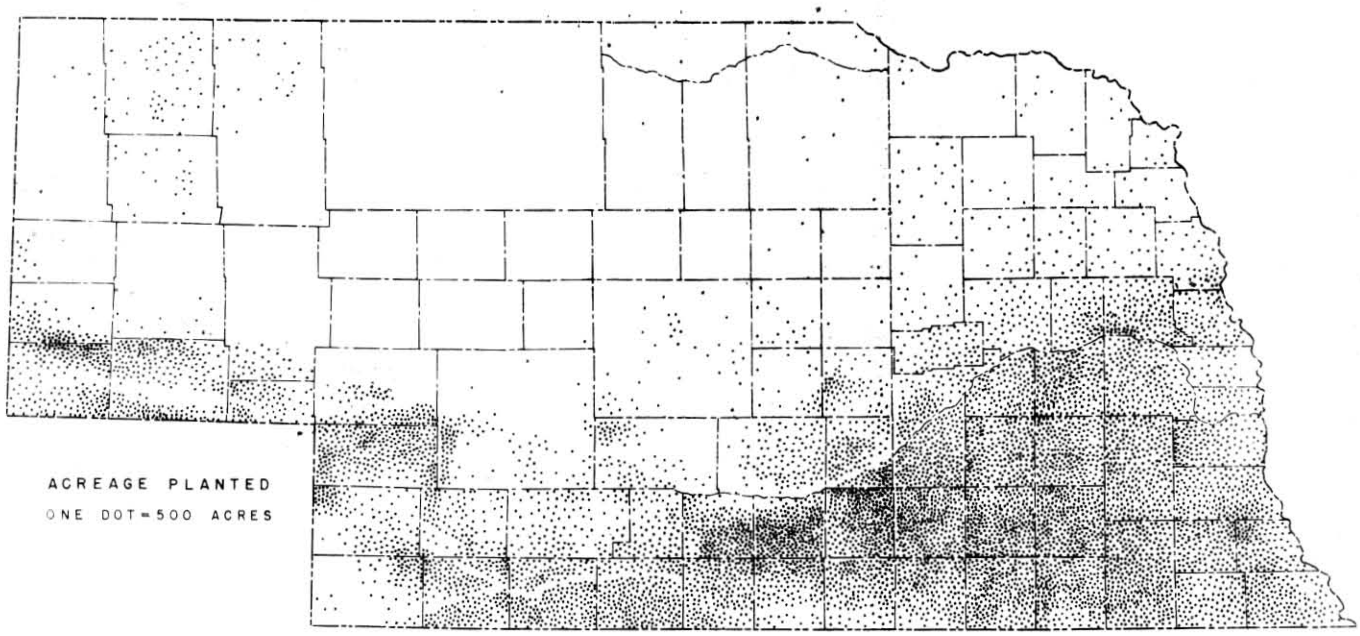
SOURCE—NEBRASKA COOPERATIVE CROP AND LIVESTOCK REPORTING SERVICE

NEBRASKA STATE PLANNING BOARD

W. P. A. O. P. NO. 465-81-3-155

XLIII

DISTRIBUTION OF WINTER WHEAT
NEBRASKA
1937



ACREAGE PLANTED

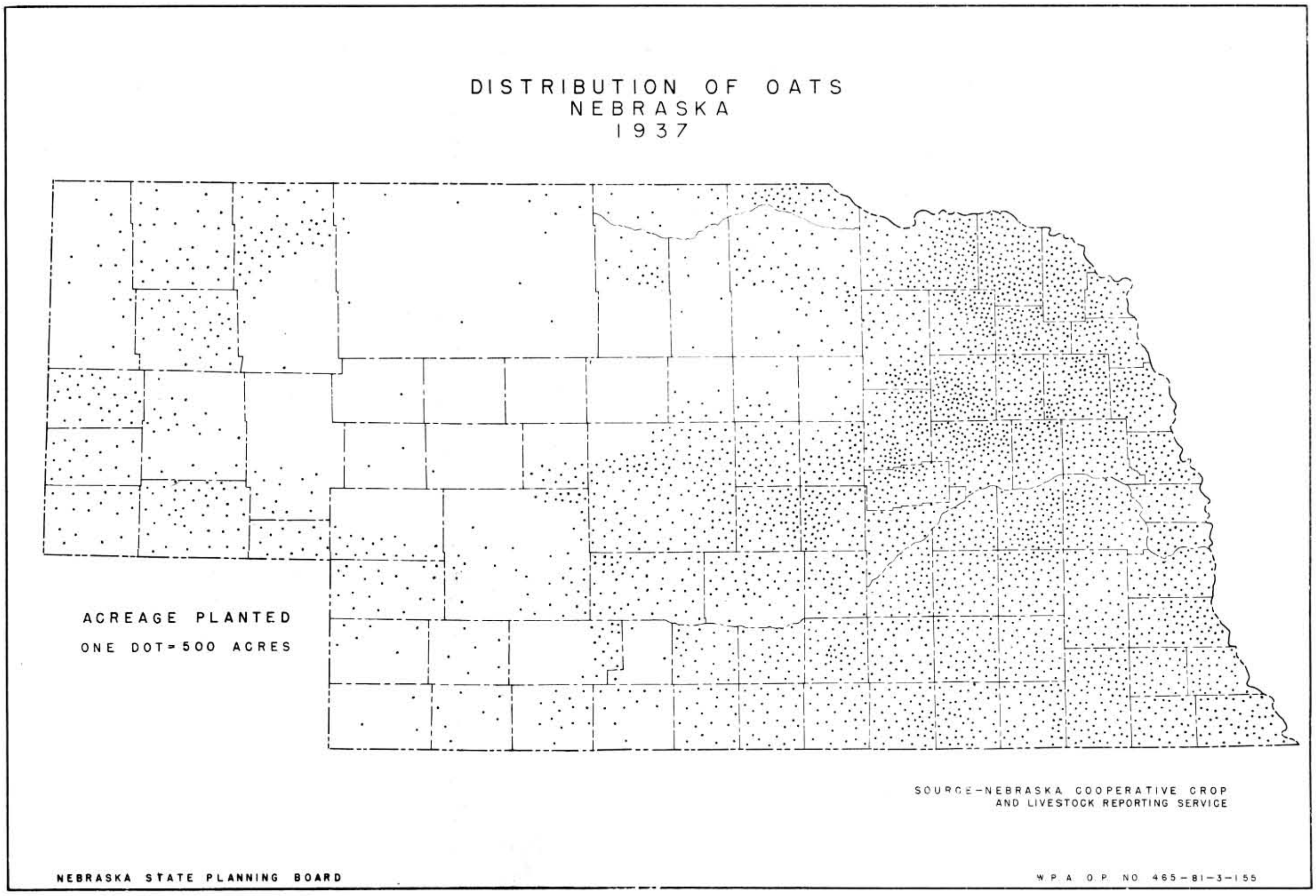
ONE DOT = 500 ACRES

SOURCE—NEBRASKA COOPERATIVE CROP AND LIVESTOCK REPORTING SERVICE

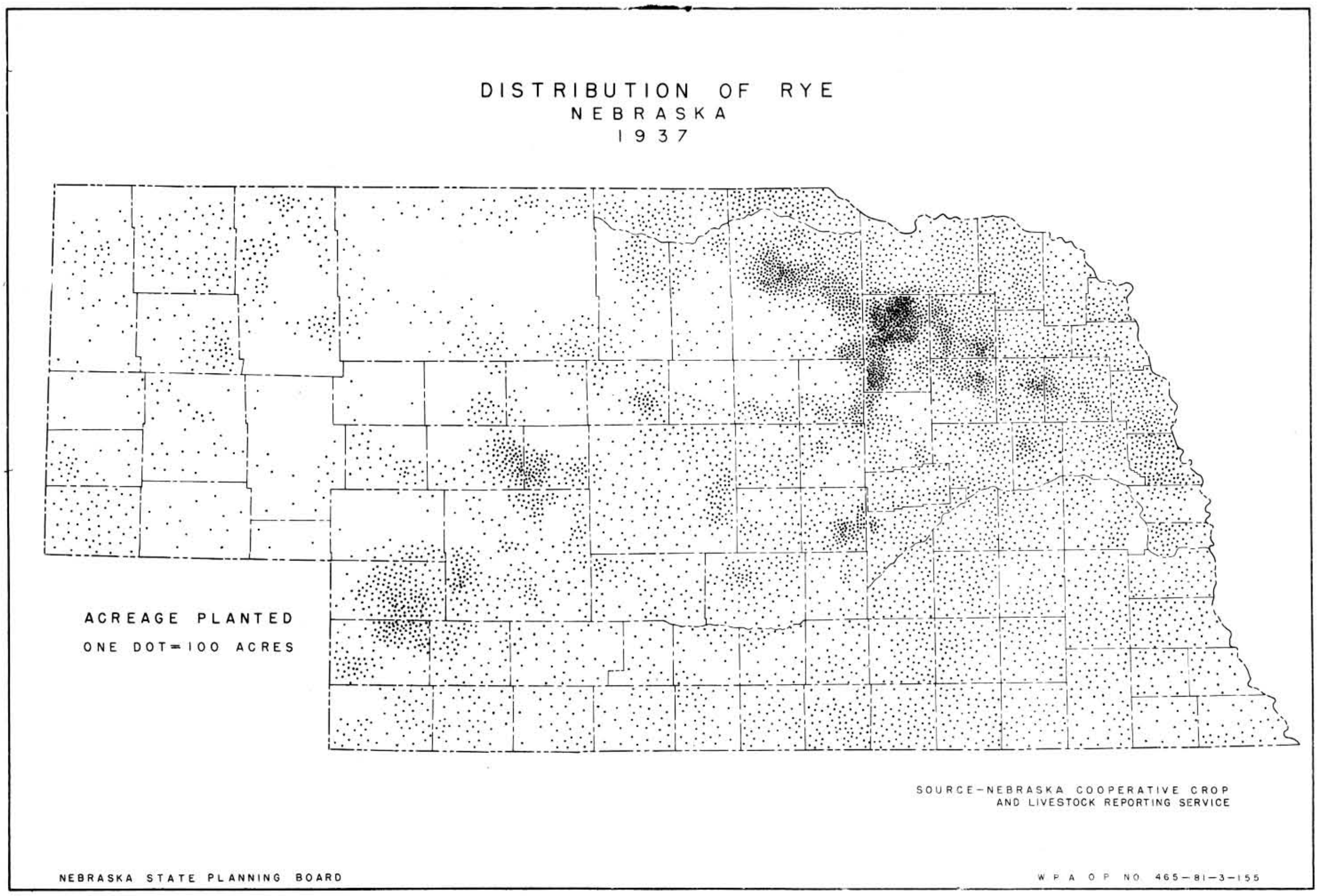
NEBRASKA STATE PLANNING BOARD

W. P. A. O. P. NO. 465-81-3-155

XLIV

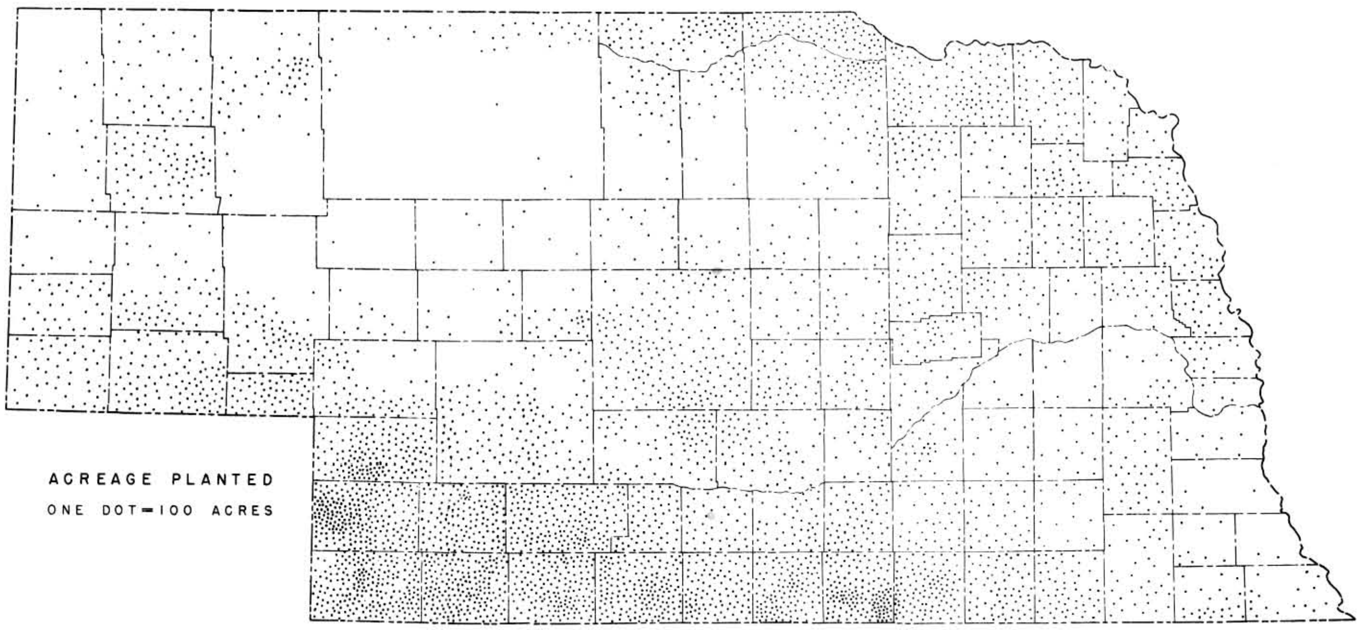

DISTRIBUTION OF OATS
NEBRASKA
1937
ACREAGE PLANTED
ONE DOT=500 ACRES
SOURCE—NEBRASKA COOPERATIVE CROP
AND LIVESTOCK REPORTING SERVICE
NEBRASKA STATE PLANNING BOARD
W. P. A. O. P. NO. 465-81-3-155

XLV


DISTRIBUTION OF RYE
NEBRASKA
1937
ACREAGE PLANTED
ONE DOT=100 ACRES
SOURCE—NEBRASKA COOPERATIVE CROP
AND LIVESTOCK REPORTING SERVICE
NEBRASKA STATE PLANNING BOARD
W. P. A. O. P. NO. 465-81-3-155

XLVI

DISTRIBUTION OF SORGHUM
NEBRASKA
1937

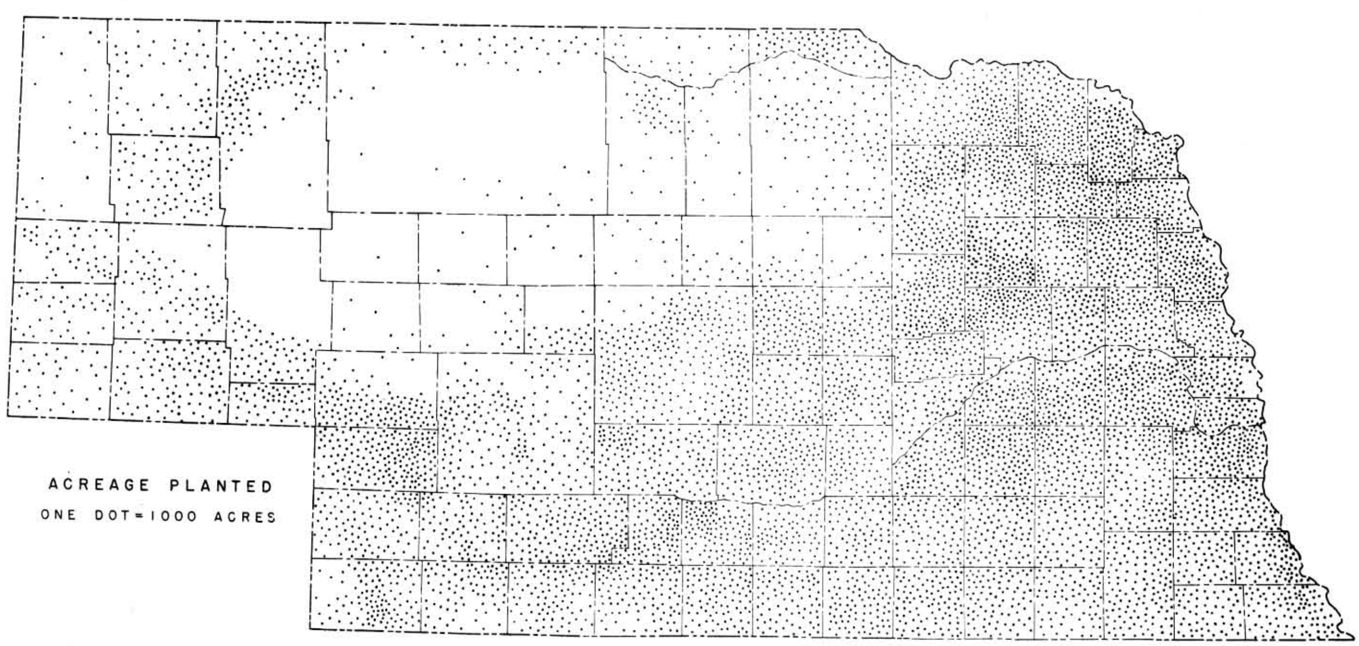


SOURCE–NEBRASKA COOPERATIVE CROP AND LIVESTOCK REPORTING SERVICE

NEBRASKA STATE PLANNING BOARD

W. P. A. O. P. NO. 465–81–3–155

DISTRIBUTION OF CORN
NEBRASKA
1937



SOURCE–NEBRASKA COOPERATIVE CROP AND LIVESTOCK REPORTING SERVICE

NEBRASKA STATE PLANNING BOARD

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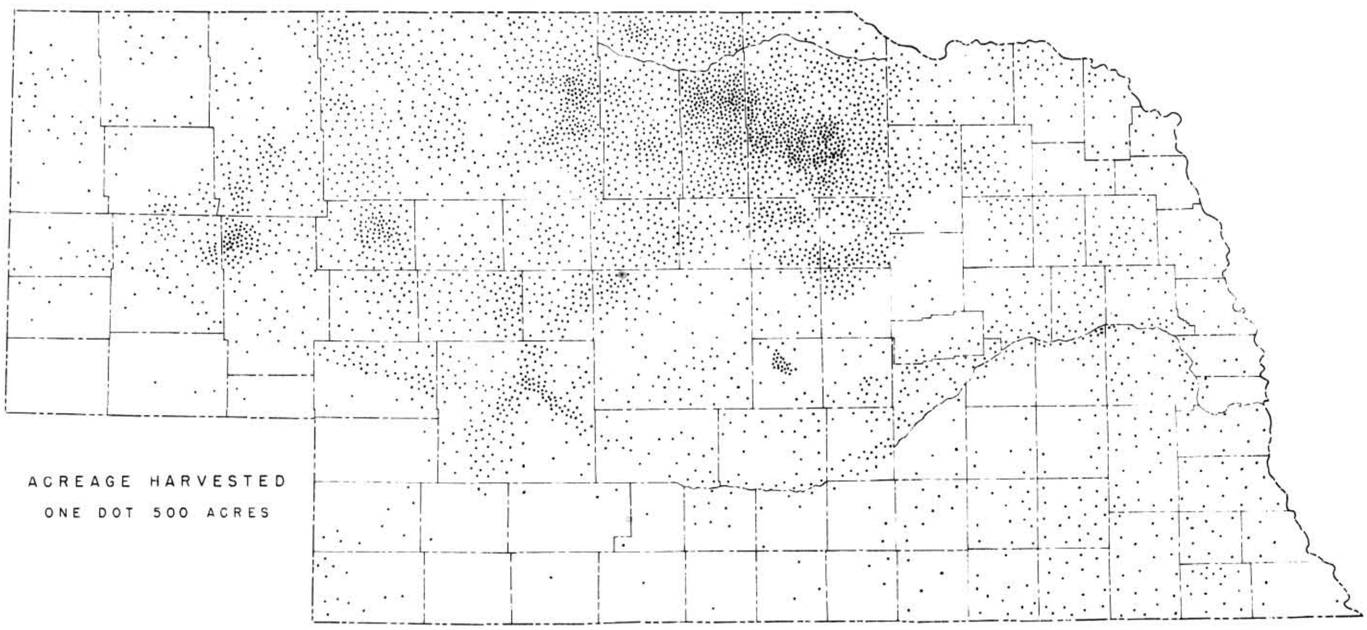
DISTRIBUTION OF WILD HAY
NEBRASKA
1937



ACREAGE HARVESTED
ONE DOT 500 ACRES

SOURCE--NEBRASKA COOPERATIVE CROP AND LIVESTOCK REPORTING SERVICE

NEBRASKA STATE PLANNING BOARD

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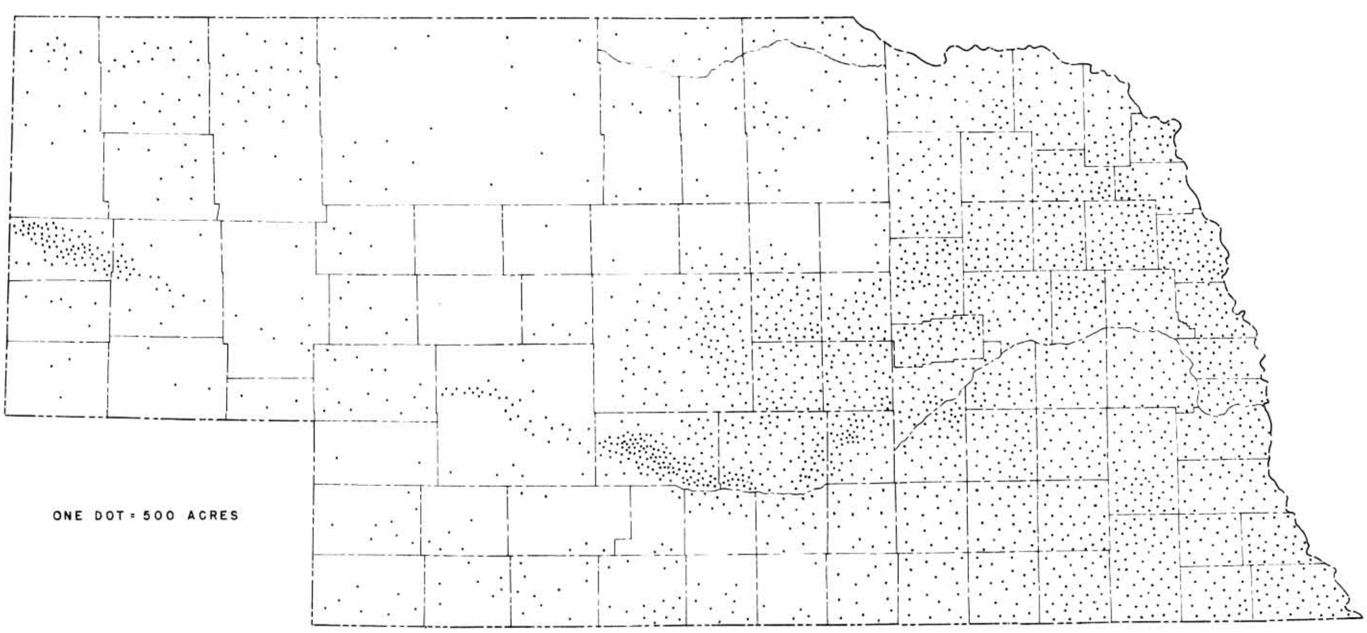
DISTRIBUTION OF ALFALFA
NEBRASKA
1937



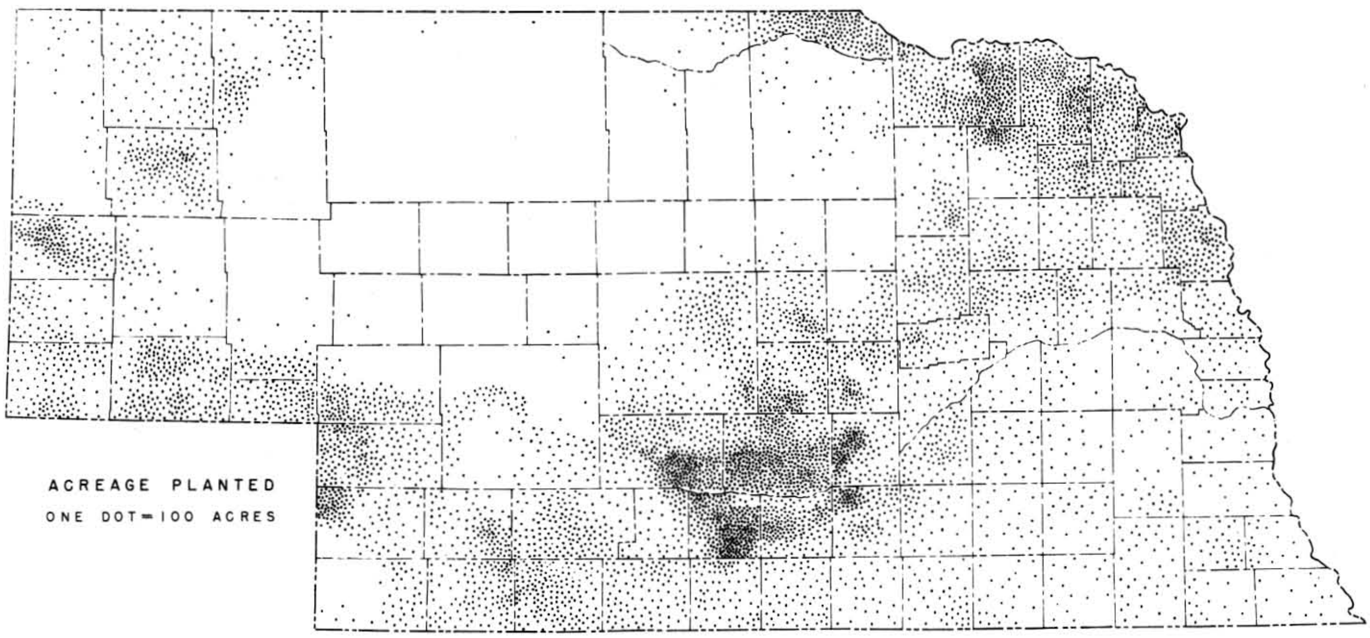
ONE DOT = 500 ACRES

SOURCE-NEBRASKA COOPERATIVE CROP AND LIVESTOCK REPORTING SERVICE

NEBRASKA STATE PLANNING BOARD

W. P. A. O. P. NO. 465-81-3-155

DISTRIBUTION OF BARLEY
NEBRASKA
1937

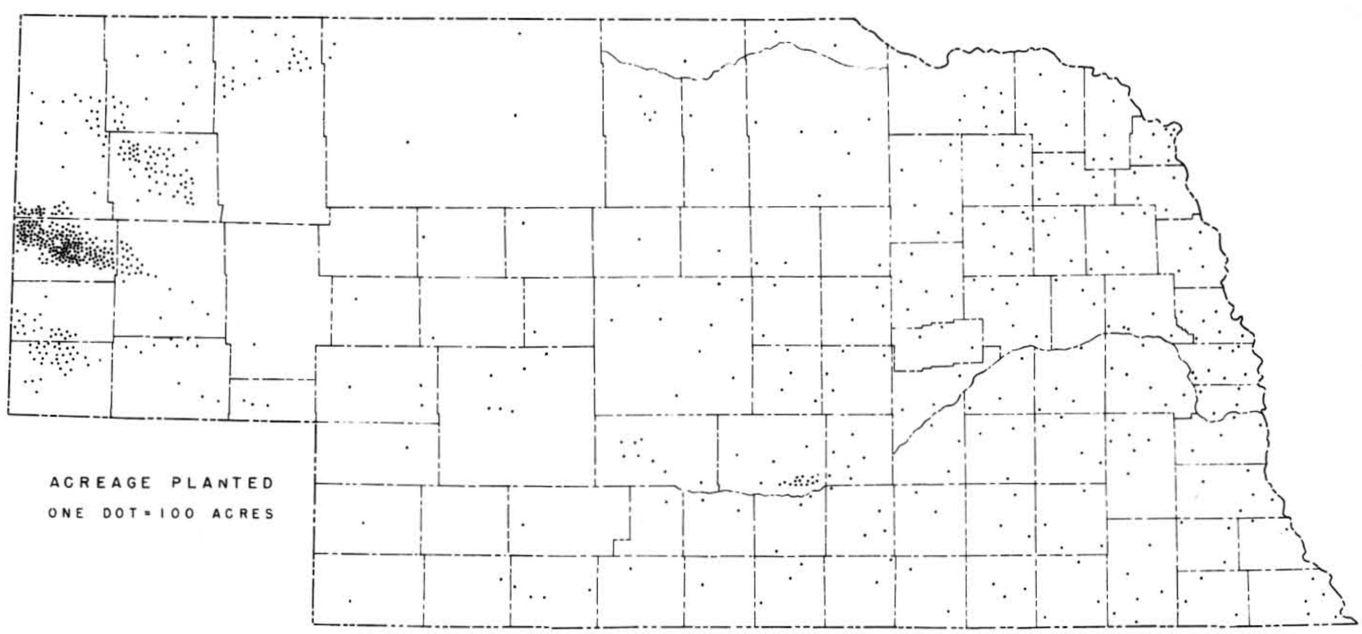


ACREAGE PLANTED

ONE DOT = 100 ACRES

SOURCE—NEBRASKA COOPERATIVE CROP AND LIVESTOCK REPORTING SERVICE

DISTRIBUTION OF POTATOES
NEBRASKA
1937



ACREAGE PLANTED

ONE DOT = 100 ACRES

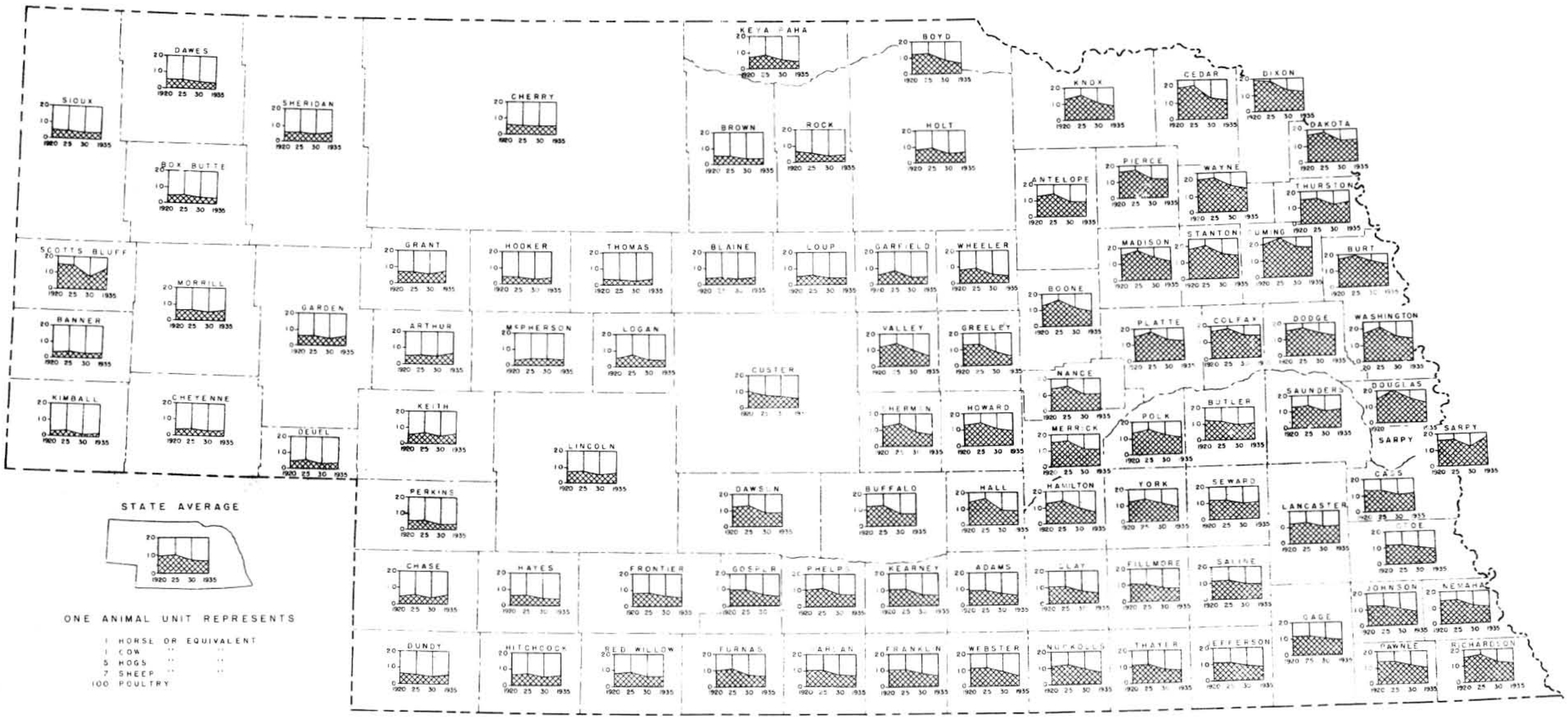
SOURCE--NEBRASKA COOPERATIVE CROP AND LIVESTOCK REPORTING SERVICE

NEBRASKA STATE PLANNING BOARD

W P A O P NO 465-81-3-155

LIVESTOCK PER 100 ACRES IN FARMS BY ANIMAL UNITS

NEBRASKA 1920–1935



ONE ANIMAL UNIT REPRESENTS

- 1 HORSE OR EQUIVALENT
- 1 COW " "
- 5 HOGS " "
- 7 SHEEP " "
- 100 POULTRY

COMPILED FROM PUBLISHED RECORDS U.S. BUREAU OF AGRICULTURAL ECONOMICS

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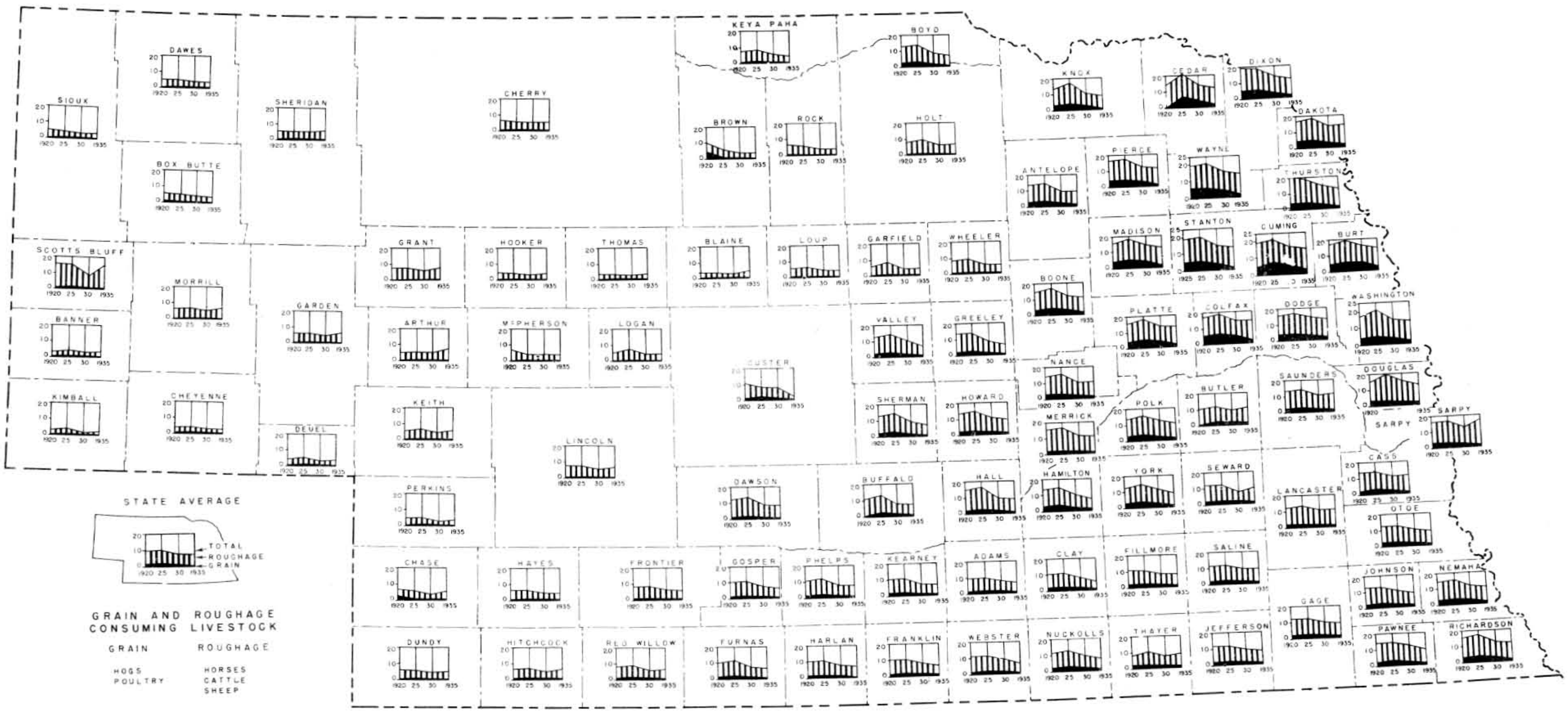
NUMBER OF GRAIN AND ROUGHAGE CONSUMING LIVESTOCK PER 100 ACRES IN FARMS

LIVESTOCK EXPRESSED IN ANIMAL UNITS

NEBRASKA 1920-25-30-35



GRAIN AND ROUGHAGE CONSUMING LIVESTOCK

GRAIN	ROUGHAGE
HOGS	HORSES
POULTRY	CATTLE
	SHEEP

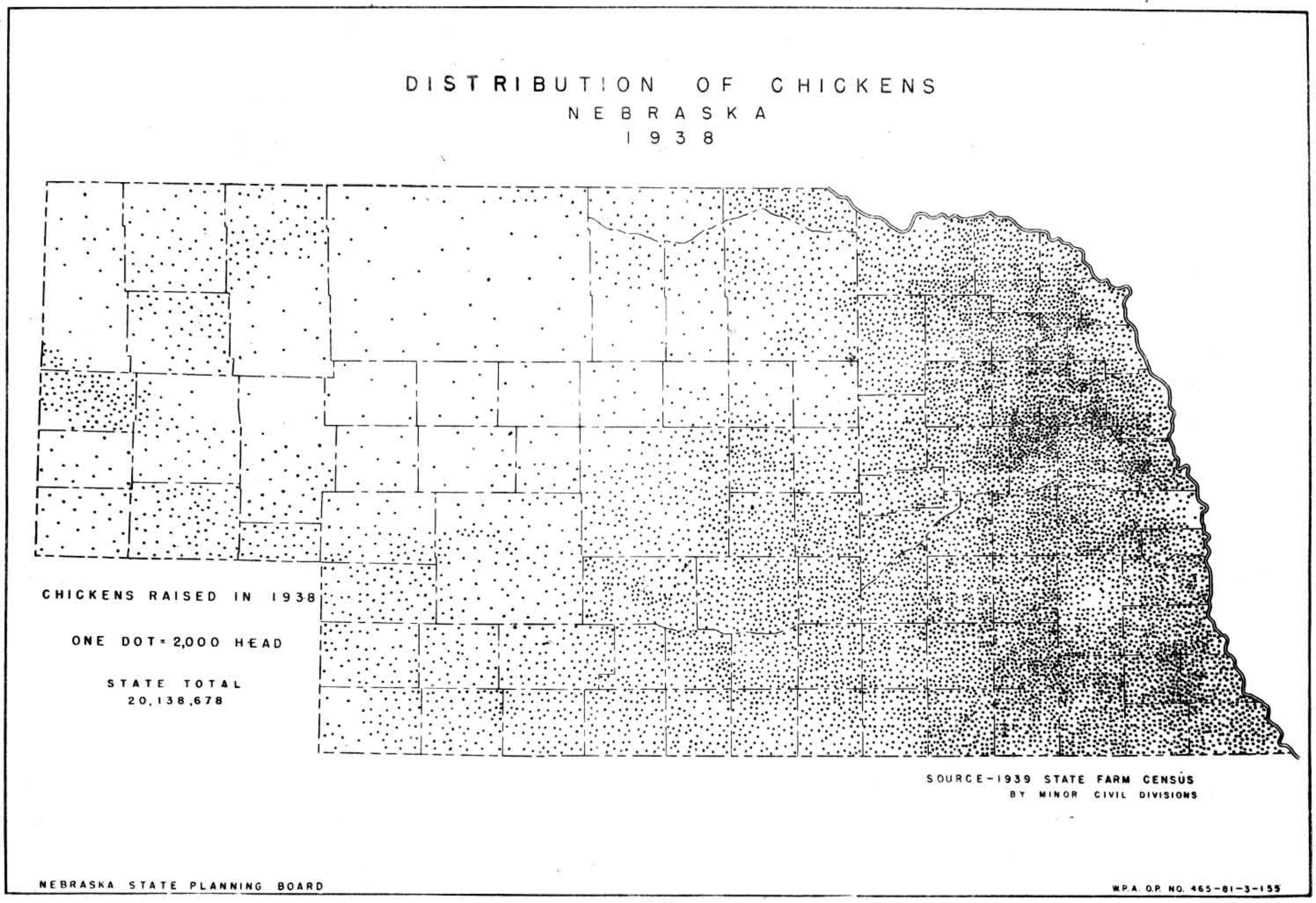
ONE ANIMAL UNIT REPRESENTS

- 1 HORSE OR EQUIVALENT
- 1 COW " "
- 5 HOGS " "
- 7 SHEEP " "
- 100 POULTRY "

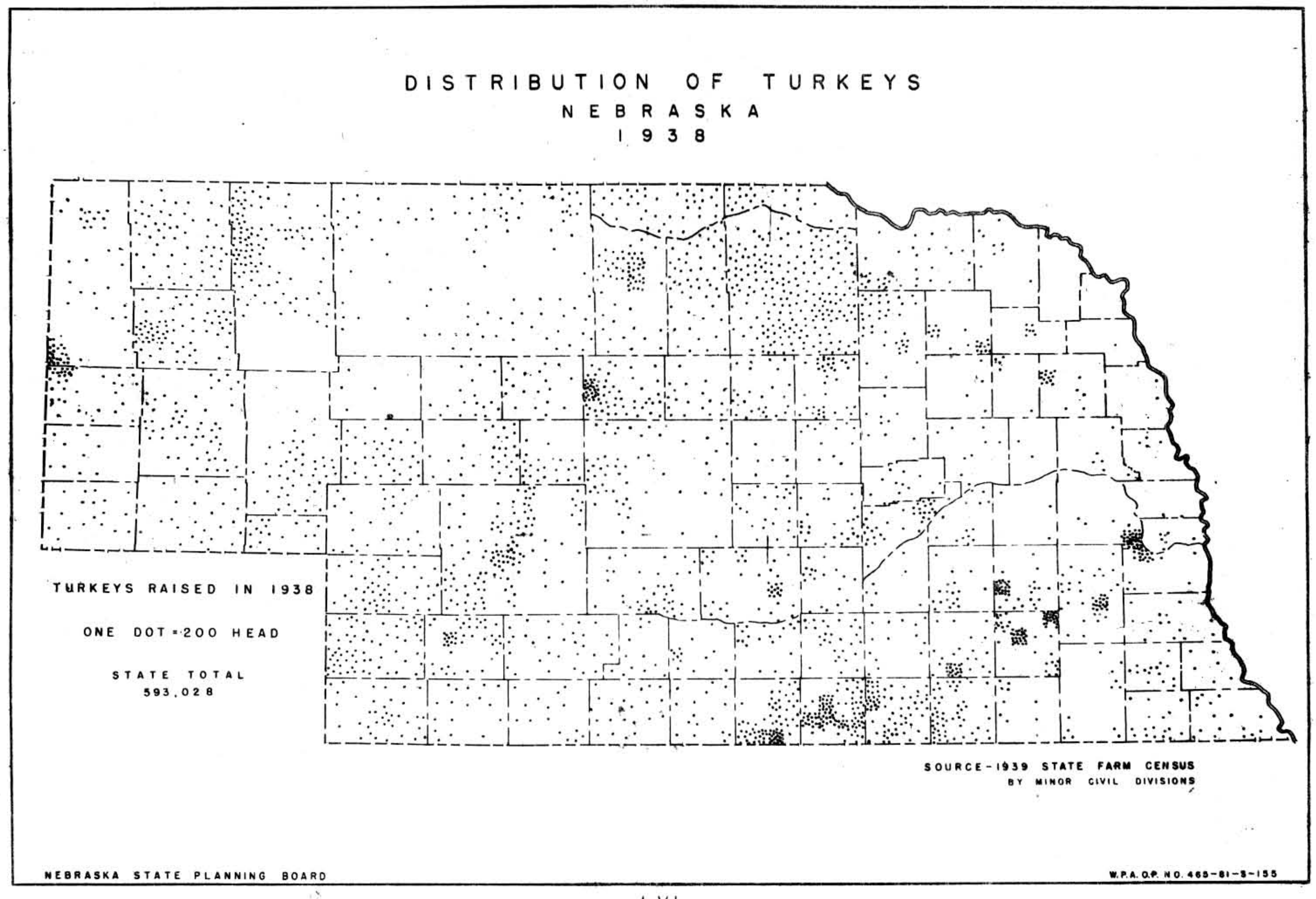
COMPILED FROM PUBLISHED RECORDS U.S. BUREAU OF AGRICULTURAL ECONOMICS

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NOS. 165-81-...

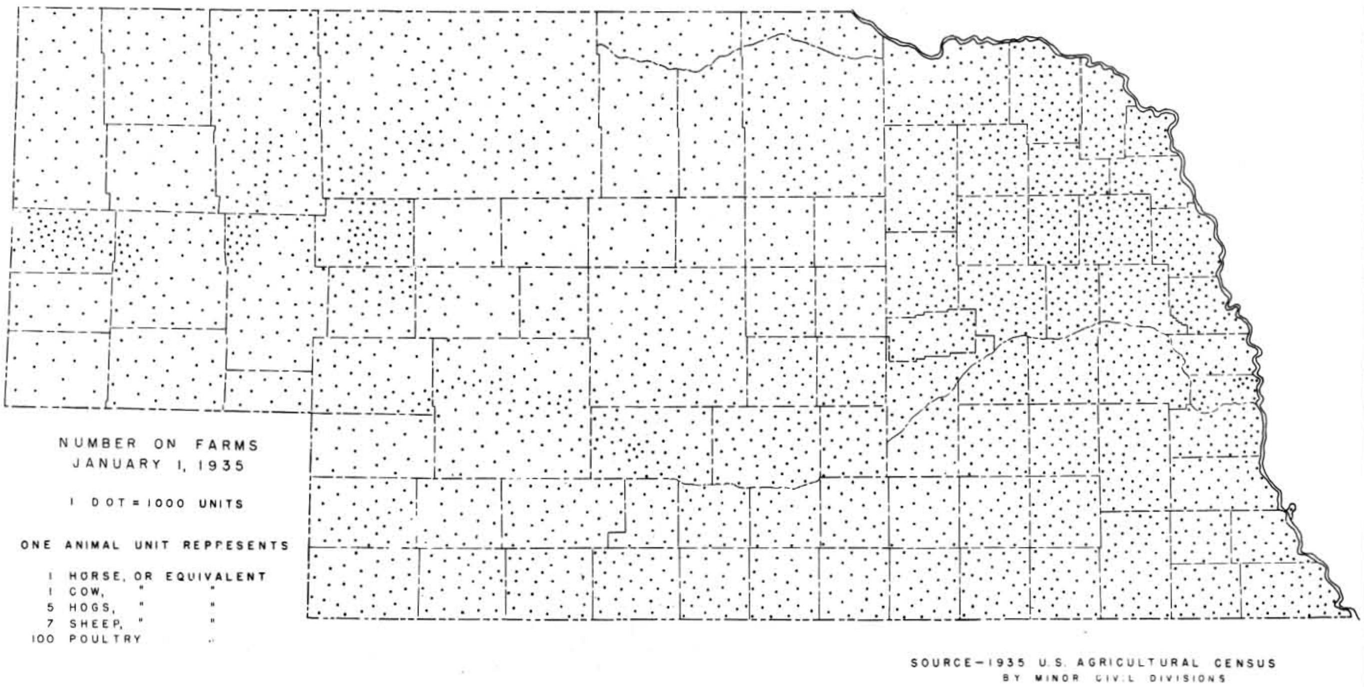

DISTRIBUTION OF CHICKENS
NEBRASKA
1938
CHICKENS RAISED IN 1938
ONE DOT = 2,000 HEAD
STATE TOTAL
20,138,678
SOURCE-1939 STATE FARM CENSUS
BY MINOR CIVIL DIVISIONS
NEBRASKA STATE PLANNING BOARD
W.P.A. O.P. NO. 465-81-3-155

LV


DISTRIBUTION OF TURKEYS
NEBRASKA
1938
TURKEYS RAISED IN 1938
ONE DOT = 200 HEAD
STATE TOTAL
593,028
SOURCE-1939 STATE FARM CENSUS
BY MINOR CIVIL DIVISIONS
NEBRASKA STATE PLANNING BOARD
W.P.A. O.P. NO. 465-81-3-155

LVI

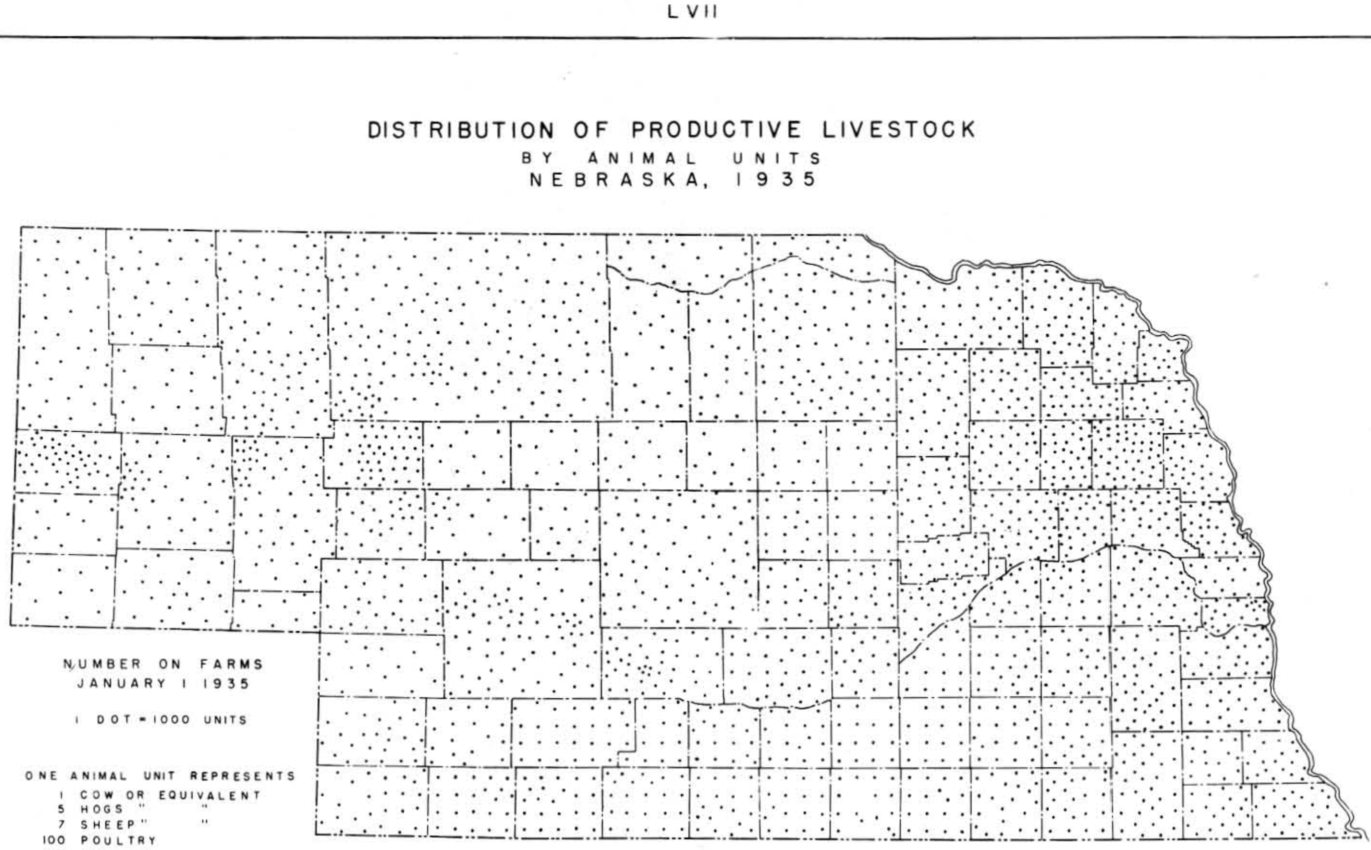
DISTRIBUTION OF LIVESTOCK
BY ANIMAL UNITS
NEBRASKA 1935



NEBRASKA STATE PLANNING BOARD

WPA OP NOS 165-81-6999 AND 465-81-3-155

DISTRIBUTION OF PRODUCTIVE LIVESTOCK
BY ANIMAL UNITS
NEBRASKA, 1935



NEBRASKA STATE PLANNING BOARD

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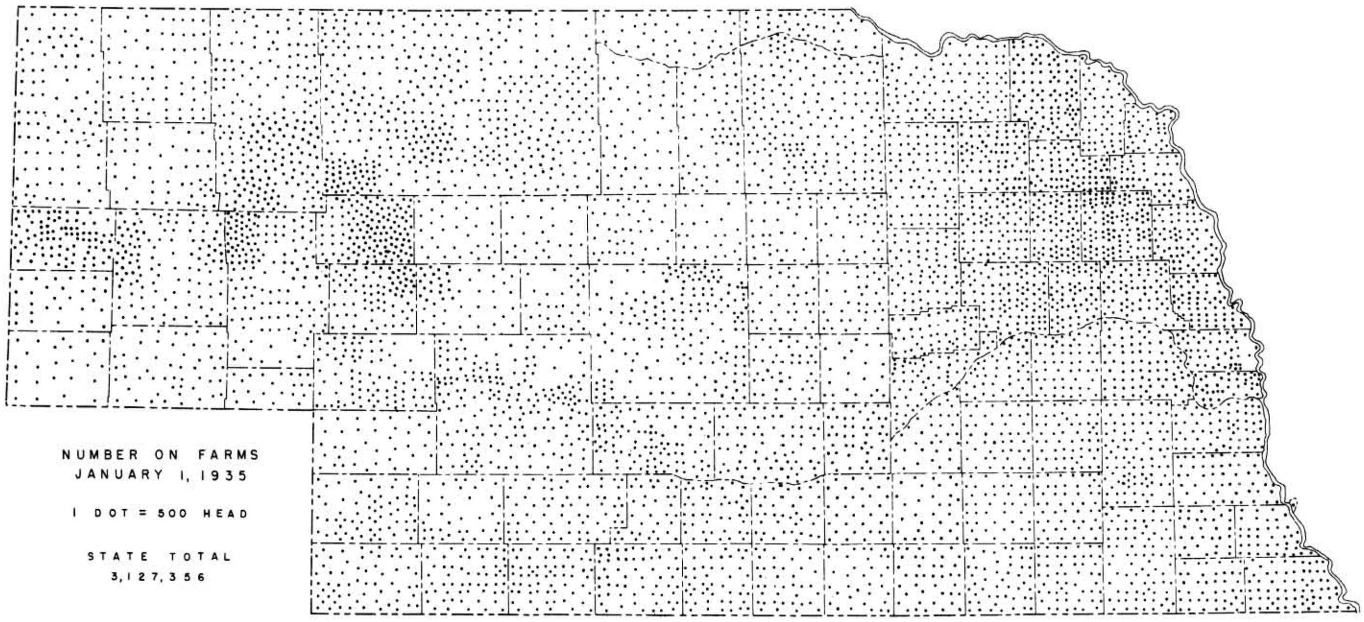
DISTRIBUTION OF CATTLE
NEBRASKA
1935



NUMBER ON FARMS
JANUARY 1, 1935

1 DOT = 500 HEAD

STATE TOTAL
3,127,356

SOURCE—1935 U.S. AGRICULTURAL CENSUS
BY MINOR CIVIL DIVISIONS

NEBRASKA STATE PLANNING BOARD

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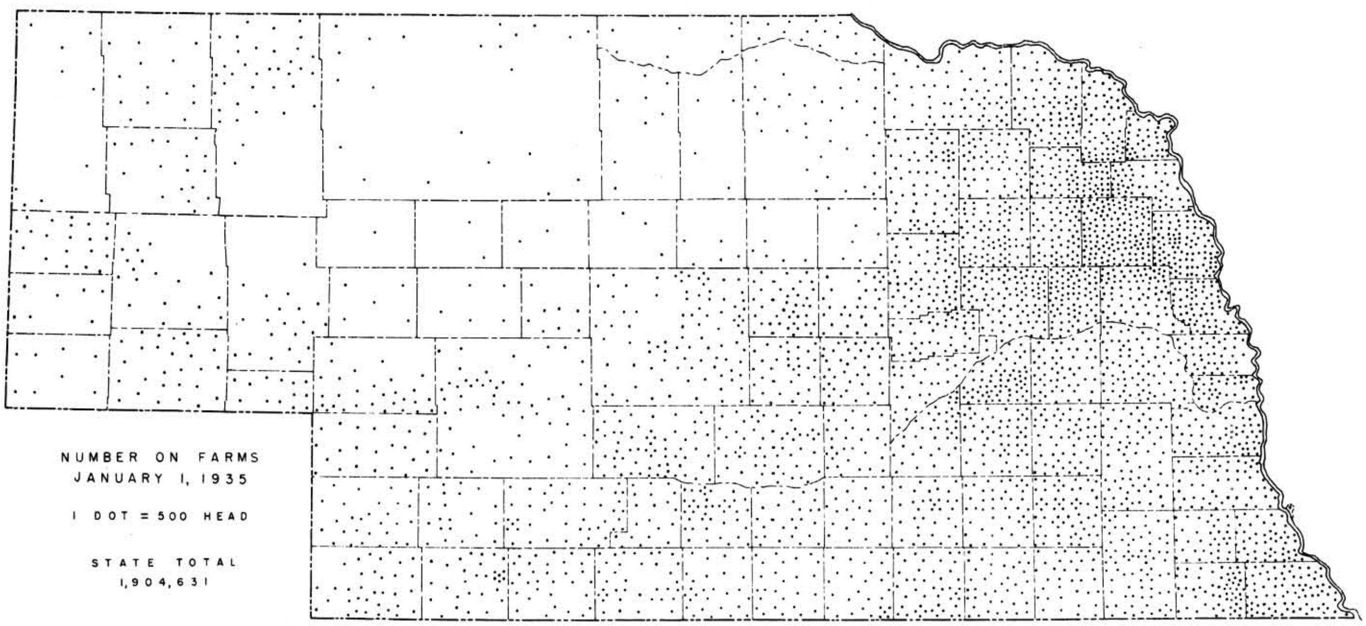
DISTRIBUTION OF HOGS
NEBRASKA
1935



NUMBER ON FARMS
JANUARY 1, 1935

1 DOT = 500 HEAD

STATE TOTAL
1,904,631

SOURCE—1935 U.S. AGRICULTURAL CENSUS
BY MINOR CIVIL DIVISIONS

NEBRASKA STATE PLANNING BOARD

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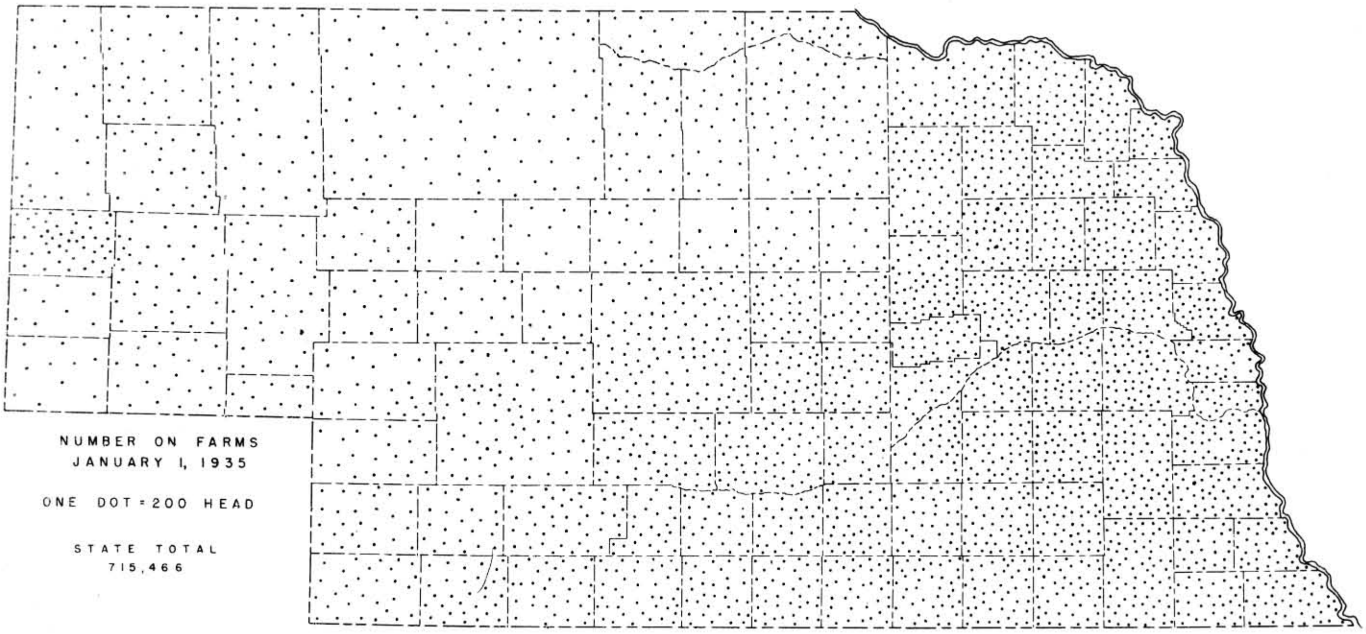
DISTRIBUTION OF HORSES AND MULES
NEBRASKA
1935

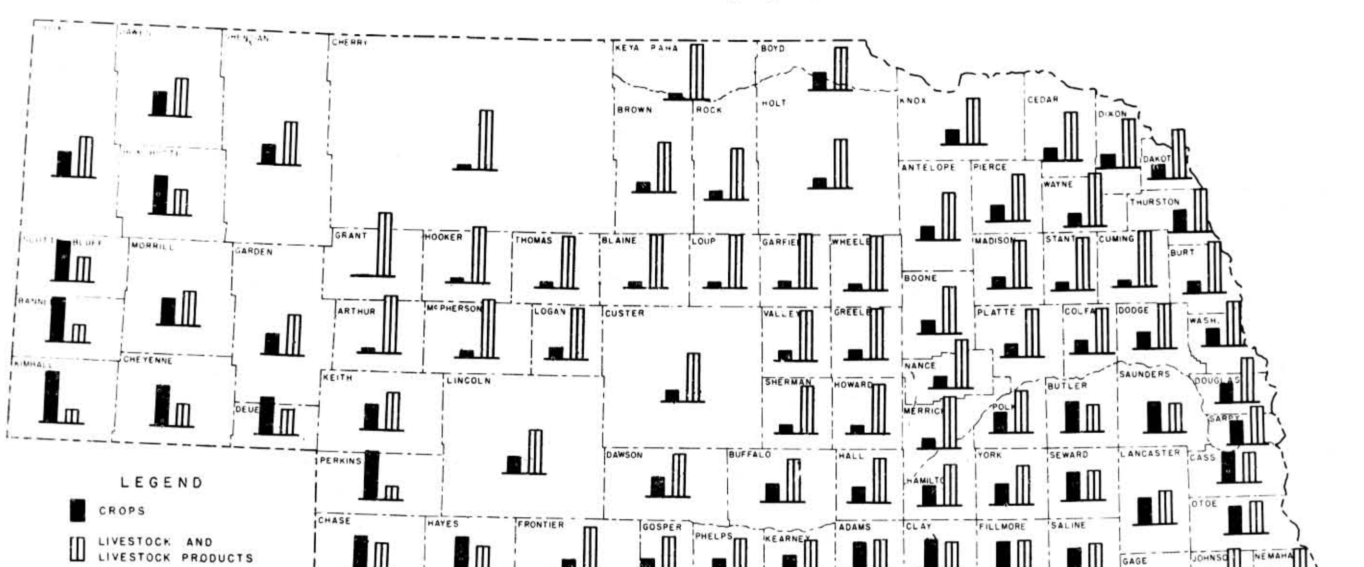


SOURCE—1935 U. S. AGRICULTURAL CENSUS
BY MINOR CIVIL DIVISIONS

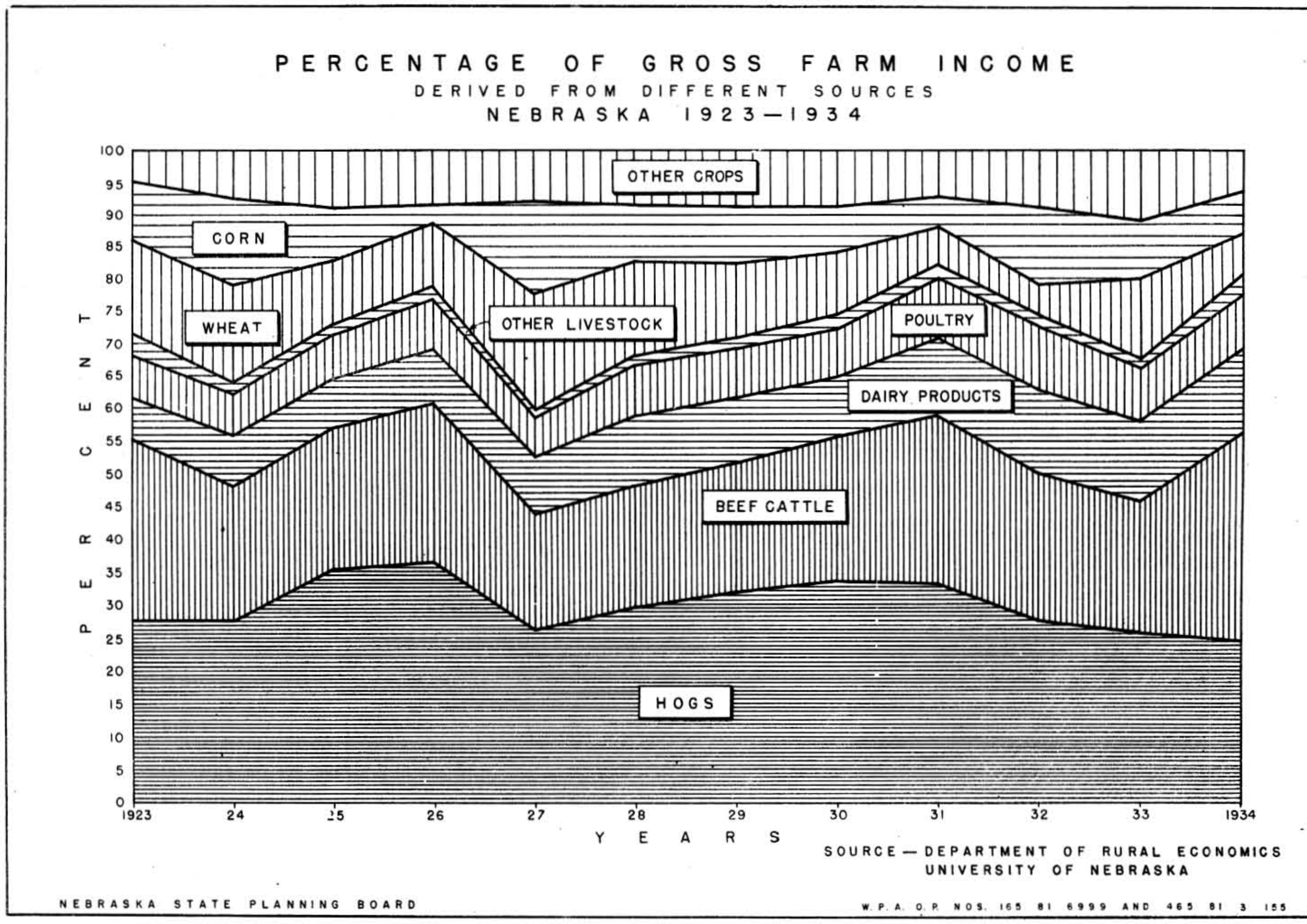
NEBRASKA STATE PLANNING BOARD

W.P.A. OP. NOS. 165-81-6999 AND 465-81-3-155

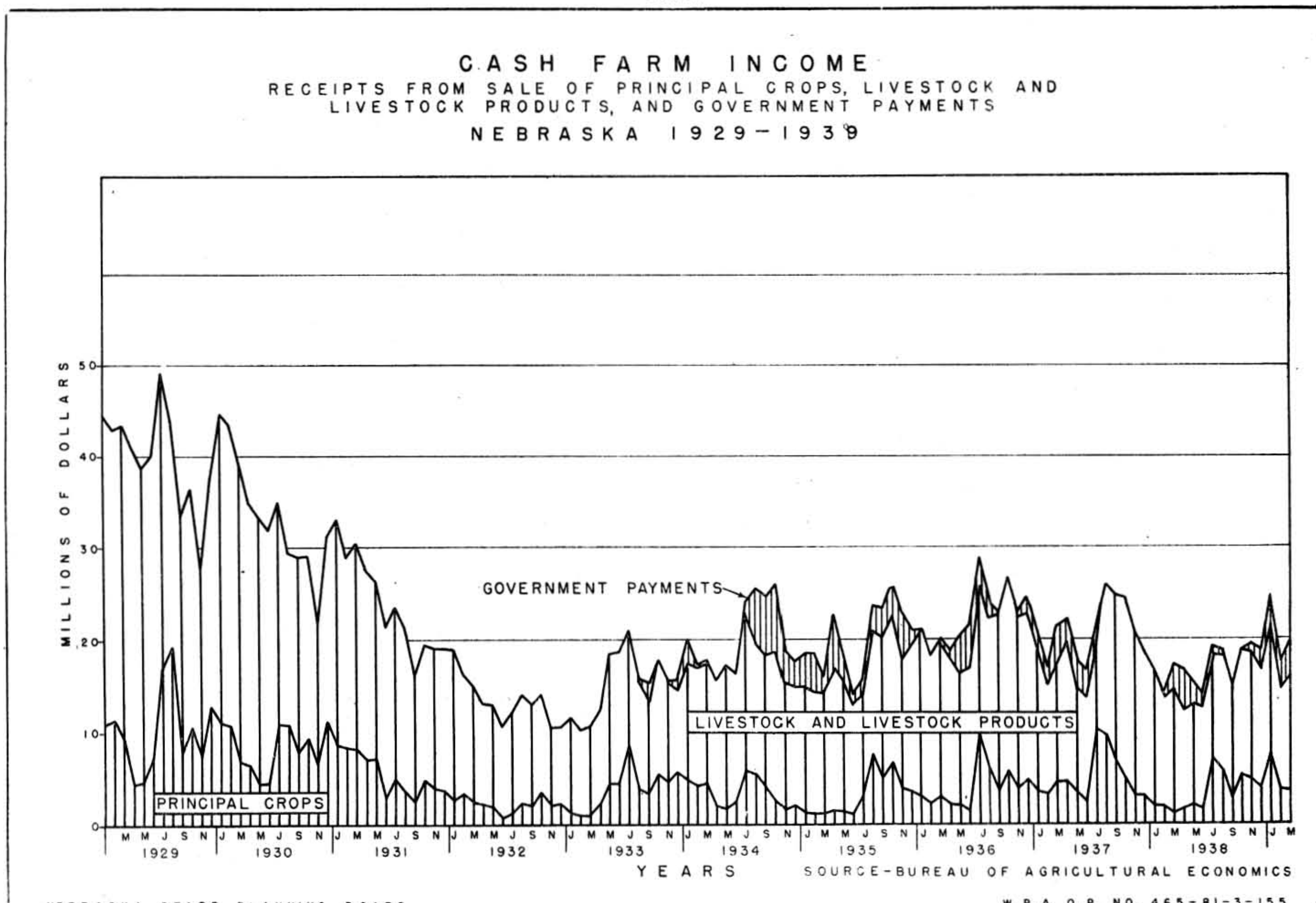
SOURCES OF FARM INCOME
PERCENTAGE CHARTS SHOWN
NEBRASKA, 1929



COMPILED FROM PUBLISHED RECORDS U.S.
BUREAU OF AGRICULTURAL ECONOMICS


PERCENTAGE OF GROSS FARM INCOME
DERIVED FROM DIFFERENT SOURCES
NEBRASKA 1923—1934
OTHER CROPS
CORN
WHEAT
OTHER LIVESTOCK
POULTRY
DAIRY PRODUCTS
BEEF CATTLE
HOGS
PER CENT
YEARS
SOURCE — DEPARTMENT OF RURAL ECONOMICS
UNIVERSITY OF NEBRASKA
NEBRASKA STATE PLANNING BOARD
W. P. A. O. P. NOS. 165 81 6999 AND 465 81 3 155

LXIII


CASH FARM INCOME
RECEIPTS FROM SALE OF PRINCIPAL CROPS, LIVESTOCK AND
LIVESTOCK PRODUCTS, AND GOVERNMENT PAYMENTS
NEBRASKA 1929—1939
GOVERNMENT PAYMENTS
LIVESTOCK AND LIVESTOCK PRODUCTS
PRINCIPAL CROPS
MILLIONS OF DOLLARS
YEARS
SOURCE-BUREAU OF AGRICULTURAL ECONOMICS
NEBRASKA STATE PLANNING BOARD
W. P. A. O. P. NO. 465-81-3-155

LXIV

MANUFACTURING

INDUSTRIES OF NEBRASKA

The manufacturing industries which were based and developed on the natural resources of the State in harmony with physical environment have prospered. The need and environmental conditions have been conducive to the successful development of meat packing, grain milling, beet-sugar manufacturing, and the manufacturing of stone, sand, and clay products.

There are more than 75 well defined industries and 1,150 manufacturing establishments in Nebraska. During normal years these industries provide work for approximately 390,000 persons. Agricultural and mineral products have an annual value of about a half billion dollars. Processing adds more than 25 per cent of total value and 25 per cent to the value of raw products.

STATISTICS OF REPRESENTATIVE MANUFACTURED PRODUCTS
NEBRASKA, 1935

Industry	Number of Establishments	Number of Employees	Nebraska's Rank	Value of Products (1,000 dollars)	Value added by Manufacture (1,000 dollars)	Location of Establishments	Description of Industry	Remarks
Meat Packing	17	5,849	8	106,511	12,733	Omaha, Lincoln, Grand Island, Hastings, Scottsbluff, McCook, and Falls City.	Processing fattened cattle, hogs, and sheep.	The most important manufacturing industry in Nebraska. Omaha is one of the largest meat packing centers in the world.
Wheat Milling	79	987	11	23,806	3,972	Omaha, Lincoln, Grand Island, Hastings, Crete, Ravenna, and others.	Wheat is milled and made ready for further processing.	The baking industry makes extensive use of Nebraska's milled wheat.
Butter	102	1,084	8	23,154	3,643	Omaha, Lincoln, Grand Island, Hastings, Fremont, Norfolk, Alliance, Crete, and Orleans.	Butterfat is collected at many stations throughout the State and shipped to the factories where it is manufactured into butter.	Nebraska creameries produce annually about 85,000,000 lbs. of butter.
Brewing	5	337	21	2,232	1,611	Omaha, Columbus, and Crete.	The manufacture of beer.	Subsequent to the repeal of prohibition, the manufacture of beer has become an important Nebraska industry.
Poultry	26	566	5	5,633	802	Well distributed throughout the State.	Dressing poultry.	About 25,000,000 chickens are produced annually in Nebraska.
Ice Cream	29	203	31	1,426	726	Well distributed throughout the State.	Dairies, creameries, and other establishments manufacture this product.	About 3,000,000 gallons of ice cream are made annually.
Stock Feed	14	139	28	1,986	505	Widely distributed throughout the State.	Grains, alfalfa, sugar-beet molasses, beet pulp, cotton cake, et cetera are milled into stock feed.	These products bring stock raising and meat packing into closer harmony.
Canning	6	464	27	1,940	416	Fremont, Norfolk, Scottsbluff, Nebraska City, and Plattsmouth.	The products canned are corn, tomatoes, beans, pumpkins, squash, cabbage, apples, and cherries.	Home canning is also of major importance.

Source: United States Census and Biennial Census of Manufactures

VALUE OF MANUFACTURED PRODUCTS
BY INDUSTRY GROUPS
Nebraska, 1900-1935
(Thousands of Dollars)

Industry	1900	1909	1914	1919	1921	1923	1925	1927	1929	1931	1933	1935
Food	86,964	126,896	161,926	433,891	217,562	262,818	295,870	294,644	334,086	215,368	135,371	180,442
Textiles products	2,564	2,049	1,427	6,993	1,306	2,046	4,046	3,010	1,142	1,185	670	232
Forest products	4,476	3,223	2,141	1,206	2,625	3,638	1,916	4,120	5,597	3,551	1,877	3,656
Printing and publishing	3,431	6,754	7,880	15,156	15,402	15,819	16,207	16,397	18,932	16,529	10,935	12,902
Chemicals	1,853	1,923	1,825	5,653	2,450	4,123	3,575	3,952	5,395	3,208	1,662	2,888
Rubber				930	2,184	2,649		2,695				
Leather	2,064	1,583	833	1,521	680	1,001	1,039	1,533	1,716			135
Stone and clay	2,754	3,108	2,288	3,486	2,489	3,383	3,342	2,275	2,430	1,433	523	1,138
Iron and steel	3,360	355	1,239	3,112	2,523	3,326	3,194	1,708	2,304	1,709	1,035	1,330
Nonferrous	954	624	650	2,233	1,105	1,268	2,416	1,306	1,094	773	349	665
Machines	1,083	3,143	3,295	8,213	4,224	3,523	3,745	5,832	6,068	3,829	1,436	1,167
Transportation	394	634	436	6,308	636	792	490	656	542	220	76	742
Railroad repair	2,624	4,642	6,737	17,909	16,900	18,727	15,408	14,991	18,888	9,389	6,217	
Petroleum and coal	525	1,415	1,928	2,446	3,094	3,185	3,241	3,605	3,989	2,397		173
Miscellaneous	30,944	42,670	39,012	86,985	60,486	88,769	88,819	63,361	82,135	34,504	34,139	50,175
Totals	143,990	199,019	221,616	596,042	333,665	415,057	443,308	420,084	484,268	294,095	194,310	255,445

Sources: United States Census and Biennial Census of Manufactures

Where no figures are given the products have been grouped under other industries.

TRANSPORTATION

EARLY ROAD SYSTEMS

The development of transportation in Nebraska reveals the successive evolutionary changes occurring in all progressive frontiers. As far back as 1855, the Territorial Legislature passed an act which provided for the surveying of public roads. The same year Congress authorized the construction of the first federal highway in the State, extending from Omaha to Fort Kearney near the present city of Kearney.

The first legislative authorization for a State Highway Department in Nebraska was in a 1913 law, which authorized counsel to counties concerning highway improvements. The first concentrated action of the State for highway improvement followed a joint meeting of representatives from the State Highway Department and the counties as provided by this statute. The present era of road construction was initiated by the passage of the Federal-Aid Road Act by Congress in 1916, and the acceptance of the terms of this Federal Act by the 1917 State Legislature.

RAILROADS

The transcontinental line of the Union Pacific Railroad was completed to the west coast in 1869. Other important railroads were constructed throughout Nebraska from 1870 to 1890. Even though there are a few points in the sparsely settled sand hills which are more than 30 miles from a railroad, Nebraska has an adequate railway system. Two high-speed transcontinental lines traverse the entire length of the State. Other main lines and numerous branch lines serve practically every community and are capable of handling all traffic originating in the State.

Plate LXV shows the railroad lines of Nebraska. The railroad mileage of various lines is listed below:

Railroad	Mileage
Chicago, Burlington, and Quincy	2,854.59
Union Pacific	1,356.97
Chicago and Northwestern	1,100.97
Missouri Pacific	359.31
Chicago, St. Paul, Minneapolis and Omaha	261.45
Chicago, Rock Island, and Pacific	250.46
Omaha Bridge & Terminal	1.45
Total	6,185.20

HIGHWAYS

The Nebraska State Highway System as outlined in the 1939-1940 Biennial Report of the Bureau of Roads and Bridges was made up of approximately 9,000 miles of marked and maintained roads and 2,220 miles of roads designated for the State system but not maintained by the State. This total approximates 11,220 miles.

Nebraska is well supplied with road-surfacing materials for all types of roads. Sand, gravel, crushed stone, and cement are produced in adequate quantities for road construction. It is necessary to import bituminous materials, lumber, and products from steel mills. However, steel is fabricated in the State.

Highway U. S. 20, U. S. 30, U. S. 6, and Nebraska 2 traverse the State in an east-west direction, and U. S. 73, U. S. 77, U. S. 81, U. S. 281, U. S. 83, Nebraska 14, 15, and 19 traverse the State in a north-south direction. All of the above-named highways traverse the Platte River Basin for a part of their length except U. S. 20 which crosses the northern section of the State including the Minor tributaries of the Missouri, the Elkhorn, the Niobrara, and the White River-Hat Creek Basin. U. S. 6 and U. S. 30 are surfaced throughout their length with concrete or bituminous materials.

Highway U. S. 30 follows the Platte River, South Platte River, and Lodge Pole Creek across the State. The major portion of this highway is in the Platte River Basin as illustrated by the highway map of the State Highway System, page 72. Other routes cross several river basins in traversing the State.

AIRWAYS

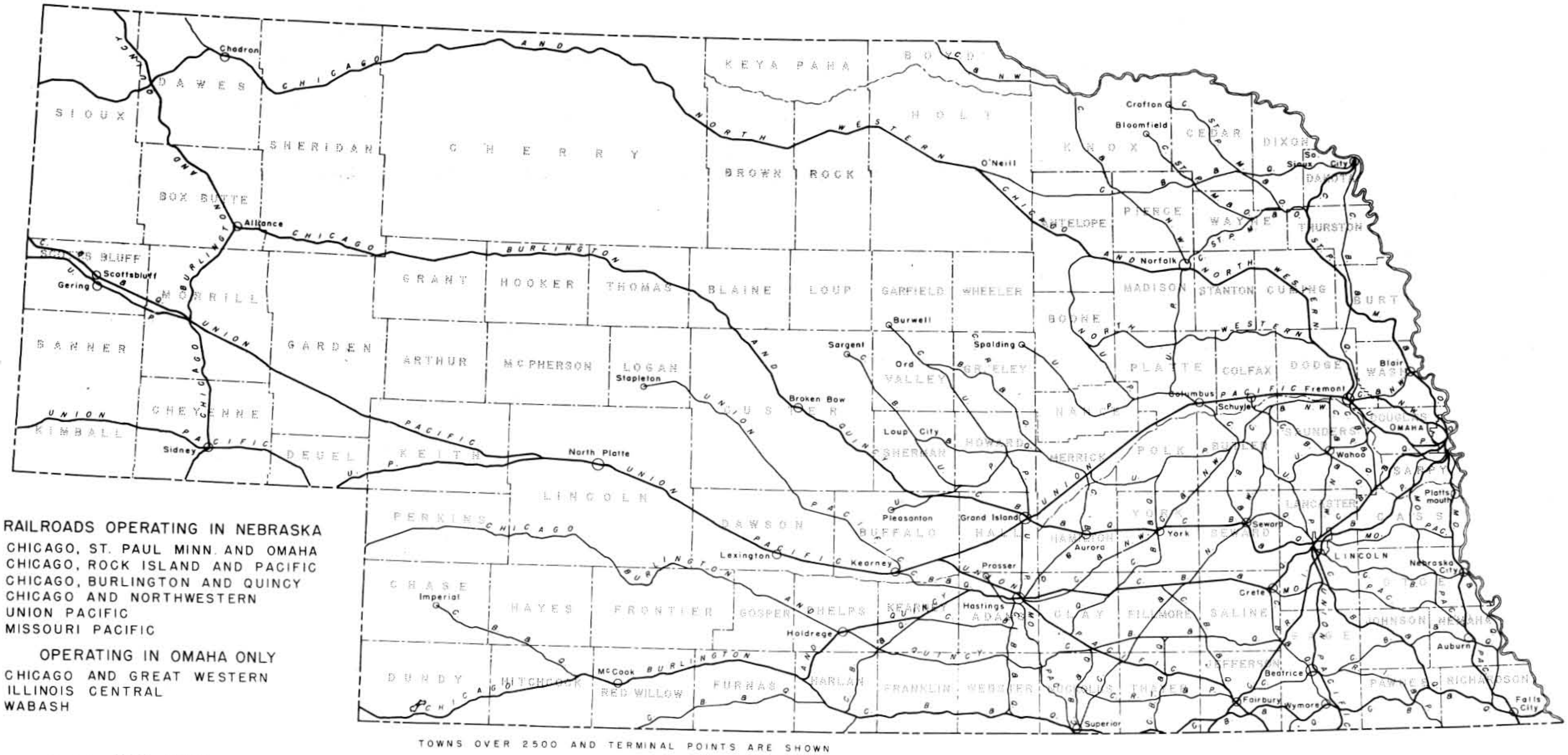
Three major airlines cross Nebraska: (1) The United Airlines, operating from coast to coast, crosses the State from east to west; (2) the Mid-Continent Airlines, operating from Minneapolis to Kansas City via Sioux City and Omaha, crosses Nebraska from north to south; and (3) the Inland Airlines operating between Cheyenne, Wyoming, and Huron, South Dakota crosses the panhandle. A branch of the United Airlines also operates between Denver and Grand Island.

As shown by the following table, 42 Nebraska towns have landing facilities for aircraft. The airports at Omaha, North Platte, and Grand Island are capable of handling the largest airliners now operating.

NEBRASKA AIRPORTS
January, 1941

Ainsworth	Gordon	Stuart
Alliance	Grand Island	Tecumseh
Atkinson	Hastings	Tekamah
Auburn	Hayes Center	Valentine
Beatrice	Hebron	York
Big Springs	Holdrege	Wayne
Blair	Kearney	
Bridgeport	Kimball	To be completed in 1941
Broken Bow	Lincoln (3)	
Chadron	Long Pine	
Chambers	Norfolk	
Columbus	North Platte	Clay Center
Crawford	Ogallala	Falls City
Crete	Omaha	Imperial
Fairbury	Rushville	Nebraska City
Ft. Crook	Scottsbluff	Neligh
Ft. Robinson	Sidney	
Fremont	St. Paul	

RAILROADS IN NEBRASKA
1939



RAILROADS OPERATING IN NEBRASKA

CHICAGO, ST. PAUL MINN. AND OMAHA
CHICAGO, ROCK ISLAND AND PACIFIC
CHICAGO, BURLINGTON AND QUINCY
CHICAGO AND NORTHWESTERN
UNION PACIFIC
MISSOURI PACIFIC

OPERATING IN OMAHA ONLY

CHICAGO AND GREAT WESTERN
ILLINOIS CENTRAL
WABASH

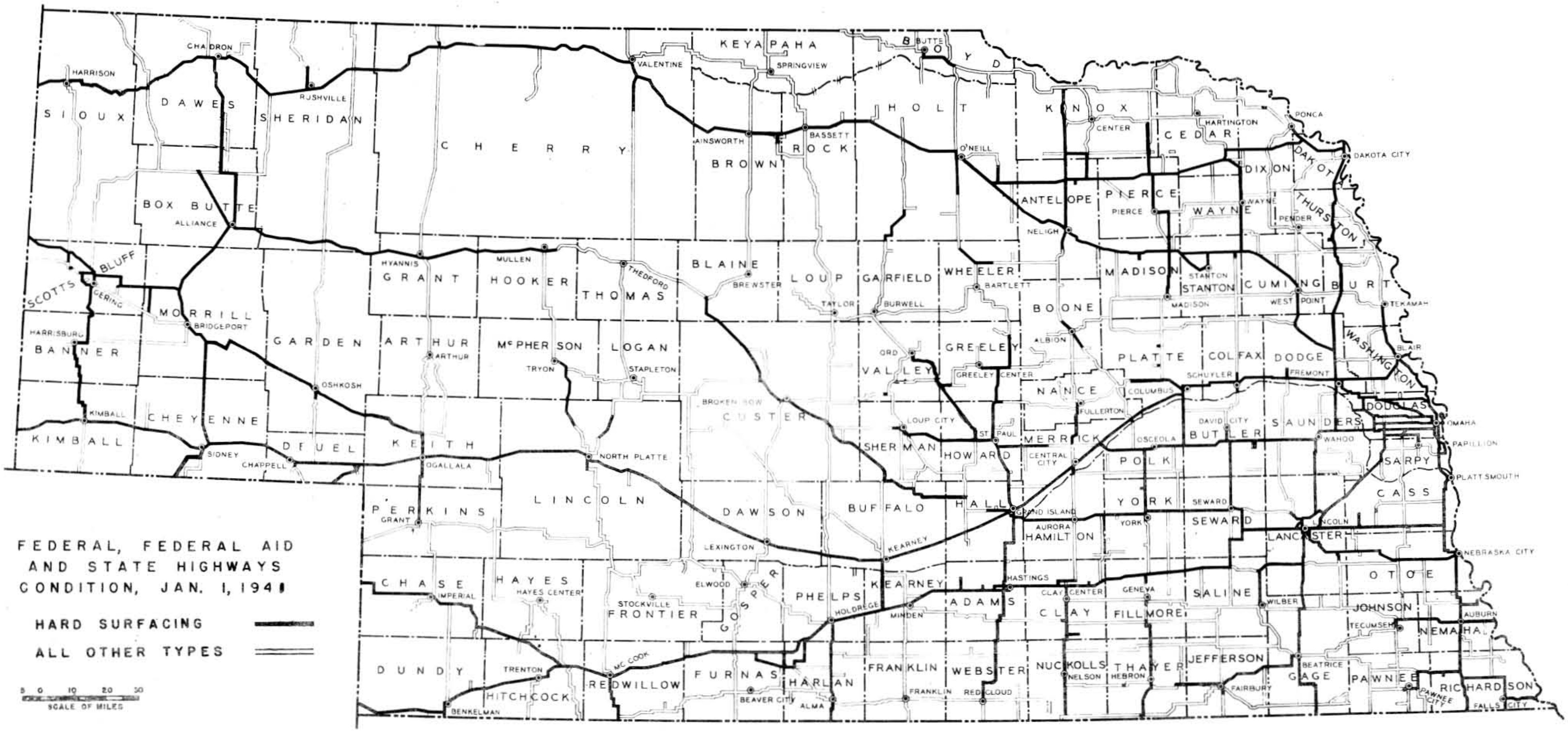
MAIN LINES
BRANCH LINES

SOURCE—NEBRASKA RAILWAY COMMISSION

NEBRASKA STATE PLANNING BOARD

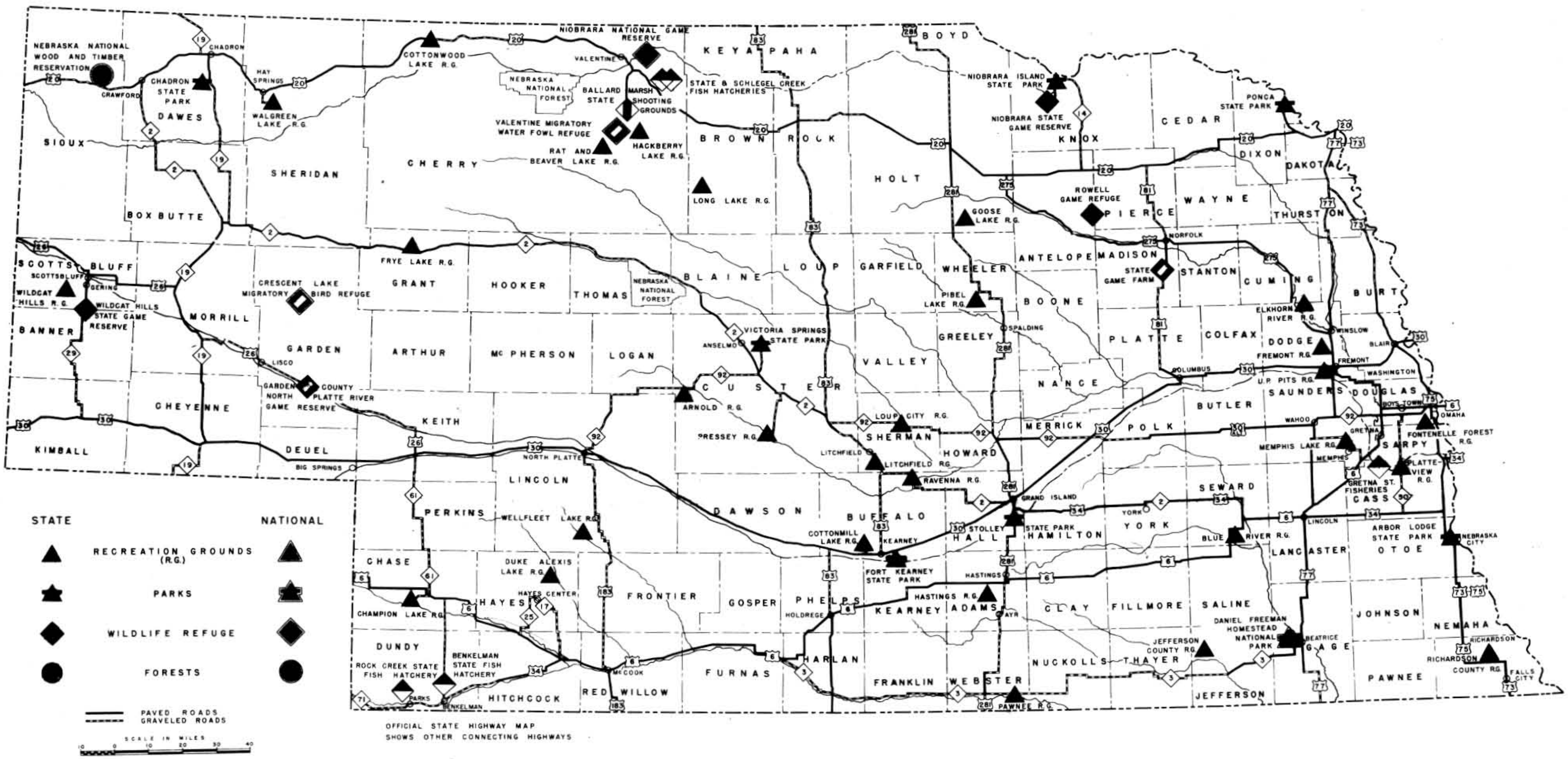
W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

NEBRASKA HIGHWAY SYSTEM
1941



SOURCE—DEPT. OF ROADS AND IRRIGATION

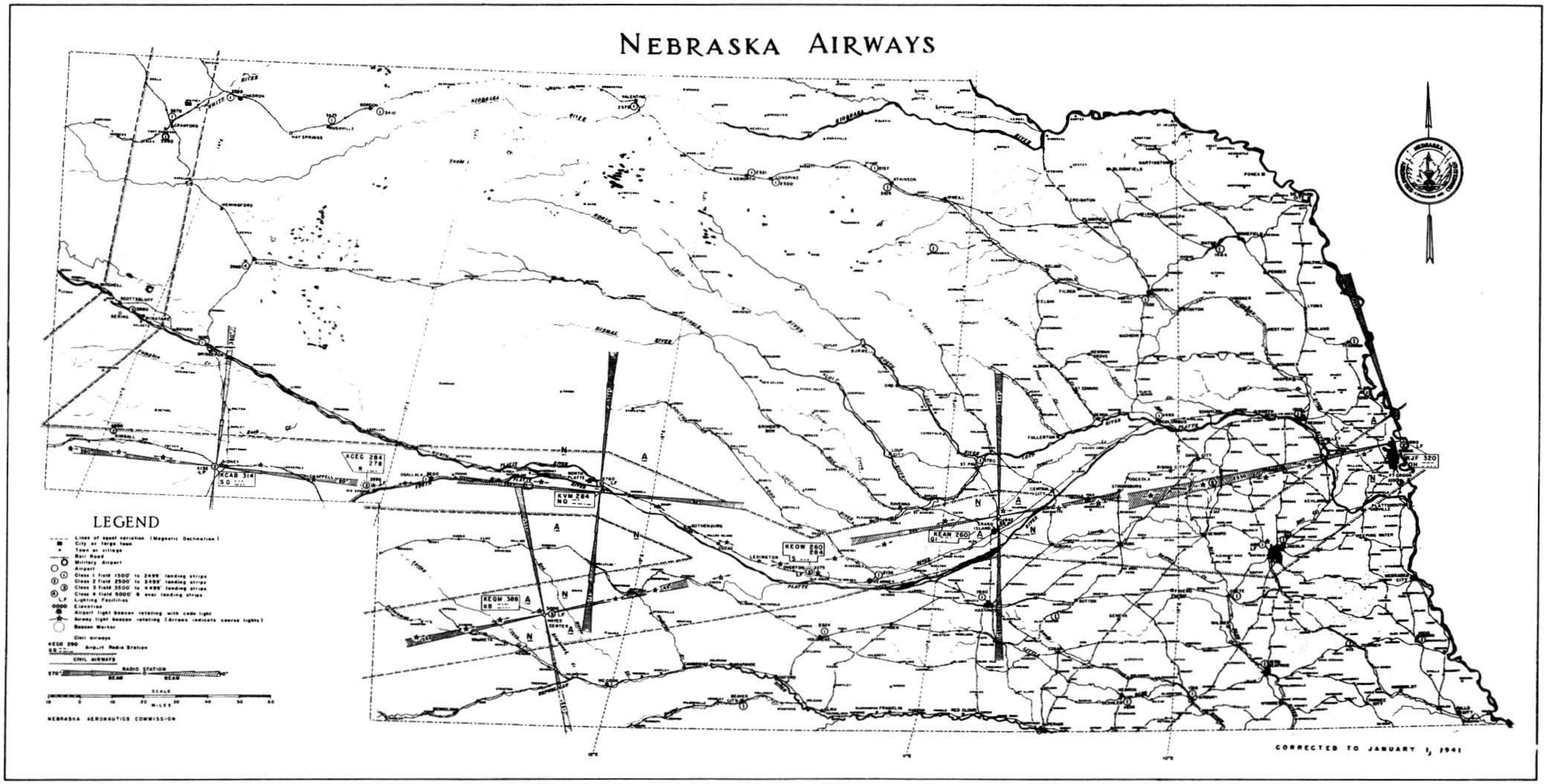
PARKS AND RECREATIONAL AREAS
NEBRASKA 1939



SOURCE—STATE GAME, FORESTATION, AND PARKS COMMISSION

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NO. 465-81-3-37


NEBRASKA AIRWAYS
LEGEND
Lines of equal variation (Magnetic Declination)
City or large town
Town or village
Rail Road
Military Airport
Airport
Class 1 field 1500' to 2499' landing strips
Class 2 field 2500' to 3499' landing strips
Class 3 field 3500' to 4499' landing strips
Class 4 field 5000' & over landing strips
L.F Lighting Facilities
0000 Elevation
Airport light beacon rotating with code light
Airway light beacon rotating (Arrows indicate course lights)
Beacon Marker
Civil airways
KEGO 290 Airport Radio Station
CIVIL AIRWAYS
RADIO STATION
BEAM
BEAM
SCALE
MILES
NEBRASKA AERONAUTICS COMMISSION
KCAB 314
KCEG 284
KVM 284
KEOW 260
KEAM 260
KEGM 388
KJF 320
CORRECTED TO JANUARY 1, 1941

NAVIGATION

Commercial navigation in Nebraska is possible only on the Missouri River. The flow of the other streams is too irregular and shallow.

The existing navigation project for the improvement of the Missouri River from Kansas City, Missouri to Sioux City, Iowa was provided for in the River and Harbor Act adopted January 21, 1927. This project which provided for the construction of a 6-foot channel has been completed between Kansas City and Omaha.

There are 2 distinct units of improvement designed to stabilize and regulate the channel of the river. The Fort Peck Reservoir, near Glasgow, Montana regulates the downstream flow. This reservoir has a capacity of 20,000,000 acre-feet. The construction of bank revetments, permeable dikes, and the removal of snags stabilizes the channel.

Navigation above Kansas City is dependent upon the release of water from the Fort Peck Reservoir, since the normal low-water flow is definitely inadequate to maintain navigable depths. The navigation program depends, therefore, upon the rate of impounding at Fort Peck as determined by precipitation and run-off in the tributary area.

The proposed method of operating the Fort Peck Reservoir provides for a minimum flow of 30,000 second-feet at Yankton, South Dakota, except under unusual drought conditions, when a slight reduction in the amount may be required.

During periods of high water a satisfactory channel now exists between Kansas City and Omaha for barges and commercial tows loaded to a draft of 5.5 feet. During the low water period in the fall the channel in this section accomodates drafts of only 4 feet. With favorable progress the channel from Omaha to Sioux City may be opened to navigation in 1941. This will give Nebraska a total navigable water front of about 240 miles.

The recently completed 6-foot channel of the Missouri River between Kansas City and Omaha was officially opened to commercial navigation June 3, 1939 by the arrival of a Diesel tow boat which brought 2 barges containing 350,000 gallons of gasoline. The cargo was equal to 44 railroad tank cars of gasoline.

When commercial navigation was initiated on the river June 3, 1939, Army Engineers reported the channel in excellent condition. However, the channel is still being shaped into its final course. Finishing improvements are being put on the cut-off stretch near Plattsmouth.

The newly completed river channel between Rulo and Florence has been lighted and marked. One hundred buoys and 37 day markers were installed. The buoys indicate the course of the channel. After commercial navigation is established lights will probably be installed to permit night navigation. At present the river is lighted only below Kansas City for night navigation.

Army engineers have spent 12 years and nearly $140,000,000 to transform the Missouri River into a navigable stream. When the 764-mile stretch from St. Louis to Sioux City is completed approximately

LXIX

$160,000,000 will have been expended.

An authorization by the River and Harbor Act May 31, 1939 includes additional improvement of the Missouri River and provides for the construction of a 9-foot channel not less than 300 feet wide from Sioux City to the mouth of the river. The first cost is estimated at $6,000,000. When the 9-foot channel is completed the type of equipment found in the remainder of the system will be able to operate to Omaha and Sioux City.

The improvement of the natural outlet should result in reduced transportation rates to the principal industrial centers of the East, and to the points of consumption for our agricultural products. These conditions should serve as stimuli to the industrial development within our State. Plate LXIX shows how Nebraska is connected with the navigable waterways of the United States.

WILD LIFE AND RECREATIONAL FACILITIES

STATE AND FEDERAL PARKS, RECREATION GROUNDS, AND GAME RESERVES
Nebraska, 1939

NAME	COUNTY	TOWN	ACRES
NATIONAL FORESTS			
Nebraska National	Cherry	Merriman)	217,808
Nebraska National	Thomas	Halsey)	
Wood and Timber Reservation	Sioux	Fort Robinson*	10,240
Total			228,048
STATE FISH HATCHERIES			
Benkelman	Dundy	Benkelman	30
Gretna	Sarpy	Gretna	50
Rock Creek	Dundy	Benkelman	120
Schlegel Creek	Cherry	Valentine	560
State Fish Hatchery	Cherry	Valentine	480
Total			1,240
STATE RECREATION GROUNDS			
Arnold Lake	Custer	Arnold	40
Ballard's Marsh	Cherry	Valentine	1,500
Blue River	Seward	Milford	14
Champion Lake	Chase	Champion	16
Cottonmill Lake	Buffalo	Kearney	100
Cottonwood Lake	Cherry	Merriman	160
Duke Alexis	Hayes	Hayes Center	100
Elkhorn River	Dodge	West Point	200
Fontenelle Forest	Douglas	Omaha	2,500
Fremont	Dodge	Fremont	307
Frye Lake	Grant	Hyannis	345
Goose Lake	Holt	Clearwater	350
Hackberry Lake	Cherry	Wood Lake	440
Hastings	Adams	Ayr	55
Jefferson County	Jefferson	Alexandria	30
Litchfield	Sherman	Litchfield	20
Long Lake	Brown	Ainsworth	80
Loup City	Sherman	Loup City	51
Memphis Lake	Saunders	Memphis	147
Pawnee Lake	Webster	Guide Rock	40
Pibel Lake	Wheeler	Spalding	80
Platteview	Cass	Louisville	190
Pressey	Custer	Callaway	80
Rat and Beaver	Cherry	Wood Lake	444
Ravenna	Buffalo	Ravenna	80
Richardson County	Richardson	Verdon	55
U. P. Pits	Dodge	Fremont	307
Walgren Lake	Sheridan	Hay Springs	130
Wellfleet	Lincoln	Wellfleet	110
Wildcat Hills	Scotts Bluff	Scottsbluff	1,000
Total			8,971
STATE PARKS			
Arbor Lodge	Otoe	Nebraska City	65
Chadron	Dawes	Chadron	804
Fort Kearney	Kearney	Newark	40
Niobrara Island	Knox	Niobrara	408
Ponca	Dixon	Ponca	200
Stolley	Hall	Grand Island	43
Victoria Springs	Custer	Anselmo	60
Total			1,620
STATE GAME RESERVES			
Burt County	Burt	Oakland	50
Cass County	Cass	Murdock	2,560
Columbus-Genoa	Platte	Columbus-Genoa	2,500
Dakota County	Dakota	Jackson	760
Dodge County	Dodge	Fremont	1,425
Douglas County	Douglas	Valley	750
Garden County	Garden	Oshkosh	7,000
Jefferson County	Jefferson	Fairbury	1,080
Lancaster	Lancaster	Lincoln	160
Lancaster	Lancaster	Lincoln	42
Lincoln County	Lincoln	North Platte	14
Loup County	Loup	Taylor	2,720
Madison	Madison	Norfolk	10
Niobrara Island	Knox	Niobrara	562
Nuckolls County	Nuckolls	Bostwick	1,850
Pierce County	Pierce	Pierce	160
Rowell	Antelope	Tilden	440
Saunders County	Saunders	Ames	72
Saunders County	Saunders	Ashland	500
Saunders County	Saunders	Cedar Bluffs	3,425
Saunders County	Saunders	Wahoo	1,760
Sheridan County	Sheridan	Hay Springs	2,660
Stanton and Cuming	Stanton and Cuming	Stanton	776
State Game Farm	Madison	Norfolk	160
Walton	Lancaster	Walton	5,188
Washington County	Washington	Fort Calhoun	1,450
Wildcat Hills	Scotts Bluff and Banner	Scottsbluff	800
Total			38,874

FEDERAL GAME RESERVES

National Water Fowl Sanctuary	Garden	Mumper	41,000
Niobrara National	Cherry	Valentine	16,681
Total			57,681
Grand Total			336,434

Wild life and recreational facilities in Nebraska have been affected by the development and use of the water resources of the State. Irrigation, drainage, and industries have had a tendency to diminish or pollute the lakes, marshes, and streams.

The depletion of bodies of water such as Crescent Lake in Garden County is a prime factor in reducing waterfowl and fish population. On a lesser scale perhaps wild life has been reduced by the drainage of small marshy and swampy tracts on farms. These were essential habitats for many fur-bearing animals and afforded feeding, watering, and resting places for a variety of other forms of wild life. However, the widespread development of farm ponds and stock-watering places is evidence of a change of sentiment about drainage. In some parts of the State farmers have constructed small dams to conserve surplus water supplies. Such supplies are conducive to the conservation and propagation of wild life.

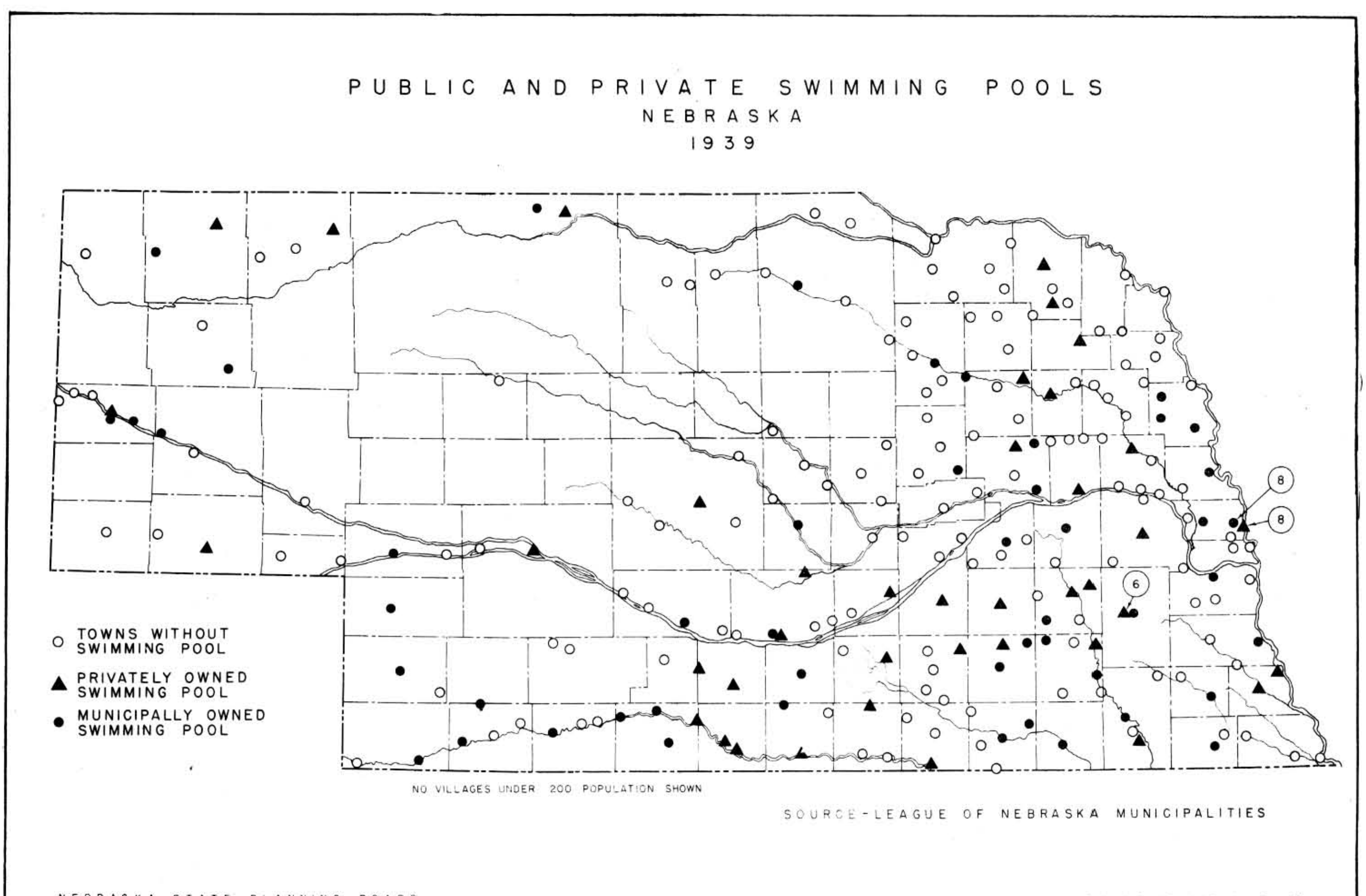
Recent droughts have seriously affected the aquatic habitat of wild life in Nebraska. During periods of low water the wild life of the marshes and lakes which cannot migrate perishes. Many fish lakes dried up reducing the normal hatch of game birds. There has been some progress in restocking fish and game in depleted areas. Severe winter conditions during drought periods freeze shallow lakes to the bottom killing large numbers of fish. Holes are sometimes cut in the ice or artesian wells are put down in the lakes to keep them open. To prevent loss, the fish are sometimes seined from the shallow lakes in the fall and transferred to more stable bodies of water.

The fluctuation of the water levels also affects the growth of various kinds of vegetation upon which migratory waterfowl, muskrats, beaver, and mink feed. Fitting wildfowl requirements into an engineering program is a promising field for study and investigation.

The creation of an adequate system of refuges along the principal routes of migration and at points of greatest concentration is desirable even though any worthwhile refuges are destined to interfere to some extent with boating, fishing, and shooting. To be effective any system of refuges should harbor througnout the open season the most important waterfowl species in shooting areas. Refuges and sanctuaries present excellent opportunities to stimulate interest in better wild-life management.

POLLUTION

Water pollution is destructive to fish, waterfowl, and their food and nesting materials. Pollution such as sewage and industrial waste results in toxic concentrations that are the causes of much



destruction. Sewage and industrial wastes should be treated before they are discharged into streams.

The summer low-water conditions are dangerous because of the reduced supply of water and the highly concentrated pollution substances. High temperatures also increase toxicity.

While pollution has reached the nuisance stage in only a few areas it should be considered an important factor in the utilization of our water resources. Increasing population and manufactures will intensify the problem to a point where water treatment will become imperative.

RESERVOIR LAKES

Lakes created by the construction of large power and irrigation dams are of great value to the conservation of wild life.

Restoration of wild life involves the re-establishment of their habitats. For aquatic birds and animals suitable waters must be made accessible. Improved methods of land use will tend to provide additional food and cover which is the first requirement for terrestrial animals.

WATER RESOURCES

SURFACE WATER AND GROUND WATER

SURFACE WATER

Surface water is the precipitation residue in excess of absorption and infiltration. Surface water may also be a portion of the ground water that reappears from the ground-water supply directly into the drainage courses. The wide variation of such elements as precipitation, evaporation, run-off, ground seepage, and transpiration also affect the surface-water supply. Although rainfall and run-off are the major factors determining supply of surface water, physiography and climate are also important factors.

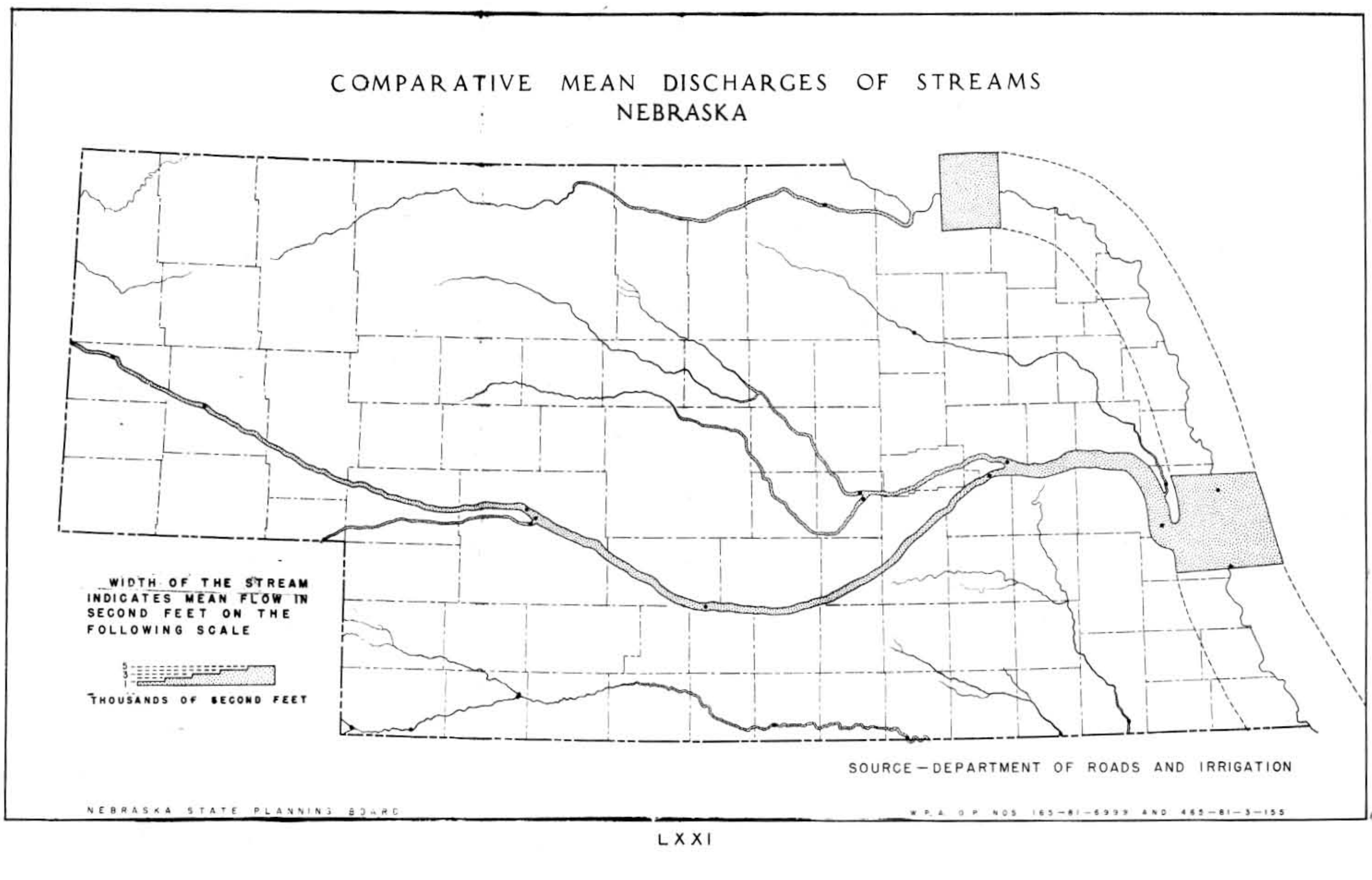
A natural balance of retarded surface flow, underground storage, and the seepage from underground-storage supplies tends to maintain a fairly regular supply of water in streams, lakes, and ponds. The replenishing sources for stream flow are precipitation, underflow of rivers, upstream contributions, and subsurface flow from adjoining land. The sectional contributions to river discharge vary according to the thickness of the water-bearing formation, the area, degree of saturation, and the permeability of the soils. The factors affecting the quantity of river-water loss are permeability and gradient of adjoining lands, the quantity of water in the rivers, and the rate and amount of evaporation. In some parts of the State surface water is augmented by irrigation practices, while in other parts it is depleted.

STREAMS

The general direction of the major stream courses of Nebraska is from northwest to southeast. The streams of the State vary considerably in quantity of water and uniformity of flow, because of geologic, soil, and climatic conditions of their basins. Those fed mainly by surface run-off vary more in discharge; those heading in the ground water of sandy lands, as in the Sand-Hill Region maintain a more uniform flow. All the larger streams within or adjoining the State have been gauged at regular intervals for several years. The discharges of these streams are quite well known. At the present time, the Department of Roads and Irrigation in cooperation with the United States Geological Survey maintains automatic-recorder equipment at 48 stations, in Nebraska. The resulting daily discharge records are invaluable in planning for the future utilization of the water resources of this State. Long-time records for Nebraska are perhaps more nearly complete than for any of the other western states where irrigation is practiced extensively. Our streams present problems relating to drainage, flood control, irrigation, power development, wild life, domestic water supply, and recreational use.

LAKES

The lakes are numerous but usually small and shallow. Counting those with areas of 15 acres or more, the State has more than 2,300 lakes, marshes, and artificial reservoirs. Most of the natural lakes and marshes are in the Sand-Hill Region. They are shallow, many of them intermittent. About 1,000 of them became dry during the recent drought.



AREA OF SURFACE WATER

The combined area of the intermittent lakes and marshes averages about 163 square miles, and that of the permanent streams about 495 square miles. The maximum area of the surface water of the State, not including floods, is about 890 square miles. The average is about 640 square miles. The droughts of 1934 and 1936 reduced the combined area to about 300 square miles.

The area of the water surface of the State has been increased considerably during the past few years by the construction of reservoirs in connection with water power, irrigation, and erosion-control works. When the reservoirs are filled, the irrigation and water-power projects now under construction, or authorized for construction, will add about 42,600 acres of water surface to the State. The evaporation loss from the reservoirs and other free-water surfaces of the State is considerably less than the amount of direct rainfall they receive.

VOLUME OF SURFACE WATER

The amount of surface water, like the soil moisture, varies greatly throughout the year. Not including the discharge of the Missouri, the annual inflow is about 2,000,000 acre-feet from Kansas, Colorado, Wyoming, and South Dakota, through the Republican, South Platte, North Platte, and Niobrara rivers, and their tributaries. The outflow by Hat Creek, White, Niobrara, Little Blue, Big Blue, Republican, and Platte rivers, is about 6,800,000 acre-feet. This shows that the outflow exceeds the inflow by about 4,800,000 acre-feet, or an amount equal to slightly more than 5 per cent of the total volume of the mean annual rainfall of the State.

The annual discharge of the Missouri River varies between 25,000,000 and 52,000,000 acre-feet at Rulo. Of this, there are only about 5,800,000 acre-feet contributed by Nebraska creeks and rivers. About 1,000,000 acre-feet are contributed by Nebraska streams below Rulo, Nebraska. Consequently, the volume of surface water in the State is relatively small.

In 1931 the Surface Water Division of the United States Geological Survey entered into a cooperative agreement with the Nebraska Department of Roads and Irrigation in extending the study of the water resources of Nebraska. This study has been continuous.

FLOOD WATERS

Every large stream in the State reaches flood-stage in some part of its course. The streams in Nebraska which are subject to floods throughout their courses are the Missouri, the Republican, the Platte, and the Loup rivers.

Nebraska floods occur within the period April 1st to August 31st. More than 50 per cent of the floods come in June. The control of excess run-off tends to equalize maximum and minimum stream flow. Peak flows are retarded and reduced to provide dependable water supply for irrigation during periods of low flow and drought.

EARLY FLOODS

Destructive stream floods have occurred in Nebraska during its entire history. Several of the early floods are matters of legend and tradition rather than of historical record. One of the early floods occurred in 1785, a year known in Middle Western Regions as "The Year of the Big Waters". All the steams of the North and Middle West reached flood stages. These were recorded on the Mississippi in the vicinity of the present site of St. Louis. Probably very little damage was done because Nebraska was undeveloped at that time.

The next great flood occurred in 1826. The spring season of that year was characterized by excessive rainfall throughout the Middle West. The Missouri and Mississippi rivers were at high stage during April and May.

Another maximum flood visited this area in 1844. Sufficient evidence exists to establish it as one of the greatest floods in the history of this territory. Monetary loss was small because Nebraska was not yet settled.

Other general floods occurred in 1845, 1851, 1858, 1881, and 1886 although little is known concerning them.

One of the most important floods accurately recorded occurred during the latter part of May and the first part of June, 1903. It resulted in very high flood stages throughout the central and eastern part of the Missouri River Basin. It was exceeded only by the flood of 1844.

Floods in the Republican-Kansas River Basin subsequent to that of 1903 occurred in 1904, 1908, 1915, 1923, and 1935. None of them equaled the flood of 1903 in eastern Kansas, although the flood of 1935 in the upper Kansas River closely approached it.

At the crest of the 1935 flood, the discharge was approximately 9 times greater than had ever been previously recorded. Previous floods were as high as 24,500 cubic feet at Hardy, Nebraska, where the river crosses the state line into Kansas. The 1935 flood discharged 225,000 second-feet at this point.

After a month of greater-than-normal precipitation, exceptionally heavy rains during the night of May 30, and 31, 1935, followed by moderately heavy rainfall during the next 2 days, caused the greatest flood on the Republican River that had occurred there during a period of at least 70 years.

The Republican River Valley from the eastern part of Colorado to Junction City, Kansas, a distance of 350 miles, was flooded for a width ranging from three-quarters of a mile to 1.5 miles. More than 100 lives were lost and much livestock and many buildings were destroyed. Thousands of acres of rich farm land, covered by deposits of sand brought down by the flood waters, were greatly damaged. Nearly all the highway bridges over the river were either destroyed or rendered impassable. The highways along the valley were washed out in many places. On the main line of the Burlington Route from Chicago and St. Louis to Denver, about 40 miles of track were destroyed. Regular train schedules were not resumed for three weeks. The loss of the railroad, chargeable directly to the flood in the Republican River Valley, was estimated at $1,500,000.

The following data showing the crest of the flood at various Nebraska points are based on the investigations made by the Missouri River Division of the Corps of Engineers, United States Army, and The State Engineer of Nebraska.

Point on River	Crest of Discharge Area of Cross-Section Sq. Feet	Mean Velocity in Feet Per Sec.	Crest Discharge in Cu. Feet Per Sec.
Newton, Colorado	23,900	4.30	103,000
Max, Nebraska	25,000	7.60	190,000
Bloomington, Nebraska	56,800	4.41	250,000
Hardy, Nebraska	45,900	4.91	225,000

The estimated maximum flow at any point on the river was at Cambridge, Nebraska below the mouth of Medicine Creek, where 280,000 second-feet was reached at crest discharge. At Bloomington, Nebraska the river rose from 7.5 depth at 6:00 P.M., May 31st, to a crest depth of 20.4 at 10:30 P.M., June 1st with a width of flow of 1.5 miles. At points on the river a 12-foot greater rise was recorded over that of any previous flood.

The following table shows losses based on investigations made by the Missouri River Division of the Corps of Engineers, United States Army, the State Engineer of Nebraska, the division of Water Resources of the Kansas State Board of Agriculture, and Colorado state and county officials:

Summary of Losses in Colorado and Nebraska

	Colorado	Nebraska
Lives Lost	6	94
Livestock Lost	300	8,100
Poultry Lost	*	46,500
Highways Damaged (Miles)	"5	341
Highway Bridges Damaged	'6	307
Crops Damaged (Acres)	**	42,000
Farm Land Damaged (Acres)	15,000	57,000
Total Value of Property Loss	o$790,000	#$7,532,000

* No Record
" Estimated
' Does not include county bridges
** Area damage in Colorado was chiefly hay land and is included under farm land damaged
o Includes damage to county bridges and roads
Includes $1,500,000 loss of Burlington Railroad directly chargeable to the flood, a small part of which occurred in Colorado

The largest single item of loss in Nebraska, and the one requiring considerable attention is the future land use in the flood plain. This area was severely damaged by deposition of sand and gravel and by the cutting away of top soil. Strong winds stir up dense clouds of sand which whip about cutting off vegetation. The result is much damage and discomfort in adjoining areas.

Two of the most destructive floods in the history of the State occurred in the Republican River Valley in May 1935, and in the Missouri River Valley in eastern and southeastern Nebraska July 1938. These floods were caused by cloudbursts and excessive rainfall. Both incurred great loss of life and property.

Several floods of considerable intensity have been recorded in the Republican River Valley and its tributaries; one in 1905 and 1915, and 4 in 1935, 3 of which occurred within a period of 17 days. The first of the 1935 floods occurred on May 28th, when the water at McCook, Nebraska reached about the same stage as the flood of 1915, which, up to that time, was the worst flood in the history of this area. The second flood, and the worst in the history of the river, occurred on May 30th, 31st, and June 1st. The third flood occurred on June 16th and 17th at McCook, but did not cause any additional damage.

In 1935 farmers planted a limited area of the flood plain to such crops as corn and cane, but returns were disappointing. An extensive well-planned, tree-planting program is being considered for the rehabilitation on lands rendered unfit for cultivation by floods.

MISSOURI RIVER FLOOD

The Missouri River Valley in eastern and southeastern Nebraska experienced a severe flood July 2 to 18, 1938. Complete and accurate data on the damages and losses in the affected area are not available at this time.

The flood was caused by excessive precipitation and melting snow in the Upper Missouri, and Yellowstone basins of Wyoming and Montana, supplemented by considerable discharges from streams farther down the river, including the Platte.

The Nebraska State Planning Board and federal agencies are considering plans for the development of ways and means by which a recurrence of severe flood damages may be avoided.

The plan for flood control includes the construction of reservoirs on the larger tributaries for the retention of maximum flood flows. Any plan for flood control should be supplemented by a proper adjustment in land use. The development of water-conserving tillage practices and water-retarding factors is a very important part of a comprehensive flood-prevention and control program.

The crest of the flood reached Bismarck, North Dakota on July 8th; Pierre, South Dakota on July 10th; and Omaha on July 11th. The United States Geological Survey has not made a final determination of the exact discharge at the crest of the flood, but at Omaha it was between 115 and 120 thousand second-feet. At Omaha the stage remained above 16 feet from July 3rd to July 17th, and above 18 feet from July 9th to July 15th. The partial operation of the Fort Peck Reservoir this year reduced the flood stages which would otherwise have occurred, by about 1.5 feet.

Official estimates of property loss in the Missouri River flood are not available at this time. No loss of life was reported. Unofficial reports estimate heavy losses of livestock and property. Thousands of acres of rich farm land were inundated, and crop loss reached into thousands of dollars.

GROUND WATER

Ground water is one of the most important resources of Nebraska. Some authorities suggest that it is of greater importance than the soil.

The more readily available ground-water supply is about 750 times the total volume of the surface water of the State. It is estimated at approximately 10 times the average annual rainfall or an amount sufficient to fill a rectangular tank about 390 feet deep and 10 miles wide, extending the length of the State. Much ground water has been lost in late geologic times because deep valleys tap the water-bearing mantlerock resulting in considerable underflow leakage.

Maintaining a permanent ground-water supply causes grave concern. Recent drought, waste, and drainage have resulted in heavy losses of ground water. Although the ground-water supply has not been seriously depleted in any part of the State, there are places where the water table has been lowered. Such conditions require the initiation of conservation measures.

WATER HORIZONS

There are many water-bearing horizons in the State. Their distribution is not uniform. Some areas have little or no ground water and other areas have vast quantities of it. In some sections the water horizons are shallow, and in others they are deep.

Mantlerock Horizons

Most of the surface of Nebraska is underlain by thick layers of soil and subsoil, and thick open-textured mantlerock. Thick layers of sand and gravel facilitate the accumulation and storage of relatively large quantities of the rainfall as ground water. The importance of these favorable conditions for ground-water storage is not generally understood or appreciated.

Relatively unconsolidated mantlerock covers large areas of Nebraska. A large part of the loess in south-central Nebraska is underlain by 2 thick sand and gravel deposits known as Holdrege-Grand Island sands and gravels which outcrop at places along the borders of the Republican, Little Blue, Platte, and Loup valleys. These deposits which carry much ground water, underlie the middle course of the Platte Valley and reach northward and westward for a considerable distance under the sand hills and at places into the hard lands. These water-bearing strata pinch out south of the Republican River in Nuckolls, Webster, Franklin, and Harlan counties.

The sand-hill areas are occupied at the surface by dunesand and other sandy materials. The materials of the alluvial lands vary greatly in texture, grading from silt to sand and gravel. In places along larger valleys such as the Platte, Loup, and Republican there are terraces capped with loess.

Glacial deposits of varying thickness occupy the drift-hill area in southeastern Nebraska. The 200 feet or more of drift, in Nebraska, includes 2 fairly persistent sand and gravel sheets and 2 boulder-clay deposits called till sheets. Both were formed by glaciers but differ thusly; till is ice-transported, and the associated sands and gravels are water-laid.

Bedrock Water Horizons

In Nebraska it is not generally necessary to tap the bedrock waters. However, there are places where comparatively deep wells must be made in order to obtain domestic water supplies and secure water for special purposes.

Salt Water Horizons

In some small areas of Nebraska there is a scarcity of good drinking water. In other areas shallow ground water makes weak wells that become dry or nearly so during droughts and increase in yield after wet years. In some places the water is saline or alkaline creating difficult water-supply problems.

The main sources of salt water occur as follows: (1) in the Dakota group; and (2) in zones of the Permian and Pennsylvanian System, as at Lincoln, and near Union and Unadilla.

ARTESIAN WELLS

Much of the State is underlain by formations carrying water under pressure. The pressure may be sufficiently strong to cause a flow when tapped by wells. The pressure is developed in aquifers confined between impervious strata.

All ground waters contain some salts in solution. The chemical qualities of artesian water seem to vary with the distance it has moved from the point of intake to the place where it is tapped by wells. Other contributing factors are: (1) the rate of movement; and (2) the continuity of the reservoir rock. The leading artesian aquifers are the subglacial gravels, Holdrege sand and gravel, Ogallala formation, Chadron formation, Dakota group sandstones, Mississippian limestone, Niagaran dolomite, Galena dolomite, St. Peter sandstone, and the Jordan sandstone. In order to secure a maximum supply of water the wells are usually left open to a number of different water horizons, hence the water from most of these wells is chemically and physically a mixture of them all.

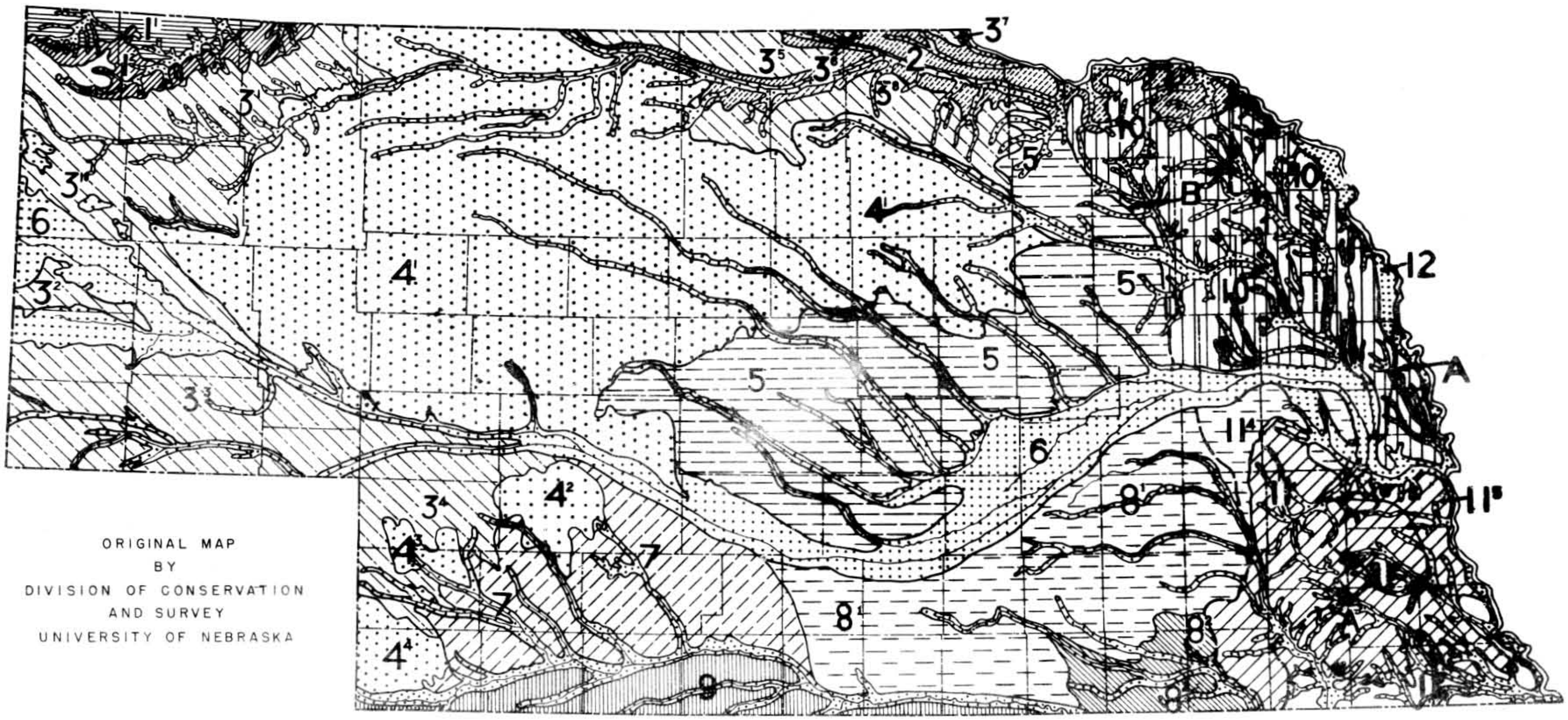
There are more than 1,500 flowing wells in the State. Many of them are located in the sand-hill region. They are used for about the same purposes as other wells. The waters from mineralized artesian wells are used for sanitarium, bathing, and other purposes.

There is a great waste of artesian well water. Many wells have ceased to flow because of the collapse of corroded casings, while others no longer flow because of a reduction in hydrostatic pressure. The artesian waters of the State have not been used to much advantage except in places where there is scant, shallow, well water, and in parts of the sand-hill region where the wells are shallow and inexpensive. At Beaver Crossing flowing wells are used in the development of small streams and ponds for trout culture, and a number of other uses. There are a number of places in the State where artesian water is impounded in fish ponds and lakes.

In 1935, the Legislature assigned to the State Geological Survey the duty of conserving the artesian waters of the State against waste.

At present there is a special demand for information concerning the distribution and configuration of water-bearing formations, and the origin, movement, quantity, quality, and availability of ground water. There is need for a water-table record showing depth, draw-down, and seasonal fluctuations. Since 1930 an investigation of the ground-water levels in Nebraska has been in progress by the United States Geological Survey in cooperation with the Water Survey of the Conservation and Survey Division of the University of Nebraska. The Central Nebraska Ground-water Survey, although a separate investigation, served to in-

GROUNDWATER REGIONS
NEBRASKA



ORIGINAL MAP
BY
DIVISION OF CONSERVATION
AND SURVEY
UNIVERSITY OF NEBRASKA

1^{1-2}–NORTHWEST SHALE LAND REGION, 2–NORTH SHALE LAND REGION, 3^{1-4}–WESTERN TABLELAND REGION, 3^{5-8}–NORTHERN TABLELAND REGION, 4^{1-4}–SANDHILL REGION & OUTLIERS, 5–CENTRAL REGION, 6–PLATTE VALLEY LOWLAND, 7–SOUTHWEST REGION, 8^{1-2}–LOESS PLAIN REGION, 9–REPUBLICAN VALLEY REGION, 10–NORTHERN DRIFT REGION, 11^{1-5}–SOUTHERN DRIFT REGION, 12–MISSOURI RIVER LOWLAND, A–SOUTHEAST EDGE DAKOTA SANDSTONE, B–WEST EDGE OF DRIFT.

augurate the fluctuation studies. Studies were made of the ground-water resources of the Platte River Valley in central Nebraska where periodic measurements of the water levels have been made on approximately 120 irrigation and test wells since August 1930, to determine their fluctuation in response to precipitation, irrigation, stream flow, and in some cases pumpage. The present State-wide water-level program incorporates a number of these original Platte Valley wells, so that the continuity of these records has not been broken.

A resume of the periodic observations of water levels in central Nebraska since 1930 written by a member of the State Water Survey furnishes the following data: periodic observations were made in about 100 wells located in the Platte River Valley in central Nebraska between Grand Island and Cozad. These observations reveal that the water levels in the wells show a declining fluctuation range from 1 to 8 feet during the period October 1930 to October 1934. This indicates a general decline of the ground-water table throughout this part of the Platte Valley. The general decline cannot be interpreted as permanent but results from the interrelated factors of annual and monthly precipitation, temperature, depth of ground water, wind movement, barometric pressure, and the season of the year.

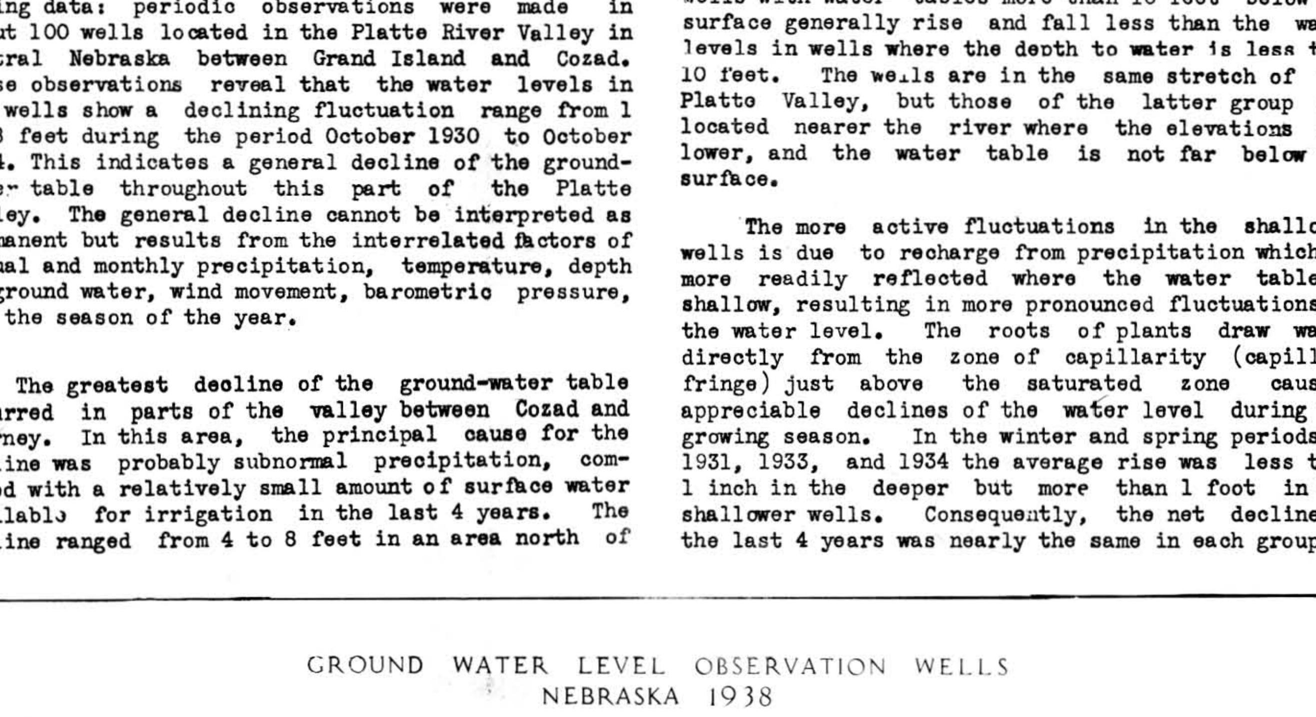
The greatest decline of the ground-water table occurred in parts of the valley between Cozad and Kearney. In this area, the principal cause for the decline was probably subnormal precipitation, combined with a relatively small amount of surface water available for irrigation in the last 4 years. The decline ranged from 4 to 8 feet in an area north of Cozad and Lexington, and from 3 to 4 feet in an area on the north side of the valley from Lexington to beyond Kearney.

East of Kearney the decline of the water table has been generally less than the decline west of Kearney. In the area east of Kearney the decline was less because the water table had not been built up to any great extent by surface irrigation prior to 1930. Such decline was due largely to subnormal precipitation and pumpage.

A comparison of the relation between fluctuating water levels in 20 wells between Grand Island and Kearney, and precipitation show that water levels in wells with water tables more than 10 feet below the surface generally rise and fall less than the water levels in wells where the depth to water is less than 10 feet. The wells are in the same stretch of the Platte Valley, but those of the latter group are located nearer the river where the elevations are lower, and the water table is not far below the surface.

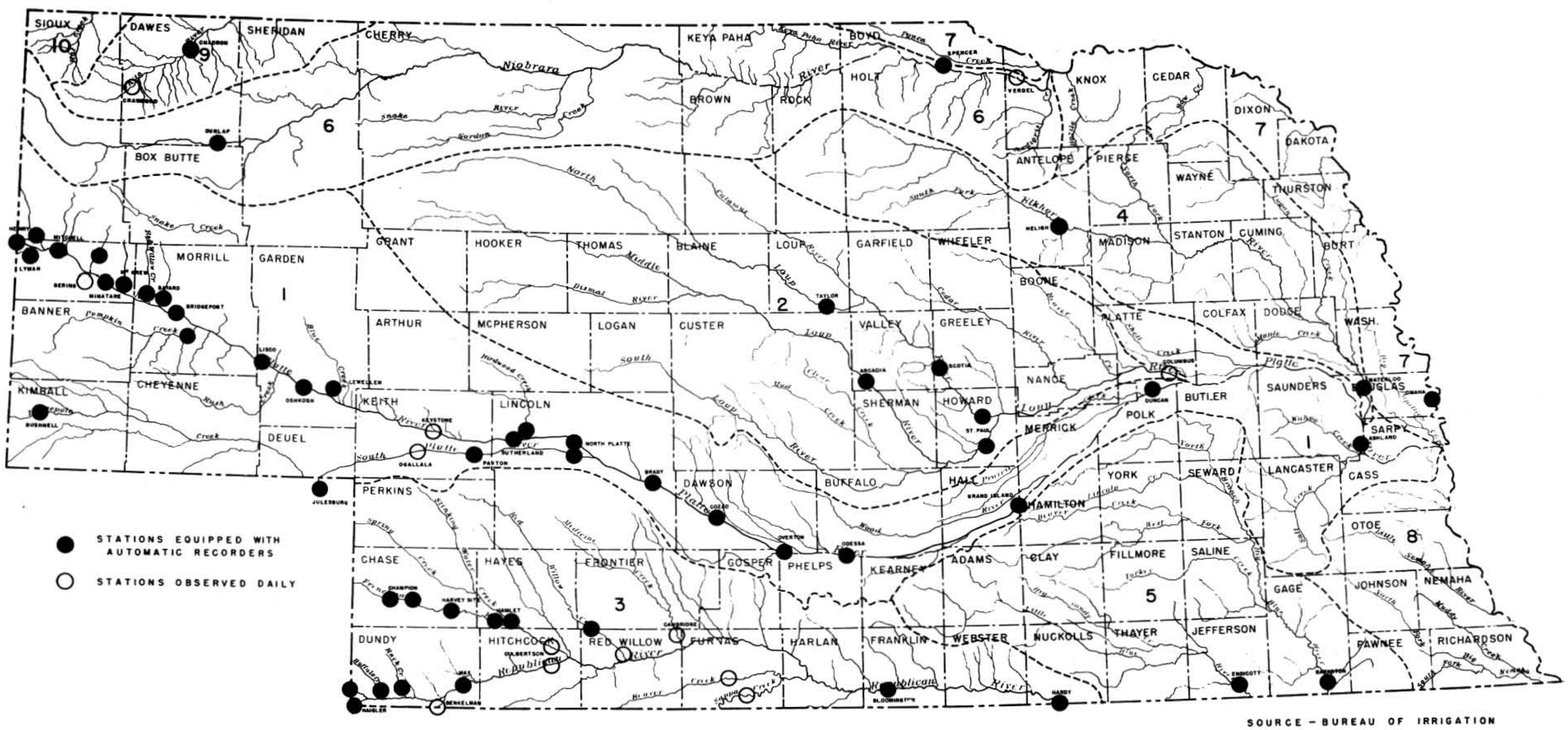
The more active fluctuations in the shallower wells is due to recharge from precipitation which is more readily reflected where the water table is shallow, resulting in more pronounced fluctuations of the water level. The roots of plants draw water directly from the zone of capillarity (capillary fringe) just above the saturated zone causing appreciable declines of the water level during the growing season. In the winter and spring periods of 1931, 1933, and 1934 the average rise was less than 1 inch in the deeper but more than 1 foot in the shallower wells. Consequently, the net decline in the last 4 years was nearly the same in each group.

GROUND WATER LEVEL OBSERVATION WELLS
NEBRASKA 1938



NEBRASKA STATE PLANNING BOARD W.P.A. O.P. NO. 465-81-3-155

STREAM GAGING STATIONS
NEBRASKA 1941



During the last half of 1932 the water levels in all wells in the Platte Valley showed rather high rises due to an above normal precipitation at that time. From October 1931 to April 1932 the average precipitation recorded at Grand Island and Kearney was slightly above normal, and consequently considerable water percolated into the ground and was added to the ground-water reservoir during this recharge period. As a result, the water level did not reach as low a level in 1932 as it did in 1931. Since July 1932, the precipitation has been about 22 inches below normal - almost the normal precipitation for 1 year. The water level in the valley has suffered annual declines.

In 1935, when precipitation was above normal during the fourth, fifth, and sixth months, ground water rose considerably. As rainfall decreased the water table dropped accordingly. During the summer of 1936, which was one of the warmest on record, the ground water declined more noticeably in the shallow wells, less in the terrace wells, and least of all in the deep wells.

Thus, the study of fluctuations of ground water requires a consideration of such factors as annual and monthly precipitation, atmospheric temperature, the depth to ground water, wind movement, barometric pressure, and the season of the year.

PRESENT STATUS OF GROUND-WATER LEVELS

At the time of the last readings in the fall of 1938, ground-water levels showed normal annual and seasonal fluctuations. Records for the bottom-land wells reveal a maximum fluctuation of 3.23 feet for the 5-year period. The high recording occurred in June 1935, and the low in August 1936. The fluctuation high in bottom-land wells for the entire State was 0.1 of a foot below the normal high, and the 1938 low was 0.3 of a foot above the normal low. At the last reading in the fall of 1938, the shallow wells were 1.35 feet higher than the low recording of 1936.

For the terrace-land wells (15 to 30 feet) the maximum fluctuation range for the 5-year period, 1934 to 1938 inclusive, was 1.87 feet. The high record occurred in June 1935, and the low in August 1937. The fluctuation high for 1938 in terrace-land wells was 0.18 feet lower than the normal high, and 0.05 feet lower than the normal low.

The maximum fluctuation range of deep wells (30 to 275) during the 5-year period, 1934 to 1938, was 0.55 feet. The high was reached June 1935, and the low August 1937. The fluctuation high for 1938 in these wells was 0.12 feet lower than the normal high and 0.16 feet lower than the normal low.

IRRIGATION AND RECLAMATION

Every section of Nebraska has one or more specific water problems. These may be related to irrigation, domestic water supply, flood, drainage, navigation, pollution, wildlife, or power. Some areas have a complexity of such problems.

The attempt of individual communities to solve water problems involving county, state, and interstate interests on a local, and sometimes temporary, basis often results in aggravating rather than solving the problem. Broader planning programs have been introduced from time to time by state and federal agencies. The most recent of these is organized and directed through the correlated efforts of the federal, state, and local divisions of the water resources committees.

However, interest in irrigation and reclamation throughout the history of Nebraska, increased or decreased in direct relation to the failure or success, of agricultural production. Nebraskans have always experienced the effects of alternating humid and arid climatic cycles. Economic losses resulting from unstable climatic conditions have stimulated interest in planning for conservation and efficient use of the water resources of the State. Long-time records prove that floods and droughts are normal recurrences within climatic cycles.

Nebraska lies in two fluctuating climatic zones; subhumid east of the 100th meridian, and semiarid west of it, with a twilight zone between the two.

The settlement of Nebraska was made by people from the humid eastern states. They plowed, sowed, and cultivated too often without harvest. Agricultural crops and methods applicable in humid states were unsuited to the variable climatic conditions of this State. Consequently, the slow, difficult process of agricultural adjustment commensurate with the demands of the hazardous physical environment still remains unfinished. The economic security of Nebraska continuously expands or painfully contracts according to the alternating periods of adequate rainfall or withering drought. The future permanent economic and social stability of the State will be threatened proportionately to the deficiency of precipitation occurring within the hydrologic cycle.

Nevertheless, suggested irrigation programs to insure dependable crop production has met with considerable disapproval and condemnation throughout the history of the State. During the early years, irrigation was considered with much caution. The severe droughts from 1894 to the present have greatly influenced public opinion in favor of irrigation and the construction of new projects. The struggles and triumphs experienced by Nebraskans by which they became "water minded" will be developed in subsequent paragraphs.

HISTORY OF IRRIGATION

The droughts occurring in the 1860's and 1890's, and the 1930's focused attention of state and federal irrigation organizations on Nebraska. Each drought cycle brought greater disaster because of steadily increasing settlement and development stimulated during wet cycles. The struggle and triumph of irrigation in Nebraska are based upon human suffering, the untiring efforts of far-sighted individuals, and the cooperative planning between states and federal organizations.

The challenge of droughts has been met in various ways and degrees of permanency during the irrigation history of our State. As early as 1860, 4 miles of ditch canals were in operation. Since that time, interest in irrigation has been intensified with each recurring drought. Development of irrigation has been in progress to the present time.

IRRIGATION LEGISLATION

State legislation governing the development of irrigation was enacted slowly. It is apparent that the statesmen of territorial days did not foresee the necessity of providing for irrigation enterprises in the Constitution adopted in 1866.

In 1867 the territory adopted the common law of England except when it conflicted with the constitution of the United States or those of the separate states. Due to climatic differences between England and Nebraska, the common law was not entirely applicable to our State.

Provisions of law relating to internal improvements were extended to irrigation canals by a law of 1877. "This law empowered canal companies to issue bonds and condemn right-of-way canals". This included the common-law rule as to riparian rights, and the rule held until abrogated by statute.

The State Legislature passed the Saint Raynor Law in 1889 which provided that rights to use water for beneficial or useful purpose could be acquired by appropriation. The court held that this law abrogated the common law of riparian rights. This law of 1889 required the posting of notices on the bank of the stream at the point of intended diversion, and the location of diversion, but no provision was made for policing diversions in order of priority.

The first State irrigation convention was held February 11, 1891 in Representative Hall, Lincoln, Nebraska. Delegates from 36 counties attended. The important work of the convention was the appointing of a committee to prepare and present a bill on irrigation. The bill was defeated in the Legislature March 21st, 1891, with a vote of 35 to 32. Failure to obtain a constitutional majority ended all hope of legislation during the session of 1891. The bill prepared by this committee was finally passed as the "Parnell Bill", and appears in the statute books today with little modification.

A committee appointed at the Lincoln meeting arranged for an interstate convention composed of delegates from Nebraska, Kansas, Wyoming, Colorado, North Dakota, South Dakota, Texas, and the territories of Oklahoma and New Mexico. This convention was held in Kansas in 1892.

An irrigation bill introduced in the 1893 Legislature was bitterly opposed and defeated. The Saint Raynor Law was amended to permit the filing of water-rights on streams 20-feet wide or more.

Serious State-wide droughts occurring in 1894, and 1895 resulted in crop failure and heavy livestock losses. These droughts profoundly influenced irrigation legislation. On April 14, 1895 an irrigation code became a law in Nebraska. It was quite complete in nearly every detail, and was taken from the Wyoming Irrigation Code. This law dedicated the water of every natural stream to public use, and the right to divert unappropriated water for beneficial use was never to be denied. The law also provided that the priority of the use of water was to be administered and recognized as follows: (1) for domestic use, (2) for irrigation, (3) for power and manufacturing purposes. This law provided a State Board of Irrigation, with a membership of 3, namely: the Governor, Attorney General, and Commissioner of Public Lands and Buildings. A secretary who shall be a hydraulic engineer was employed as were also a number of assistant secretaries and water commissioners. Up to 1912 no irrigation company measured water to the users except the Farmers Canal, the extension of which was a United States Reclamation project. Its measurements were taken at the farmers' headgates.

In 1911 the State Board of Irrigation was replaced by the State Board of Irrigation, Highways, and Drainage. The law also provided for the cancellation of appropriations after 3 years of non-use.

When the Civil Administrative Code became effective in 1919, the Department of Public Works was created which took over the power and duties assigned to the old State Board of Irrigation, Highways, and Drainage.

In 1933 the Legislature changed the name Department of Public Works to its present name, the Department of Roads and Irrigation. The State engineer was given the additional duties of chairman of the State Planning Board, Director of the Motor Vehicle Division, and Director of Highway Safety and Patrol.

DEVELOPMENT OF IRRIGATION

The irrigation industry has made slow but extensive growth since the early nineties, but has not as yet developed the maximum use of our water resources. The objective of the State is to develop our irrigation possibilities as fully as possible but with every safeguard against failure. Since the land area suitable for irrigation far exceeds the amount of water available for reclamation, it is necessary for the State to control the allocation and distribution of water in order to secure maximum benefit from it.

WATER STORAGE

Marked improvements have been made in the methods of storage and use of water for irrigation in Nebraska. Pioneer irrigators experienced the hazard of a low, undependable water supply diverted from streams during the irrigation season. To insure a dependable irrigation flow when most needed, attempts were made to preserve the nonseasonal flood flows. Regulating reservoirs were constructed such as the Pathfinder and Guernsey in Wyoming, and Lake Alice, Lake Minatare, and others in Nebraska, making a total reservoir storage of about 1,300,000 acre-feet in the North Platte Valley in Wyoming and Nebraska prior to 1936. The capacity of irrigation reservoirs now under construction or completed are as follows:

Reservoir	Capacity (acre-feet)
Kingsley (under construction)	2,000,000
Sutherland (completed)	178,000
Total	2,178,000

Nonseasonal water impounded in the Pathfinder reservoir is released during the irrigation season and flows in the channel of the North Platte River to a point near Whalen, Wyoming where much of the storage flow is diverted for United States Reclamation projects in that state and also in Nebraska. In Nebraska there are 7 irrigation districts having claim to Pathfinder storage by virtue of their so-called Warren Act contracts. The application of this water builds up the ground-water storage in the terrace and slope lands of the valley from which there is an all-year return flow to the river. By reservoir and ground-water storage the flow of the upper course of the river is stabilized.

The Kingsley and Sutherland reservoirs will supply water for the irrigation districts between North Platte and Grand Island and will have a tendency to stabilize the flow of the river for power developments.

SAND-HILL STORAGE

The Sand-Hill area is an important water storage region. It lies between the Platte and Niobrara rivers in north-central Nebraska. The Sand-Hill country occupies approximately 22,000 square miles, or 14,000,000 acres. The area is generally covered with a loosely compacted, fine-grained, wind-blown sand. This formation ranges from 25 to 100 feet in thickness. Beneath the wind-blown sands, beds of loosely compacted sands and clays outcrop in most of the valleys.

The Sand-Hill area, like a great sponge, has absorbed and stored vast quantities of rainfall over a long period of time. In some parts of the area the ground is water-saturated to a depth of 300 feet or more. Thus, 300 feet of water-filled earth contains about 100 feet of water.

Sand-Hill ground water is the important regulatory factor in the projects on the Loup rivers, because it gives a uniform flow to the streams where they leave the sand hills. However, in their lower courses, the surface run-off to the rivers is less uniform and might be regulated by reservoir storage.

NEW IRRIGATION PROJECTS

Plate LXXV shows the existing and contemplated irrigation in Nebraska in 1940.

A Nebraska authority states that it would be possible to trace a fairly accurate weather chart by reviewing the applications made for water appropriations as recorded in the State engineer's office. During dry years there are many applications. During wet years the number is reduced to a minimum.

Recent droughts, especially those occurring in 1934 and 1935, again emphasized the need for more extensive irrigation. These droughts molded public opinion favorably for additional irrigation development. In 1933 the Nebraska Legislature passed Senate File number 310 which authorized the organization of public power and irrigation districts. Under this law the following self-liquidating, federal projects were organized, approved, and are now under varying stages of construction or in operation: (1) Central Nebraska Public Power and Irrigation District which will irrigate 200,000 acres; (2) the Platte Valley Public Power and Irrigation District developed primarily for power, will deliver supplemental water to 102,000 acres under previously existing irrigation projects below North Platte; (3) North Loup Public Power and Irrigation District to irrigate about 38,000 acres; (4) Middle Loup Public Power and Irrigation District to furnish water for 45,000 acres. When these federally financed projects are completed, Nebraska will have an additional area of more than 300,000 acres which represents an increase of some 43 per cent of the land now under irrigation in the State.

FEDERAL APPROPRIATIONS

The total allotments covering both loans and grants made by the Federal Government for the 4 public power and irrigation districts in the State are $50,267,000. A substantial part of the total allotment is to be used for the irrigation phases of these developments. In addition to these irrigation projects $12,814,000 has been allotted to the Loup River Public Power District, and $10,791,500 to 28 Rural Electrification Districts.

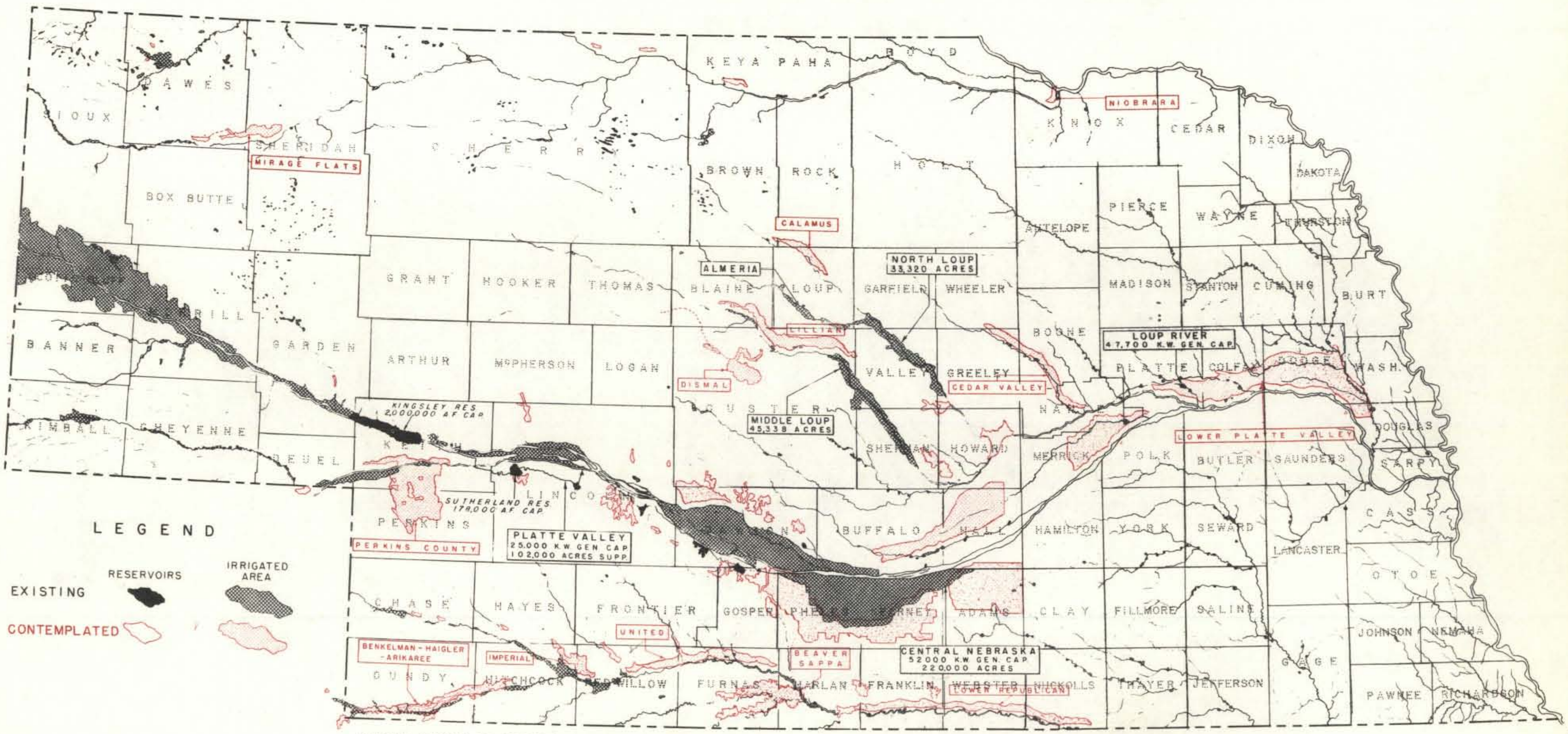
IRRIGATED ACREAGE

The acreage of irrigated land for each county in Nebraska as indicated by the county assessor's records is shown in the following summary:

LAND IRRIGATED
Acres

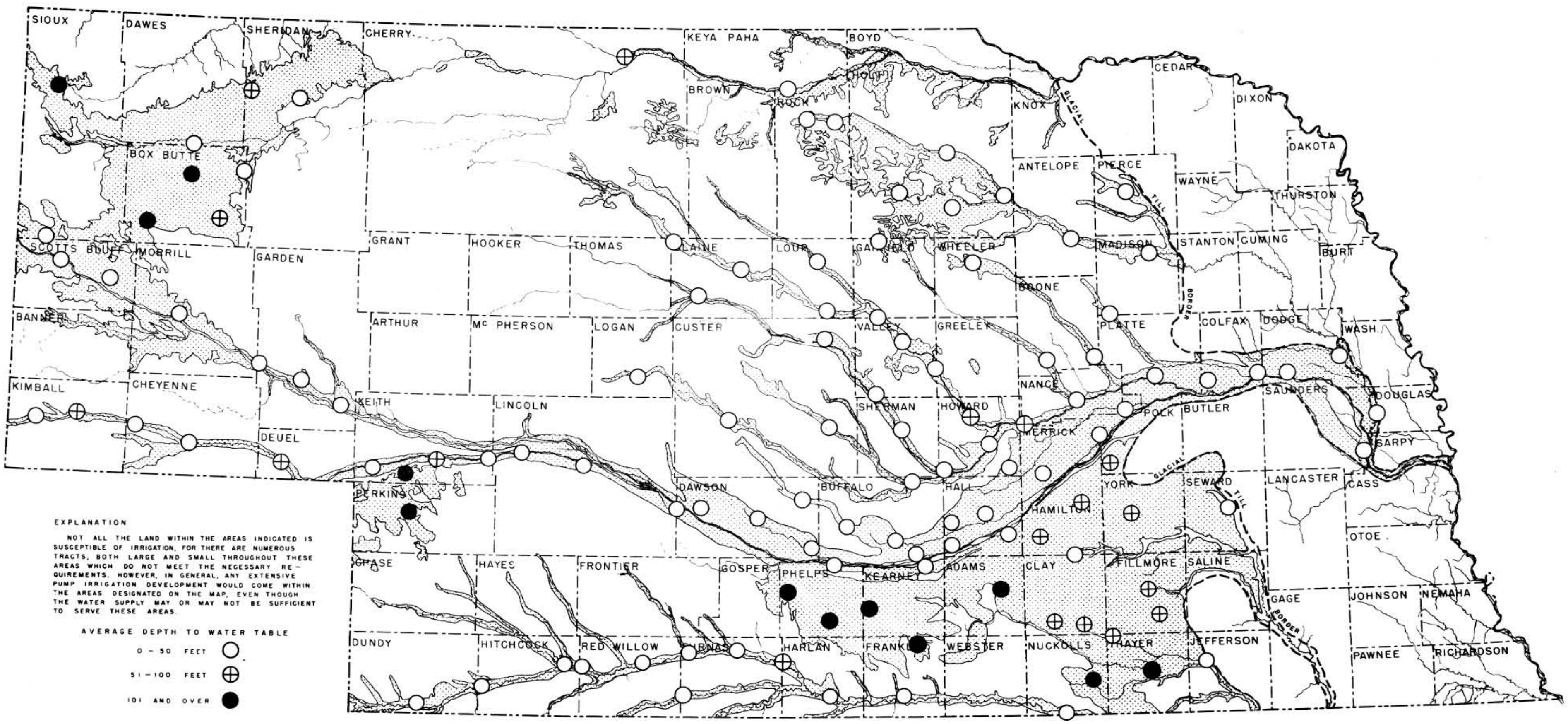
County	Pump 1937	Total Pump and Ditch 1940
Adams	274	450
Antelope	22	389
Arthur	0	10
Banner	78	1,365
Blaine	140	220
Boone	515	1,273
Box Butte	0	3,960
Boyd	11	65
Brown	310	572
Buffalo	22,350	54,081
Burt	0	60
Butler	143	759
Cass	120	190
Cedar	0	20
Chase	1	2,257
Cherry	1	2,662
Cheyenne	321	4,248
Clay	44	327
Colfax	110	2,462
Cuming	380	783
Custer	354	4,711
Dakota	0	130
Dawes	32	11,118
Dawson	14,201	85,400
Deuel	2,087	6,860
Dixon	19	64
Dodge	624	1,352
Douglas	1,205	1,235
Dundy	75	4,020
Fillmore	22	365
Franklin	387	1,250
Frontier	0	353
Furnas	379	1,018
Gage	139	200
Garden	408	24,080
Garfield	189	2,790
Gosper	285	1,283
Greeley	131	1,650
Hall	9,702	15,278
Hamilton	1,430	1,974
Harlan	569	1,577
Hayes	360	1,349
Hitchcock	319	10,980
Holt	112	160
Howard	492	550
Jefferson	124	220
Johnson	1	41
Kearney	1,365	9,892
Keith	2,160	25,060
Keya Paha	0	65
Kimball	403	7,674
Knox	77	220
Lancaster	85	110

EXISTING AND CONTEMPLATED IRRIGATION
NEBRASKA
1940



SOURCE—BUREAU OF IRRIGATION, WATER POWER AND DRAINAGE

MAP SHOWING
GENERALIZED AREAS OF FLAT TOPOGRAPHY WITH ARABLE SOILS IN NEBRASKA



SOURCE OF DATA: CONSERVATION AND SURVEY DIVISION
UNIVERSITY OF NEBRASKA

NEBRASKA STATE PLANNING BOARD

Lincoln	1,901	47,260
Logan	22	22
Loup	211	5,115
Madison	403	1,366
Merrick	1,448	4,717
Morrill	229	84,500
Nance	67	473
Nuckolls	147	400
Otoe	0	5
Perkins	148	480
Phelps	1,342	8,200
Pierce	651	656
Platte	223	1,335
Polk	30	428
Red Willow	1,462	5,150
Richardson	0	35
Rock	95	280
Saline	158	309
Sarpy	105	200
Saunders	20	410
Scotts Bluff	647	201,000
Seward	115	536
Sheridan	121	1,000
Sherman	40	3,830
Sioux	78	28,383
Stanton	190	1,417
Thayer	228	340
Thomas	40	44
Thurston	1	34
Valley	225	12,281
Washington	0	120
Wayne	0	50
Webster	75	710
Wheeler	0	46
York	81	656
Total	73,059	693,970

The foregoing table shows that irrigation is practiced in 88 of the 93 counties in Nebraska. Scotts Bluff County has the largest irrigated acreage with 29 per cent of the total irrigated land in the State. The total area of the State now capable of being served by present irrigation facilities is 40 per cent of the total area susceptible to reclamation, and 4 per cent of the total cultivated land in the State. However, less than 2 per cent of Nebraska is now being irrigated. These comparisons show that there is a relatively small portion of the State under irrigation, and that the existing possibilities for expansion are promising.

Of the 17 states in which irrigation is practiced, California has the greatest irrigated area with over 4,000,000 acres. Colorado ranks second with 3,300,000 acres. Nebraska holds eighth place with less than a million acres. It is not generally realized that the irrigation development in the United States is rather small. For example, the total irrigated area in the 17 states is approximately 18,500,000 acres, which is about 5 per cent of the 400,000,000 acres cultivated in the United States.

BENEFITS OF IRRIGATION

The benefits derived from irrigation are not confined to the irrigated areas alone, but are extended to every part of the State. To those living outside the irrigated territory come benefits in the way of greater wealth for our State. During drought years, feed and general farm commodities are shipped from the irrigated areas to needy portions of the State.

A comparison of differences in crop production on irrigated and unirrigated land further emphasizes the advantages to be enjoyed by the induction of successful irrigation practices. The amount of increase in crop yields is dependent upon a number of factors among which are the physical features of the soil and the amount and distribution of moisture. Therefore, no reliable figure can be given with reference to the increase that would be applicable under all conditions and in all localities. The most valuable data available are the records maintained at the State experiment stations where research has been conducted to determine the increase in crop yields for irrigated land over that on dry land under similar conditions.

Records show that the application of supplemental water when needed results in the difference between 100 and 300 bushels of potatoes per acre; between 2 and 4.5 tons of alfalfa per acre, and between no sugar beets and 15 tons of sugar beets per acre. The above statistics indicate the advantages that can be expected when supplemental water is available and is applied at the proper time. The records used in this study were obtained over a period covering 10 to 12 years, and therefore, represent an average of conditions for the period of the experiment.

The benefits of irrigation resulting in the increased production capacity of the land are reflected in other ways. With reference to population statistics, Scotts Bluff County is a good example, since it has the largest irrigated acreage of any county in the State. The assurance of crop yields every year is very necessary, and one of the inducements for the location of manufacturing plants used in processing agricultural products.

Throughout 50 years of irrigation experience Nebraskans have become increasingly irrigation-conscious. This is attested by the magnitude of present irrigation undertakings which will result in facilities for the conservation and utilization of our 2 greatest natural resources, water and soil. The Keystone Reservoir with 2,000,000 acre-feet of storage, the Sutherland Reservoir with a capacity of 178,000 acre-feet, and the projects on the North, Middle, and Loup rivers together with existing projects will be capable of transforming hazardous agricultural areas into productive fertile valleys adequately served with electricity, and the associated conveniences of the urban centers. Irrigation plans will be continued until all available irrigable land within the limits of feasibility is developed to the maximum expansion.

Thus, it is possible for a State of great agricultural risks to become a land of reasonable security in the future. To achieve agricultural stability in an unstable climatic environment is the challenging task to state and local community planning. If the change is to occur, the State and minor civil divisions of the region no less than the Federal Government must energetically attack the problem. Federal progress along some lines will be conditioned in large measure by the extent to which complementary action is effected by the State and its subdivisions. The success or failure of an active long-term program of readjustment and development for Nebraska will depend very largely upon local attitudes, policies, and action.

The recent droughts are only temporary setbacks and if proper adjustments and full utilization of the water resources are made, a much safer and more prosperous future lies ahead for Nebraska.

PUMP IRRIGATION

Soon after irrigation from surface supplies was begun in the valley of the Platte, farmers began to use windmills as a means of raising water from wells. The records show that many windmills were in use for irrigation purposes prior to the year 1900. It is probable that at least 5 irrigation wells were in operation in the Platte River Valley prior to the year 1912. Since that date, the number of wells has increased steadily.

The progress of irrigation in Nebraska has been erratic largely because of the variation in precipitation. The occurrence of a number of wet years occasioned abandonment of ditches and wells, whereas, a few dry years would find all types of irrigation systems being revived again. The total annual precipitation is not always a yardstick by which to estimate the amount of supplemental water necessary. The corn crop of Nebraska is dependent upon ample rainfall in July and August, the season when drought often occurs.

A preliminary study of pump-irrigation costs was made in Nebraska by a representative of the United States Department of Agriculture in 1913. This report shows that at that time there was a great variation in the methods of well construction and pump design.

Because of a decided lack of good well-drilling equipment, there was a tendency to use wells of large diameter dug by hand. For the most part, the depth was limited to 25 or 30 feet due to the type of equipment used and the existence of a common belief that large-diameter shallow wells produced better yields than small-diameter deep ones. This misunderstanding was costly to many early pump irrigators.

As well machinery developed, and the process of digging irrigation wells was better understood, holes of small diameter and greater depth came into common use.

Early casings were often made of wood; however, in some cases, a rough wall of stone was laid up. Later the perforated galvanized casing came into very common use and there was developed precast concrete casings of various diameters and designs. Metal and concrete casings were commonly sunk by removing the material from the interior with a sand bucket and applying pressure to force the tube downward. No attempt was made to place screened gravel around the outside of the casing. Later development consisted of pouring screened gravel around the casing and allowing it to settle with the casing. One of the later developments consisted in putting down a large-size blank casing to the required depth. The perforated casing was placed inside and centered. Screened gravel was poured between the 2 and the blank casing removed. This produced the so-called "gravel packed" well which has proven so successful in many areas where it has been impossible to get good results with old-time methods.

Many of the early wells consisted of large-diameter pits dug to a point near the water surface. Below this a small-diameter casing penetrated the water-bearing strata. In this pit was placed a horizontal centrifugal pump which, because of its simplicity and low first cost, has always been popular in irrigation practice. This particular type of pump, however, is ordinarily installed near the water surface in order that a short suction line can be used to facilitate priming and increase the efficiency. Rotary pumps were used at an early date and were also placed in pits in order that they might operate near the water table. The water lift, which consisted of a series of buckets mounted on an endless chain, made an early appearance in the valley. Later came the vertical centrifugal pump which at that time required a casing 36 inches or more in diameter. A later design could be lowered into a 24-inch hole. The deep-well turbine developed about 1901, also made an early appearance in the Platte Valley and now promises to be one of the most popular of all irrigation pumps.

As is generally the case in all newly irrigated regions, water-handling methods were crude and little attempt was made at land leveling, construction of borders, or use of corrugations. For the most part, the entire discharge of the pump was conducted in one ditch to some row crop where the flow was directed to a few rows and largely left to take care of itself.

PRESENT DEVELOPMENT

There is indeed room for a great deal of standardization both in the methods of well construction and general design of the irrigation plant. At the present time, there are in operation in the State many heavy duty well-drilling rigs manned by capable operators who understand well-drilling and development practices. There has been a tendency of late years to standardize on the use of the 18 or 24-inch diameter wood, metal, or concrete casings put down by the gravel-pack method.

Within the last year or two, well drillers from California have introduced the so-called "stove pipe" casing into western Nebraska for deep wells. This casing, made of red steel, is forced downward with large hydraulic jacks as sand and gravel is removed from the interior with a sand bucket. As the casing is lowered, a careful log is kept of the position and extent of all water-bearing material. When drilling is completed, a perforation device is lowered inside the casing and perforations are cut opposite strata of favorable water-bearing gravel.

Well development by surging and proper pumping methods is better understood now than in former years. Under old methods of development, the pump was started and often discharged great quantities of sand which damaged impeller, bearings, and volute cases to say nothing of the cave-ins which generally occurred lowering the ground around the casing for several feet. At present, if it is necessary to remove fine materials from the water-bearing gravel, it is done by lowering the surge block into the casing and oscillating it up and down beneath the water surface with the well rig. Water is alternately drawn in and driven out through the perforations. This process brings in some sand which can be removed with a bucket and when the pump is installed, it is started slowly and brought up to speed through several hours time.

Much has been learned about the character and extent of water-bearing gravels in all parts of the State. Tests have established the fact that a considerable depth of water-bearing material is important if wells of high yield are to be obtained. The yield of a well is measured by what is known as "specific capacity". The water surface within a well lowers preceptibly as the pumping proceeds. This lowering of the water surface is known as "draw-down". The specific capacity is the number of gallons yielded per minute per foot of draw-down of the water surface. In other words, it is the discharge in gallons per minute per foot of draw-down.

Tests made by the Department of Agricultural Engineering, University of Nebraska in 1931, brought to light many important facts regarding the yield of wells. That the depth of gravel strata is important is exemplified in the following data:

	Well Number 8	Well Number 13
Diameter of casing	24 inches	24 inches inside
Depth of well	54 feet	90 feet
Depth of water	36.33 feet	66.58 feet
Discharge per foot of draw-down	32 gal. per minute	66.5 gal. per minute

The test of the above wells showed that well Number 8 had a draw-down such that when pumping 690 gallons per minute, the total lift was 41 feet, while well Number 13 was capable of discharging about 1,200 with a total lift of 42 feet. The great superiority of well Number 13 is immediately apparent.

In the old days, many wells were located by guess, although in some cases the so-called "water witch" was brought into play definitely to decide the matter. Now the drilling of test wells of small diameter to sample the character and extent of the water-bearing strata has become a matter of regular routine with all reputable well men.

MATCHING PUMP TO WELL

When the driller has completed a well, and turned it over to the landowner, the next job is that of purchasing a pump. Tests made in the valley of the Platte in 1931 showed that wells of identical diameter of casing and depth of water-bearing material may have widely varying specific capacities (yield in gallons per minute per foot of draw-down). It is not possible for a manufacturer to sell the landowner a pump exactly fitted to any particular well until a pump test has been run to determine just what type of bowl assembly and impeller is needed to develop the best possible efficiency. Pumps are sold without this information every day but the farmer may contribute hundreds of gallons of engine fuel or pay for many kilowatts of electricity which go for no purpose except to pay for a job of mismatching pump to well. Good well drillers are rapidly preparing themselves to render a well-testing service. Some pump manufacturers practically insist on a well test before a pump will be sold for any job and farmers are rapidly learning that high efficiency pays good dividends when an outfit is operated through a long pumping season, or when the total lift is considerable.

Careful matching is particularly important where direct-connected electrical outfits are used. Most of the motors which the farmer will purchase are of the constant-speed type which means that the pump will operate at a given discharge and head. It may be that the well is capable of producing only 800 gallons per minute, in which case there would be serious consequences if the pump were so operated that the discharge was 1,000 gallons per minute. Some wells have characteristics which make it more economical to pump them at less than their maximum capacity, hence the importance of correctly fitting the pump to the job.

Most pump manufacturers have conducted exhaustive tests on their equipment, and are prepared to furnish the purchaser an outfit which will develop high efficiency if information regarding the yield of the well can be furnished. The day of blind well-drilling and pump fitting is rapidly drawing to a close and so much the better for the future of pump irrigation in Nebraska.

TYPES OF PUMPS USED

For pumping from sand pits, streams, and shallow wells the horizontal centrifugal pump has many advantages. It is comparatively cheap in first cost, light in weight, has few moving parts and is now so well-designed that high efficiencies are developed. It may be had in sizes which will deliver from 50 to 5,000 gallons per minute against heads of from 0 to 200 or more feet. In ordinary installations, the pump proper is set upon the lake or stream bank with the suction line in the water and the discharge line extending to the point of delivery. The one common mistake made in installations of this type is the use of too small a discharge pipe giving rise to excessive friction head which greatly reduces the discharge or requires excessive power.

The vertical centrifugal pump is similar to the horizontal except that the volute case and impeller are placed beneath the water surface and are carried on a heavy metal frame, or on the discharge pipe. The shaft leads from the impeller to the surface where it may be driven by a belt or directly connected to a power unit. This type of equipment is particularly well adapted to wells in which there is considerable fluctuation of the water table, but where the total head does not exceed 50 feet. A casing at least 24 inches in diameter is necessary to accommodate the large sized volute.

A third type of pump which is becoming increasingly popular, because of its rugged construction, long life, wide adaptability, and relatively high efficiency, is the turbine. It works on the same principle as the types just described except that it is smaller in diameter and may be designed to operate with any lift from 50 to 800 feet. The shaft comes to the ground surface to permit a drive. It runs down inside of the discharge pipe to the impellers mounted in the bowls and placed near the bottom of the well. Each impeller with its volute case of bowl assembly is known as a stage end and in ordinary irrigation practice from 2 to 6 stages are necessary to raise water efficiently, depending on the lift.

Pumps of this type are designed to meet almost any condition of lift and quantity of water desired. The propeller and mixed-flow pumps are somewhat similar in design to the turbine and have wide usage in irrigation practice for certain conditions of lift and discharge.

In the early days the common type of drive was the flat belt which resulted in efficiency losses of from 10 to 15 per cent. When high lifts and more continuous operation are contemplated, consideration may well be given to the multiple "V" belt drive which is proving popular due to its long life and high efficiency. When an internal combustion motor is used for power the modern bevel-gear drive may be substituted for the belt and a direct-connected arrangement employed with little loss of power.

POWER OF PUMPING

The farm tractor is yet by far the most popular type of power used for pumping in Nebraska. The farmer has the tractor, so why not use it? In many cases, this is good logic.

When the power required is too great or when the outfit must be operated continuously through the summer and fall months, then an engine power unit or an electric motor may prove more profitable. The light, high-speed Diesels are gaining in popularity because of their cheapness of operation. The first cost is high, however, and to be profitable a long-running season is necessary, during which a large acreage of ground can be covered. The operating cost may be only one-fourth that of an ordinary gasoline engine.

With the ever-increasing expansion of electric power lines, there is sure to be added interest in electric motors as a means of driving pumps. The same drives as mentioned for engines may be used for them but the direct-connected arrangement is more popular. When directly connected, the pump must run at uniform speed and, therefore, is limited by its design to some specific head and delivery. Greatly added running costs may result if a careful job of matching pump, motor, and well is not done.

In several communities, specially designed power lines are being carried into rural districts with the expectation that farmers will see fit to use the new form energy for pumping. In many instances, the pumps now owned by the farmers are of the old, slow-speed type and have been operated by tractors. With engine power it was possible to drive the outfit at any desired speed by changing the throttle. If the delivery was such that the well was pumped out the speed could always be reduced. When the change to electricity is made, care must be used to get well engineered drives if the venture is to be attended with much success.

It would seem only logical that a pump test should be run on the well to determine its yield and the most economical pumping rate. If electrical power is available, a motor may be used to determine horsepower requirements and efficiencies of the pump at various speeds. When the most efficient operating conditions are discovered then a drive may be designed which will give best results. A motor which is too big for the job at hand may prove expensive and one which is too small will overload and heat dangerously in the summer.

PUMPING COSTS

Under given conditions of lift and discharge, it is possible to estimate the cost of pumping quite closely. There are, however, many conditions which enter into and vary the situation when dealing with plants which have already been installed. Fixed costs are arrived at by figuring interest on the investment plus depreciation on the equipment to which is added taxes. Figures on operating costs are made up of such items as fuel, lubricating oils, repairs, cost of electricity, attendance, et cetera. Thus, on a plant recently examined, the costs were arrived at as follows:

Well.	$ 500.00
Pump	450.00
Power Unit.	700.00
Total Cost	$1,650.00
Interest on $1,650.00 at 5%. . .	$ 82.50
Depreciation on well at 3% . . .	15.00
Depreciation on pump at 8% . . .	36.00
Depreciation on engine at 12%. .	84.00
Total Fixed Cost Per Year	$217.50

If 100 acres are irrigated, it is apparent that the fixed cost per acre will be $2.17 regardless of how much the plant is operated. The necessity of watering a fairly large acreage with expensive pumping plants is at once recognized.

Operating costs may vary a great deal, depending upon many factors. Low plant efficiencies mean high operating costs, and these low efficiencies may be due to a great many things which only careful examination or actual test will discover.

Assuming a belt and pump efficiency of 60 per cent and an engine burning tractor fuel at 10 cents per gallon, the fuel cost only for lifting enough water to cover an acre one foot deep through various heads would be about as follows:

Foot of lift	Cost per acre-foot
10	$ .26
20	.52
30	.78
40	1.04
50	1.30
60	1.56
80	2.08
100	2.60

Low engine and pump efficiencies may produce fuel costs several times as great as those above indicated. Successful pump irrigation under any condition requires a well-engineered plant. Under actual conditions, surveys seem to indicate that a figure of 10 cents per acre-foot per foot of lift for a total cost of pumping is perhaps a good average when all things are taken into consideration.

Figures on highly efficient Diesel or electrically operated plants show total costs as low as 3 cents to 3 1/2 cents per acre-foot per foot of lift.

DISTRIBUTION OF PUMP-IRRIGATION WELLS

Practically all irrigation wells in Nebraska are west of a line passing north and south along the eastern edge of Hamilton County. This line marks the western border of the till sheet or the point at which the glaciers which invaded eastern Nebraska extended. West of this line, beds of Pleistocene gravels and sands underlie the mantle materials. These Pleistocene deposits are, for the most part water-bearing, and, where they can be encountered at relatively shallow depths, provide excellent supplies for irrigation pumping. Up to the present, pump-irrigation developments have taken place largely along streams because of the lower lift and less expense encountered in applying water. If a series of dry years should follow, extensive developments can be looked for in the high plains south of the Platte River where lifts may exceed 100 feet.

The actual number of irrigation wells now in existence and the acreage irrigated is not definitely known. Some indication can be obtained, however, from the summary given under Irrigated Acreage in the Irrigation and Reclamation section; this summary shows the counties in which pumps are found and the corresponding irrigated acreage.

The Assessor's Report for 1937 indicates that pump irrigation was practiced in 77 counties, and that the area so irrigated was 73,059 acres of which 86.3 per cent or 63,059 acres were located in 17 counties, each of which has more than 500 acres under pump irrigation.

The number of counties having over 1,000 acres each under pump irrigation was 12 and these 12 counties contained 60,653 acres or 83 per cent of the State total pump-irrigated acreage.

Only 6 counties in the State had over 1,500 acres each under pump irrigation but these 6 counties account for 52,401 or 71.7 per cent of the total pump-irrigated acreage in the State.

Three counties; Buffalo, Dawson, and Hall, are shown to contain 46,253 acres under pump irrigation which is 63.3 per cent of the State total.

No reliable data are available as to the potential capacity of irrigation pumps now existing in the State but it is thought to average about 750 gallons per minute, and that the average period of operation varies from 200 to 400 hours per year. The average area irrigated by each pump probably varies from 50 to 60 acres, and the average amount of water pumped is probably about 1 acre-foot or less per acre irrigated.

PROBABLE BENEFITS FROM IRRIGATION

With the exception of material gathered at the North Platte and Mitchell Experiment stations, little actual experimental data exist as to the increased yields to be expected from application of irrigation water. These data obtained under certain soil and climatic conditions could not be expected to apply universally over the State of Nebraska but will serve to give some indication as to the increases to be expected.

In the irrigation of corn at the North Platte Experiment Station in the years from 1925 to 1934 inclusive, the application of 13.74 inches of water produced an average yield of 55.82 bushels as contrasted to 18.54 dry land or an increase of 37.27 bushels per acre. This represents an increased yield of 2.58 bushels per inch of water applied.

In the years from 1927 to 1935 inclusive, silage corn was irrigated with an average application of 13.18 inches of water. This produced an average yield of 10.56 tons of fodder per acre or 1,171 pounds of silage per inch of irrigation water added. As no records of dry land silage yields are available, no comparison between irrigated and dry land yields is possible. The highest single yield of corn silage obtained under irrigation up to the present is 20.3 tons per acre.

In the 11 years, 1925 to 1935 inclusive, an average of 25.38 inches of irrigation water has been applied to potatoes per year. This has increased the yield from 99.5 bushels per acre on dry land to 333.3 bushels for irrigated land or an increase of 233.8 bushels per acre. In other words, each inch of water added has produced 10.74 bushels of potatoes.

The greatest use of irrigation water for alfalfa at the North Platte Station has been for the purpose of restoring water to the subsoil preparatory to reseeding of the crop on land which has recently been in alfalfa, and from which the subsoil moisture has been removed by its deep-root system. In the 10 years, 1926 to 1935 inclusive, an average application of 18.15 inches of water per year has produced 4.62 tons of alfalfa per acre as contrasted with 1.95 tons under dry land conditions or an increase of 2.67 tons per acre. In other words, each inch of water added has produced 435 pounds of alfalfa.

PROPOSED PUMP-IRRIGATION PROJECTS

Five new public pump-irrigation projects have been approved by the Department of Roads and Irrigation, and four of these applications have been filed with the Public Works Administration in Washington, D. C. These irrigation districts were organized in Hall, Dawson, Merrick, Box Butte, and Clay counties. The estimated cost and number of acres for each project are as follows:

Name of District	Estimated Cost	Acreage
Hall County Public Pump-Irrigation District	$ 364,230	30,000
Dawson County Public Pump-Irrigation District	358,600	24,000
Merrick County Public Pump-Irrigation District	275,455	16,000
Panhandle Public Pump-Irrigation District	440,500	10,000
Harvard Public Power and Irrigation District	608,000	20,000
Total	$2,046,785	100,000

WATER POLLUTION

Pollution of streams, lakes, and ground water is rapidly becoming a menance in Nebraska. The water supply is polluted and contaminated by garbage, industrial refuse, offal and seepage from ground water. Unsanitary disposal of foul materials which makes streams unrightly, filthy, and unsuited for bathing, boating, and wild life, is now prohibited by law. Shallow ground waters absorb the odors of decaying organic materials thus becoming not safely potable.

Sources of water supply of many municipalities are unfavorably located in relation to sewage disposal and sources of water pollution and contamination. Town and city garbage, industrial refuse, and sewage in streams are often responsible for unsanitary conditions.

SANITARY WELL WATER

Unfortunately the sources of most water supplies are poorly located with reference to sanitation because too little thought has been given in the past to the relation of sources of contamination and water supply. Most drinking water in the State is drawn from wells with an abundant ground-water supply.

Except in a few areas, the supply is sufficient. This does not mean that all town and farm water supplies are free from pollution and contamination.

Recent water surveys furnish valuable data concerning water-bearing formations, and the source, depth, quality, direction, and rate of the movement of ground water. These data afford scientific guidance in the location and development of sanitary rural and urban water supplies. The following rules relate to sanitary well water conservation in Nebraska:

1. Open or dug wells are not sanitary.

2. The well driller must know the structure of the land, the depth of the water table, and the direction of the ground-water movement in order to determine the sanitary location of a well.

3. Wells should be located where they will not catch the polluted and contaminated underflow from privy vaults, cess pools, leaky sewers, flooded streams and other sources. It is necessary that wells be located upgradient from sources of pollution and contamination.

4. When the farm home, town, or city is located in a broad valley, the well or wells should be placed up-valley and the sewage disposal down-valley from the home, town, or city.

5. Every municipality should protect its water-producing ground against pollution or relocate the water supply on clean, protected ground.

6. Wells should be graded up, and enclosed to prevent the entry of surface drainage and the trapping in them of frogs, mice, rats, and other animals.

7. In places where the ground water is separated by clay layers at first, second and third waters, the well should be sunk to the lower water-bearing sands. The upper water, which may be polluted, should be adequately cased off.

8. Spring water in general is not a sanitary source of drinking water because it is supplied from local drainage areas. These areas are apt to become contaminated because there is usually a shallow depth of earth through which the water filters from the surface to the aquifer.

The Well Drillers Association is one of the largest of its kind in the United States. Its members cooperate with the Geological and Water Surveys of the University of Nebraska and the State Department of Health in a program of well water improvement. The University of Nebraska offers short courses and extension service for the well drillers, who report the depths, types of wells, and other valuable data to the surveys on well logs.

WATER TREATMENT

Polluted and contaminated waters are unsafe for domestic use without adequate treatment consisting of sedimentation, aeration, flocculation, filtration, and disinfection. The sewage treatment varies with the type and subsequent use of the water. The usual chemicals used are alum, lime, soda, and chlorine. Finally, hard water should be softened by the application of small quantities of lime. Thus far no practical method has been devised to improve the potability of salt water.

Most of the well water in Nebraska is naturally safe for drinking purposes, therefore water treatment is less common in the State than in most other states. The careless disposal of sewage and industrial wastes is fast polluting the ground water, lakes, and streams, making water treatment increasingly necessary.

At present, the major streams of the State are rather seriously polluted. Ample legal authority exists to control stream pollution by requiring the installation of necessary treatment works. The State Department of Health gives advisory service to improve the operation and maintenance of existing treatment plants. The major problems consist of the difficulty of securing State and local appropriations large enough to provide an adequate staff to insure efficient and continuous operation of such plants.

Study should be given to sewage and industrial waste treatment plants now operating to devise a guidance program for local administration and technical supervision of such works. The major objective is to insure their continuous and satisfactory operation.

REGULATIONS RELATING TO WATER SANITATION

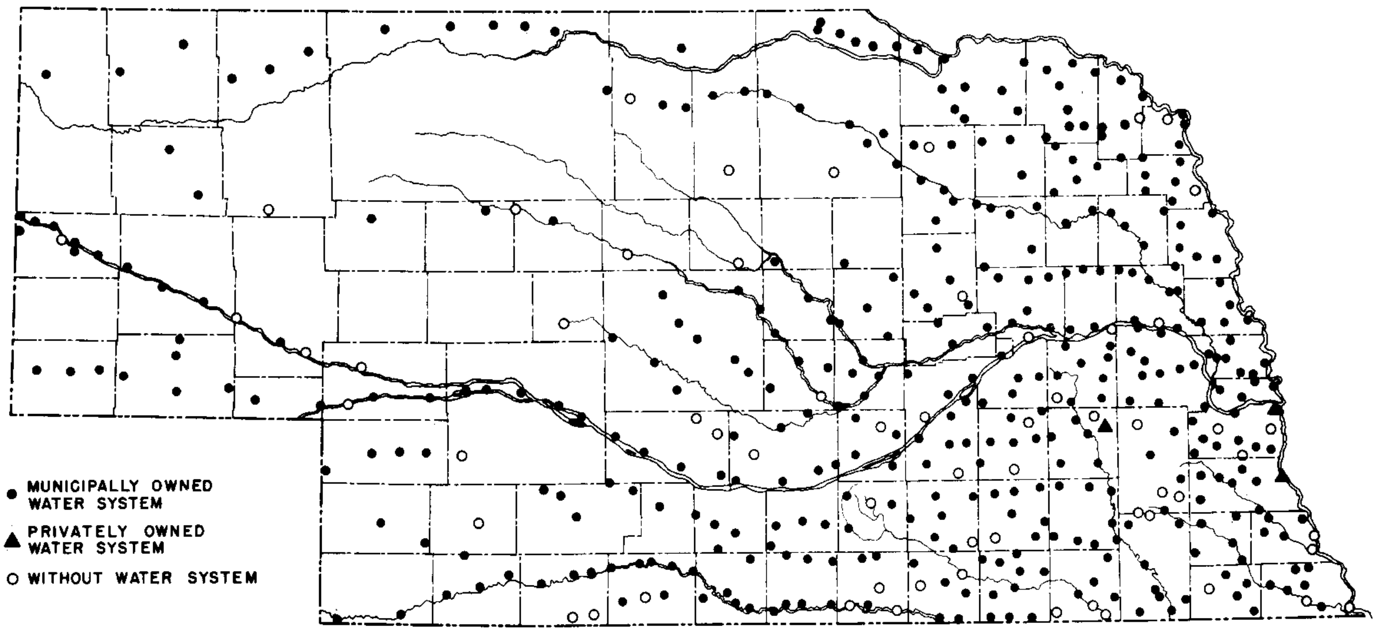
No municipality, district, corporation, company, institution, person or persons, shall install, change or make alterations in or additions to, or enter into contract for installing, changing, making alterations in or additions to any water works system to serve more than twenty-five persons, any sewerage system to serve more than twenty-five persons, or any swimming pool, public swimming or bathing place or places, until complete plans and specifications fully describing the proposed construction, alterations or additions have been submitted to, and received the written approval of the State Department of Health.

Plans and specifications for water works, sewerage systems and swimming pools must be submitted in triplicate. When approved, one of these is for filing as a permanent record with the Department, one is for the owner, and the other for the engineer submitting such plans and specifications. Thereafter such plans and specifications must be substantially adhered to, unless deviations are submitted to, and receive the written approval of the State Department of Health.

DOMESTIC UTILIZATION OF WATER
PLATTE RIVER BASIN
Estimated Population, 1938

	Water Supply System	Public Swimming Pools	Sewer System	Sewage Treatment Plants
Municipal population with access to service	219,521	159,283	201,175	122,362
Per cent of municipal population with access to service	95	69	87	53
Total municipal population of Basin				230,528

MUNICIPAL WATER SUPPLY SYSTEMS
NEBRASKA
1939



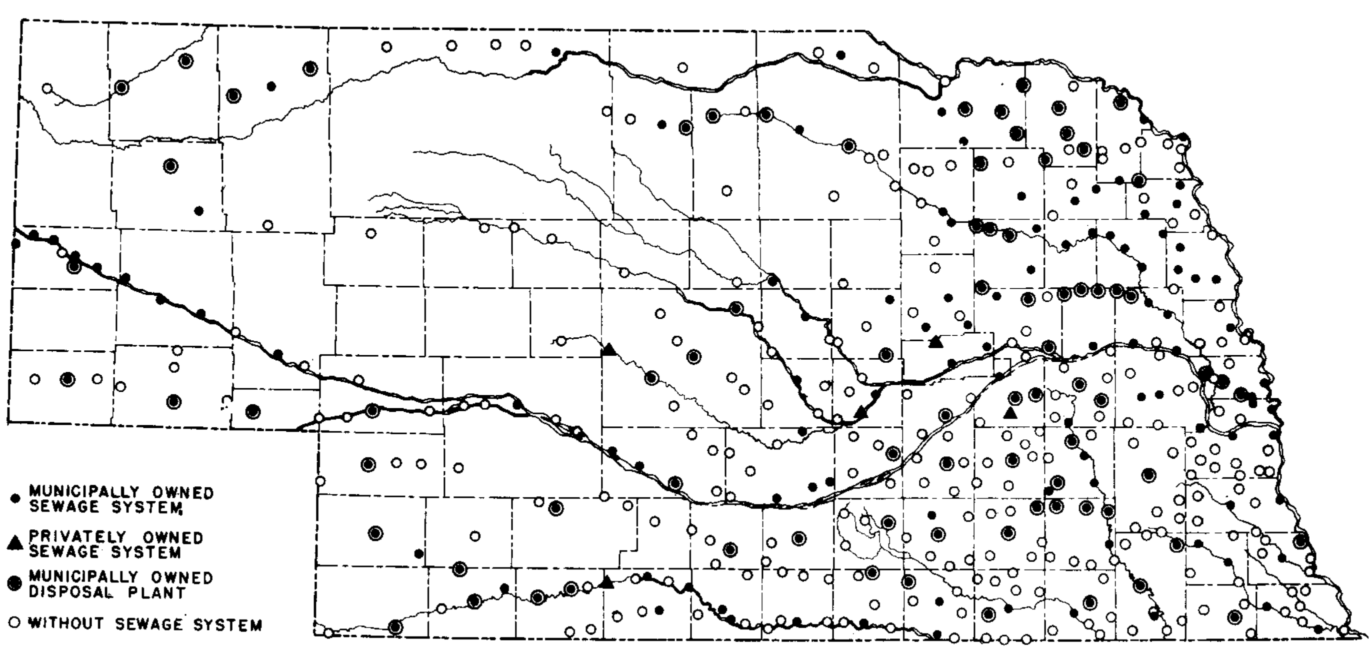
NO VILLAGES UNDER 200 POPULATION SHOWN

SOURCE—LEAGUE OF NEBRASKA MUNICIPALITIES

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NO. 465-81-3-155

MUNICIPAL SEWAGE SYSTEMS AND SEWAGE DISPOSAL PLANTS
NEBRASKA 1939



NO VILLAGES UNDER 200 POPULATION SHOWN

SOURCE—LEAGUE OF NEBRASKA MUNICIPALITIES

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NO. 465-81-3-155

DOMESTIC UTILIZATION OF WATER
LOUP RIVER BASIN
Estimated Population, 1938

	Water Supply System	Public Swimming Pools	Sewer System	Sewage Treatment Plants
Municipal population with access to service	39,522	13,648	29,309	11,781
Per cent of municipal population with access to service	88	31	66	26
Total municipal population of Basin				44,684

DOMESTIC UTILIZATION OF WATER
REPUBLICAN RIVER BASIN
Estimated Population, 1938

	Water Supply System	Public Swimming Pools	Sewer System	Sewage Treatment Plants
Municipal population with access to service	40,034	26,265	30,342	16,259
Per cent of municipal population with access to service	88	58	67	36
Total municipal population of Basin				45.444

DOMESTIC UTILIZATION OF WATER
ELKHORN RIVER BASIN
Estimated Population, 1938

	Water Supply System	Public Swimming Pools	Sewer System	Sewage Treatment Plants
Municipal population with access to service	56,422	24,311	51,268	18,564
Per cent of municipal population with access to service	95	41	86	31
Total municipal population of Basin				59,378

DOMESTIC UTILIZATION OF WATER
BLUE RIVER BASIN
Estimated Population, 1938

	Water Supply System	Public Swimming Pools	Sewer System	Sewage Treatment Plants
Municipal population with access to service	99,857	72,234	79,549	61,168
Per cent of municipal population with access to service	98	71	78	60
Total municipal population of Basin				102,290

DOMESTIC UTILIZATION OF WATER
NIOBRARA RIVER BASIN
Estimated Population, 1938

	Water Supply System	Public Swimming Pools	Sewer System	Sewage Treatment Plants
Municipal population with access to service	13,623	4,227	9,653	5,697
Per cent of municipal population with access to service	87	27	62	36
Total municipal population of Basin				15,694

DOMESTIC UTILIZATION OF WATER
MINOR MISSOURI RIVER BASIN ABOVE PLATTE
Estimated Population, 1938

	Water Supply System	Public Swimming Pools	Sewer System	Sewage Treatment Plants
Municipal population with access to service	253,580	231,595	247,306	6,399
Per cent of municipal population with access to service	99	91	97	3
Total municipal population of Basin				254,959

DOMESTIC UTILIZATION OF WATER
MINOR MISSOURI RIVER BASIN BELOW PLATTE
Estimated Population, 1938

	Water Supply System	Public Swimming Pools	Sewer System	Sewage Treatment Plants
Municipal population with access to service	37,467	14,542	28,013	2,958
Per cent of municipal population with access to service	90	35	67	7
Total municipal population of Basin				41,544

DOMESTIC UTILIZATION OF WATER
WHITE RIVER BASIN
Estimated Population, 1938

	Water Supply System	Public Swimming Pools	Sewer System	Sewage Treatment Plants
Municipal population with access to service	6,486	6,309	6,309	6,309
Per cent of municipal population with access to service	95	93	93	93
Total municipal population of Basin				6,808

ELECTRIC POWER

The development of the electric light and power industry in Nebraska began about 1882. Electric trolley cars were operated in Omaha for the first time in 1887 and in Lincoln about 1890. It was not until 1900 that electricity came into more general use in the State. Today nearly every town has either a power plant producing electricity or is connected to a high-voltage power line. Rural electrification is developing rapidly in Nebraska.

The following table shows the annual increase in the number of consumers of electricity during recent years:

NUMBER OF PRINCIPAL CUSTOMERS
USING ELECTRIC ENERGY
Nebraska, 1926-1937

Year	Commercial Service	Municipalities Railroads and Miscellaneous	Residential	Farms	Total
1926	33,202	392	172,892	2,500	208,986
1927	35,356	529	181,781	4,000	221,666
1928	36,491	474	186,144	6,260	229,369
1929	39,034	632	194,542	7,485	241,693
1930	38,869	617	199,332	8,960	247,778
1931	41,131	1,263	193,136	9,930	245,460
1932	42,054	528	183,777	9,660	236,019
1933	41,049	502	182,802	9,522	233,875
1934	41,297	636	186,360	9,544	237,837
1935	42,087	707	191,392	9,946	244,132
1936	43,102	1,056	193,137	10,899	248,194
1937	43,050	886	195,346	12,583	251,865

Source: Compiled by the Edison Electric Institute for the Nebraska State Planning Board

RURAL ELECTRIFICATION

For a number of years conditions were not favorable to the development of rural electrification in the State. The following are some of the factors which have helped to make rural electrification possible:

(1) Enabling legislation under which the farmers could organize.

(2) Supply of wholesale electric energy at low cost.

(3) Available money for financing at a low rate of interest.

In 1933 the Legislature passed Senate File 310 permitting the organization of public power districts. To date, 30 rural electrification districts have been organized under this law. Plate LXXXI shows the Nebraska Rural Electrification Districts that have been organized under Senate File 310.

HYDROELECTRIC POWER

Also organized by authority of Senate File 310, are the 3 large Public Works Administration projects. Of these 3 projects the Platte Valley Public Power and Irrigation District and the Loup River Public Power and Irrigation District are operating and the Central Nebraska Public Power and Irrigation District is under construction. When completed the last named will be the largest hydropower plant in Nebraska.

TRANSMISSION LINES AND RURAL ELECTRIFICATION

The large federal power projects are being tied together by 2,000 miles or more of high-voltage transmission lines in order to avoid standby costs and to increase the dependability of service. The hookup includes the Sutherland, Tri-County, Columbus, and the other projects which will serve the rural electrification districts, institutions, and municipalities of the State. The cost of this electric distribution system will be approximately $20,000,000.

In an effort to use the potential power in the streams of the State, there have been approximately 287 power sites developed in Nebraska, a number of which are operating at this time. There are 22 hydropower plants in the Big Blue River, the most completely developed river in the State. The largest hydroelectric power projects in the State are those near Kearney, Gothenburg, Valentine, Boelus, Fullerton, Sargent, Ericson, Barnston, and Superior in addition to the Public Power District plants recently completed or under construction. There are, in addition, potential power sites which could be developed when the demand for electric energy increases.

TYPE OF PRIME MOVER

Steam is the principal type of prime mover used in the generation of electric energy in Nebraska. In 1936, 80 per cent of the generating capacity of the State was steam, 15 per cent internal combustion, and 5 per cent hydro. In 1938, by including the Sutherland and Loup River projects, the rate of generating capacity by types was changed to 62 per cent steam, 13 per cent internal combustion, and 25 per cent hydro. The hydrogenerating capacity increased from 13,713 kilowatts in 1936 to 85,866 as shown in the report of the 1938 Electric Power Statistics by the Federal Power Commission. With the completion of the Tri-County project it will be increased further to 137,866 kilowatts, representing about 34 per cent of the total generating capacity of the State.

NEBRASKA RURAL ELECTRIFICATION DATA
November, 1940

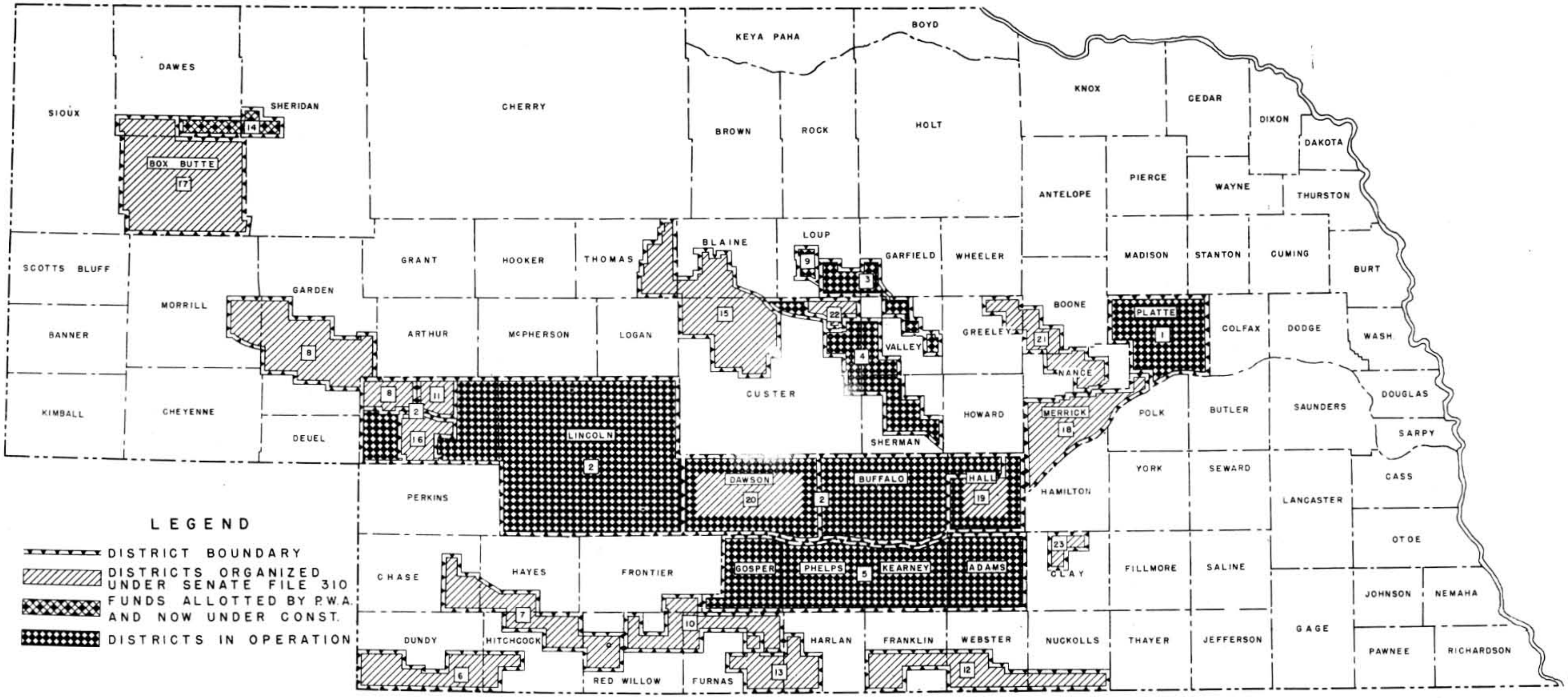
Rural Public Power Districts	(1) Total REA Allotments	Miles of Transmission Lines		Customers	
		Circuit (2)Auth.NSRC	Energized	Present	Ultimate
Boone-Nance	$231,000	234.40	114	117	447
Buffalo County	399,000	184.25	164	277	460
Burt County	522,000	648.85	513	781	1,026
Butler County	180,000	198.75	139	157	303
Cedar-Knox	373,000	493.68	347	582	749
Chimney Rock	275,250	341.95	245	530	667
Cuming County	680,300	687.10	583	895	1,061
Dawson County	427,000	270.60	289	441	636
Eastern Nebraska	1,746,000	2,459.40	1,500	2,700	4,322
Gering Valley	45,000	47.65	38	105	126
*Hall County	172,000	122.50	140	150	348
*Hamilton County	223,500	294.00	98	89	486
Howard County	425,000	602.05	330	318	1,135
Lancaster County	586,950	652.82	479	663	1,240
Loup River	540,000	692.25	493	581	1,359
Madison County	290,000	362.75	223	215	662
*Merrick County	125,000	112.00	106	130	267
Norris	357,000	594.85	400	536	569
Northeast Nebr.	306,000	376.00	220	365	659
Polk County	482,500	507.25	380	556	855
Roosevelt	227,000	228.50	195	535	550
Seward County	284,000	308.00	237	311	532
Southeastern Nebr.	441,500	436.75	465	765	1,100
Southern Nebr.	430,000	430.00	355	562	1,825
Stanton County	165,000	226.50	142	178	347
Thayer County	187,000	173.00	0	0	382
Wayne County	387,500	439.81	196	345	934
York County	283,000	256.80	178	222	608
Totals	(1)$10,791,500	12,382.46	8,560	13,156	23,655

(1) Includes $536,250 for wiring and irrigation equipment
(2) Nebraska State Railway Commission as of October 15, 1940
* Districts recently consolidated with Southern Nebraska R.P.P.D.

Compiled in the office of the Nebraska State Planning Board from data furnished by Power Districts

NEBRASKA PUBLIC POWER AND IRRIGATION DISTRICTS

DECEMBER, 1940



DISTRICTS

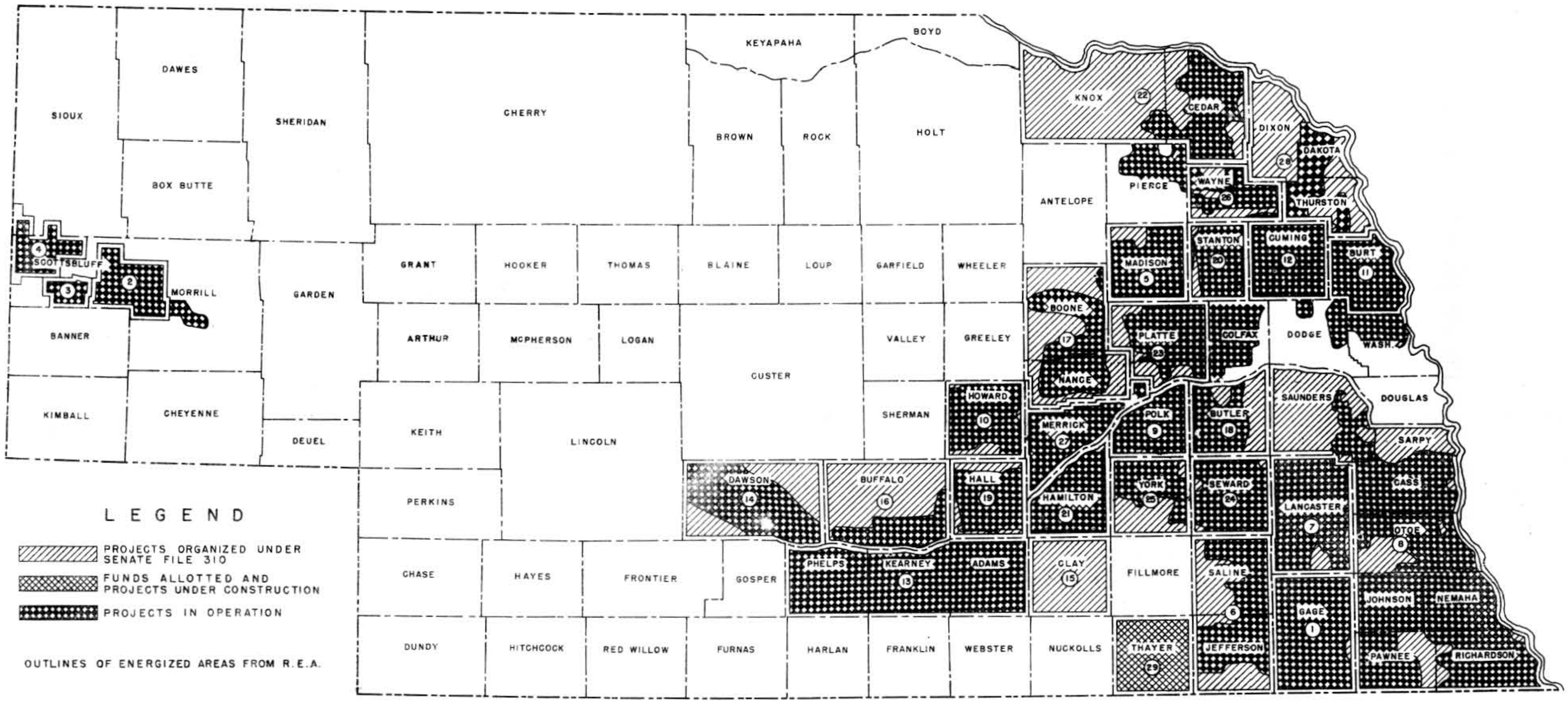
1 LOUP RIVER PUBLIC POWER DISTRICT
2 PLATTE VALLEY PUBLIC POWER & IRRIGATION DISTRICT
3 NORTH LOUP PUBLIC POWER & IRRIGATION DISTRICT
4 MIDDLE LOUP PUBLIC POWER & IRRIGATION DISTRICT
5 CENTRAL NEBRASKA PUBLIC POWER & IRRIGATION DIST.
6 BENKLEMAN-HAIGLER-ARIKAREE PUBLIC POWER & IRR. DIST.
7 IMPERIAL VALLEY PUBLIC POWER & IRRIGATION DISTRICT
8 BLUE CREEK PUBLIC POWER & IRRIGATION DISTRICT
9 ALMERIA PUBLIC POWER & IRRIGATION DISTRICT
10 UNITED PUBLIC POWER & IRRIGATION DISTRICT
11 WHITE TAIL PUBLIC POWER & IRRIGATION DIST.
12 REPUBLICAN RIVER PUBLIC POWER & IRR. DIST.
13 BEAVER-SAPPA PUBLIC POWER & IRR. DIST.
14 MIRAGE FLATS PUBLIC POWER & IRR. DIST.
15 DISMAL RIVER PUBLIC IRRIGATION DISTRICT
16 SOUTH PLATTE PUBLIC POWER & IRRIGATION DIST.
17 PANHANDLE PUBLIC PUMP IRRIGATION DISTRICT
18 MERRICK COUNTY PUBLIC PUMP IRRIGATION DIST.
19 HALL COUNTY PUBLIC PUMP IRRIGATION DISTRICT
20 DAWSON COUNTY PUBLIC PUMP IRRIGATION DIST.
21 CEDAR VALLEY PUBLIC POWER & IRRIGATION DIST.
22 SARGENT PUBLIC IRRIGATION DISTRICT
23 HARVARD PUBLIC POWER & IRRIGATION DISTRICT

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NO. 465-81-3-155

NEBRASKA RURAL ELECTRIFICATION DISTRICTS

DECEMBER, 1940

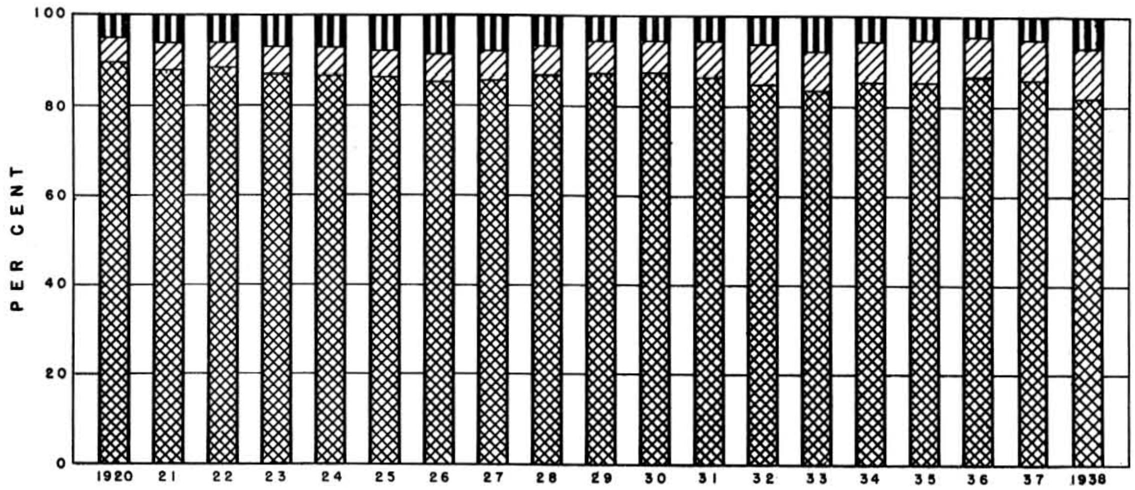


DISTRICTS

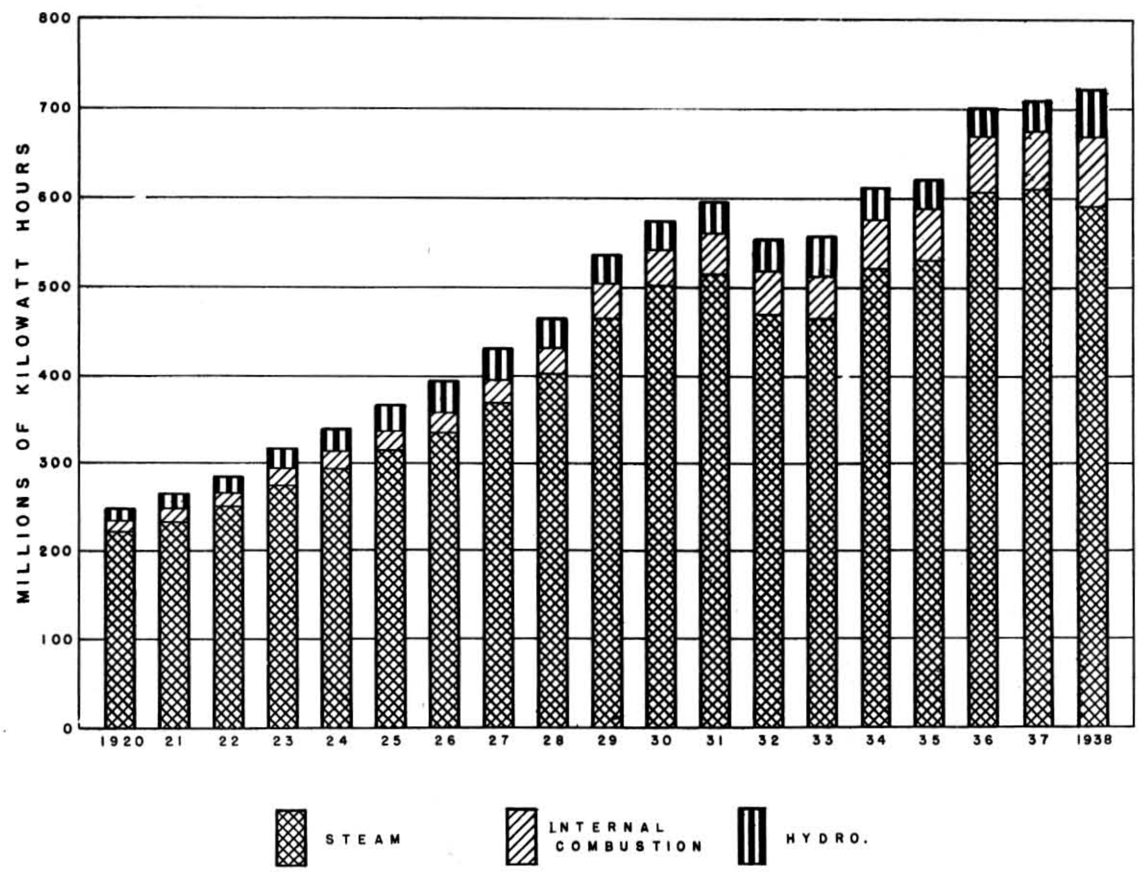
1 SOUTHEASTERN NEBRASKA PUBLIC POWER DISTRICT
2 CHIMNEY ROCK PUBLIC POWER DISTRICT
3 GERING VALLEY RURAL PUBLIC POWER DISTRICT
4 ROOSEVELT RURAL PUBLIC POWER DISTRICT
5 MADISON COUNTY RURAL PUBLIC POWER DISTRICT
6 NORRIS RURAL PUBLIC POWER DISTRICT
7 LANCASTER COUNTY RURAL PUBLIC POWER DISTRICT
8 EASTERN NEBRASKA PUBLIC POWER DISTRICT
9 POLK COUNTY RURAL PUBLIC POWER DISTRICT
10 HOWARD COUNTY RURAL PUBLIC POWER DISTRICT
11 BURT COUNTY RURAL PUBLIC POWER DISTRICT
12 CUMING COUNTY RURAL PUBLIC POWER DISTRICT
13 SOUTHERN NEBRASKA RURAL PUBLIC POWER DISTRICT
14 DAWSON COUNTY PUBLIC POWER DISTRICT
15 CLAY COUNTY RURAL PUBLIC POWER DISTRICT
16 BUFFALO COUNTY PUBLIC POWER DISTRICT
17 BOONE—NANCE RURAL PUBLIC POWER DISTRICT
18 BUTLER COUNTY RURAL PUBLIC POWER DISTRICT
19 HALL COUNTY RURAL PUBLIC POWER DISTRICT
20 STANTON COUNTY RURAL PUBLIC POWER DISTRICT
21 HAMILTON COUNTY RURAL PUBLIC POWER DISTRICT
22 CEDAR—KNOX RURAL PUBLIC POWER DISTRICT
23 LOUP RIVER PUBLIC POWER DISTRICT
24 SEWARD COUNTY RURAL PUBLIC POWER DISTRICT
25 YORK COUNTY RURAL PUBLIC POWER DISTRICT
26 WAYNE COUNTY RURAL PUBLIC POWER DISTRICT
27 MERRICK COUNTY RURAL PUBLIC POWER DISTRICT
28 NORTHEAST NEBRASKA RURAL PUBLIC POWER DISTRICT
29 THAYER COUNTY RURAL PUBLIC POWER DISTRICT

TOTAL PRODUCTION OF ELECTRICITY FOR PUBLIC USE
BY TYPE OF PRIME MOVER
NEBRASKA
1920—1938

PERCENTAGE PRODUCED



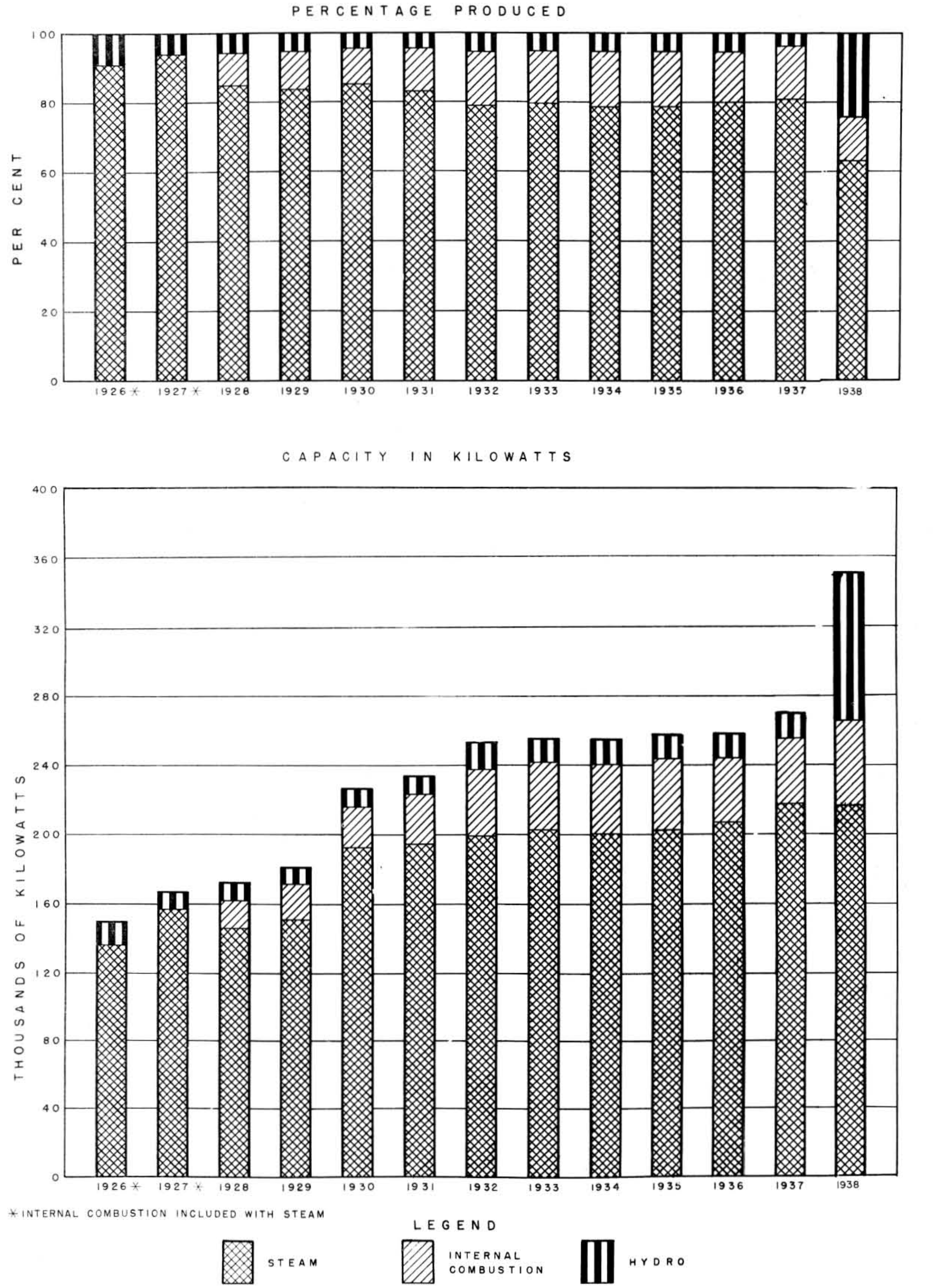
PRODUCTION IN KILOWATT HOURS



SOURCE—FEDERAL POWER COMMISSION

NEBRASKA STATE PLANNING BOARD W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

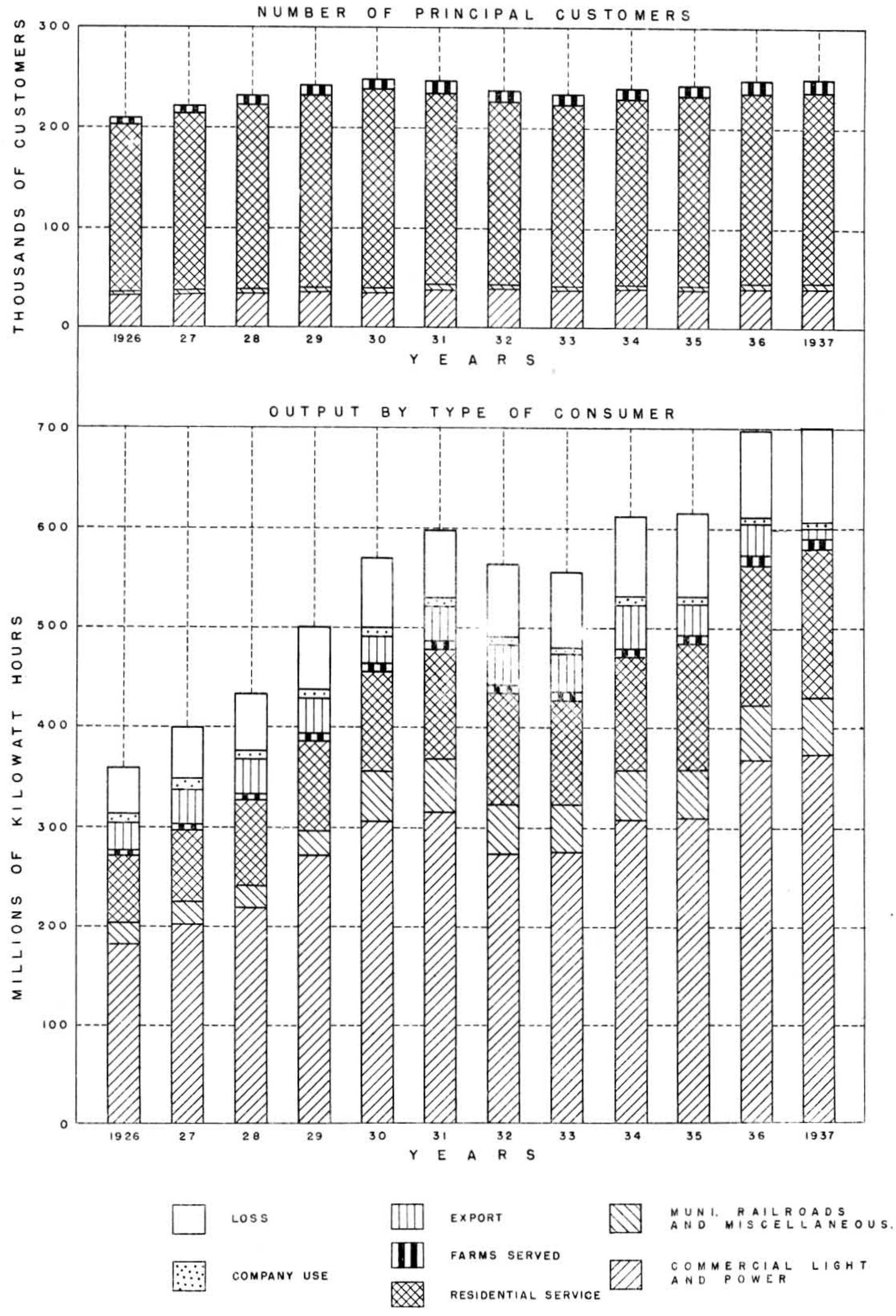
GENERATING CAPACITY IN KILOWATTS
BY TYPE OF PRIME MOVER
NEBRASKA
1926—1938



SOURCE—EDISON ELECTRIC INSTITUTE
FEDERAL POWER COMMISSION FOR 1937—1938

NEBRASKA STATE PLANNING BOARD W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-115

DISTRIBUTION OF ELECTRIC ENERGY IN NEBRASKA 1926 1937



NEBRASKA STATE PLANNING BOARD

SOURCE—EDISON ELECTRIC INSTITUTE

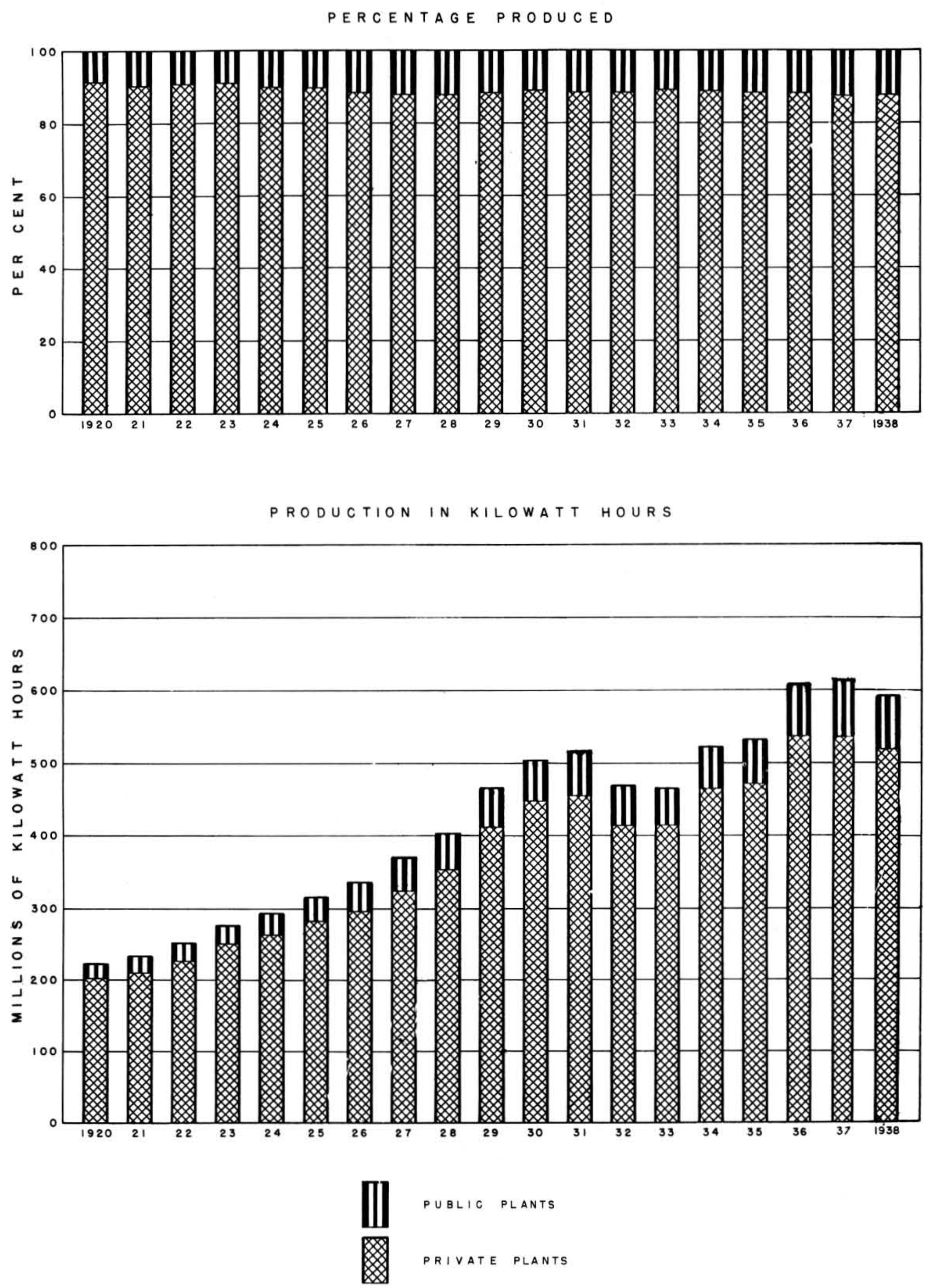
W. P. A. PROJECT O.P. NO. 165—81—6999

PRODUCTION OF ELECTRICITY FOR PUBLIC USE

BY TYPE OF OWNERSHIP

KWH GENERATED BY STEAM

NEBRASKA 1920—1938



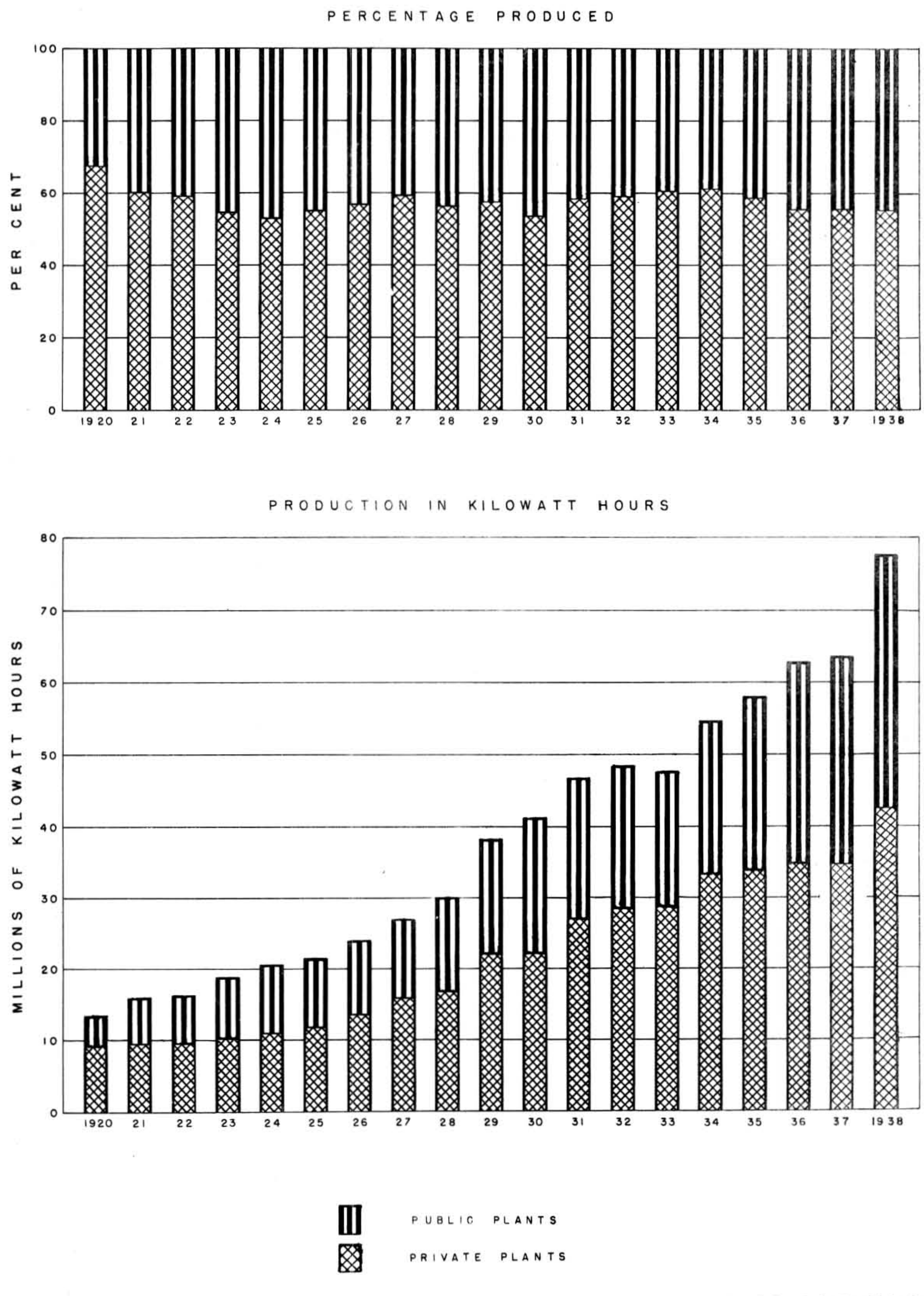
SOURCE—FEDERAL POWER COMMISSION

NEBRASKA STATE PLANNING BOARD   W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

PRODUCTION OF ELECTRICITY
FOR PUBLIC USE
BY TYPE OF OWNERSHIP

KWH GENERATED BY INTERNAL COMBUSTION

NEBRASKA 1920—1938



SOURCE—FEDERAL POWER COMMISSION

NEBRASKA STATE PLANNING BOARD

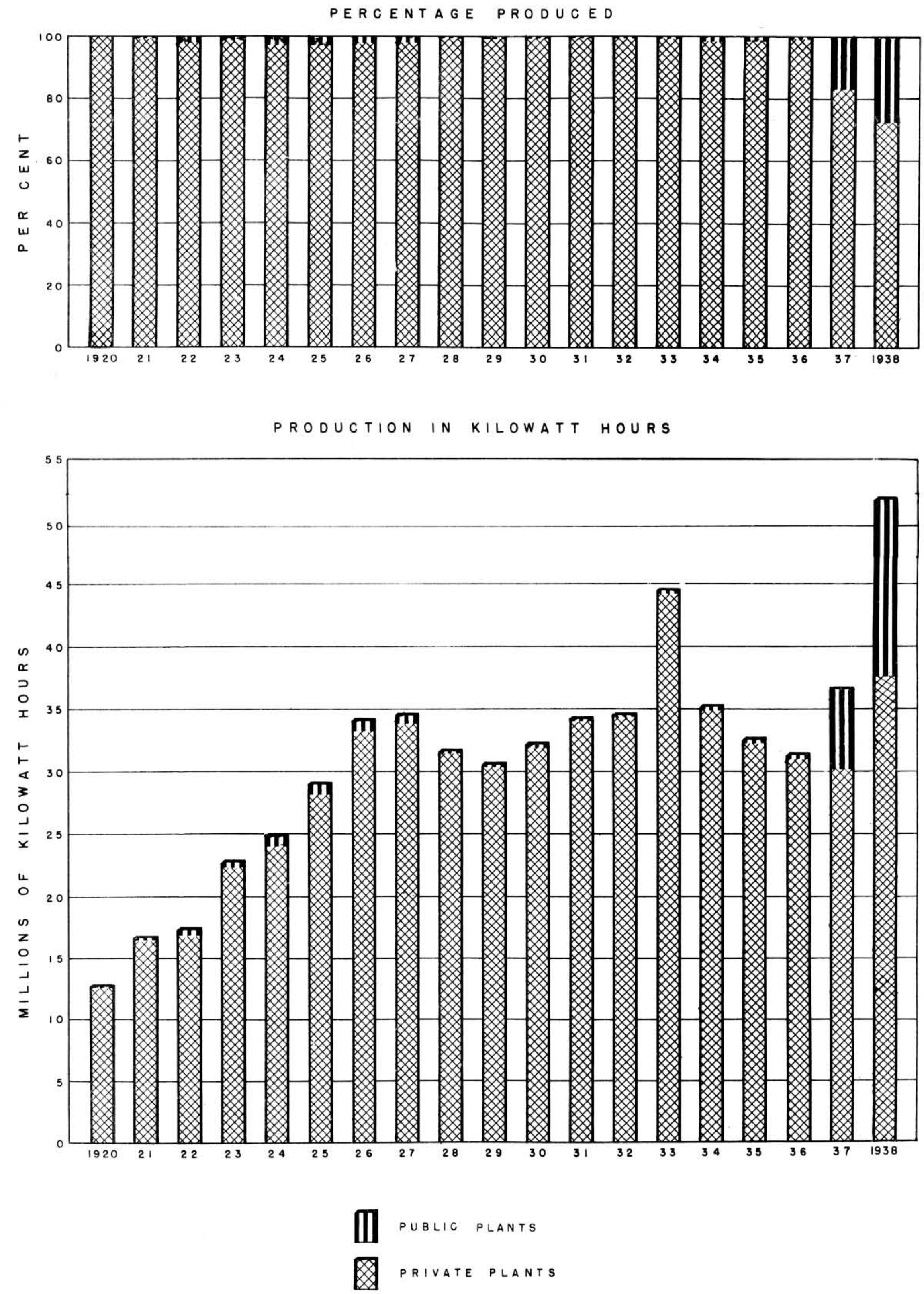
W.P.A. O.P. NOS. 165-81-6999-AND 465-81-3-155

PRODUCTION OF ELECTRICITY FOR PUBLIC USE

BY TYPE OF OWNERSHIP

K. W. H. GENERATED BY WATER POWER

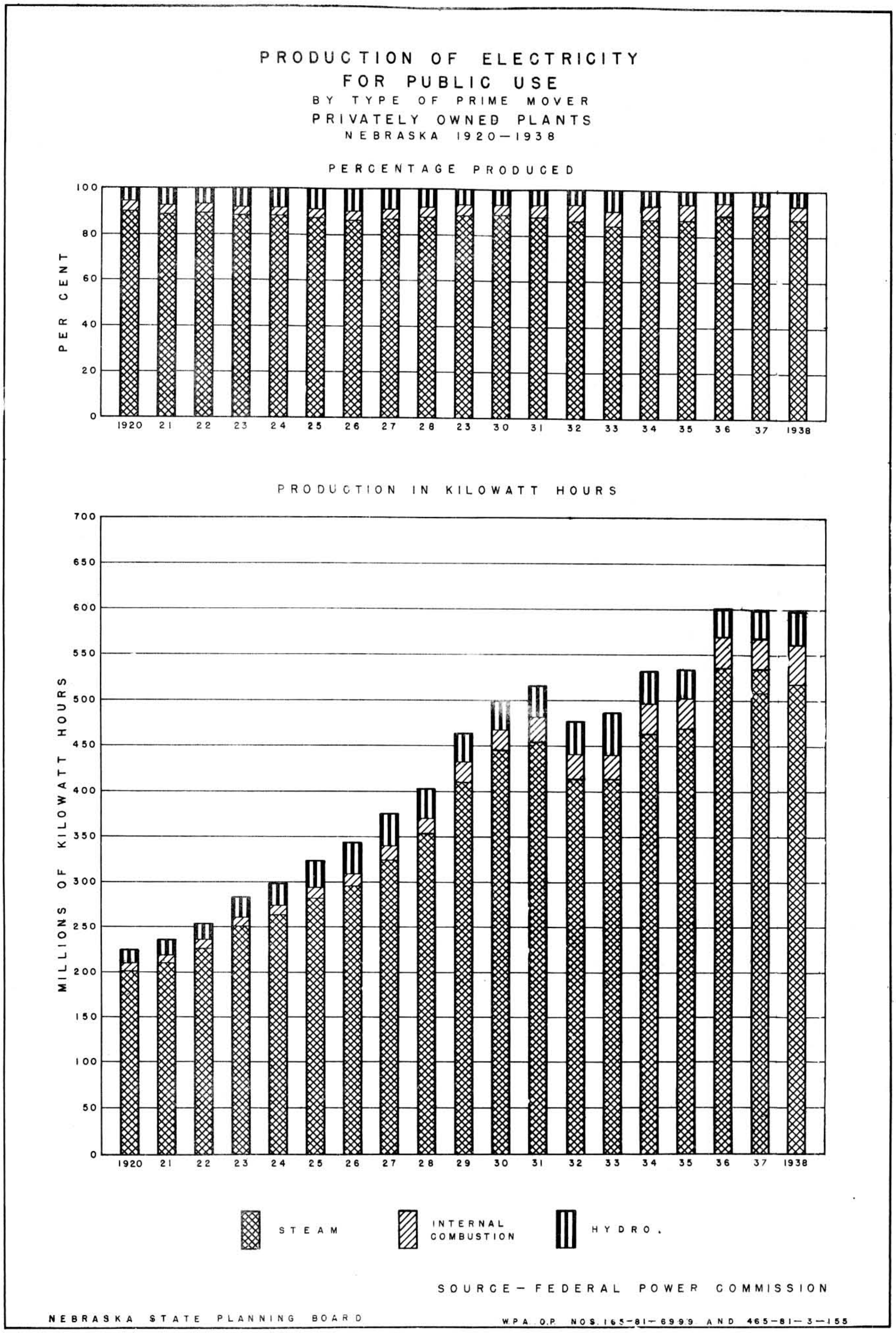
NEBRASKA 1920—1938



SOURCE—FEDERAL POWER COMMISSION

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155



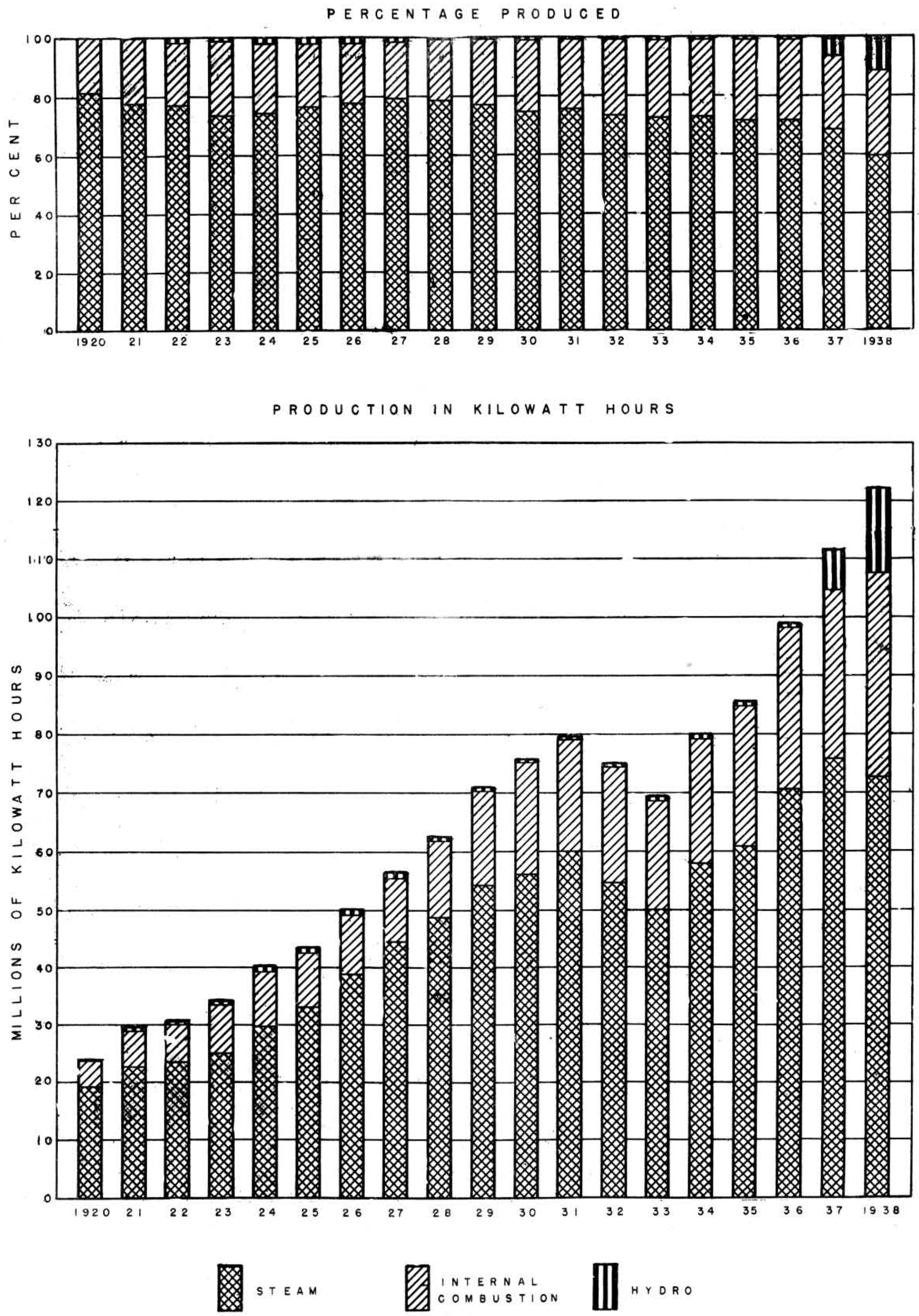
PRODUCTION OF ELECTRICITY
FOR PUBLIC USE
BY TYPE OF PRIME MOVER
PRIVATELY OWNED PLANTS
NEBRASKA 1920—1938
PERCENTAGE PRODUCED
PER CENT
PRODUCTION IN KILOWATT HOURS
MILLIONS OF KILOWATT HOURS
STEAM
INTERNAL COMBUSTION
HYDRO.
SOURCE — FEDERAL POWER COMMISSION
NEBRASKA STATE PLANNING BOARD
W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

PRODUCTION OF ELECTRICITY FOR PUBLIC USE

BY TYPE OF PRIME MOVER

PUBLICLY OWNED PLANTS

NEBRASKA 1920-1938

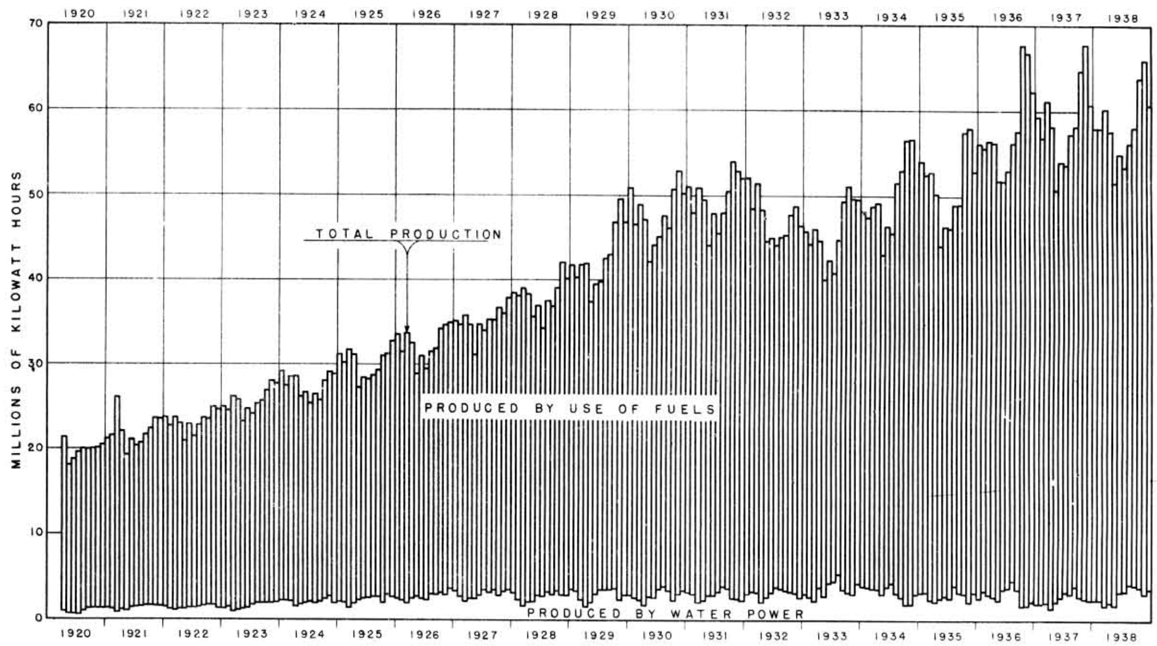


SOURCE FEDERAL POWER COMMISSION

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NOS. 165-81-6999 AND 465-81-3-155

MONTHLY PRODUCTION OF ELECTRICITY
FOR PUBLIC USE
BY FUEL AND BY WATER POWER
FOR WATER YEARS 1920–1938
NEBRASKA

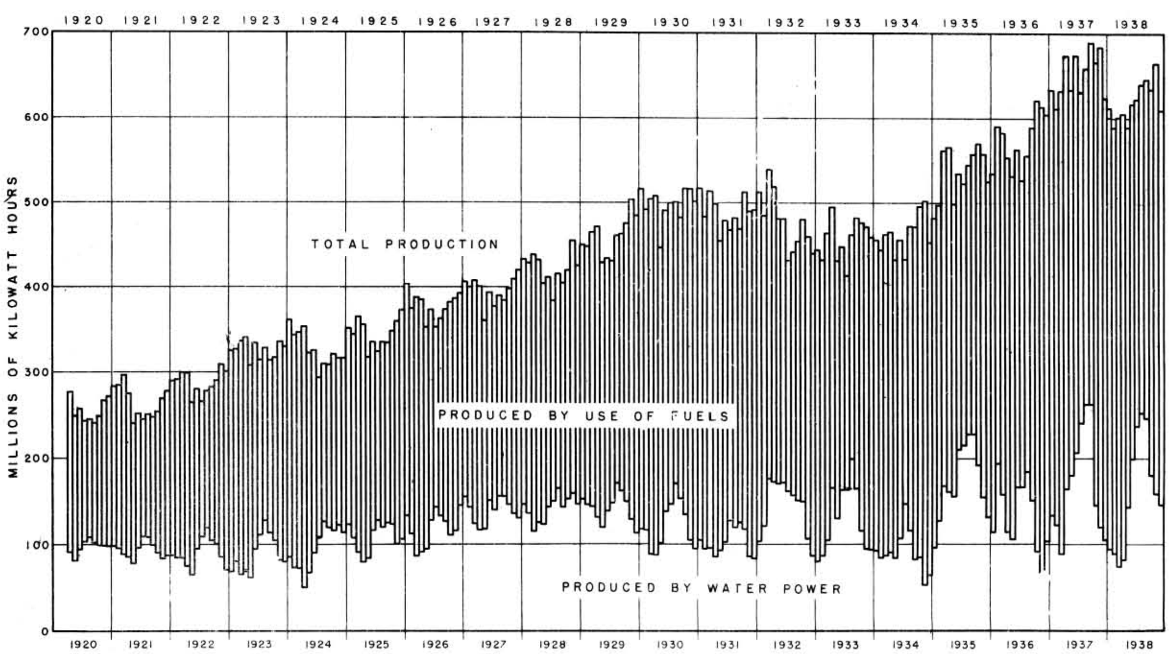


SOURCE–U.S. GEOLOGICAL SURVEY
AND FEDERAL POWER COMMISSION

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P. NO. 465–81–3–155

MONTHLY PRODUCTION OF ELECTRICITY
FOR PUBLIC USE
BY FUEL AND BY WATER POWER
FOR WATER YEARS 1920–1938
WEST NORTH CENTRAL DIVISION



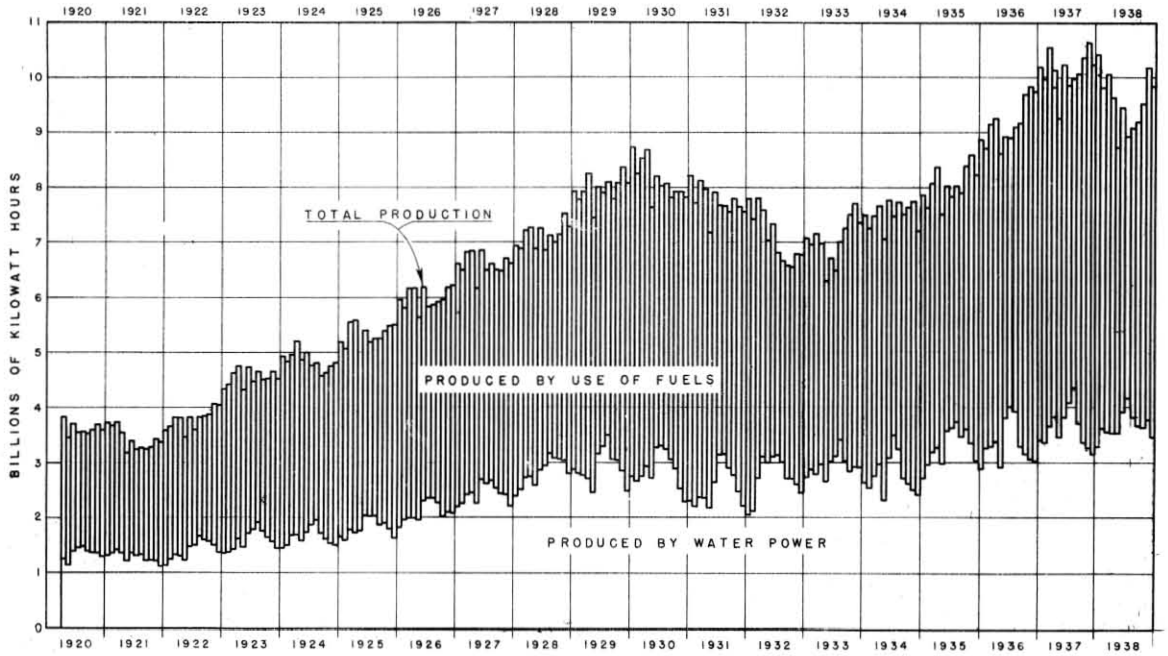
SOURCE–U.S. GEOLOGICAL SURVEY
AND FEDERAL POWER COMMISSION

WEST NORTH CENTRAL DIVISION
NORTH DAKOTA MINNESOTA
SOUTH DAKOTA IOWA
NEBRASKA MISSOURI
KANSAS

NEBRASKA STATE PLANNING BOARD

W.P.A. O.P.–NO. 465–81–3–155.

MONTHLY PRODUCTION OF ELECTRICITY
FOR PUBLIC USE
BY FUEL AND BY WATER POWER
FOR WATER YEARS 1920 1938
UNITED STATES



SOURCE-U.S. GEOLOGICAL SURVEY
AND FEDERAL POWER COMMISSION

PLATTE RIVER BASIN

DESCRIPTION

The Platte River Drainage Basin including the area drained by the North Platte, South Platte and Platte rivers slopes gently southeastward from the summit of the Rocky Mountains in Wyoming and Colorado to the Missouri River at Plattsmouth, Nebraska. The basin has an east-west length of approximately 680 miles. The irregularity of the northern and southern boundaries results in considerable variation in the width of the basin. The width increases from the western extremity to 280 miles near the 106th meridian, then decreases to 60 miles at the 102nd meridian. East of the 102nd meridian the basin is irregular in shape, averaging about 35 miles in width. This river system, excluding the Loup and Elkhorn river basins, drains an area of 68,590 square miles, of which 21,100 square miles or 30 per cent lies in Colorado, 27,500 square miles or 41 per cent in Wyoming, and 19,991 square miles or 29 per cent in Nebraska. The portion of the river basin in Nebraska is 26 per cent of the total area of the State, and includes all or parts of 44 counties embracing a sinuous stretch through the central part of the State from west to east. The river traverses the entire length of Nebraska dividing the State into two sections, the larger lying north of the stream.

There are two trunk valleys in the western portion of Nebraska known as the North Platte and the South Platte. They converge near the city of North Platte, Nebraska to form a single-trunk valley which extends to the Missouri River.

The North Platte rises in northern Colorado and flows northward, into Wyoming and eastward into Nebraska. The Sweetwater and Laramie rivers are its main tributaries. The North Platte River Basin drains an area of 37,379 square miles. The South Platte rises in the high Rockies of central Colorado and collects the run-off of several tributaries draining an area of 24,030 square miles. It joins the North Platte at the town of North Platte, Nebraska to form the Platte River. The drainage area of the Platte River below the junction of the North Platte and South Platte rivers is 28,791 square miles. The principal tributary of the Platte is the Loup River, which drains a large area in central Nebraska.

The river valley varies greatly in character, depth, and width, throughout its course. The North Platte Valley in Nebraska is wide and deep in Scotts Bluff and Morrill counties, somewhat narrower across Garden and Keith counties, expanding again in Lincoln County.

The South Platte Valley, approximately 90 miles long in Nebraska, has a fairly uniform width and is rather deep. The valley proper consists of flood plains, low terraces, and colluvial slopes. The valley sides are gradual slopes, except near Ogallala and Sutherland, where there is some rough, stony land. Impervious bedrock generally occurs above the bottomland level in the surrounding uplands, thus preventing appreciable loss by underflow of water originating within the drainage area.

The Platte Valley, from the central part of Lincoln County to eastern Saunders County, becomes more shallow and increases in width. From the confluence of the Elkhorn and Platte rivers to the Missouri River, the valley becomes narrower and the valley sides are steeper. The average gradient of the Platte Valley is about 6 feet per mile. From a point east of North Platte to the mouth of the Loup River, the channel is underlain by more or less pervious mantlerock. From the confluence of the Loup River to the mouth of the Platte River near Plattsmouth the basin is "closed" with the exception of a section west of Fremont where there is underflow through Todd Valley, which rejoins the river near Ashland.

GENERAL GEOLOGY

The geology of the Platte River Basin is more complex than that of the other basins of the State. The valley of the Platte extends nearly parallel to the dip of the bedrock, exposing a number of bedrock formations and several mantlerock formations. Bedrock is at or near the surface in approximately one-third of the basin, and mantlerock occurs within the remaining two-thirds.

Bedrock Formation (Plate VI)

Outcrops of bedrock within the Platte Valley watershed are mainly limited to the area west of North Platte and east of Columbus. Within the remainder of the area the bedrock forms the platform upon which mantlerock has been laid. The exposed bedrock formation, from oldest to youngest, is as follows:

(a) Permo-Pennsylvanian (11, Plate VI)

Interbedded limestone and shale, with some sandstones; about 500 feet exposed in the Platte Valley, between Ashland and Plattsmouth; includes the oldest rocks that outcrop in the State; present in subsurface at increasing depth westward; generally impervious; some of the more porous beds locally yield a small supply of water, which is often highly mineralized.

(b) Dakota group (10, Plate VI)

Cretaceous; includes an upper gray to buff sandstone, 100 to 150 feet thick (Dakota sandstone); a middle varicolored red and gray shale, 50 to 60 feet thick (Fuson shale); and lower, gray sandstone with some interbedded dark-gray shale, about 200 feet thick (Dakota sandstone); occurs below mantlerock or is exposed in Lancaster County, central and eastern Saunders County, northern and western Cass County and southern Sarpy County; present in subsurface to west; upper and lower sandstones important aquifers; water highly mineralized in certain localities; sandstone zones porous; when encountered at depth usually furnishes artesian water because of impervious confining material above and below.

(c) Graneros shale (9, Plate VI)

Cretaceous; dark-gray shale; with sandy and coaly material in lower part; increases from thickness of 90 feet or less in eastern part to over 500 feet in Banner County; present below mantlerock as northeast trending band across east-central Dodge, west-central Saunders, northwest Lancaster and northeast Seward counties; present subsurface to west; impervious except for sandy zones in lower part; forms impervious platform in the area where it occurs immediately below the mantlerock.

(d) Greenhorn limestone (8, Plate VI)

Cretaceous; interbedded-gray, fossiliferous limestone and dark-gray shales; thickness about 30 feet to the east, thickening in subsurface to 75 feet or more in western part of the State; occurs as a narrow, north-northwest trending band below mantlerock in southeastern Butler, western Saunders, and central Dodge counties, present at greater depth to west; relatively impervious; base locally sand and sometimes yields a small supply of water.

(e) Carlile shale (7, Plate VI)

Cretaceous; gray to dark-gray plastic shale; thickens from about 150 feet in eastern part to about 450 feet in subsurface in Banner County; underlies mantlerock and forms impervious platform in Butler, eastern Colfax, western Dodge, and western Saunders counties; present in subsurface to west.

(f) Niobrara chalk (5 & 6, Plate VI)

Cretaceous; light bluish-gray, chalky shale to impure chalk; thickness 250 to 560 feet or more, thickening westward; present below mantlerock between Grand Island and east of Columbus, where it forms the impervious platform.

(g) Pierre shale 4 1A, 1B, Tertiary over Pierre Plate VI)

Cretaceous; dark-gray to brownish sandstones and shales, thickness uncertain but may be as much as 300 to 400 feet in subsurface in western Nebraska, absent in central and eastern part of State; exposed in small area in northwestern Scotts Bluff County, may be present in subsurface of Scotts Bluff, Banner, Kimball, Cheyenne, and southwestern Morrill counties; contains some porous beds which are locally water-bearing.

The Cretaceous rocks were folded and subsequently eroded prior to the deposition of the over-lying Tertiary rocks which were laid down upon the beveled edges of the Cretaceous.

(i) Chadron formation (3, in part, Plate VI)

Tertiary age; greenish-gray clay, silt, and some sand and gravel; 50 to 125 feet or more in thickness; at or near the surface in the North Platte Valley in the western half of Scotts Bluff County; eastern limit in subsurface undetermined but known to be present as far east as North Platte; impervious for most part, except in lower part, which contains some porous zones; relatively high surface run-off; may be horizon of artesian water at Broadwater.

(j) Brule clay (3, in part, Plate VI)

Tertiary age; flesh-colored to light-gray, hard, silty clay, some sandy zones; up to 700 to 800 feet in thickness; to the west, thinning eastward, exposed in Lodgepole and Pumpkin Creek valleys and in the North Platte Valley, west of Keystone; known to occur below the mantlerock and the Ogallala group between Keystone and North Platte, and for a short distance eastward; relatively impervious high surface run-off; forms impervious platform limiting downward penetration of ground water in region west of North Platte.

(k) Arikaree-Gering and associated beds (2, Plate VI)

Tertiary age; gray sandstone and limy sandstone with some channel sandstones and gravels; up to 700 to 800 feet thick; wedges out southwestward under Ogallala group outcrops in Box Butte Table, Wildcat Ridge, and northwestern part of Cheyenne Table; generally porous; favorable to rain-water penetration and ground-water percolation; an important aquifer, but does not yield water as readily as Pleistocene sands and gravels.

(l) Ogallala group (1A, 1B, 1C, Plate VI)

Tertiary age; sand, gravel, limy sandstone, some clay, gray to white, in part reddish, 50 to 400 feet or more thick; outcrops in valley walls between North Platte and Bridgeport, and Cheyenne and Perkins tables; generally occurs below mantlerock in Platte Valley west of Columbus; predominately porous, favorable to penetration of surface water and percolation of ground water; an important aquifer, generally yielding water less readily than Pleistocene sands and gravels.

Mantlerock Formation (Plate V)

The bedrock of the area was folded and eroded to ridges, hills, tables, and valleys prior to the accumulation of the mantlerock which is Pleistocene and Recent in age. A description of the mantlerock from oldest to youngest, follows:

(a) Holdrege sands and gravels

Relatively unconsolidated, medium to coarse-grained sands, with some gravel, becoming coarser toward base; thickness about 50 to 100 feet or more; porous throughout, resulting in ready penetration and rapid percolation; an important aquifer, supplying many irrigation wells.

(b) Fullerton clay

Dark-colored clay, silt and fine sand; thickness up to 65 feet; occasionally absent; locally forms an impervious layer restricting downward penetration of ground water, but its noncontinuous nature prevents its being an effective confining layer except locally.

(c) Grand Island sands and gravels

Similar in nature to Holdrege; fine-texture near top, becoming coarser at base, 50 to 100 feet or more thick, porous, good water-bearing material; an important aquifer, furnishing supply to many irrigation wells.

The Holdrege and Grand Island sands and gravels are limited to the area west of Columbus. East of the drift border contemporaneous deposits include two drift sheets, each of which is up to 100 feet thick. The lower drift (Nebraskan) is underlain in places by subglacial sands and gravels and is often separated from the upper drift sheet (Kansan) by intertill sands and gravels. The drift material is a heterogeneous mixture of clay, silt, some sand and boulders; is relatively impervious and there is high surface run-off where it forms the surface material.

(d) Loveland formation

Reddish-brown silty clay locally, with some silt and sand in lower part; 10 to about 150 feet thick; overlies glacial drift east of drift border except where removed by post-Loveland, pre-Peorian erosion, and occurs above the Holdrege and Grand Island sands and gravels west of the till border; relatively impervious, except for basal part, which is locally porous.

(e) Peorian loess

Gray to buff, silty clay; 20 to 150 feet or more in thickness, thickening westward; relatively impervious; rests upon Loveland formation or older deposits, generally coextensive with the Loveland formation; forms loess hills and plains and caps many terraces; outcrop area is region of relatively high surface run-off.

(f) Alluvium

Clay, silt, sand, and gravel accumulations in bottom lands of many of the valleys; locally porous; an important aquifer east of drift border because of absence of more reliable water horizons in the underlying mantlerock.

Bedrock Structure

The regional dip of the bedrock is westward, except for an upfold known as the Cambridge Arch, which probably crosses the Platte Valley in the vicinity of North Platte. Bedrock horizons occur at successively greater depths from east to west, except over the Cambridge Arch. For example, the Dakota group is at the surface near Ashland; at Grand Island it occurs at a depth of 905 feet, at Holdrege it is 1,620 feet below the surface, and near Harrisburg it has not been reached at a depth of 5,697 feet.

The regional slope of the bedrock platform is southeastward. This slope is the controlling factor in the southeastward underflow of ground water.

TOPOGRAPHY

The topography of the Platte River Basin shows great diversity. Rugged Rockies, high plateaus, and rolling prairies create wide variations in elevation in the basin which extends from the summit of the Rocky Mountains to the Missouri River.

The basin is divided into two major physiographic divisions, namely; the Rocky Mountain System and the Interior Plains Region. In Nebraska the Platte River Basin occupies chiefly the High Plains section of the Great Plains Province.

The Rocky Mountain region lies chiefly in North-central Colorado, but extends also into western Wyoming and forms the western boundary of the Platte Basin. The eastern slope of the Rocky Mountains consists of a number of ranges of varying heights and lengths having steep, rocky, granite slopes and frequent precipices of ledge rock. The slopes are cut by several snow-fed mountain streams which flow eastward in narrow, steep, deeply-incised rock channels which broaden as the streams emerge abruptly into the gently-sloping plains country. In the higher elevations of the basin, the sides of the drainage channels are usually very precipitous, but there are occasional small narrow valleys with alluvial floors and flatter side slopes. Where disintegration and erosion have taken place sufficiently to form a fairly deep soil, the mountains are covered with forest growth. Occasional snow-capped peaks rise to altitudes of more than 14,000 feet. The land elevation at the foot of the mountains is less than 5,000 feet at many places.

The Great Plains Province extends from the base of the Rocky Mountains in Colorado to the 1,500-foot contour line in eastern Nebraska. The plains vary in elevation from 5,000 feet at the base of the Rocky Mountains to the 1,500-foot contour line in eastern Nebraska.

The portion of the plains near the mountains is usually smooth and more steeply sloping than the plains farther east. Occasional low, flat ridges and rounded buttes are scattered throughout the western portion of the Great Plains. The general slope diminishes toward the east, and the surface becomes more rolling. In some regions there are areas of sand hills and ridges, from 20 to 60 feet in height, which are generally covered with a growth of native grasses. In places where the vegetation has been destroyed, wastes of drifting sand have resulted.

The High Plains, a section of the Great Plains Province, comprises approximately 74 per cent of the total area of Nebraska and is the largest physiographic division occupied by the Platte River Basin. This section extends from the 1,500-foot contour line which approximately marks the eastern boundary of the Great Plains in Nebraska to the base of the Rocky Mountains. The topography is featured by broad, flat tablelands surrounded by escarpments, isolated buttes, occasional level basins depressed below the level of the surrounding country, and areas of typical bad lands which are roughly eroded.

STREAMS OF THE BASIN

The principal streams of the Platte River Basin are the North Platte, the South Platte, and the Platte River proper.

The North Platte River rises in the high mountainous area of northern Colorado on the eastern slope of the Continental Divide and flows northward through Wyoming to a point near Casper, where its course changes to an eastward direction as far as Douglas, Wyoming. From this point, the river flows southeastward throughout the remainder of its course. The North Platte River enters Nebraska 70 miles south of the northwestern corner of the State. The length of the river from its source to its confluence with the South Platte below North Platte, Nebraska is approximately 680 miles. The drainage area comprises 37,379 square miles, of which 6 per cent is in Colorado, 68 per cent in Wyoming, and 26 per cent in Nebraska. The river gradient averages 6 feet per mile. The mean annual precipitation for the North Platte drainage area in Nebraska is 18 inches. The mean annual discharge of this river at its confluence with the South Platte is about 2,499 second-feet.

North Platte Tributaries

The principal tributaries of the North Platte in Wyoming are the Sweetwater and Laramie rivers. The Sweetwater River rises in the western part of Wyoming and flows eastward to its confluence with the North Platte just above the Pathfinder Dam, 45 miles southwest of Casper, Wyoming. The Laramie River rises in northern Colorado and flows in a northward and northeastward direction to join the North Platte near Fort Laramie, Wyoming.

The principal tributaries of the North Platte in Nebraska are Horse, Pumpkin, Blue, and Birdwood creeks.

Horse Creek rises in the Laramie Mountains east of Laramie, Wyoming and flows eastward until it reaches a point near the Nebraska line where it turns sharply and flows northward for 25 miles. It then changes its course again to flow eastward, joining the North Platte River in Nebraska, a short distance east of the Wyoming-Nebraska state line. The stream, 136 miles in length, drains an area of 1,792 square miles of which only a small portion is in Nebraska. The mean annual precipitation is 16 inches and the mean annual discharge of the creek into the North Platte is 73 second-feet.

Pumpkin Creek rises in the western part of Banner County near the Wyoming-Nebraska state line. It flows in a general eastward direction to join the North Platte River a few miles east of Bridgeport, Nebraska. The stream, about 72 miles in length, contributes at its mouth a mean annual discharge of 41 second-feet. The drainage basin is about 55 miles in length and about 18 miles in width and has an area of 998 square miles. The average annual precipitation is approximately 16 inches. This basin has considerable bottom land which is modified by numerous low, hilly divides extending from the bordering regions. Irrigation is practiced on the valley floor. Dry farming and grazing are also carried on quite extensively. During dry years the natural flow of the stream is over-appropriated, therefore, additional irrigation developments without provision for storage would not be considered feasible.

Blue Creek has its source in the sand-hill springs and lakes in northwestern Garden County, Nebraska. The stream follows a general southeastward course for its length of 30 miles. Because of the natural regulation from the sand-hill area, the flow of this stream fluctuates but slightly. The drainage basin, about 30 miles in length and about 7 miles in width, embraces an area of 220 square miles. Blue Creek does not become a live stream until it reaches a point several miles below Crescent Lake. After the stream becomes defined, the flow gradually increases throughout its course reaching considerable volume at its mouth. The average annual precipitation is approximately 18 inches. A major portion of the irrigable area in the Blue Creek basin is now served by existing irrigation developments. Projects with natural flow appropriations from Blue Creek also have contracted with the Lake Water Carrying Company for supplemental water from Crescent Lake. The storage water is released from this natural lake when needed, but during periods of drought the supply available for irrigation is almost negligible. This condition could be remedied by constructing a channel reservoir farther down the stream at a point above the diversion works of the Paisley Canal. The flow at this point averages about 80 second-feet, representing the surface run-off below Crescent Lake. The stream contributes at its mouth a mean annual discharge of 81 second-feet.

Birdwood Creek has its source in the sand-hill springs and marshes of western Arthur County, Nebraska. The stream is 32 miles in length and assumes a general southeastward course. The basin, about 35 miles in length and 20 miles in width, embraces an area of 804 square miles. The average annual precipitation is approximately 19 inches. There are three appropriations on file with rights to divert 111 second-feet of water to irrigate 7,800 acres of land. There are, however, only 5,927 acres being served at the present time. The stream contributes a mean annual discharge at its mouth of approximately 179 second-feet.

South Platte River and Tributaries

The South Platte River has its source on the eastern slope of the Continental Divide in a region which is known as the South Park Area in the central part of Colorado. It flows northeastward entering Nebraska near the southeast corner of Deuel County, then flows slightly north of eastward to its junction with the North Platte River below the city of North Platte. The stream is approximately 450 miles long with a drainage area of 24,030 square miles of which 79 per cent is in Colorado, 8 per cent in Wyoming, and 13 per cent in Nebraska. The principal tributaries are the Cache la Poudre River in Colorado, and Lodgepole Creek in Nebraska. The gradient of the river averages 22 feet per mile and the mean annual precipitation is 16 inches. The mean annual discharge of the South Platte River at its mouth is approximately 413 second-feet.

Cache la Poudre River rises in the northern part of Larimer County, Colorado and flows southeastward to its junction with the South Platte River near Greeley, Colorado. This stream flows in a network of small, shallow channels. It is a live stream sometimes reaching flood stage during the fall, winter, and spring, but its flow dwindles markedly during the summer. The river drains an area of 1,303 square miles with an average gradient of 49 feet per mile for its 125 miles of length. The mean annual precipitation is 16 inches. The river discharges a mean annual flow at its mouth of 148 second-feet.

Lodgepole Creek rises in Albany County in southeastern Wyoming and flows in an eastward direction through Wyoming, Nebraska, and Colorado, to its confluence with the South Platte River a short distance above Julesburg, Colorado. The stream, about 212 miles in length, drains an area of 3,101 square miles and includes much of Kimball and Cheyenne counties and the southwestern part of Deuel County. It enters Nebraska in the middle part of the west edge of Kimball County, traverses Cheyenne County, thence flows southeastward across the southwest corner of Deuel County to join the South Platte River in Colorado a few miles south of the Nebraska state line. The average gradient of this stream is 24 feet per mile. The mean annual precipitation is 17 inches. The Lodgepole Valley traverses a broad tableland region. The basin has an elevation of 5,150 feet at the Wyoming-Nebraska line and 3,510 feet at its mouth. A portion of the area is too rough and sandy to be tilled, but large tracts are suitable for farming. There is a total of 12,920 acres covered by existing irrigation appropriations, however, at the present time, only 8,222 acres are being served. The mean annual discharge of the creek at its mouth is 15 second-feet.

Platte River and Tributaries

The Platte River proper is that stretch of river between the confluence of the North and South Platte rivers near North Platte, Nebraska and the mouth of the river near Plattsmouth, Nebraska. The stream, approximately 310 miles in length, meanders eastward draining an area of 28,791 square miles, all of which lies in Nebraska. The average gradient of the river is six feet per mile. The mean annual precipitation is approximately 23 inches. The drainage from the south side of the Platte River is minor with the exception of Salt Creek which heads in southern Lancaster and eastern Seward counties and empties into the Platte at Ashland, Nebraska. The drainage from the north side of the Platte River is much greater. Tributaries from the north include Wood River, Prairie, Buffalo, and Shell creeks. These tributaries are not of sufficient importance to justify an individual development of each. The river is broad, shallow, and usually loaded with fine sand. In some sections it flows into a single channel, while in other places it spreads out as interlacing streams among sandy islands. The mean annual discharge of the Platte River at its mouth is approximately 6,785 second-feet.

SURFACE WATER

The greater part of the perennial water supply of the Platte River system originates high on the front range of the Rocky Mountains of Colorado and Wyoming. The precipitation generally in the form of snow often reaches 40 inches and is greater than in any other part of the basin. The run-off from the melting snows increases in volume after the middle of April, usually reaching a maximum in early June. The run-off varies with the temperature until the middle of July, after which time it is relatively light. The run-off in Colorado and Wyoming during the winter months is comparatively low. The stream-flow characteristics of the Colorado and Wyoming streams are just the opposite from those in Nebraska, where the greater portion of the annual flow occurs during the fall and winter months. This is due partly to the distortions caused by the regulation of run-off at Pathfinder and Guernsey reservoirs and partly because of the increased return flow in Nebraska, made possible by upstream diversions. At North Platte, Nebraska, only 34 per cent of the total annual flow occurs during the months of May and June as compared with 58 per cent above the Pathfinder Reservoir. The mountain streams flow in deep, rocky channels where little water is lost by percolation, but in the plains area the gradient flattens, the stream beds are broad and shallow and are composed of pervious sand and gravel beds of varying thicknesses which allow the escape of considerable water where low ground-water tables exist. The North Platte River is a perennial stream. The South Platte in Nebraska is a live stream during fall, winter, and spring. The Platte River is intermittent from below North Platte to its junction with the Loup. From there to the Missouri the stream is perennial.

GROUND WATER

The basin in Nebraska occupies 8 ground-water regions referred to as the Western Tablelands (3^1, 3^2, 3^3)*, the Sand-Hill Region (4^1, 4^2), the Southwest Region (7), the Loess Plains (8^1), the Central Region (5), and Northern Drift Region, the Southern Drift Region (11) and the Platte River Lowlands (6).

Within the Western Tablelands water is generally encountered in the Arikaree and Ogallala sandstones at depths between 100 and 300 feet. The Brule clay forms an impervious floor which interrupts downward migration of the ground water. This floor is, in general, quite high above the Platte Valley bottom land. Considerable water is found in the Lodgepole Valley alluvium and in the fractured and jointed Brule clay underlying the alluvium.

There is little surface run-off in the Sand-Hill Region; most of the rainfall percolates into the ground and becomes ground water. The live streams which head in the sand hills are generally amply supplied with water during most of the year. Brule clay and, to a lesser degree, Cretaceous shale form the Pleistocene sands, and dunesand. The depth to water is variable, depending on the topography. Depths as great as 700 to 800 feet are known. The water is medium hard. In some of the lake basins, alkaline water occurs near the surface underlain at depths of 50 feet or more by fresh water.

Thick deposits of loess mantle the Southwest Region, in some places resting upon Pleistocene sands and gravels but more generally on the Ogallala beds. The Pierre shale and Brule clay form the impervious platform. Intake is largely from surface drainage and the small sand-hill areas. The Pleistocene sands and gravels and the Ogallala sandstones furnish the water supply at depths of 100 to 250 feet. Analyses of water from wells at Farnam, Eustis, Elwood, and Smithfield indicate 333.0 to 387.6 parts per million mineralization.

The thick Holdrege and Grand Island sands and gravels occur below the loess cap in the Loess Plains Region and furnish a good supply of water at depths 80 to 150 feet. These sands and gravels are recharged by underflow from the Platte River, and from the sand hills north of the Platte; the direction of underflow is generally southeastward.

Wood River and Shell Creek drain separate areas of the Central Region. This Region is level to hilly and capped with deposits of loess which overlie the Holdrege and Grand Island sands and gravels, which in turn are underlain by the Ogallala beds locally. The Cretaceous shales form the impervious platform in the Wood River drainage, and Pierre shale and Niobrara chalk form the platform in the Shell Creek drainage area. Replenishment is from local rainfall and from the underflow from the sand hills on the north and northwest. An abundant supply of good quality water is generally available at depths of about 100 feet or more. In the valleys proper, however, the depth to water is generally about 50 feet or less. Analyses of water at Eddyville, Miller, and Amherst in the Wood River Valley show a total solid content of 317.4, 328.6, and 360.5 parts per million respectively.

A small area of the Northern Drift Region is included in the Platte River Basin. It is capped by loess which overlies the glacial drift deposits. Most of the wells in this area are either in the alluvium of the bottom lands, in the intertill sands and gravels, or in the subglacial gravels. These water-bearing horizons are dependent upon local rainfall for replenishment. The alluvial deposits are usually readily recharged when rainfall is adequate, but the sands and gravels associated with the till are less accessible to recharge because of the impervious nature of the associated till and loess. A deep source of water supply is available in eastern Platte and western Colfax counties in the Dakota sandstone generally at depths of 500 to 600 feet. The supply is adequate, but the water may be quite highly mineralized. The Dakota sandstone, however, is generally absent in the drift region of south Sarpy County; where present, it is largely drained and not a reliable source of water. Occasionally a small supply of water can be obtained from within the Pennsylvanian bedrock below the drift but this source is unreliable and most wells which are sunk in the bedrock to any considerable depth encounter water of poor quality which is often salty.

The Southern Drift Region is essentially similar to the Northern Drift Region but may be subdivided into three subregions on the basis of presence or absence of certain water-bearing formations. In central and eastern Cass County the Dakota sandstone is absent or very thin. Therefore, the alluvium of the valleys, the intertill, subglacial sands and gravels, and the Pennsylvanian bedrock must be relied upon for a water supply. The Dakota sandstone is present in the subsurface in northwestern Cass, Lancaster, Saunders, Butler, and Seward counties and is available as a source of deep water, increasing in depth westward about 500 to 600 feet in the western part of the drift region. In general, the water of the Dakota sandstone is hard, and locally salty. In northeastern Butler County and northern and northeastern Saunders County the subglacial sands and gravels are well developed and furnish a water supply which is generally reliable. Todd Valley is an old course of the Platte River which has been filled deeply with sands and gravels which are loess capped. Within this lowland area good water is found at depths of 80 to 100 feet.

The Platte Valley Lowlands include the alluvial bottom land and low to high loess-capped terraces of the Platte Valley proper. The central part is underlain by the Holdrege and Grand Island sands and gravels. Similar but generally thinner sands and gravels occur under the bottom lands in the western part. The alluvial deposits in the lower course of the Platte River are generally quite thick. Replenishment is from rainfall and from subsurface drainage from the sand hills. In general, the water supply is abundant and many wells in this region are now being used for irrigation. Underflow is down-valley with the exception of the area between Cozad and a point east of Grand Island where it is southeastward. Water analyses in this region show a variation in total solid content of from 224 to 913.5 parts per million and an average of about 495 parts per million.

AGRICULTURAL AND INDUSTRIAL DEVELOPMENT

The Nebraska section of the Platte River Basin is characterized by predominating types of agricultural and industrial development. They cover a wide diversity of agricultural, mineral, and manufacturing activities. Agriculture is the most valuable industry with manufacturing and mineral production next in importance. The leading crops are grain, hay, sugar beets, and potatoes.

Agriculture

Of the total 19,991 square miles in the drainage area of the Platte River in Nebraska, 736 square miles are under irrigation.

Farming without irrigation is most successfully practiced in the eastern half of Nebraska where the annual rainfall is greater than 20 inches, and becomes more hazardous toward the west as the average annual precipitation diminishes, although irrigation is carried on in all parts of the basin. The principal dry-farm crops are wheat, corn, oats, barley, beans, and hay.

The largest irrigated area is in the North Platte Valley. All crops which are raised by dry-farming methods are also produced under irrigation, which usually more than doubles the yield. Other important irrigated crops of the valley are alfalfa, sugar beets, potatoes, melons, market gardens, and fruits.

The livestock industry is the oldest in Nebraska. Changing conditions, due to settlement and fencing of range land, have brought about a general decrease in livestock raising during the last several decades, but it is still a major industry and furnishes the raw products for a large number of factories and packing plants in the area.

Industry

Industrial development in the Platte River Valley is largely confined to the extreme eastern and western irrigated area. The beet-sugar refining industry produces in excess of 130,000 tons of beet sugar annually. In 1932 Nebraska ranked second among the states of the Nation in sugar production. The manufacturing industry in the eastern portion of the basin is largely confined to the processing of agricultural commodities and the production of building material.

Manufacturing in the Basin

Manufacturing ranks second to agriculture in importance. The majority of the raw materials used are farm products and the factories and packing houses provide markets for a large percentage of the crops raised. The largest and greatest number of factories are located at Denver, Colorado, and Omaha, and Lincoln, Nebraska, although other establishments such as sugar beet factories, flour and grist mills, and those handling dairy products are well scattered over the basin.

The growth of manufacturing was steady up until 1914. Manufacturing increased rapidly during the World War, reaching the peak production in 1919. In Nebraska, slaughtering and meat packing rank first in importance with flour and grist mills, beet sugar, dairy products, railway construction shops, printing, foundries, and machine shops following in the order named. Manufacturing in the basin especially for those industries using raw materials derived from agricultural products, is expected to grow with the increase in population and area farmed. The industrial section of Nebraska is nearer the large markets of the country and has greater agricultural resources from which to draw than the portion of the basin farther west, but is somewhat handicapped by lack of fuel which must be shipped in from the neighboring states. Colorado and Wyoming have large fuel reserves, but their sources of agricultural raw materials are somewhat limited because of the lack of available water supply for expansion of the irrigated area.

The Platte River Basin in Nebraska is primarily an agricultural area. More than 95 per cent of the land area is in farms. Approximately 44 per cent is in crops, 53 per cent in permanent pasture and wild hay, and 3 per cent is in other land use.

Approximately 50 per cent of the crop land is normally planted to corn,36 per cent to small grains, 8 per cent to tame hay, and 6 per cent to all other crops. Crop production varies from relatively intensive production of corn and other feed grains in the eastern part of the basin to extensive production in the range areas of the sand hills to the west. The eastern part of the basin is devoted to the production of corn, alfalfa, hogs, and cattle, with wheat as the principal cash crop. Sugar beets and potatoes are important crops in the irrigated sections of the western part of the basin.

The production of livestock ranges from intensive in the eastern portion to extensive methods and practices in the western portion of the basin and the Sand Hills. Hogs are the most important livestock of the entire area. Cattle rank second. Sheep are relatively more important in the western part than in the eastern part of the basin. Much of the corn,oats, and other feed grains are marketed through livestock.

Farm Size and Tenancy

During the period from 1930 to 1935 the number of farms under 3 acres in size decreased while the number of farms from 3 to 99 acres increased. There was practically no change in the number having from 100 to 174 acres. This latter group is the most common in size,constituting 31 per cent of all the farms in 1935. Farms averaging from 100 to 499 acres constituted 70 per cent of all farms. Excluding the irrigated sections, the farms in the upper basin are much larger than those of the lower basin. A number of farms in the upper basin average from 500 to 999 acres, some have a land area of more than a thousand acres.

Slightly less than 50 per cent of the farms in the basin were operated by tenants in 1935. In some counties the proportion of farm tenancy was over 55 per cent. The increases in farms operated by tenants have been fairly steady during the past 25 years.

FARM INCOME

Seventy-one per cent of the income from Nebraska agriculture for the period from 1923 to 1934 was from the sale of livestock and livestock products and 29 per cent from the sale of crops. Nearly 74 per cent of the income from livestock was from the sale of beef cattle and hogs. Seventy-one per cent of the income from crops was from the sale of wheat and corn. In 1933 the benefit payments on corn constituted 3.2 per cent and those on livestock 1.3 per cent of the total income.In 1934 the benefit payments on crops constituted 9.9 per cent of the total income and payments on livestock amounted to 7.8 per cent. Although the figures above are given for the State as a whole, they are applicable to the Platte River basin in general. The sale of sugar beets and potatoes provide the western irrigated portions of the basin with the largest cash income, although sheep and cattle are important cash crops in some areas where feed is available. In the eastern part of the basin hogs and cattle provide much of the farm income and wheat is the principal cash crop, though some oats and barley are sold.

WATER SUPPLY. CONTROL, AND UTILIZATION

HEADWATERS TO NORTHGATE SECTION

The North Platte River outflow from Colorado averages 370,000 acre-feet annually after having served 120,000 acres of native hay land in North Park. The headwaters of the 2 Wyoming streams, Big Creek and Encampment River, lie in Colorado and normally produce approximately 120,000 acre-feet of water per year. By adding 120,000 acre-feet to the run-off at the Colorado-Wyoming line, the river gives a total outflow from Colorado of 490,000 acre-feet. It is estimated that North Park irrigation requires 1 acre-foot per acre per year, or 120,000 acre-feet for this area. Two small transmontane canals divert approximately 8,000 acre-feet annually from the headwaters of Michigan Creek, in North Park, to the Poudre Basin. The average yearly run-off of the North Platte River in Colorado, including the Laramie River, aggregates 610,000 acre-feet. If the proposed Colorado Transmontane Diversion project to the Cache la Poudre River is constructed, an additional 100,000 to 200,000 acre-feet per year will be diverted from the North Platte River Basin and the flow of the river will be reduced a like amount.

The proposed Transmontane Diversion project from North Park to Poudre Basin will never be constructed unless water is imported from the Colorado River in like amount and exchanged for North Platte water.Even this is unlikely as the cost is prohibitive. The Grand Lake Diversion project (320,000 acre-feet annually), soon to be constructed, will furnish supplemental water to the Poudre Basin and has displaced the proposed North Park Transmontane project. The Seminoe-Casper-Alcova project will absorb any surplus water from North Park.

NORTHGATE TO SARATOGA SECTION

Above the Saratoga station, about 40 miles downstream from Northgate, the mean annual run-off is 890,000 acre-feet with an increment to the North Platte River of 520,000 acre-feet. Of this amount, 120,000 acre-feet originates in Colorado, leaving 400,000 acre-feet of the flow originating in Wyoming above Saratoga. Irrigation in this section of the North Platte River Basin is largely confined to meadow lands along the tributary streams. If the proposed Saratoga and Sierra Madre projects are constructed with diversion works in this section, the flow of the river will be reduced to about 50,000 acre-feet annually.

SARATOGA TO PATHFINDER DAM SECTION

At the station above Pathfinder Reservoir, located 135 miles downstream from Saratoga, the mean annual run-off is 1,300,000 acre-feet, with an increment of 410,000 acre-feet. Medicine Bow and Sweetwater rivers are the principal tributaries entering this section. The Pathfinder Reservoir, with a capacity of 1,070,000 acre-feet, was completed in 1909. Since that time the downstream river flow has been greatly changed due to the impoundage and release of water at the reservoir. The reservoir when full has a water surface of 23,000 acres. During 24 years of operation, with carryover storage, the average annual evaporation losses amounted to 55,000 acre-feet. The irrigated lands in this river section are largely confined to native hay.

The Rock River project in the Medicine Bow River Basin has not been completed. When put into operation this project will ultimately reduce the river flow. The Seminoe Reservoir now under construction, will provide 1,020,000 acre-feet of storage. The estimated cost of the storage and power feature is $8,360,000. The reservoir with a surface area of 23,000 acres will have an annual evaporation loss estimated at 50,000 acre-feet. By subtracting the Pathfinder and Seminoe Reservoir losses, and considering the reduction of flow of the North Platte if the proposed Saratoga and Medicine Bow projects are constructed and the Sierra Madre project completed, the annual flow available to the lower river will be reduced to about 1,120,000 acre-feet.

PATHFINDER DAM TO WHALEN DIVERSION DAM SECTION

In the North Platte River section between Pathfinder Dam and the Whalen Diversion Dam, a distance of 200 miles, the river increment averages 280,000 acre-feet, varying from 100,000 to 580,000 acre-feet. Ordinarily, 180,000 acre-feet of this inflow occurs during the non-irrigation season, leaving 100,000 acre-feet available for irrigation if it is adequately controlled at the Guernsey Reservoir.

The Guernsey Reservoir located 10 miles above the Whalen Diversion Dam, was completed in 1927. While the channel reservoir originally held 72,700 acre-feet, silt deposits have reduced the capacity to 57,000 acre-feet. Of this amount, 47,000 acre-feet are live storage, although the storage available for irrigation is considerably less, due to the retention of water necessary for an operating head at the Guernsey Power Plant. At present, the storage capacity available for river regulation with a view to irrigation is approximately 40,000 acre-feet. Thus, it is clear that the efficiency of the reservoir for irrigation is greatly reduced. The capacity of this reservoir is inadequate to control the surplus run-off of high water years from tributaries entering the 200-mile section of the North Platte River between Pathfinder and Guernsey. It is estimated that silt encroachments will reduce the active capacity to about 25,000 acre-feet in 15 years, thereby curtailing considerably the benefits to irrigation.

Approximately 20,000 acres of land are irrigated directly from the North Platte River in this 200-mile section. The United States Reclamation Service has made engineering studies and plans for the reclamation of about 35,000 acres along the river, east of Casper, by the operation of pumping plants. With cheap power available from the Seminoe project, this proposal may be revived.

The Casper-Alcova Canal, known also as the Kendrick Irrigation System, now under construction, will divert water from the North Platte River a short distance below the Pathfinder Dam. The estimated cost of the irrigation features is $11,620,000. The Alcova channel-reservoir created by the diversion dam will have an annual evaporation loss of 7,000 acre-feet. The estimated annual requirement for the 66,000 acres comprising the Casper-Alcova project is 230,000 acre-feet headgate diversion, of which 110,000 acre-feet will be consumed. Because of the priority of this project, only the peak flows will be available for direct flow diversion, and the irrigation requirements must be supplied primarily by water stored in the Seminoe Reservoir. As a result of the operation of the Seminoe-Casper-Alcova project, the new burden to be imposed upon the North Platte River will approximate 160,000 acre-feet annually.

WHALEN TO BRIDGEPORT SECTION

The Whalen-Bridgeport section constitutes a 100-mile interstate river stretch and is one of the most highly developed agricultural districts in the Platte River Basin. Agriculture dominates the area, although stock raising continues to be an important industry. Favorable soils, climate, and marketing facilities permit a wide diversification in crop production. The diversion works for the large government canals are at the Whalen Diversion Dam at the upper portion of the section. Two canals, the Interstate, on the north side of the river, with a capacity of 2,200 second-feet, and the Fort Laramie, on the south side of the river, with a capacity of 1,600 second-feet, serve 220,000 acres. Approximately 25 per cent of this land lies in Wyoming and 75 per cent in Nebraska. The mean annual diversion is approximately 800,000 acre-feet.

The Tri-State Canal, with a capacity of 1,200 second-feet, diverts annually 300,000 acre-feet of water at a point about 45 miles downstream from Whalen and 1 mile below the Wyoming-Nebraska line, to serve approximately 83,000 acres on the north side of the North Platte River. Numerous other canals of considerable size also divert a large volume of water from the river in this section. Headgate requirements in this section approximate 1,300,000 acre-feet.

The average annual flow recorded above the Whalen station is 1,611,000 acre-feet. Normal run-off under present conditions of irrigation development is 1,570,000 acre-feet. Not all of this water is available to the irrigators below, because of the lack of equalization facilities. As a result of the operation of the Sutherland and Tri-County Power and Irrigation projects on the lower North Platte and Platte rivers, the North Platte River flow will be completely controlled and used.

The Laramie River is the principal tributary entering the Platte River in the Whalen to Bridgeport section. Contributions from the Laramie River during the irrigation season are very erratic, varying from 36,000 to 398,000 acre-feet and averaging about 150,000 acre-feet. The Laramie River flow is not dependable in this section, more than one-half of the annual flow occurring during the non-irrigation season. Most of the run-off of the Laramie River is consumed within its own drainage basin. However, according to an interstate decree by the United States Supreme Court, Colorado is permitted to divert, by way of the transmontane canals, 38,000 acre-feet per year, if obtainable, from the Laramie River to the Poudre River Basin. The run-off of the Laramie River is largely controlled by the Wheatland No. 2 channel-reservoir (a unit of the Wheatland project) which has a capacity of 100,000 acre-feet, and by the Lake Hattie Reservoir which has a capacity of 60,000 acre-feet. Wheatland Reservoir No. 3 with a capacity of 90,000 acre-feet has just been completed and will conserve all surplus up-river water.

Approximately 400,000 acres are irrigated from the North Platte River in the Whalen-Bridgeport section. This contiguous area, served by 3 large and many smaller canals, contributes an enormous return flow to the river. Three-hundred miles of drains have been constructed to serve this area. Based on the 1931-1934 records, the measured return flow migrating to the river in this section amounts to approximately 935,000 acre-feet, of which 584,000 acre-feet are visible and 351,000 are invisible. Under normal conditions, the return flows which enter this section, plus tributary inflows between Bridgeport and North Platte and a relatively small amount of up-river water, supply the direct-flow rights east of Mitchell, 14 miles below the Wyoming-Nebraska line. Approximately 40 per cent of the return-flow water entering the North Platte River in this section is not available during the irrigation season. Formerly this winter return flow passed down the river unused except for power purposes. Now, lower Nebraska irrigation and power projects are storing, diverting, and using such water.

BRIDGEPORT TO NORTH PLATTE SECTION

The Bridgeport-North Platte River section is 135 miles in length. The mean annual discharge at Bridgeport, present conditions of up-river development, is 1,470,000 acre-feet. The early operation of Wyoming projects now under construction, and increased demands of adjudicated and inchoate water rights in Colorado and Wyoming will deplete up-river flow and reduce river outflow at Bridgeport a like amount. The average yearly up-river depletion is estimated at 350,000 acre-feet with Bridgeport average yearly outflow forecast at 1,120,000 acre-feet.

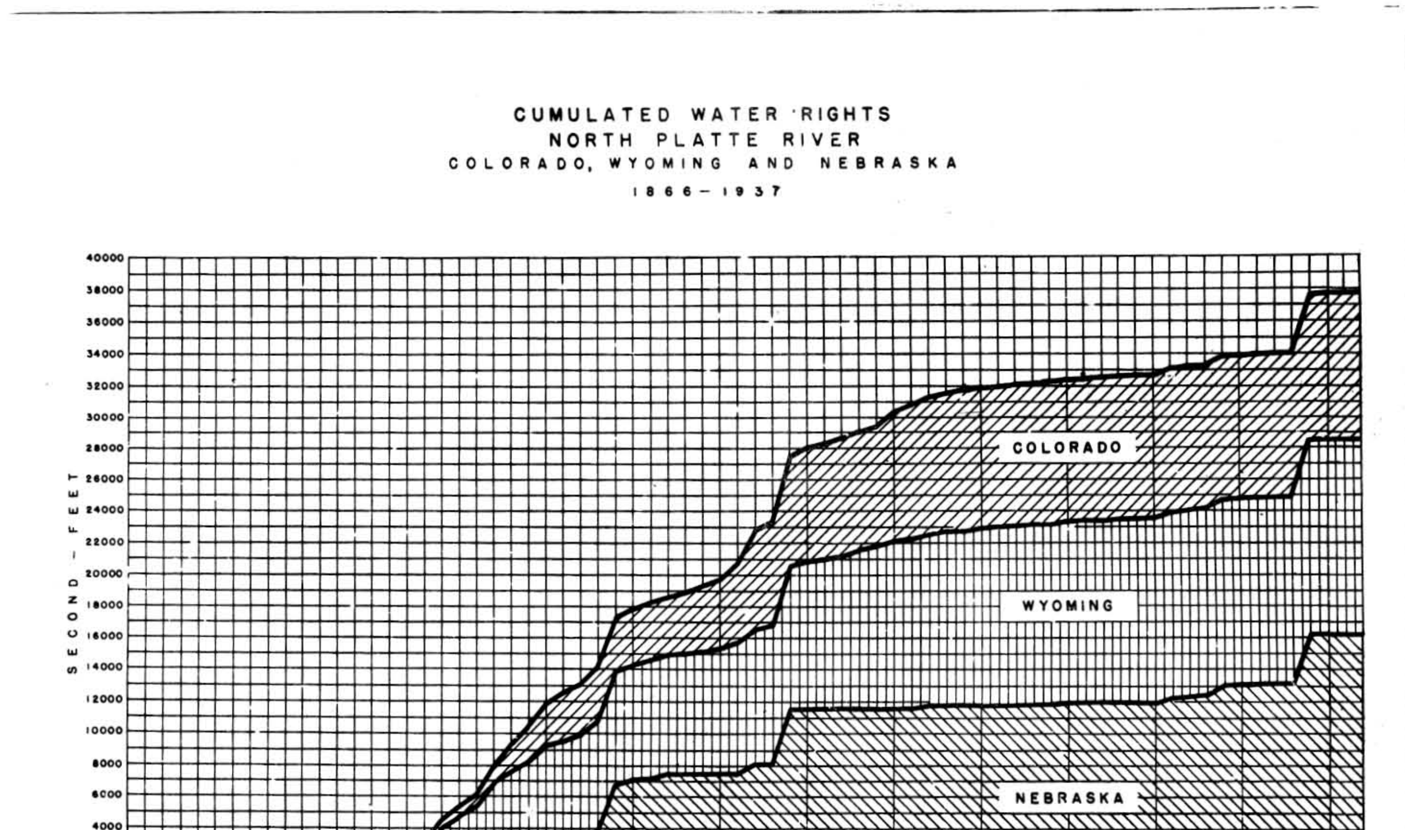
Considerable water enters the North Platte River between Bridgeport and North Platte. The chief source is from the Sand Hills on the north, through surface tributaries and by deep percolation. The amount of return flow from irrigation is negligible. The net section inflow (after depletion by irrigation uses on 90,000 acres of irrigated land and by river channel evaporation losses of 100,000 acre-feet) approximates 450,000 acre-feet per annum. The principal surface streams in this section are the Blue and Birdwood creeks. These streams, together with less important tributaries, contribute to the North Platte approximately 300,000 acre-feet of water per year, leaving large invisible accretions from this area. Approximately 50 per cent of the annual flow enters the river from May to September and is available for direct irrigation. Of the total return flow entering the river, about 60 per cent occurs during the irrigation season.

Irrigation in this section has been somewhat restricted by the less favorable water-supply situation and by the lack of extensive areas readily irrigable from the main river. Stockraising is an important industry. A large percentage of farm activity on the tributaries is ranching. Where water is available for irrigation, the favorable soil and climatic conditions enable a wide diversification in crops. During years of high precipitation, considerable diversification and good yields are attained without irrigation.

Wide changes in river flow are imminent in the lower part of this river section, due to early completion and operation of diversion and storage units at 2 large power and irrigation projects located near the town of North Platte and in the North Platte-Overton River section.

The Platte Valley Public Power and Irrigation District system is fed by a 2,000 second-feet supply canal diverting from the North Platte River at Keystone. Winter river flow will be stored in the Sutherland off-channel reservoir of 175,000 acre-feet capacity and released when needed to produce power and supply supplemental irrigation water to projects east of North Platte.

A large channel reservoir, capacity 2,000,000 acre-feet, is under construction in the North Platte River 50 miles upstream from the town of North Platte by the Central Nebraska Public Power and Irrigation District. When completed all surplus river flow will be equalized and used.



NORTH PLATTE TO GRAND ISLAND SECTION

The North Platte-Grand Island section is 140 miles in length. A considerable part of the run-off originating in this stretch enters the Platte River near the lower end of the section and is not available for diversions above Lexington. Irrigation projects depend largely on the up-river flow to supply water requirements.

The principal tributary to the North Platte in this section is the South Platte River. However, no dependable flow is received from this stream, approximately 85 per cent of it is consumed by irrigation within the South Platte River Basin. The South Platte River Interstate Compact imposed legal limitation on the quantities of flow required to be passed into Nebraska.

During the 10-year period, 1925-1934, the average gross annual gain between North Platte and Overton was 200,000 acre-feet above the evaporation losses and the water used to irrigate 100,000 acres. During the years of low flow such as 1932-1935, the Platte River flow at Overton was from 100,000 to 200,000 acre-feet less than at the North Platte station. Of the mean annual flow slightly in excess of 2,000,000 acre-feet which passes Overton, approximately 50 percent is non-irrigation season flow.

Upon completion and operation of the Platte Valley Public Power and Irrigation project and Central Nebraska Public Power and Irrigation project up-river run-off will be completely conserved; first used for power generation and reused for irrigation of land in the Platte Valley between North Platte and Grand Island. The Platte River will then become a live stream, throughout the year, due to equalization through power plants and return-flow water from the large canal systems and from the irrigated lands east of North Platte. However, increased consumption of water, by new storage reservoirs and large areas of irrigated land, will reduce annual river outflow at Grand Island to approximately 1,000,000 acre-feet per annum.

Water reaching Grand Island will be the residue from several reuses in Colorado, Wyoming, and Nebraska. Eighty per cent of the Platte River Basin run-off above Grand Island will be consumed in 10 years.

Irrigation developments in the North Platte to Grand Island section closely reflect the ever-changing climatic conditions common to the border zone between arid and humid regions. During that part of the cycle when high precipitation occurs, excellent yields of diversified crops are produced by dry-farming methods and, in suitable localities even without the practice of summer fallowing. Conversely, in unfavorable years or during the cycle of low precipitation, unirrigated crops have been either partial or total failures, and even in dry-farmed lands have yielded but a fraction of normal. Prior to the recently completed irrigation projects, all irrigation development has been by private enterprise, both through cooperative efforts and through concerns selling water at a profit.

GRAND ISLAND TO MISSOURI RIVER SECTION

The Grand Island-Missouri River section of the Platte is 190 miles in length. It seems fairly well established that the rather infrequent droughts and periods of subnormal precipitation do not warrant the expense of irrigation facilities in this section. The Platte River is an intermittent stream from Grand Island to the mouth of the Loup River near Columbus. In years of low run-off the bed in this portion of the river is a dry channel for several months during the irrigation season. A considerable volume of water is contributed by the Loup River near Columbus and the Elkhorn River near Ashland. The Platte River is perennial below the mouth of the Loup River. The mean annual discharge at the mouth of the Platte is approximately 5,000,000 acre-feet, 60 per cent of the discharge occurring during the non-irrigation season.

INTERSTATE PROBLEMS-NORTH PLATTE RIVER BASIN

Colorado, Wyoming, and Nebraska are the states most vitally interested in the North Platte River, since this stream traverses, drains, and serves each of them. The waters of the North Platte River are widely used for irrigation. The average yearly water production of the North Platte Basin is 3,300,000 acre-feet, of which 50 per cent is now consumed by irrigation.

Existing uses of North Platte water are primarily for irrigation, and involve water rights in the 3 states. Definite shortage of water in Nebraska exists during the late summer months of normal years of flow, and there has been a pronounced shortage in recent low-water years. Extensive power and irrigation projects now under construction in the Wyoming and Nebraska portions of the basin, will equalize and control up-river flows of high-water years and impose additional large demands on river flow.

As far back as 1926, negotiations were invoked to reach a solution of the North Platte River interstate controversy by compact. Negotiations were ineffective. During the recent years of low-river flow, shortage of water for old irrigation appropriations in Nebraska has become pronounced. In October 1934, Nebraska initiated a suit against Wyoming in the United States Supreme Court, asking for an interstate administration of the North Platte River priorities and an equitable apportionment of its water. Subsequently, Colorado became a party to the suit. Taking of evidence began at Lincoln, Nebraska during 1936, and will continue at intervals until all data are presented by the 3 interested states.

MEASURED VISIBLE RETURN FLOW

The development of irrigation often results in the establishment of perennial streams in water courses which, prior to the development, have carried only intermittent flow. This phenomenon has been manifest in a marked degree in the North Platte Valley between Whalen and Bridgeport, and between Bridgeport and North Platte. Additional perennial streams have been established by the construction of drainage ditches made necessary by the rise of the water table. In some cases it has been possible to divert water from such streams into canals which formerly procured their supply from the river and thus reduce the draft on the river at the point of former diversion.

There are three sources from which visible return flow is derived: (1) Surface run-off from precipitation and waste from irrigated fields; (2) percolation of waters of the drainage area which have been forced to the surface by the rise in the water table; (3) waste water from canals and laterals.

The actual depletion by irrigation operations of the water supply of a stream depends entirely upon the consumptive use and losses incurred by increased evaporation which is caused by the development of increased areas of surface water. A large proportion of the return flow may be lost by deep percolation from a particular valley or drainage system, but such loss is a gain for another area and does not represent an actual loss in the sense of depletion of the regional supply.

Net diversion requirements or diversion duties are affected mainly by soil mechanics, in that the quantity of water required to serve as a vehicle for the transportation of consumptive use requirements will be determined by the permeability of the soils of which canal banks and irrigated fields are composed. The requirements are affected to a smaller degree by surface configuration of the irrigated area and by rate of evaporation.

Consumptive use is also affected by soil mechanics and by a number of additional factors. The major factors are: (1) evaporation from water surfaces and soils, and (2) transpiration requirements of plants.

Diversion requirements may be reduced by reducing the permeability of canals and laterals, and by improving the surface of the ground through increased skill on the part of the irrigator. The extent to which any reduction may be possible is therefore dependent upon economical consideration and improved technique of irrigation. Excessive diversions tend to increase consumptive use by additional evaporation from irrigated fields and seeped lands.

Reuse may be made of all return-flow waters which appear as surface flow during the irrigation season. Two solutions for increasing the net return flow that may be made available for reuse during the irrigation season are: (1) The construction of drainage systems to reduce the time required for the percolating water to appear at the surface. This tends also to reduce consumptive use by reducing evaporation incident to a high water table and to diminish the interval between original diversion and availability as return flow. (2) The construction of reservoirs to retain the return flow which becomes available between irrigation seasons.

Diversion duty is generally low in the North Platte Valley and generally high in the South Platte area. Average diversions for the years 1917 to 1926 inclusive, on the government projects on the North Platte are reported as 4.55 acre-feet per acre. Of this amount 2.23 acre-feet, or 49 per cent was delivered to farms; .36 acre-feet or 8 per cent was wasted and 1.96 or 43 per cent was lost in transportation through canal systems. The diversion duty for the irrigated district of the South Platte between Denver and Julesburg was 2.38 acre-feet per acre.

The higher duty of the South Platte may be partially accounted for by the following factors: (1) The greater length of time that irrigation has been practiced has resulted in reduced transportation losses in canals; increased skill of irrigators; better preparation of land surfaces for irrigation purposes; (2) The high value of irrigation water has made necessary its economic use.

The objective in the complete utilization of water resources for irrigation is to reduce diversion duty to an amount equal to the consumptive use plus the smallest possible quantity required to convey the necessary water to the irrigated fields. The latter amount will comprise the return flow to the stream. Due to the factors named and to differences in soil mechanics and climatic conditions, percentage return flow determined for a given district is in no way applicable to another district.

FLOODS

The flow of the North Platte has a very minor effect upon floods and irrigation on the lower rivers. The flows of both the North and the South Platte rivers are well controlled by reservoir storage for irrigation and domestic uses. The flow from the drainage area below the reservoirs is further controlled by the well-distributed return flow from irrigation operations. The effect of the regulation is manifest in the channel of the North Platte by the rapid increase of vegetated islands. In previous years the spring floods served to change the position of the sand and gravel bars and to destroy vegetation that had taken root upon them. The reduced flows have served to stabilize the position of the bars and to make it possible for willows and other vegetation to develop. The effect of the return flow coupled with storage regulation is to afford a better distribution of the flow of the river and to reduce the small effect the flow of the river previously had upon floods in the lower river.

In considering the relation between navigation and irrigation, a distinction must be made at all times between the two possible sources of water required for irrigation. When a direct diversion is made from the Platte River or from any of its tributaries for the purpose of irrigating land, the natural flow of the river is diminished. When such direct diversion is made during any month of the irrigation season except April and June, it means that the discharge is reduced during the normal low-water flow of the navigation season on the Missouri River. In the Missouri River Basin the low-water months during the navigation season are March, May, July, August, September, October, and November. Therefore, any diversion made directly from the low-water flow of a tributary during any or all of the above months necessarily operates to reduce the low-water flow of the parent stream and is accordingly detrimental to the interests of navigation. The small percentage of return flow that may occur during the above months of low-water flow on the navigable section of the Missouri River cannot at any time compensate for the damage to the navigable capacity of the Missouri River during the period that substantial increase in low-water flow is desirable. The stage of the Missouri River at its mouth on the last day of a particular month reflects the influence of the water discharged by certain headwater tributaries during the first day of that month.

The utilization for irrigation purposes of water that has been stored during the high-water season is an entirely different matter. During the months of April and June there is normally a larger volume of water in the Missouri River than is required in the interest of navigation. During these 2 months it would be possible to store a very large percentage of the total run-off of the entire Missouri River Basin, without producing adverse results insofar as the navigable section of the main stream are concerned. It is entirely possible that the diminished volume of flood flows effected by storage (and subsequent use) of the surplus water during the above months would prove beneficial rather than harmful to the interests of navigation.

Water stored during these 2 months could be used for irrigation, and the return flow resulting therefrom would increase the normal low-water flow of the Missouri River during the months of March, May, July, August, September, October, and November, when a larger discharge may at times be needed for navigation. But even under this ideal scheme for the utilization of surplus waters for irrigation purposes, there would be an increment of water lost because of augmented return flow during the months of December, January, and February, when there is no navigation on the Missouri River or on the Middle Mississippi River. However, the small amount of water lost because of return flow during these 3 months would not be of great importance compared to the water which is, under existing conditions, lost during the months of April and June because of the high stages which occur during these months.

Irrigation that is accomplished by the use of the waters, stored during the high-water periods in April and June of each year, or during the months of December, January, and February when there is no navigation on the Missouri River, is beneficial to navigation in that the resulting return flow augments the volume of the parent stream when navigation requires a discharge in excess of that which occasionally occurs during periods of severe drought.

IRRIGATION DEVELOPMENT

EARLY HISTORY

Throughout the history of the Platte River Basin, water for irrigation has been considered one of the most important natural resources. Irrigation constitutes the outstanding economic feature in the Platte River Basin, greatly exceeding power, flood control, and navigation in both existing importance and potential development.

Irrigation practices began in the Nebraska portion of the Platte River Basin in the early sixties and gradually extended westward into Colorado and Wyoming with permanent settlement. An irrigation ditch was constructed on the South Platte River as early as 1859. Small, individual enterprises were constructed along the tributary streams in the late sixties and seventies, and in the early eighties a number of canals were constructed along the main stream. Developments since have spread over practically all the easily irrigated land along the principal water courses.

Irrigation gradually increased in Nebraska from approximately 12,000 acres in 1890 to nearly a million acres at the present time. Irrigation has been extensively developed throughout both the North and South Platte valleys, and has extended eastward along the main Platte River. Scotts Bluff County in western Nebraska has approximately 200,000 acres of irrigated land which is equal to 20 per cent of the total irrigated acreage of the State.

The House Document Number 197, published in 1934 gives the total irrigated acreage in the Platte River Basin as 2,452,950 or 12.7 per cent of the total irrigated area in the United States.

FACTORS AFFECTING IRRIGATION PRACTICES

Wide diversity of geology, topography, soils, land use, climate, and economic conditions in the basin affect irrigation practices and create problems of varying complexity and magnitude. The principal irrigated districts on the North and South Platte rivers lie between the 101st and 105th meridians of longitude and the 39th and 43rd parallels of latitude. The elevation of irrigated lands above mean sea level ranges from 2,800 feet at North Platte, Nebraska to 4,200 feet at Fort Laramie, Wyoming, in the North Platte Valley and to 5,500 feet at Boulder, Colorado, in the South Platte Valley. The average gradient of the North Platte Valley is about 7 feet per mile, and the South Platte Valley 8 feet per mile. The irrigable area along the North Platte lies close to the river. About 60 per cent occupies the flood plains, and 40 per cent the higher terraces. Conditions are similar on the South Platte except that the principal irrigation development in the upper reaches of the stream is along the tributaries. The lands along both rivers are, in general, well adapted to irrigation in that they have favorable slopes and good subsurface drainage.

There is also a wide variety of soils in the Platte River Basin. In the North Platte Basin, the soils tend toward clays, while those in the South Platte River Basin are predominately sand to sandy loams. Eastward as the 2 streams merge, the soils are generally sandy, gradually changing to fertile silt, clay loams, and the loessal soils of the Missouri Basin.

The climate varies from arid in most of the western portion through semiarid to nearly humid in the western portion of the basin. In the high, arid, western portion of the basin where precipitation is 10 inches or less, grazing and lumbering predominate. In the plains section much sod remains unbroken and supports extensive livestock operations. In the semiarid areas extensive small grain and general dry-farming are practiced. In western Nebraska agriculture cannot be carried on successfully without the use of supplemental water. In the large, concentrated, irrigation areas of central and western Nebraska profitable crops of sugar beets, potatoes, alfalfa, and small grains are produced. Farming conditions improve eastward where precipitation approaches or exceeds 30 inches, until intensive and stable farming become general. However, there are some years of deficient moisture in every part of the State.

There are important and variable evaporation losses from both the North and South Platte River channels. The channels are, in general, very wide, and the depth of water is quite shallow even during periods of maximum discharge. During periods of low flow a great width of sandy channel is exposed. Since the water table lies close to the surface, a considerable quantity of water is brought to the surface by capillarity and then evaporated.

The mean annual relative humidity of the irrigated sections on the North and South Platte rivers is less than 65 per cent.

The average wind velocity over the region is relatively high, probably ranging from 9 to 12 miles per hour with a maximum of over 75 miles per hour.

There is sunshine 65 per cent of the time.

A wide variety of both existing and potential irrigation development is represented over the Platte River Basin which attempts to meet the individual requirements peculiar to each section. Numerous systems have been constructed ranging in size from small individual ditches to large canals built by cooperative organizations and irrigation companies.

CLIMATIC CONDITIONS AND IRRIGATION DEVELOPMENT

The interest and development of irrigation in Nebraska were directly related to the drought periods of the 1860's, the 1890's and the 1930's, and to an increasing demand for farm products. Concentrated cooperative efforts began in this State following the severe drought period of 1894 and 1895. Three irrigation districts were formed at that time. The early efforts of individual landowners were followed by cooperative undertakings as the need for larger systems became apparent. Irrigation companies both for cooperative development and promotional purposes were organized in the eighties. Considerable speculation in irrigation property occurred during the drought of 1890 to 1894. Projects were promoted with little or no regard for the adequacy of their water supply or their economic feasibility. As a result, irrigation development received a severe setback that lasted for nearly 10 years.

Most of the developments under irrigation companies were promoted primarily for the sale of land. Water rights were contracted to the land purchasers under a 10-year payment plan that provided for the ownership and operation of the irrigation system passing to the purchasers at the expiration of the period. In most cases, the canals were constructed to serve more land than the available water supply warranted, and many legal complications and financial difficulties ensued. When the systems were turned over to the land owners at the end of the contract period mutual organizations or irrigation districts were formed for the purpose of administering the affairs of the projects.

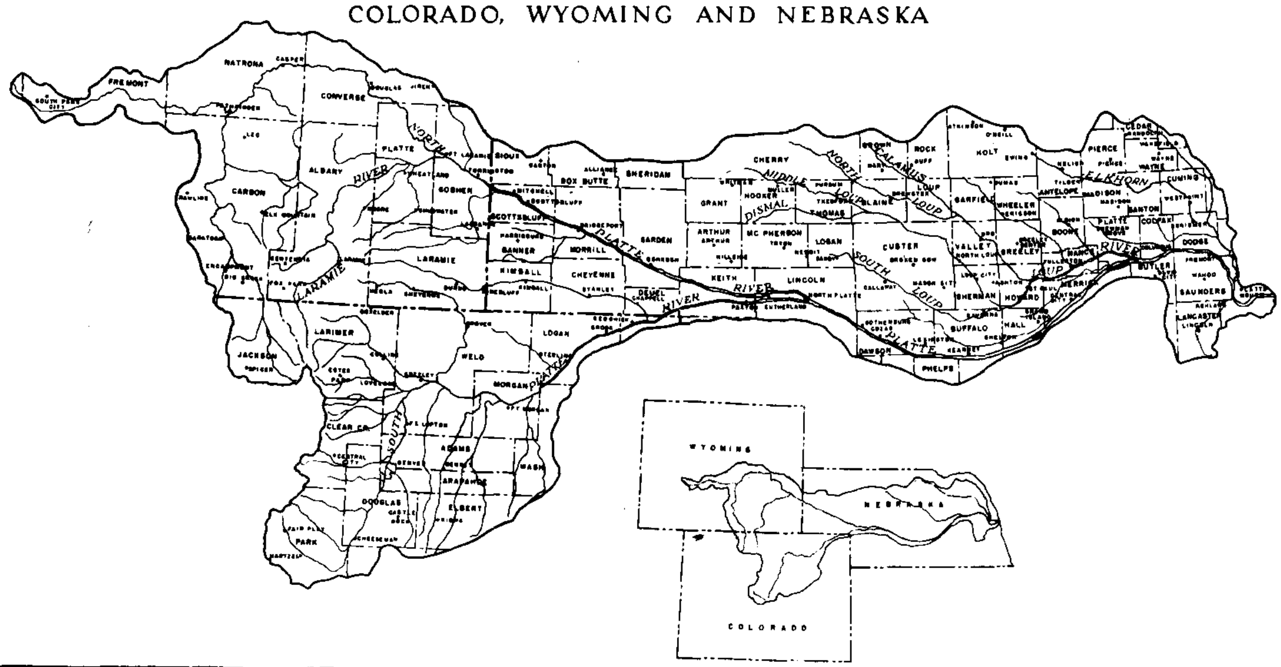
During the early development of irrigation, there was no stream regulation, and the river became very low in the late summer and fall. When storage reservoirs were constructed, all of the projects on the main stream having rights therein were assured an ample water supply. This was also true of practically all land on the tributary streams having storage systems. In dry years, some of the junior rights experienced partial shortages, the amounts varying with the dates of priority. In years of extreme low run-off, even the oldest rights are seriously affected while the desirability of additional storage is recognized in many cases. The infrequency of extreme years has caused landowners to accept occasional crop losses rather than the burden of stored water expense.

Periods of wet years caused the farmers to discontinue irrigation. Canals fell into disuse with ultimate abandonment. A revival of irrigation took place about 1914 which resulted from several causes. Droughts had occurred in 1910, 1911, and 1914. There was also an increase in farm prices.

FLOW OF THE PLATTE RIVER

Nearly all of the perennial supply of the Platte River and its tributaries originates in the Rocky Mountains of Colorado and Wyoming. Run-off from the mountain area starts early in the spring with the melting snow and increases with the late spring rains to a high flood stage usually during the latter part of May. A gradual decrease then occurs until about July 15th after which the discharges drop rapidly and low stages usually continue throughout the irrigation season. The water of the river loses itself in the wide, sandy river bed between Kearney and the mouth of the Loup River, and the river bed becomes practically dry in late summer. Irrigated lands are flooded heavily during the high-water period. The excessive use of water during the irrigation season has re-

PLATTE RIVER BASIN
INCLUDING NORTH PLATTE,
SOUTH PLATTE, LOUP AND
ELKHORN RIVER BASINS
COLORADO, WYOMING AND NEBRASKA



sulted in large areas of seeped and swampy lands and with meadows that do not dry out until late in the year.

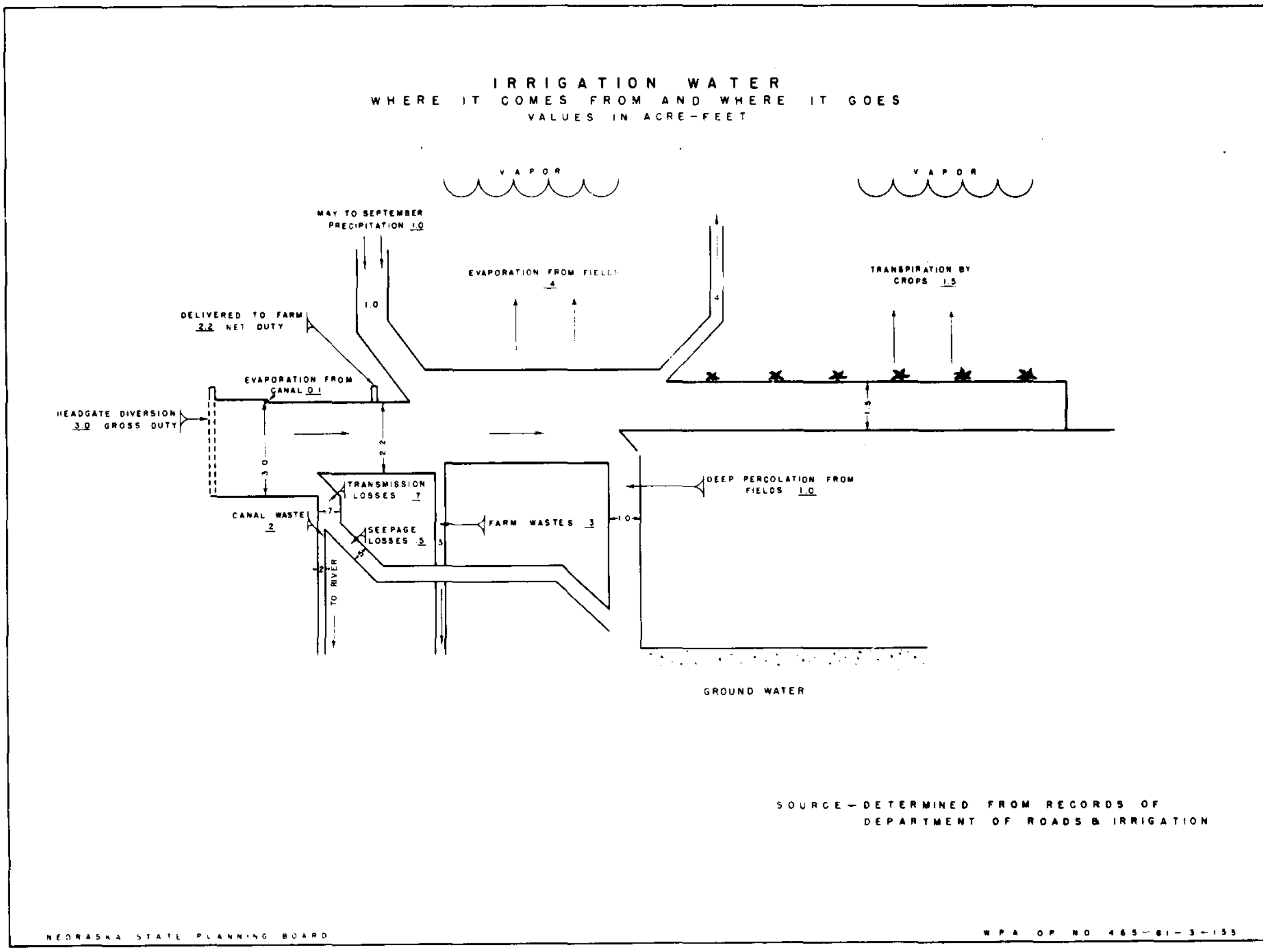
RETURN FLOW AND STREAM FLOW DEPLETION

Return flow and stream flow depletion on the North Platte and South Platte rivers have been studied in detail by the United States Geological Survey and the State Bureau of Irrigation. These studies indicate that the return flow does not come entirely from the water applied to the lands bordering the stream, although it is caused by irrigation raising the ground-water table in the vicinity. There was a large and progressive increase in return flow prior to about 1925 during the period of irrigation expansion. The increase has been slight during the past 15 years, indicating that the limit of return flow has been reached. For example, the average annual return flow to the North Platte River between Whalen and Bridgeport, a distance of 94 miles, is approximately 792,000 acre-feet; the area irrigated adjacent to the river is 264,000 acres, nearly all of which has been watered since 1919: and the estimated net stream depletion in that section averages approximately 330,000 acre-feet per year. The average annual return flow from all streams of the basin has been estimated at 1,260,000 acre-feet. It varies greatly in different parts of the basin and for different streams. About 1,028,000 acre-feet of the total average return flow for the basin accrues to the South Platte River which supplies irrigation water for 465,000 acres of land. The net stream depletion for the entire basin is estimated at 1,000,000 acre-feet annually.

DUTY OF WATER

The duty of water varies according to the differences existing between the upper and lower portions of the Platte River Basin. The duty of water reflects the adaptation of irrigation practices to the various requirements of the individual localities, the differing water need of crops, the seasonal use of water, and the seniority of water rights.

Generally considered, the duty of water is uniformly high, a condition resulting largely from the efficient coordination of the irrigation works, the scarcity of water, the systematic handling of return flow water, and the nature of the soil irrigated. However, owing to the irrigation methods employed, and the necessity of utilizing the water supply to the best advantage at the time it is available, the rate and amount of water applied to the land are seldom in accordance with the duty that would be indicated under the best irrigation practice.



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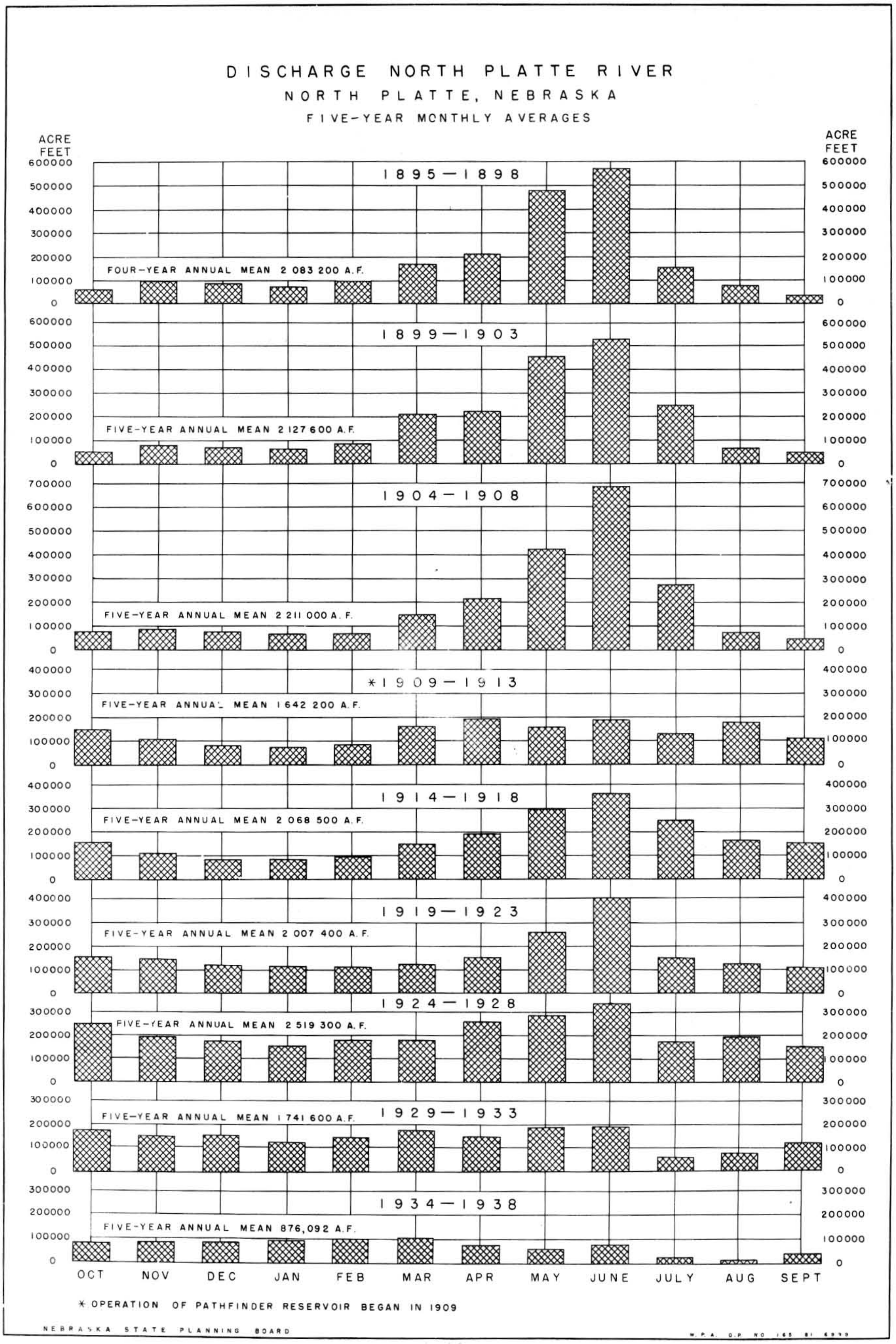
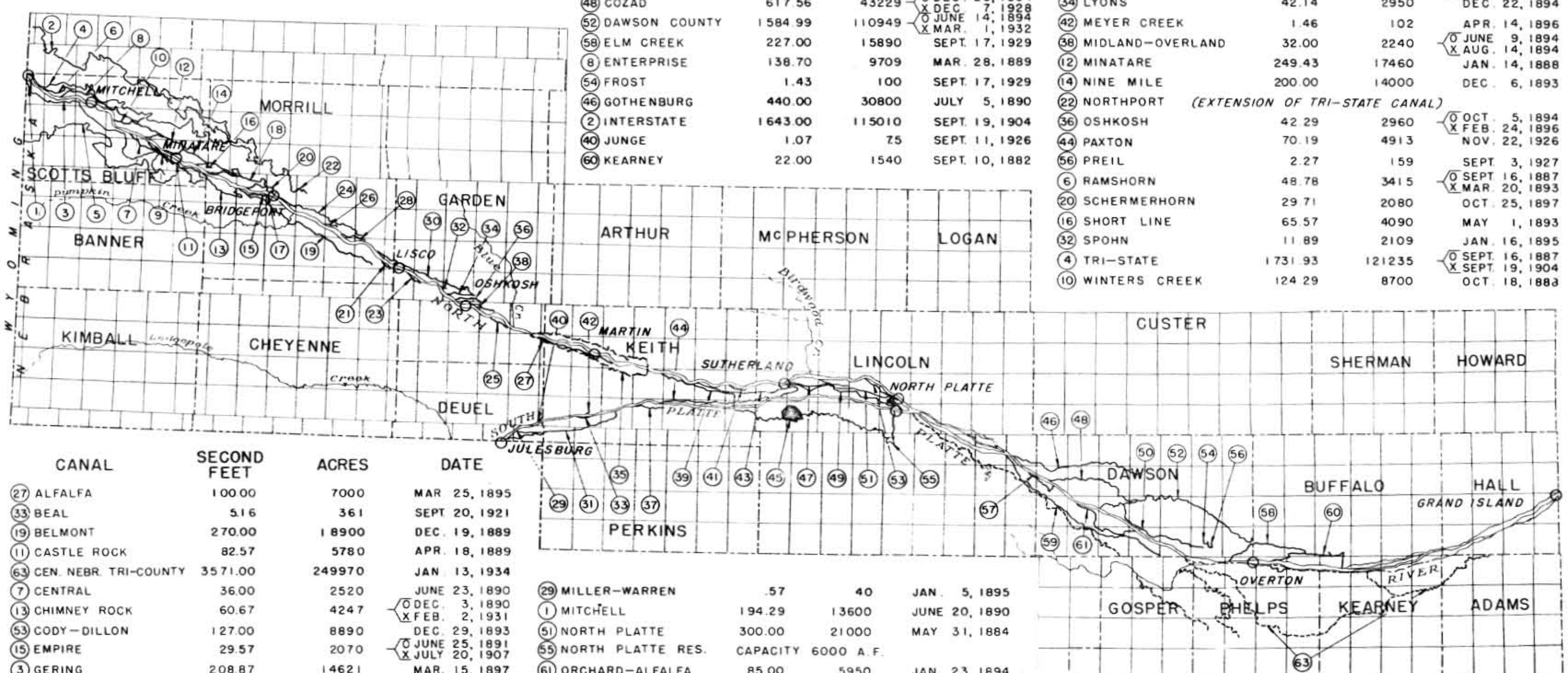
Under the present practice, from 2 to 4 acre-feet per acre are diverted at the respective project headworks. The water actually applied to the land ranges from about 1.0 to 2.5 acre-feet per acre. The figures are representative for the better developed areas along the main stream. Slightly lower duties prevail on individual systems, particularly during years when sufficient water is available to permit liberal diversions.


DISCHARGE NORTH PLATTE RIVER
NORTH PLATTE, NEBRASKA
FIVE-YEAR MONTHLY AVERAGES
ACRE FEET
1895—1898
FOUR-YEAR ANNUAL MEAN 2 083 200 A.F.
1899—1903
FIVE-YEAR ANNUAL MEAN 2 127 600 A.F.
1904—1908
FIVE-YEAR ANNUAL MEAN 2 211 000 A.F.
*1909—1913
FIVE-YEAR ANNUAL MEAN 1 642 200 A.F.
1914—1918
FIVE-YEAR ANNUAL MEAN 2 068 500 A.F.
1919—1923
FIVE-YEAR ANNUAL MEAN 2 007 400 A.F.
1924—1928
FIVE-YEAR ANNUAL MEAN 2 519 300 A.F.
1929—1933
FIVE-YEAR ANNUAL MEAN 1 741 600 A.F.
1934—1938
FIVE-YEAR ANNUAL MEAN 876,092 A.F.
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
* OPERATION OF PATHFINDER RESERVOIR BEGAN IN 1909
NEBRASKA STATE PLANNING BOARD

IRRIGATION CANALS IN OPERATION
FROM THE
NORTH PLATTE, SOUTH PLATTE AND PLATTE RIVERS
SEPTEMBER 24, 1937

CANAL	SECOND FEET	ACRES	DATE
(18) ALLIANCE	100.00	7000	DEC. 26, 1892
(26) BEERLINE	30.00	2100	OCT. 13, 1894
(50) BERQUIST LATERAL	(EXTENSION OF DAWSON COUNTY CANAL)		
(24) BROWN'S CREEK	188.71	13210	JAN. 20, 1892
(48) COZAD	617.56	43229	O DEC. 28, 1894 X DEC. 7, 1928
(52) DAWSON COUNTY	1584.99	110949	O JUNE 14, 1894 X MAR. 1, 1932
(58) ELM CREEK	227.00	15890	SEPT. 17, 1929
(8) ENTERPRISE	138.70	9709	MAR. 28, 1889
(54) FROST	1.43	100	SEPT. 17, 1929
(46) GOTHENBURG	440.00	30800	JULY 5, 1890
(2) INTERSTATE	1643.00	115010	SEPT. 19, 1904
(40) JUNGE	1.07	75	SEPT. 11, 1926
(60) KEARNEY	22.00	1540	SEPT. 10, 1882
(28) LAMORE	20.00	1400	JULY 18, 1896
(30) LISCO	37.22	2605	O JULY 1, 1893 X APR. 6, 1910
(34) LYONS	42.14	2950	DEC. 22, 1894
(42) MEYER CREEK	1.46	102	APR. 14, 1896
(38) MIDLAND-OVERLAND	32.00	2240	O JUNE 9, 1894 X AUG. 14, 1894
(12) MINATARE	249.43	17460	JAN. 14, 1888
(14) NINE MILE	200.00	14000	DEC. 6, 1893
(22) NORTHPORT	(EXTENSION OF TRI-STATE CANAL)		
(36) OSHKOSH	42.29	2960	O OCT. 5, 1894 X FEB. 24, 1896
(44) PAXTON	70.19	4913	NOV. 22, 1926
(56) PREIL	2.27	159	SEPT. 3, 1927
(6) RAMSHORN	48.78	3415	O SEPT. 16, 1887 X MAR. 20, 1893
(20) SCHERMERHORN	29.71	2080	OCT. 25, 1897
(16) SHORT LINE	65.57	4090	MAY 1, 1893
(32) SPOHN	11.89	2109	JAN. 16, 1895
(4) TRI-STATE	1731.93	121235	O SEPT. 16, 1887 X SEPT. 19, 1904
(10) WINTERS CREEK	124.29	8700	OCT. 18, 1883



CANAL	SECOND FEET	ACRES	DATE
(27) ALFALFA	100.00	7000	MAR. 25, 1895
(33) BEAL	5.16	361	SEPT. 20, 1921
(19) BELMONT	270.00	18900	DEC. 19, 1889
(11) CASTLE ROCK	82.57	5780	APR. 18, 1889
(63) CEN. NEBR. TRI-COUNTY	3571.00	249970	JAN. 13, 1934
(7) CENTRAL	36.00	2520	JUNE 23, 1890
(13) CHIMNEY ROCK	60.67	4247	O DEC. 3, 1890 X FEB. 2, 1931
(53) CODY-DILLON	127.00	8890	DEC. 29, 1893
(15) EMPIRE	29.57	2070	O JUNE 25, 1891 X JULY 20, 1907
(3) GERING	208.87	14621	MAR. 15, 1897
(5) GERING-FORT LARAMIE	1533.57	107350	O SEPT. 19, 1904 X MAY 5, 1934
(21) HANNAH	5.71	400	SEPT. 24, 1294
(37) HOLLINGSWORTH	30.00	2100	JUNE 5, 1894
(43) KEITH-LINCOLN	186.00	13020	FEB. 2, 1894
(35) KEYSTONE	CAPACITY 2000000 A.F.		APR. 27, 1934
(17) LOGAN	5.71	400	OCT. 17, 1889
(29) MILLER-WARREN	.57	40	JAN. 5, 1895
(1) MITCHELL	194.29	13600	JUNE 20, 1890
(51) NORTH PLATTE	300.00	21000	MAY 31, 1884
(55) NORTH PLATTE RES.	CAPACITY 6000 A.F.		
(61) ORCHARD-ALFALFA	85.00	5950	JAN. 23, 1894
(47) PAXTON-HERSHEY	130.00	9100	FEB. 12, 1894
(23) RUSH CREEK	9.64	675	DEC. 11, 1894
(41) SHERIDAN-WILSON	10.00	700	OCT. 9, 1892
(25) SIGNAL BLUFF	30.13	2109	JAN. 16, 1895
(57) SIX MILE	40.00	2800	OCT. 22, 1894
(9) STEAMBOAT	15.86	1110	O OCT. 22, 1895 X JULY 22, 1896
(49) SUBURBAN	183.00	12810	MAY 22, 1894
(39) SUTHERLAND	CAPACITY 296000 A.F.		O JAN. 13, 1934 X FEB. 8, 1934
(45) SUTHERLAND RES.	CAPACITY 175000 A.F.		
(59) THIRTY MILE	330.42	23129	O SEPT. 7, 1926 X APR. 9, 1929
(31) WESTERN	131.43	9200	O JUNE 14, 1897 X APR. 13, 1926

O FIRST APPROPRIATION DATE
X LATEST APPROPRIATION DATE
—— IN OPERATION
---- UNDER CONSTRUCTION
○ GAGING STATIONS

SOURCE - BUREAU OF IRRIGATION, WATER POWER AND DRAINAGE
NEBRASKA

NEBRASKA STATE PLANNING BOARD

W.P.A. PROJECT OP. NO 165 81 6999

DRAINAGE

The early practice of flooding meadow land and later the extension of the irrigation to higher lands back from the river have long since raised the ground water and caused large areas of water-logged land along the bottoms. Some of the swampy land has been used for pasture and the production of wild hay, but the reclaimed value of a large portion has warranted the installation of extensive drainage systems. This work has been carried on by the Federal Government, by duly organized drainage districts, or by private enterprise. A substantial area has been completely reclaimed, while a large area also has been greatly benefited by partial drainage through the work thus far performed. There still remains considerable land that requires relief from the surplus water and it is believed that the drainage program will continue for sometime.

PRESENT DEVELOPMENT

The extreme drought of recent years has stimulated a State-wide interest in irrigation. Projects in the central part of the State, embracing several hundred thousand acres of land, have recently been placed under construction. Since most of the stream flow during the irrigation season is already appropriated for use, storage facilities are being provided for the conservation of the non-seasonal flow in order that the water may be utilized when needed during the dry summer months. Hydroelectric power plants are being developed in conjunction with the new irrigation projects. The use of these hydroelectric power plants will result in the reduction of water costs to the land. Some of the same power plants will be sources of energy for the market created by rural electrification.

During the period from 1920 to 1930, inclusive, the average annual discharge of the Platte River at Overton, Nebraska, was approximately 2,000,000 acre-feet. The 2,000,000 acre-feet represents the average annual flow below the irrigated area.

The greater portion of this run-off occurs during the nonirrigation season. The Kingsley Reservoir when completed will tend to conserve and regulate the water supply.

Eastward and downstream from Central City, the main Platte Valley has a typically subhumid climate. Irrigation is unnecessary in all but periods of extreme drought, and never has been practiced to any extent.

The potentialities of irrigation development in the Platte River Basin as a whole, narrow down to a combination of the potential projects on the North Platte and on the Platte River east of the town of North Platte. Potential irrigation in the South Platte and the Loup basins may be considered as independent features in summing up the maximum ultimate irrigation development.

Development should include the most effective use of all water resources of the North Platte and main Platte rivers, and the reclamations of the largest area of land suitable for and susceptible of irrigation from storage facilities available at various points in the territory. Such development would make due allowance for the water requirements of all existing projects and proposed extensions thereto; and, in addition, would provide for the distribution of the surplus supply, insofar as it could be conserved to potential developments having the greatest apparent merit.

PUMP IRRIGATION

A few pump-irrigation plants were operating in the Platte Valley more than 25 years ago and some pumping was done from streams before that time. Prior to 1900, windmills were used for irrigation purposes. At least 5 irrigation wells were in operation in the Platte River Valley prior to 1912. Since that date the number of wells has steadily increased.

During recent years, pump irrigation in the Platte River Basin has increased as a result of the acute shortage of water for gravity irrigation. At present this practice is confined largely to the central part of the basin.

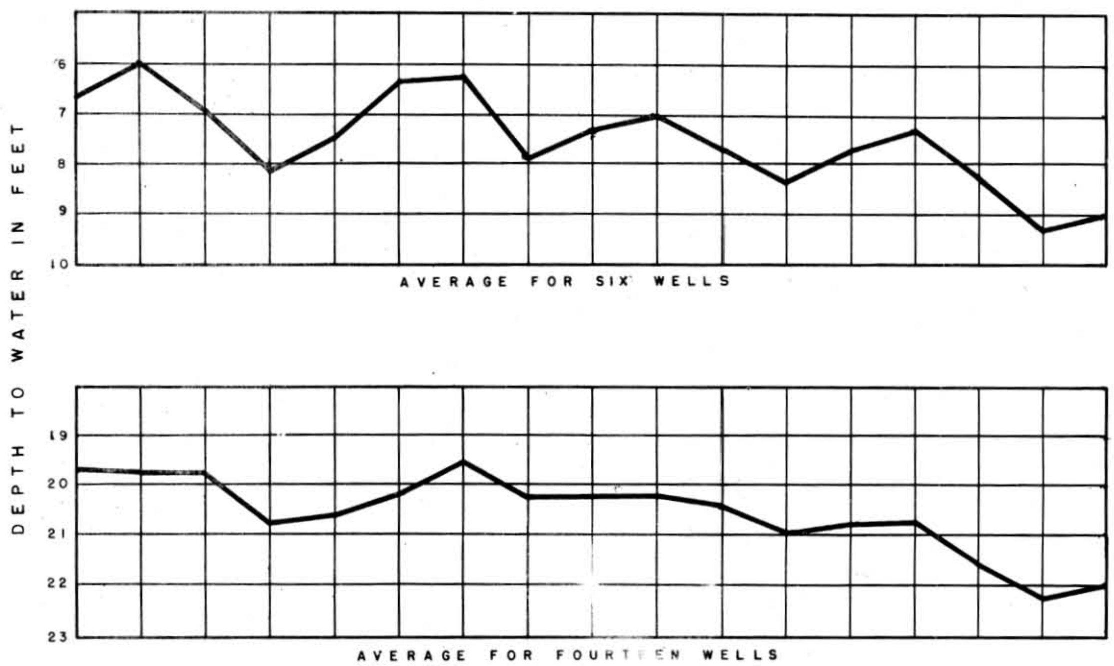
Practically all irrigation wells in Nebraska are west of a north-south line extending along the eastern edge of Hamilton County. The line marks the western border of the till sheet and glaciated area in this State. West of this line great beds of Pleistocene gravels and sands underlie the mantle materials. These Pleistocene deposits are for the most part water-bearing and, where they can be encountered at relatively shallow depths, provide excellent supplies for irrigation pumping. Up to the present, pump irrigation developments have taken place largely along streams because of the lower lift and less expense in applying water. If a series of dry years should follow, there will be extensive developments in the High Plains south of the Platte River where lifts may exceed 100 feet.

There are about 700 irrigation wells in the middle course of the Platte Valley. At the present time there are 17 power pumping plants along the main North Platte River. These plants serve areas varying from 5 to 550 acres under heads of 7 to 35 feet. Practically all of the plants use centrifugal pumps driven either by electric motors or gas engines. In some cases the power is furnished by the owners' tractors or automobiles.

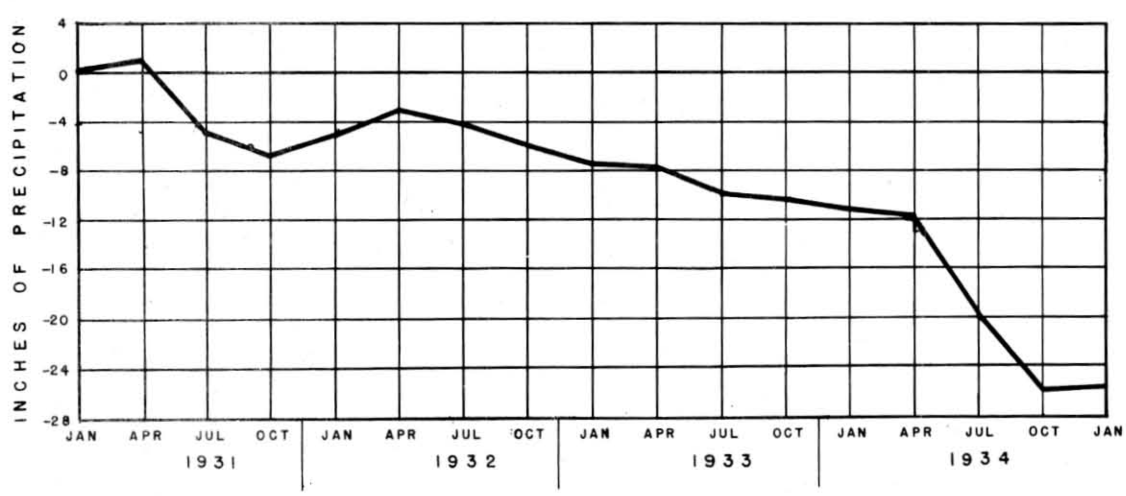
Since Nebraska is subject to recurring droughts, the volume, depth, fluctuation, and movement of ground water are of major importance to irrigation practices. Nebraska has relatively large quantities of available ground water. The prospects for developing successful pump irrigation in central and western Nebraska are promising. The high tablelands in the region south of the Platte, from Phelps and Kearney counties eastward to a point in Seward County, are underlain with thick, gravel, water-bearing strata which carry a continual flow of ground water from the Sand Hills to the Platte River. Although the ground water is deep, this supply might be used successfully under certain conditions. It would seem that as long as the Platte persists there should be ground water for pump irrigation. It is possible through flood-water canals and drainage, preferably by tile, to control the volume of ground water and the water-table level for both subirrigation and well irrigation. The water table is relatively high in the North Platte to Grand Island section of the river. The lift varies from 30 to 40 feet, the max-

GROUND WATER ELEVATIONS
PLATTE RIVER VALLEY
BETWEEN GRAND ISLAND AND KEARNEY
NEBRASKA

AVERAGE WATER LEVELS



AVERAGE ACCUMULATIVE DEPARTURES FROM NORMAL PRECIPITATION
SINCE JANUARY 1, 1931

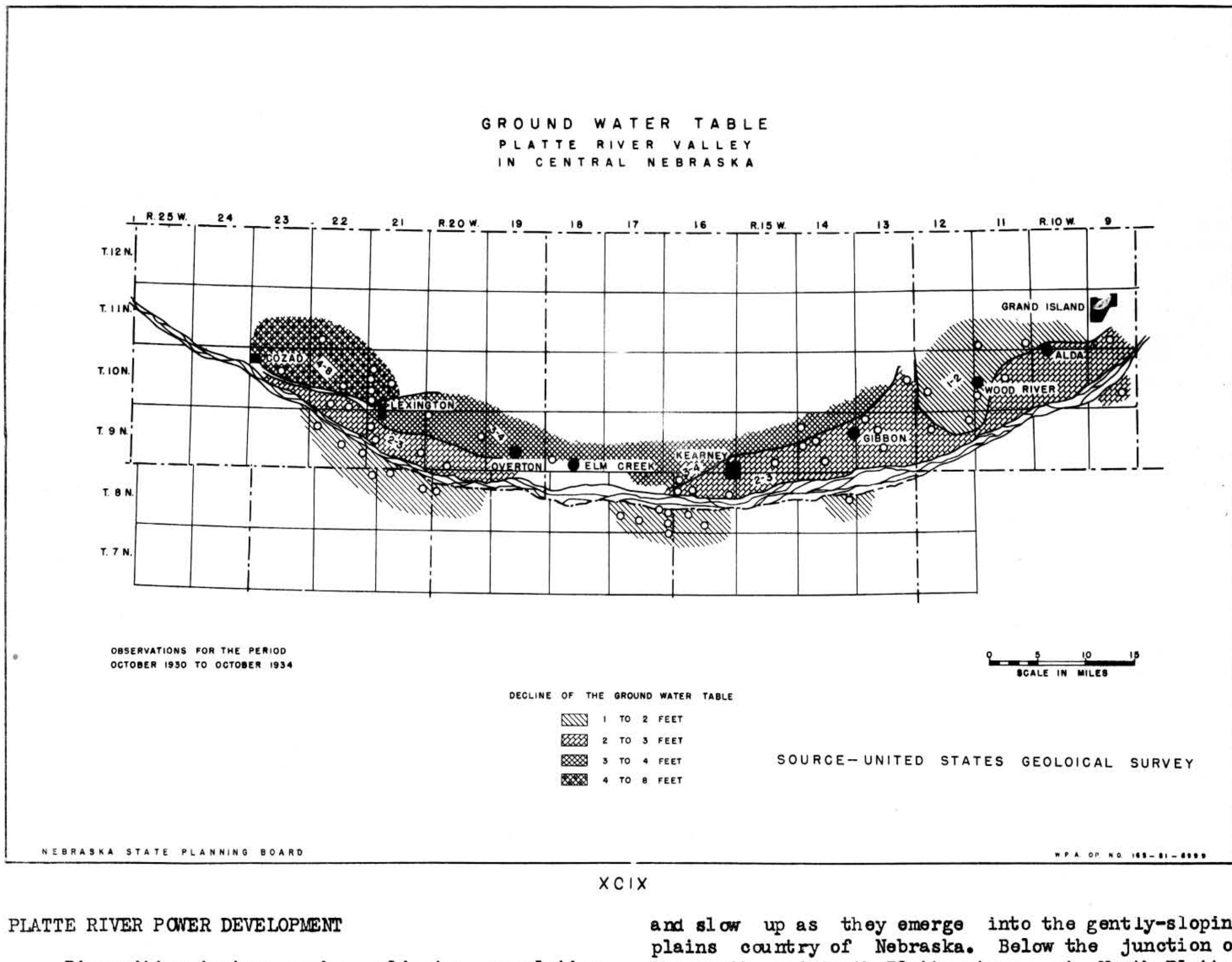


SOURCE — U. S. GEOLOGICAL SURVEY
DEPARTMENT OF INTERIOR

NEBRASKA STATE PLANNING BOARD　　WPA OP NOS 165—81—6999 AND 465—81—3—155 imum being 65 feet. The common unit provides an average water supply of about 2.5 second-feet to each 50 to 60 acres. There are also many small streams in the basin which would furnish enough water to irrigate several small farms by pumping the supply a few rods to a high point.

The ground water of the Platte and some other valleys of the State is pumped for irrigation at about the same cost as for canal irrigation. Pump irrigation is becoming increasingly popular, and the irrigated acreage will continue to expand as fuel costs decrease and efficiency of pump equipment is improved. A small amount of water applied to the land when needed often greatly increases the yield per acre on the pumping units now in operation. Although additional water is not always essential for the production of good crops, it is generally conceded that a supplemental supply of water in addition to the precipitation insures a fair yield and results in increased production. The relatively high production in the central section of the Platte River Basin is the result of irrigation.

Thus far, much of the development of pump irrigation has been experimental,yet the success attained has given a strong impetus to the improvement of this kind of irrigation. It is evident that pump irrigation should not be undertaken without careful consideration of the quantity, quality, depth to ground water, suitability of soils, cost of instalation and maintenance, and the economic benefit to be derived from such development. Pump irrigation will continue to extend over a much larger area of the State.



XCIX

PLATTE RIVER POWER DEVELOPMENT

Diversities in topography, climate, population density, natural fuel supplies, and the status of the vested water rights are primary factors in the consideration ofwater-power development in the Platte River Basin. As previously stated the Platte River Basin includes a wide variety of topographic features. Between the headwaters of the system and the mouth of the main stream there is a difference of more than 12,000 feet. In their upper reaches both the North and South Platte rivers drop rather abruptly from the steep slopes of the Rocky Mountains as swift, deeply incised streams. These rivers broaden and slow up as they emerge into the gently-sloping plains country of Nebraska. Below the junction of the North and South Platte rivers at North Platte, Nebraska, the Platte flows through a broad valley in a wide shallow channel and joins the Missouri River near Plattsmouth, Nebraska.

The climatic conditions also cover a wide range. The entire basins of the North and South Platte, with the exception of a narrow strip in the higher altitudes, lie in a region classed as arid. Run-off is limited and irrigation is recognized as prerequisite to the success of agricultural pursuits. As a result, the doctrine of riparian rights is nonexistent in Colorado and Wyoming, and is applicable in Nebraska only to the smallest legal division (40 acres) on a stream. Furthermore, the use of water for irrigation purposes holds preference over its use for water power under the statutes of Wyoming and Nebraska. At the present time the natural flow of all streams in Colorado, Wyoming, and western Nebraska is entirely appropriated for irrigation purposes. Legal circumstances, economic consideration, and the weight of public opinion throughout the Platte Basin require that water power development be entirely subordinated to irrigation.

The North and South Platte Drainage basins, aggregating 61,400 square miles in area, are thinly populated, and there is a general scarcity of manufacturing industry. The population density in the basin of the main river below North Platte, Nebraska, which has an area of 28,791 square miles, is somewhat greater and industrial activity is more intensive.

EXISTING DEVELOPMENTS

A major portion of the power is produced near the centers of population in the South Platte Valley of Colorado and in eastern Nebraska. Its principal use is urban. The organization of Rural Electrification Districts in 1933 initiated the concentrated movement toward the rural electrification of Nebraska.

POWER DEVELOPMENT IN NEBRASKA

The confines of any drainage basin in the State of Nebraska and probably the boundaries of the State itself are too narrow for the independent consideration of power development and utilization. Power plants generating in one basin are often the most accessible and economical source of power for other areas outside the territory under consideration. For this reason this discussion of power development concerns the entire Nebraska area rather than any individual basin.

The only comprehensive statistical information available from which general inferences can be drawn is compiled by the United States Department of Interior Geological Survey, Federal Power Commission, and Edison Electric Institute. The most noticeable feature of the Nebraska power chart is the sharp reduction in energy generated during the period from 1931 to 1933, with an increase in the amount of energy generated from 1933 to 1938 placing the present output slightly in excess of 721,500,000 kilowatt hours annually; exportations beyond State lines slightly exceed importation. This energy is being developed from an installation totaling 349,739 kilowatts of installed capacity. During the period of decreased demand from 1931 to 1933 new installations were minor, with obsolescence of equipment probably more than offsetting new installations. Of the 349,739 kilowatts of installed generating equipment 25 per cent are powered by hydro installations, 62 per cent by steam and 13 per cent by internal combustion. Hydro production has been a minor factor in electrical energy production in Nebraska, 94 per cent of all energy being produced by fuel plants in 1937.

A concentrated movement for the development of rural electrification was initiated with the passage of Senate File 310 in 1933. Thirty such districts have been organized in this State and are now under varying stages of construction or are completed.

Two large federal hydroelectric projects on the Platte have been completed. Others are under varying stages of construction.

Plant	Kilowatts
Platte Valley (Sutherland, Completed)	25,000
Central Nebraska (Tri-County, Under Construction)	52,000
Loup (Columbus, Completed)	47,700

Under construction at the present time are several public power hydroelectric developments which when completed, will aggregate 133,250 kilowatts of installed capacity, from which it is planned to develop by proposed interconnection, 500,000,000 kilowatts of firm power annually. In addition to the firm power developed, there will be a considerable amount of dump power available for industrial and offpeak loads.

The completion of these projects and some expansion of the generating facilities of the privately owned fuel plants will make approximately twice as much power available annually as is being consumed at the present time.

It is not the purpose of this report to attempt to foretell whether either the present hydro installation under construction will develop the firm power contemplated or how soon a market adequate to absorb the additional power will be developed. In general, these figures clearly indicate that for the immediate future, concentration of effort should be directed toward the expansion of present transmission and distribution systems. Developments and extension of domestic and industrial consumption are necessary to supply a market for the power which will be made available. The high costs of transmission and the fact that generating units are not situated in the most advantageous locations with respect to the concentration of population, alter the situation in certain areas of the State. Development of additional generating units may be economically and immediately desirable in such areas.

ELECTRIC POWER IN PLATTE RIVER BASIN
NEBRASKA
1937

Installed Capacity of Electric Power Plants

Type	Number Installed	Capacity in Kilowatts (thousands)
Hydro	3	27,625
Steam	16	79,495
Internal Comb.	16	7,641
Total	35	114,761

Present Status

The streams of the Platte River drainage area considered in this report have been developed for hydro power at 32 points. The majority of these were constructed for the development of mechanical power for small mill operation and nearly all have been abandoned.

There are only 3 hydroelectric plants in the basin operating on a commercial scale at the present time. These include the Gothenburg plant with 525 kilowatts of installed capacity, the Kearney plant with 2,100, and the Platte Valley, near North Platte with 25.000 kilowatts.

Potential Power Development

The upper basin is rich in natural fuel resources; coal, petroleum, and natural gas being available in abundance over a wide range of territory.

With respect to hydroelectric development the topography of the upper basin affords many excellent power sites, but the climatic conditions produce a low-stream yield in addition to creating an irrigation demand for the available water. Population density and industrial development are such that there is not a great demand for power at present.

The competition of steam-generated power would be a serious consideration in connection with hydroelectric development in the upper Platte Basin, principally because of the abundance of coal, oil, and natural gas of high thermal value. Coal mines and oil fields are favorably located with respect to power markets as are the available power sites. Steam power can be produced at a very low fuel cost. A considerable block of power which might be consumed by potential markets could be utilized in the production of the above-mentioned fuels. Thus, the selling price for hydroelectric power would necessarily have to be extremely attractive to the fuel-producing industries in order to displace steam-generated power. In the lower basin the cost of steam power would be somewhat greater on account of transportation costs of fuel. From the point of view of present trends it appears that the development of the most favorable power sites will depend upon the rate at which additional irrigation facilities can be provided.

Referring principally to individual projects, rather than any comprehensive plan of the development for the entire Platte River Basin, or major sections thereof, and, neglecting such factors as locations, accessibility to load centers and transmission, it would be possible to devise some kind of physical combination of power and irrigation in the development of practically all potential irrigation projects of importance. In every case, the limitation imposed by water supply, costs of reclamation, or irrigation practice, would necessitate that power be kept subordinated to irrigation.

In considering the feasibility of potential multiple-purpose projects, the existing sources of supply for securing electric energy and the market for such power in that area should be determined. In localities where the development of the power generation phases are physically feasible, but are not economically justified at the present time, due either to the lack of an existing market or because of an already developed source of supply in proximity to the proposed project, the construction of the power phase should be deferred until such time as the demand in the area will support the power phase of the development. However, if investigation of physical and economical conditions shows power development to be potentially desirable, the design of irrigation and flood control projects should permit the future installation of power generating equipment.

PROJECTS RECENTLY COMPLETED OR UNDER CONSTRUCTION IN THE PLATTE RIVER BASIN IN NEBRASKA

In 1933 the Nebraska Legislature passed Senate File 310 which authorized the organization of public power and irrigation districts to provide for more extensive irrigation and rural electrification developments. The recent droughts of 1934 and 1935 also promoted public interest in favor of such developments. Under this law 5 PWA and 30 REA districts were organized and are completed or in varying stages of construction. The PWA districts are: (1) The Platte Valley Public Power and Irrigation District (Sutherland project), (2) Central Nebraska Public Power and Irrigation District (Tri-County project), (3) Loup River Public Power District (Columbus project), (4) North Loup Public Power and Irrigation District, and (5) the Middle Loup Public Power and Irrigation District. Several other projects are proposed for the Platte River Basin in Nebraska. A map showing the REA districts is included in the General Section.

THE PLATTE VALLEY PUBLIC POWER AND IRRIGATION DISTRICT

The Sutherland Project is designed to store water for irrigation, and for generation of electric energy. This project is now completed and in operation. Water was first taken into the supply canal on December 5, 1935.

Water is diverted from the North Platte River at a point 2 miles west of Keystone. It is conveyed through a siphon under the South Platte River and thence by canal to the Sutherland storage reservoir located 3 miles south of the village of Sutherland. This reservoir has a capacity of 178,000 acre-feet. Water is released as needed to supply the regulation reservoir (capacity 8,000 acre-feet) and then passed through a supply canal to the power house located south of the town of North Platte. This plant has a generating capacity of 25,000 kilowatts, capable of supplying annually, 90 million kilowatt hours of electric energy. This power is transmitted through 289 miles of line, terminating at Columbus and McCook. After passing through the power turbines, the water is returned to the South Platte River which converges with the Platte River a short distance below North Platte. The water supply, after having served its function for generating electricity, is used to provide supplemental irrigation water for 8 existing canals between Brady and Kearney, Nebraska.

RESERVOIRS

Sutherland - The Sutherland reservoir is located south of Sutherland, Nebraska. The reservoir has an area of 4,350 acres, and a capacity of 178,000 acre-feet. The height of embankment is 68.0 feet and the overall length of embankment and protective dikes is approximately 6 miles. The purpose of the reservoir primarily is to provide storage of irrigation water (100,000 acre-feet minimum).

Regulating Reservoirs

The regulating reservoir is located a short distance upstream from the power house. The reservoir covers an area of 1,700 acres and has a capacity of 8,000 acre-feet.

Headworks

Diversion Dam - The diversion dam is of reinforced concrete construction, overflow type, Ogee section and extends across the North Platte River approximately 2 miles west of Keystone, Nebraska. The section is 975 feet high and approximately 1,170 feet long. A sand dike 1.5 miles long extends westward, upstream along the north side of the river. An ice chute, together with 5 sluice gates is provided at the south end of the drain. The spillway is designed to accomodate a maximum flow of 38,000 second-feet, which is about 140 per cent of the maximum recorded flood discharge of the North Platte River at this point. The sluiceway and overflow spillway design is such that a maximum of 38,000 second-feet flood flow could be passed through the gates with a 3 foot depth of flow over the spillway crest of the dam.

Intake Works

The supply canal intake is of reinforced concrete and comprises a battery of 8 vertical lift gates, all of which are 20 feet wide.

CANALS

Supply Canal

The supply canal which transports water from the intake works to Sutherland reservoir is 32.3 miles long. It is designed to carry 1,750 second-feet.

Outlet Canal

The outlet canal which conducts water from the Sutherland Reservoir to the regulating reservoir is 19.2 miles long and has a designed capacity of 1,400 second-feet.

Power Canal

The power canal transports the water from the regulating reservoir to the forebay located in the hills above the power plant. The length is 2.5 miles and the capacity 2,700 second-feet.

Tailrace

The tailrace canal carries a discharge from the power house of the district north for a distance of 2.5 miles to the channel of the South Platte River southwest of the City of North Platte, Nebraska. The capacity is 1800 second-feet.

ELECTRIC SYSTEM

Power Development

The power development of the district consists of a forebay, power conduit, penstocks. surge tank, and power house.

Power Conduit

The power conduit which conducts the flow from the forebay to the steel penstocks is a steel pipe 13.5 feet in diameter and 3,100 feet long.

Penstocks

The penstocks consist of 2 steel pipes 9.0 feet in diameter each having a length of 235 feet.

Surge Tank

The surge tank located south of power house is steel and 175 feet high, with a capacity of 1,000,000 gallons.

North Platte Hydro Plant

The hydro plant is located 4 miles southwest of North Platte, Nebraska. It is of reinforced concrete and consists of 2 vertical shaft turbines, each having an installed capacity of 18,000 horse power. Provisions have been made to permit the installation of 2 units of equal size at some later date. The normal operating head on the plant is 204 feet.

Generation

The electric energy available after 1941 is estimated at approximately 91,000,000 kilowatt hours annually of which 60,000 will be firm power. This total generation will be equivalent to an average load of 10,400 kilowatts under continuous operation. With the completion of the Kingsley reservoir (Tri-County project) the firm power of this project beginning in 1943 will probably aggregate 105,000,000 kilowatt hours annually.

TRANSMISSION SYSTEM

Transmission Lines

The transmission system consists of 4 lines having their origin at the North Platte hydro plant and extending to North Platte, McCook, Columbus via Elm Creek and Grand Island, and to Kingsley Dam near Keystone. The major transmission line (228 miles long) is operated at 115 KV and extends down through the Platte Valley with substations at Elm Creek, Hastings (Tri-County), Grand Island, and terminates at the Columbus power plant of the Loup River Public Power District, where an interconnection is made to the Loup River Public Power District transmission system. When the Jeffrey Canyon and Johnson Canyon plants of the Central Nebraska Public Power and Irrigation District are completed, this transmission line will interconnect to these 2 plants. The transmission line ending at McCook, Nebraska, is approximately 62 miles long and is constructed for 69 KV operation. The transmission line to Kingsley Dam is constructed for operation at 69 KV and is 18 miles long. The transmission to the city of North Platte is of 13.8 KV construction and is 4.75 miles long. This line was constructed to furnish energy from the North Platte hydro plant to North Platte. In addition to these lines there is a transmission line constructed for operation at 33 KV extending from the Grand Island substation to the city limits of Grand Island. There is a short line one-half mile long connecting the Grand Island substation of the Central

Power Company at Grand Island constructed for operation at 33,000 volts.

Protective Tubes

The 115 KV transmission line to Kingsley Dam is safeguarded from lightning damage by the installation of protective tubes.

Automatic Oscillographs

Automatic oscillographs have been provided at North Platte and Grand Island as an aid to the transmission line patrol crews when trouble develops.

Substations

The District has a switch yard located in the North Platte hydro plant where the transformer banks are located for stepping the generating voltage of 13.8 KV up to 69 KV and 115 KV for transmission purposes. Terminal substations are also located at the cities of North Platte and McCook, and the Central Nebraska Public Power and Irrigation District will install a terminal substation at the Kingsley Dam. On the 115 KV transmission line, a substation is provided at Elm Creek and one at Grand Island. The Grand Island substation is very complete having complete 115 KV switching equipment and bus structures. Also at this substation a 7,500 KVA synchronous condenser is located, which is used for voltage regulation on the system. These substations will provide for the delivery of power to distribution systems, and lower voltage transmission lines serving the surrounding territory, including rural electrification systems.

THE CENTRAL NEBRASKA PUBLIC POWER AND IRRIGATION DISTRICT

The Central Nebraska Public Power and Irrigation District, commonly known as the Tri-County Project, involves the irrigation of a large acreage of land in the Platte River Basin, starting at Smithfield, in Gosper County, Nebraska and extending eastward into a portion of Adams County, Nebraska. It also includes the generation of electric energy.

The district originally contemplated the reclamation of approximately 557,000 acres of land situated on the south side of the Platte River, largely on the terraces and tablelands of Gosper, Phelps, Kearney, and Adams counties. Due to a ruling of the State Supreme Court, confining the diversion and use of water within the Platte River watershed, approximately 60 per cent of the land was eliminated from the original contemplated irrigable acreage.

Topographically, the lands are level to slightly undulating and form part of the upland or tableland between the Platte and Republican River valleys. The average gradient to the east is about 8 feet per mile. In the western part, occasional interior basins are found while the western portion has more clearly defined water courses that make the topography less uniform. Except for the interior basins, the surface drainage is such that irrigation will not result in concentrations of deleterious salts which are not prominent in any of the soil types. Drainage will be necessary to prevent flooding of good lands within the depressed areas. The ground-water table ranges from 100 to 200 feet below the surface. Very little of the land included under this project has been previously irrigated.

The source of water supply for irrigation and power purposes is the North Platte River. The construction of a dam, known as the George P. Kingsley (Keystone) Dam, approximately 5 miles above Keystone, Nebraska, forms an onriver storage reservoir with a capacity of 2,000,000 acre-feet. The available natural river flow will be supplemented by storage water released from this reservoir. Water needs of the district are to be diverted through the supply canal along which 3 powerhouses are located. The water is first to be used to develop electric energy and then for irrigation purposes.

The power water not used for irrigation will be returned to the river. Conservation of flood waters in the Kingsley Reservoir will tend to make possible a more uniform flow of the Platte River.

(a) George P. Kingsley Dam and Reservoir

The earth dam approximately 2. 5 miles long and 162 feet high, will create a storage reservoir with a surface area of 35,000 acres and a capacity of 2,000,000 acre-feet of water. It is to be constructed on Brule clay. Twenty-five million cubic yards of hydraulic fill material will be used to construct the dam, 3,000,000 cubic yards of which is to be of an impervious type placed in the core of the dam. The maximum depth of water in the reservoir will be 142 feet.

The dam and appurtenant structures have been designed to pass 4 times the maximum flood of record and at the same time temporarily hold back 400,000 acre-feet of flood waters which may be released after the flood peak has been passed.

The appurtenant structures - regulating outlet, spillway, stilling basin, sheet pile cut-off wall, and small items have been constructed.

(b) Upper Diversion Dam

The upper diversion is approximately 5 miles east of the city of North Platte, Nebraska. It will be used to divert water from the Platte River into the supply canal.

(c) Supply Canal

The supply canal, approximately 76.0 miles in length and with normal capacity of 2,000 second-feet has its origin at the upper diversion dam and extends through the Jeffrey Canyon regulating reservoir and power plant located approximately 5 miles south of Brady, Nebraska, thence to the Johnson Canyon regulating reservoir located approximately 12 miles southwest of Lexington, Nebraska. From here the water passes through the Johnson Canyon power plants numbers 1 and 2, south of Lexington, Nebraska, and then to the main canal of the irrigation system or wasted into the Platte River.

(d) Jeffrey Canyon Power Plant

The Jeffrey Canyon power plant consists of two 10,000 kilovolt, 90 per cent power factor, generating units, and is to be located approximately 5 miles south of the town of Brady, Nebraska. It has a net head of 113 feet.

(e) Johnson Canyon Power Plant Number One

The Johnson Canyon power plant number 1 is located approximately 10 miles southwest of the town of Lexington, Nebraska. This plant has equipment similar to that of the Jeffrey plant, with the exception of automatic control from Johnson plant number 2, and will operate under a net head of 114 feet.

(f) Johnson Canyon Power Plant Number Two

The Johnson Canyon power plant number 2 is located approximately 7 miles south of Lexington, Nebraska, and consists of one 20,000 kilovolt, 90 per cent power factor unit with a net head of 141 feet.

(g) Transmission System

The power plants will be connected to a 115,000 volt transmission system. The Central Nebraska Public Power and Irrigation District's portion of this system consists of a line extending from the Jeffrey Canyon power plant to Lincoln by way of the Johnson Canyon power plants, Holdrege and Hastings.

(h) Substations

The main substations of the district are to be located at the 3 power plants with an intermediate substation at Hastings. Several of the substations are under construction at the present time, and the Hastings substation is now completed and in operation. These substations will provide for the delivery of power to distribution systems and to lower-voltage transmission lines serving the surrounding territory including rural electrification systems.

(i) Distribution System

A secondary distribution system of 34,500 volt lines will be connected to the substations located along the 115,000 volt lines. The lower-voltage lines will extend to several towns in the market area to be served by the Tri-County project.

(j) Middle Diversion Dam

This diversion dam is to be used to divert direct-flow water into the main canal of the irrigation system.

(k) Irrigation System

The present irrigation system includes approximately 220,000 acres to be irrigated. The main canal, which extends from the middle diversion dam eastward through Phelps, Kearney, and Adams counties, is to serve land within the above-mentioned counties.

Another lateral network whose main lateral has its origin at the Johnson Canyon Regulating Reservoir serves land in Gosper and the western part of Phelps counties.

SUMMARY OF CONSTRUCTION DATA

Kingsley Reservoir

Capacity 2,000,000 acre-feet - surface area 35,000 acres, shore lines 105 miles, length about 23 miles, maximum width approximately 4 miles and depth 142 feet.

Power and Supply Canal

Length 76 miles - capacity 2,000 cubic feet per second normal flow.

Irrigation System

Eighty one miles of main canal, 97 miles of main laterals, and 402 of small laterals. Approximately 220,000 acres of land to be irrigated.

Jeffrey Power Plant

Two units 13,000 horsepower or 10,000 kilovolts, at 90 per cent power factor, each.

Johnson Power Plant No. 1

Two units 13,000 horsepower or 10,000 kilovolts, at 90 per cent power factor, each.

Johnson Power Plant No.2

One unit, 25,000 horse power or 20,000 KVA, at 90% power factor.

Transmission Lines

Two hundred and sixty miles of 115 KV lines and a secondary system of 34.5 KV lines distributing current from the 115 KV lines. Total mileage of 34.5 KV lines has not been determined.

Substations

Jeffrey plant substation, 6,900/115,000 volts; Johnson plant number 1 substation, 6,900/115,000 volts; Johnson plant number 2 substation, 6,900/115,000 volts; Hastings substation, 115,000/34,500 volts.

LOWER PLATTE PROJECT

The Lower Platte project contemplates the reclamation of approximately 295,000 acres of land situated on both sides of the river extending east from a point near Shelton, Nebraska. Approximately 187,000 acres lie on the north side of the river and 108,000 on the south side, the area varying in width from about 1 to 10 miles, practically all of which is in the valley proper.

Topographically, the entire area is fairly smooth with gentle slopes toward the river and a fall of about 7 feet per mile downstream. The soil types vary from sandy loams to heavy silty and clay loams. Ground-water conditions are such that drainage already has been necessary over considerable areas, and would be required on a more extensive scale under a general irrigation development. For the most part the inferior areas have been excluded, and the areas selected as part of the proposed project have good productive soils, at least fairly good under drainage, and no prohibitive concentration of deleterious salts that could not be reached by proper irrigation.

The source of water supply would be the Platte River and the Birdwood Creek. Direct flow would be utilized when available during the irrigation season, and storage of water on both sources is contemplated. Divers schemes proposing various combinations have been studied but these are matters to be studied preparatory to construction.

PERKINS PROJECT (PROPOSED)

The land to be served by the proposed Perkins County project is situated on the high bench between the Platte River on the north and the Republican River on the south. This area is separated into 2 principal units by the drainage divide, the northerly unit comprising land in Keith County, and the southerly unit including land in Perkins County. Practically the entire area is under cultivation by dry farming. The lands vary from 120 to 200 feet in elevation above the South Platte River. The area in Perkins County is gently rolling with a general slope to the south and east, while the area in Keith County is more broken, with a general gradient of about 13 feet per mile to the north and east. The soil classification shows that the better types of soil consist principally of fine sandy and silt loams. Over 100,000 acres were classified as suitable for irrigation. However, the restrictions placed on water supply would result in a large surplus of land physically susceptible to irrigation which could not be provided with water.

The water for this project would depend entirely upon the surplus run-off of the South Platte River, and would be governed by the terms of the South Platte compact between the states of Colorado and Nebraska. This compact provides that the proposed Perkins County development will be allocated 500 second-feet of water to be diverted when available between October 15th and April 1st of each year, with certain limitations to protect acknowledged prior claims within the State of Colorado. Since no water could be diverted during the irrigation season, the project would be entirely dependent upon storage.

The general plan involves a diversion structure on the South Platte River about 1 mile above Ovid, Colorado. The main feeder canal, with a total length of 56.5 miles, would start with a capacity of 500 second-feet and be reduced 50 second-feet every 18 miles because of seepage losses. It would be necessary for the feeder canal to be relatively large in order to divert the water when available, because no flow would be available for a considerable length of the time. Two main laterals from the feeder canal would be required to distribute water to the reservoir system. The south supply lateral would be 8.5 miles long with a capacity of 300 second-feet. The eastern lateral would be 6.9 miles long with a capacity of 370 second-feet.

Eleven reservoir sites were selected to give a combined storage capacity of 61,190 acre-feet. All of the sites are depressional areas in the rolling tablelands. They require diking around a large part of their perimeters, rather than ordinary dams to develop the capacities desired. These dikes would vary from a few feet up to 16 feet in height. The larger dikes have been regarded as dams and range from 9 to 35 feet in height. Among the reservoir sites considered, the 11 listed in the following table were deemed the most suitable:

RESERVOIR SITES FOR THE PERKINS COUNTY PROJECT

Reservoir	Capacity Acre-feet
Swim	3,620
Lyon	13,900
Grant	7,540
Lamb	5,500
Kuskie	7,900
East Twin	3,300
West Twin	1,930
Hill	2,600
Holdrege	4,330
County Line	4,390
Godall	6,180
Total	61,190

Cost estimates were computed and found to be $12.05 per acre-foot of storage. The development of the 11 reservoirs having capacities aggregating 61,190 acre-feet would cost approximately $737,300.

*COST ESTIMATE FOR THE PERKINS COUNTY PROJECT

Diversion Dam on South Platte	$ 384,400
Main Feeder Canal	1,527,000
Supply Canal System	479,700
Eleven Dams	737,300
Distributing System @ $15 per acre	243,000
Total	3,371,400
Cost per acre for 16,200 acres	$ 208.10

*Army Engineer's "308" Report

ASHLAND RESERVOIR (POTENTIAL)

The site of this reservoir is near Ashland, Nebraska. As proposed it would be constructed to a capacity of 1,400,000 acre-feet to store the Platte River water for the purpose of aiding in the control of floods on the Mississippi and Missouri rivers, and also for the purpose of regulating the flow of these 2 streams as an aid to navigation.

Flood periods in the Mississippi and Missouri rivers are not concurrent. The Mississippi period is from the middle of February to the middle of May and the Missouri period from the middle of May to the middle of July.

The most effective and practical plan of reservoir operation for Mississippi flood control requires the storage of all water less 1,000 second-feet that would arrive at the Ashland Reservoir when the Cairo gage is above 50 feet. The reservoir, in order to be available to retain the maximum amount of flood waters, would have to be empty about February 1st and remain so until all danger of the Mississippi flood had passed. It could also be operated satisfactorily for both Mississippi and Missouri flood control with the storage in the Missouri period operating on an intermittent 60-day basis.

This reservoir could also be operated satisfactorily for the purpose of Missouri River navigation. Considering the use that might have been made of such a reservoir for the last 21 years it can be judged that it would have fully supplied the deficiencies for navigation at Kansas City in 13 of the years.

BLUE CREEK PUBLIC POWER AND IRRIGATION DISTRICT (PROPOSED)

According to the Blue Creek Public Power and Irrigation District proposal, a storage dam is to be constructed across Blue Creek about 5 miles west of Lewellen in Garden County, Nebraska. The site is above the diversion works of the existing projects. The reservoir thus created would have a surface area of approximately 700 acres with storage capacity of 15,000 acre-feet. The feeder canal with diversion works located about 8 miles north and above the storage dam would carry the water to a point about 80 feet above the surface waters of the reservoir. From here, the water would be dropped through a penstock to a hydroelectric power plant, generating 500 horsepower of energy before being released into the storage reservoir. With the 80-foot head, two 225 horsepower turbines and generators would produce annually a minimum of 2,500,000 kilowatt hours. Two miles of 33,000 volt transmission lines would be built to supply the market within the immediate vicinity of the project.

COST ESTIMATE FOR THE BLUE CREEK PUBLIC POWER AND IRRIGATION DISTRICT

Power Plant	$ 83,700
Storage Reservoir, Feeder Canal and Diversion Dam	280,000
Engineering	8,300
Interest, Legal, Administrative, etc.	26,000
Total	$ 400,000

There are 5 irrigation projects in the Blue Creek Basin. Some of the projects have priorities dating from 1890, and the flow of the stream would be ordinarily sufficient to mature good crops within the Blue Creek Basin if the water were available for such use. The irrigable land comprising these projects is very productive and large yields are obtained with adequate moisture. However, during periods of water shortage, it is often necessary to deprive these canals the use of a portion of the waters of the stream in order to satisfy senior downstream appropriations. The nonseasonal flow of Blue Creek would be impounded and released when needed to furnish supplemental water to the present irrigated lands, both within the Blue Creek Basin and also within the North Platte River Basin.

FLOOD PROBLEMS

The general topographic and climatic conditions of the Platte River Basin are not conducive to excessive run-off, hence the area cannot be considered subject to major destructive floods. Occasional local floods from cloudbursts have occurred on some of the principal tributaries causing destruction of property and, in a few cases, loss of life, but these floods are not of sufficient frequency and consequence to justify a general flood-control plan.

The mountainous regions at the headwaters of the North and South Platte rivers produce a rapid run-off during the spring snow-melt and supply a smaller, but more or less constant flow during the remainder of the summer. The tributaries in the high-plains region also contribute high flows during the spring thaw but are nearly, or entirely, dry during the summer and fall seasons. The lower country tributary to the main stream, contributes a low rate of run-off from the sand-hill region of northwestern and northern Nebraska, and a fairly rapid run-off from the loess hills forming the southern border of the basin.

The spring flood season is confined to the period April 1 to July 15, and seldom carries through this entire time range in any one year. The typical spring rise caused by melting snows and rains in the headwaters region, occurring usually in June but occasionally in May, is the largest contributor to flood flow. This season appears to be the only period during which general high flows may be expected. Flood flows during other seasons of the year are usually attributable to heavy rainstorms of the cloudburst type covering small areas. These may occur at any time between early spring and late fall, and may be expected to produce local floods on the tributaries affected. Such phenomena are not frequent enough to be treated as a constant and serious flood menace.

The occasional, large general flood comes after high temperatures have started to melt the snow in the mountains, and steady rains of several days duration have saturated the upper plains areas. The South Platte flood usually comes first followed by high water in the North Platte several weeks later. Very rarely do the high-flow peaks of the 2 rivers synchronize, but one usually occurs after the other has partially subsided. Storage reservoirs and irrigation development above the confluence of the North and the South Platte rivers tend to flatten out the peak flows.

The maximum discharge on record occurred below the mouth of the Loup River on June 6, 1896, when the Loup River during 7 hours discharged 70,000 second-feet into the Platte River.

The construction of the Pathfinder Dam on the North Platte River has exerted a decided influence on the reduction of the flood flows. Because of the topographic and geologic conditions in the lower section of the river in Nebraska this portion of the basin is less susceptible to flashy run-off. The porous river bed below North Platte, and valley storage absorb a large amount of water during high-flood stages and materially affect the flood downstream. Occasional flashy run-off below the Wyoming and

Colorado reservoirs will be impounded in the Keystone Reservoir. The operation of this reservoir will greatly reduce flood hazards in the central and lower portions of the basin.

In only a few points in the Platte River Basin is agriculture subject to flood damage even during maximum flows. Throughout the upper North Platte Basin the principal crop bordering the river is hay, which is not greatly harmed and might even be benefited by spring or early summer overflow. The middle section of the North Platte River is rather deeply intrenched with narrow flood plains, where the greatest conceivable agricultural damage would be small. The possibility of moderate agricultural damage exists on the lower North Platte and South Platte rivers, and throughout much of the Platte River Valley where valuable areas of corn and root crops border the streams. However, the wide, steeply-sloping channels provide such a great capacity that a large increase in the discharge results in a rise of only a few feet. The present stream control would permit only moderate flood damage. Such potential damage is entirely too small to justify a general flow-control plan for agricultural areas.

LANCASTER COUNTY SANITARY DISTRICT NUMBER ONE

The Lancaster County Sanitary District Number 1 was created to provide flood relief and adequate drainage for Lincoln and vicinity. After the disastrous flood of 1908, a program providing for the straightening of Salt Creek through the City of Lincoln was started and completed. Later, this straightening and deepening of Salt Creek was continued downstream toward the Platte River.

During 1940 Sanitary District Number 1 applied to the Work Projects Administration for aid in completing the straightening of Salt Creek through and below the City of Ashland, Nebraska. The project, as set up, contemplated 665,000 cubic yards channel excavation, 700 lineal feet of drainage culverts, 600 lineal feet of steel piling, relocation of one steel truss bridge, tree clearing and removing, and other appurtenant work. The total cost of this work was estimated to be $96,500, of which the Sanitary District Number 1 was to furnish $87,500 and the Work Projects Administration $9,000.

The above project is not under construction at the present time because of delays in obtaining right-of-way. It is believed, however, that this right-of-way will be acquired early in the spring of 1941 and that construction on this project will proceed during the summer.

In addition to the above project, Sanitary District Number 1 also applied to the Work Projects Administration for aid in constructing improvements to the Sewage Treatment Plant for Lincoln, Nebraska. These improvements were estimated at a total cost of $222,000, of which cost the Sanitary District Number 1 will supply $52,500 and the Work Projects Administration will furnish $169,500. This project was begun during October, 1940, and will be completed late in 1941.

In addition to the above projects, Sanitary District Number 1 applied for and received aid from the Work Projects Administration for the construction of 125 lineal feet of extension to the Antelope Creek Conduit in the City of Lincoln, Nebraska. The total cost of this improvement was estimated at $13,990 of which the Work Projects Administration contributed $9,465 and Sanitary District Number 1 $4,515. This project will be completed February 1, 1941.

LOUP RIVER BASIN

DESCRIPTION

The Loup River Basin, a portion of the Platte Basin, lies in central Nebraska and comprises an area of 15,744 square miles, which is about 20 per cent of the area of the State. The drainage basin, resembling an American elm leaf in shape, includes all or parts of 31 counties. The basin is approximately 325 miles in length and varies in width from a few miles at its source to 80 miles at its widest point, then narrows to about 4 miles near its mouth. The average width of the main valley is from 4 to 6 miles.

The basin is drained by the Loup River system herein described under, "Streams of the Basin."

GENERAL GEOLOGY

The Loup River Basin is an area of extensive mantlerock. Dunesand occurs over approximately 60 per cent of the region, generally restricted to the northern and western parts. The southeastern 40 per cent of the basin is mantled with loess. Alluvium occurs along the larger drainage ways. The mantlerock is underlain by bedrock at varying depths.

The geologic formations which have a direct relationship to ground water in the Loup River Basin are the Pierre shale and underlying Cretaceous formations, the Chadron formation, the Brule clay, the Arikaree-Gering formation, the Ogallala group, the Pleistocene sands and gravels, the Loveland formation, the Peorian loess, the dunesand and the alluvium. These formations are herein described from oldest to youngest.

Bedrock Formation

The bedrock forms the rigid platform upon which the mantlerock was deposited, and certain formations within the bedrock form the impervious floor which limits downward percolation of ground water. The Pierre shale, Niobrara formation, and older rocks were extensively folded, and more or less base-leveled by erosion, prior to the deposition of the overlying bedrock.

(a) Niobrara Formation

Chalky shale and chalk rock; varying from about 225 to 500 feet or more in thickness; forms impervious floor in the extreme eastern part of the basin where it restricts downward penetration of ground water; is in turn underlain by Carlile shale; Greenhorn limestone, Graneros shale, Dakota group of sandstones and shales and yet older sedimentary rock. The Dakota sandstone is generally a reliable aquifer, but occurs at too great a depth in this region to be depended upon for a water supply.

(b) Pierre Shale

Steel-gray to dark shale; overlies the Niobrara formation; varies in thickness from a few feet to about 1,000 feet; is non-porous and forms impervious floor in much of the basin.

(c) Chadron Formation

Greenish-gray clay, with some associated sandy beds; occurs above the Pierre shale in the western and central parts of the basin; relatively impervious, but often contains some porous material in certain zones; has a thickness of about 200 feet or more in the western part of the basin, thinning eastward to zero.

(d) Brule Clay

Flesh-colored to light-gray silty clay; zero to about 550 feet thick, thinning eastward; more extensive in subsurface than the underlying Chadron formation, often occurring immediately above the Pierre shale; relatively impervious and arrests downward penetration of ground water.

(e) Arikaree Formation

Gray to light-brownish gray, fine to medium-grained sandstones overlying the Brule clay in the western part of the basin; about 500 feet thick to the west; thinning eastward to zero; relatively porous, permits ready penetration and percolation of water; an important aquifer, the underlying Brule clay forming the impervious ground-water floor.

(f) Ogallala Group

Series of sandstones, in part lime-cemented, with associated relatively unconsolidated sands and gravels and some clay; maximum thickness about 400 feet to the west, thinning eastward; present in the subsurface of much of the basin, resting upon Arikaree-Gering formation in the western part, overlying Brule clay in the central part of the area and eastern portion; an important aquifer; large percentage of the total thickness in porous material, which favors penetration of rain and percolation of ground water.

Mantlerock Formations

The mantlerock of the Loup River Basin includes the Holdrege and Grand Island sands and gravels, the loess and dunesand and the alluvium.

(a) Holdrege-Grand Island Sands and Gravels

Underlie much of the basin, rest upon bedrock and are of Pleistocene age; total thickness 200 feet or more in the southeastern part of the basin, somewhat thinner and more local in occurrence in the rest of the area; very porous and permit rapid percolation of ground water; somewhat finer in texture northward and, therefore, less favorable as a source of ground water for irrigation wells.

(b) Loess

A windblown dust deposit which overlies the

Holdrege and Grand Island sands and gravels in the Loess Plains Region; a silty clay deposit, thicker and coarser to the north, being contemporaneous with the dunesand of the sand hills; 30 to 200 feet in thickness; relatively impervious and results in high surface run-off.

(c) Dunesand

Generally fine-grained sand which is unconsolidated; porous, permits easy penetration of rain water, with little or no surface run-off; mantles the topography of the sand-hill region; 150 feet in thickness locally, but somewhat thinner generally.

(d) Alluvium

Is of recent age; occurs to depths of 50 feet or more in many of the stream valleys of the region; composed of silt and sandy material; is generally porous.

TOPOGRAPHY

The Loup River Basin slopes southeastward from the source of the river in the springs, lakes, and marshes of the Sand-Hill Region, across the undulating grasslands to its eastern extremity at the confluence with the Platte River near Columbus. The lands of the basin lie at elevations ranging from 1,420 to 3,400 feet above sea level. The average elevation of the irrigated area is about 2,150 feet. There are no mountainous areas within the basin, but the northwestern portion of the district lies within the sand-hill lake area of central Nebraska and has an elevation up to 3,400 feet. The gradient of the valley floor is about 8 feet per mile.

The basin may be divided into 3 minor physiographic areas, namely the Sand-Hill Region, the Loess-Hill area, and the Platte Valley Lowlands. The first area, embraces in general, the northwestern and part of the central portion and is devoted largely to grazing; the second area comprises, in general, a part of the central and southeastern portion, and is devoted largely to general farming practices; and the third area occupies a comparatively small area in the extreme southeastern part of the basin near the mouth of the river.

The terraces are rather well defined along the drainage courses outside of the sand hills. The terraces bordering the river are composed of alluvial deposits of silt, sand, and gravel which are generally capped with loess. However, the sandy texture extends to the top in some places. In the upper portions of the basin the sand hills predominate, and in the lower portions beyond the valleys, the area is composed of yellow clay and fine sandy loam.

Native grass is the predominant vegetation in the sand-hill area, with shrubs and trees thriving adjacent to the streams. However, occasional "blowouts" caused by wind erosion occur over most of the area. The irrigable land is located principally in the silt loam soils of the Loess-Hill area confined chiefly to the eastern part of the basin. This irrigable land, in general, is smooth and flat, sloping gently toward and with the river. There is no salient evidence of mineral deposits in the entire basin.

STREAMS OF THE BASIN

The Loup River system is composed of 3 main branches, the North Loup, Middle Loup, and South Loup rivers converging to form the Loup River proper. The junction of the North and Middle Loup rivers is northeast of the city of St. Paul, Nebraska. The South Loup joins the Middle Loup a few miles below Boelus, Nebraska. The principal tributaries are: the Calamus River joining the North Loup River, the Dismal River joining the Middle Loup River, and the Cedar River and Beaver Creek joining the main branch of the Loup River. These tributaries originate in the Sand-Hill Region of the State and are fed by numerous springs, lakes, and marshes. The lakes range in size from small ponds to lakes several square miles in area.

The river system rises at an elevation of approximately 3,400 feet above mean sea level, flows in a general southeastward direction for an approximate distance of 280 miles, and there it discharges into the Platte River below Columbus, Nebraska, at an elevation of approximately 1,420 feet. The average gradient of the Loup River system is approximately 7.5 feet per mile.

The North Loup River has its source in the east-central part of Sheridan County, although the first live stream appears in the central part of Cherry County. The stream flows in a southeastward direction to its confluence with the Calamus River above Burwell. The Calamus River contributes an appreciable supply of constant run-off. Below the junction of these 2 streams, the North Loup River continues its southeastward course to a point northeast of St. Paul, where it joins the Middle Loup River to form the Loup River proper. At this point, the river discharges a mean daily flow of 1,070 second-feet or 36 per cent of the total yield of the Loup River Basin. The length of the North Loup River above this junction is approximately 212 miles with a combined drainage area of 4,145 square miles. The river drains the sand hills in the upper area.

The Middle Loup River has its source in the southern part of Sheridan and the eastern part of Box Butte counties, although the stream does not become well defined until it reaches southwestern Cherry County. The entire headwater region is composed of sand hills abounding in springs, marshes, and lakes. The course of the stream is southeastward to a point near Dunning, where it is joined by the Dismal River; one of the most uniformly flowing rivers in the entire system. The Middle Loup River continues its course to its junction with the South Loup, a few miles east of Boelus. The river then courses in a northeastward direction to join with the North Loup River a short distance below St. Paul. Here the river discharges a mean daily flow of 1,384 second-feet, which amount is 46 per cent of the total yield of the Loup River Basin. The length of this stream is approximately 221 miles with a drainage area of 7,567 square miles.

The South Loup River has its source in the lakes and marshes of southeastern McPherson County. The course of the stream is southeastward to the junction with the Middle Loup near Boelus. The approximate length of the stream is 152 miles with a drainage area of 2,640 square miles.

The Loup River proper is formed by the confluence of the North and Middle Loup rivers 6 miles northeast of St. Paul. It follows a general east and northeastward direction from St. Paul to Monroe and thence southeastward to join the Platte River 5 miles southeast of Columbus. The Loup River is joined by Cedar River near Fullerton; Plum Creek 5 miles west of Fullerton, and Beaver Creek near Genoa. The main stem of the river between the junction of the North and Middle Loup rivers and the mouth is about 68 miles in length. The mean annual flow of the river at its mouth is 2,970 second-feet.

The combined drainage area of the entire system is 14,427 square miles. The flow of the river is relatively sluggish at its source, but the velocity increases from west to east along its course. The flow is confined within low sandy banks which lie from 100 to 400 feet below the bordering uplands. The principal economic use of the water resources is for the production of hydroelectric power, domestic purposes, and irrigation.

SURFACE WATER

The precipitation over the basin is reflected in the discharge of the Loup River system, hence the water supply in the basin varies with the rainfall. Most of the water reaches the streams of the system through an underground route. The sandy texture of the soil readily absorbs the rainfall with little immediate surface run-off resulting. Enormous quantities of water are thus stored in a large underground reservoir. This supply has a tendency to stabilize the flows of the streams. During periods of drought, the streams draw heavily upon the lakes and alluvial ground waters causing a great depletion in supply.

The extreme variation of stream flow near the mouth has ranged from 70,000 second-feet on June 6, 1896 to 341 second-feet on February 28, 1935. The average run-off of 2,970 second-feet is relatively constant. Approximately 55 per cent of the run-off occurs during the period from April to September, inclusive. Occasionally melting snow and heavy rains cause the streams to flood during the spring and early summer, but damaging high waters occur very infrequently.

The large sand-hill area in central Nebraska forms the principal source of water supply for the Loup River. The run-off in the upper reaches of the three main streams is exceedingly constant due to the retention of the rainfall in the sandy soils at the headwaters. The spring rains throughout the lower section of the tributary streams, while affecting the run-off to a certain extent, do not produce flood conditions, and the resulting stream flow is usually uniform throughout the year.

There is very little surface run-off in the Sand-Hill Region, almost all the rainfall being percolated to the ground water and fed evenly to streams.

GROUND WATER

The direction of underflow within the Sand-Hill Region is generally southeastward. The sand-hill formation, the Holdrege and Grand Island sands and gravels, and the Ogallala beds are all adaptable to ground-water storage. In some places, these sands and gravels constitute as much as 700 or 800 feet of open-textured material. The depth of wells is largely dependent on topography. Good wells may be secured at shallow depths in the valleys and at greater depths on hills. Many artesian wells are found in the eastern part of the region at depths between 600 and 800 feet. The water is medium hard and of good quality. Locally in some of the lake basins, alkaline water occurs at shallow depths underlain at greater depths by good water. No serious ground-water problems exist. When the precipitation is abundant, however, the water table is raised, forming numerous sand-hill lakes and ponds which diminish when the precipitation is deficient. The lowering of the water table is detrimental to native grasses, hay production, and wild life.

The central region is capped by loess deposits, underlain by the Holdrege and Grand Island sands and gravels which chiefly overlie the Ogallala beds. The remainder is underlain by Cretaceous shales and chalk, forming an impervious floor. The impervious floor is on the Pierre and Niobrara formations. The Holdrege and Grand Island sands and gravels and the Ogallala beds, where present, form the reservoir rock. Local rainfall, ground water and surface drainage (both the latter from the Sand-Hill Region) contribute to replenishment. As in the sand hills, the direction of underflow is southeastward. An adequate supply of good quality water is generally available. Wells vary from shallow depth in the valley up to 100 to 600 feet in the uplands.

The Platte River Lowland Region is that area below the confluence of the South and the Middle Loup rivers to the mouth of the Loup River. The soil consists of alluvial bottom land and some low to high, loess-capped terraces. The alluvium is underlain by the Holdrege and Grand Island sands and gravels which furnish a good supply of water. These sands and gravels rest on the Ogallala beds in the western part and on the Cretaceous shales and chalk, forming an impervious floor, in the eastern part. Replenishment is from local precipitation, underflow from the sand hills and from the river. The water supply is abundant, medium hard, and of good quality.

AGRICULTURAL AND INDUSTRIAL DEVELOPMENTS

The chief industry of the Loup River Basin is agriculture with the upper portion devoted almost entirely to grazing and hay production, and the lower portion to general farming. There is no manufacturing of importance with the exception of local milling and the generation of a portion of the electrical energy for the immediate needs of the locality. The leading markets and manufacturing centers of the State (Omaha, Lincoln, Hastings, Grand Island, and North Platte) are located but a few miles outside the basin.

Following the early settlement of the Loup River Basin there was a tendency to overcrop the sandy soils of the upper portion of the area. These sandy soils in most instances have been returned to grass and at present, the chief agricultural characteristic of the upper portion of the basin is the large amount of land in pasture. In 1934 only 6.8 per cent of this area was in cultivation, with 83.3 per cent in pasture and 9.0 per cent in wild hay.

The average size of farms in the upper basin has increased from 1,587 acres in 1919 to 1,926 acres in 1934. Of the land in crops in 1929, 42 per cent was in corn, 7 per cent in oats, 14 per cent in rye and 8.1 per cent in alfalfa. Only about 2 per cent was in wheat and 1 per cent in barley. In 1933 the corn crop was only about 70 per cent of average because of insufficient rainfall. In 1934 approximately 85 per cent of the cultivated land was a total failure because of drought. The yield of corn, the principal crop, was only 25 per cent of the 1920-1929 average, and the yield of other crops was also much less than average.

Cattle numbers reached a peak prior to the cattle-buying program in 1934, and were becoming excessive for the amount of pasture land available. Allowing for the number purchased on account of drought, there were about 40 per cent more cattle on January 1, 1935 than on January 1, 1920. There are a few hogs and sheep raised but these are unimportant compared to cattle.

The size of farms in the lower basin area averaged 321 acres in 1919, and 322 in 1934. The percentage of land in farms has increased from 90 per cent in 1919, to 97 per cent in 1934, and the percentage of farm land in cultivation from 39 per cent in 1919, to 49 per cent in 1934. Of the non-cultivated land in 1934,47.3 per cent was in pasture, and 1.5 per cent in wild hay.

Corn is the principal cultivated crop in the lower basin. It comprised approximately 56 per cent of the cultivated acres in 1934. Wheat comprised 5 per cent, oats 15 per cent, and alfalfa 12 per cent of the cultivated area. There has been a decided increase in wheat and corn acreages during the past 15 years. Oats and alfalfa acreages have remained about constant in proportion to cultivated land. Yields of all crops declined greatly in 1934, when there was a 54 per cent failure of cultivated crops.

Hogs and beef cattle are the principal classes of livestock and are about equally important. Approximately 70 per cent of the corn and other food grains are marketed through hogs and cattle. During the past 15 years, livestock numbers have fluctuated according to the feed supply. At the beginning of 1935, following the drought, cattle were only about 62 per cent of the number in 1919 and hogs 43 per cent.

There are 2 distinct types of farming in the basin, range livestock in the upper part, and general farming in the lower part. Approximately three-fourths of the farms in the upper part of this basin are classed as livestock farms, nearly all of which are cattle-grazing farms. In the lower part of the basin, about half of the farms are classed as livestock farms on which hogs are as important as cattle. Approximately 77 per cent of the income in the upper part of the basin is from livestock, nearly all of which is from the sale of cattle. Fifty-nine per cent of the income in the lower part is from livestock of which less than one-half is from the sale of cattle.

The estimated capital in farms decreased about 30 per cent from 1920 to 1930. The decrease in land and buildings was about 42 per cent while that in machinery was about 11 per cent,and that in livestock 9 per cent during this period. The decrease in the upper part of the basin where cattle grazing is the dominant type of agricultural production, was less than in the eastern part where the agricultural production is on a more intensive basis.

There has been a marked decrease in the number of farms operated by owners in recent years. From 10 to 20 per cent of the farms in each county of the Loup River Basin have passed from owner to tenant operation since 1920,and approximately 50 per cent of the units are operated by tenants at the present time.

IRRIGATION DEVELOPMENT

EARLY HISTORY

In the early nineties numerous irrigation projects were developed in the Loup River Basin. During the period between 1894 and 1896, approximately 145,600 acres of land were included under existing irrigation projects. By 1900, practically all these enterprises were abandoned.

The principal reasons contributing to the failure of these earlier enterprises were: inadequate capital, too much promotion and speculation, inefficient engineering guidance, ineffectiveness of cooperative efforts, the lack of knowledge with reference to irrigation practices, and the recurring wet cycles. Many of the promoters were too sanguine regarding the immediate settlement and development of this region. Considerable misdirected effort and capital were expended attempting to develop these irrigation enterprises.

ACREAGE IRRIGABLE UNDER EXISTING IRRIGATION

Stream	Irrigable Acreage Under Projects	Acreage Covered by Appropriations
North Loup	37,850	33,587
Middle Loup	45,338	32,726
South Loup	4,614	4,614
Loup	1,960	1,960
Totals	89,762	72,887

With the limited irrigation now practiced the average crop yields for the Loup River Basin are about 90 per cent of the State averages. The chief economic use of the river at the present time is for domestic purposes and the development of hydroelectric power.

It is estimated that there are approximately 207,000 acres of irrigable land or about 2.2 per cent of the entire drainage area that could be economically developed. Much of the land in the upper portion of the basin is not well suited for irrigation. This is due to the general rough topography and the sandy topsoil.

Because of the climatic conditions of the basin, a duty of one second-foot of water for each 140 acres of land to be served has been used as a basis for determining the probable consumptive use. It is believed that under average conditions this amount of water is sufficient for the production of crops. Past records reveal that the heaviest demand for irrigation water occurred during the month of July, so a 100 per cent draft was assumed for that month. The ratio that the other months bear to July were likewise determined from records of irrigation practices in the Platte River Basin.

The principal projects now completed or in varying stages of construction are the North Loup,the Middle Loup, and the Almeria projects. There are, however, other potential irrigation projects in the Loup River Basin, namely; the Lillian project on the Middle Loup River, and the Calamus project on the Calamus River. The following is an estimate of the irrigation requirements for the 3 principal projects on the North and Middle Loup rivers as based on the projects having applications on file in the office of the Department of Roads and Irrigation.

It is estimated that 40 per cent of the water diverted from the river will be entirely consumed. The consumptive use for the North Loup, Middle Loup, and Almeria projects will amount to approximately 50,000 acre-feet annually. The flow of the river will likewise be depleted to this extent. The combined maximum diversion in July of 606 second-feet would reduce the available supply of water in the river to this amount less the return flow. The porosity of the soil is such that the unconsumed portion of the water diverted would soon migrate to the river.

IRRIGATION REQUIREMENT FOR PROJECTS

Based on Duty of One Second-Foot for Each 140 Acres

Month	Per cent of July	North Loup	Middle Loup	Almeria	Total	Total Acre-Feet
		In Second-Feet				
April	10	26	30	1	57	3,392
May	25	65	75	3	143	8,793
June	40	104	120	5	229	13,627
July	100	260	300	12	572	35,171
August	95	247	285	11	543	33,388
September	70	182	210	8	400	23,802
Total						118,173
Project Acreage		37,850	45,338	1,692		

(a) The Lillian Project

The Lillian project covers an area originally included in a development undertaken in the early nineties by the Lillian Precinct Irrigation Ditch and Power Company. The project was abandoned due to the inability to finance the enterprise. In 1896 the Lillian Precinct Irrigation District was organized and a $32,000 bond was voted to acquire title and to permit the development of the project to proceed. By 1899, 22 miles of canal had been completed, but by 1900 no land was being irrigated because the rainfall was sufficient for crop production, and as a consequence, the entire project was abandoned.

As now outlined, the project would include approximately 5,000 acres suitable for irrigation, no part of which is included in any other existing proposed project. The area lies on the right side of the Middle Loup River in the vicinity of Milburn and Gates in Custer County. Topographically, it is smooth to gently rolling. The soils generally range from fine sandy to silt loams. The project would be entirely dependent upon the direct flow of the Middle Loup River for a water supply.

The plan of reclamation now contemplated would involve a diversion dam on the Middle Loup River about 5 miles upstream from Milburn. The structure would be of earth and about 725 feet long, including 225 feet of concrete section containing five 30-foot gate openings for control purposes. The main canal would extend down stream from this point for a distance of about 19 miles, and would have an initial capacity of 80 second-feet. About 550 feet of concrete siphon and 280 feet of concrete flume would be necessary, beside which, 5.25 miles would be concrete lined to prevent excessive seepage losses.

Cost estimates show a total of $335,000.00 for the entire system or $67 per acre for the irrigable area.

(b) The Calamus Project

An application for the use of water diverted from the Calamus River for the irrigation of land was filed in November, 1895. This was followed by an application filed in February, 1896, and another in October, 1902. The first 2 applications were canceled and the third was not approved.

After preliminary steps were taken by land owners, the district court of Loup County formally decreed the organization of the Calamus Irrigation district on July 20, 1924. The organization of the district, however, was contested and the question of the legality of the organization of the district is still pending in the courts. Preliminary surveys and plans for reclamation have been made but no construction work has been done.

The lands of the district are situated in Loup County on both sides of the Calamus River in the general vicinity of Harrop. The irrigable area, estimated at 9,200 acres, consists of a strip of bottom land situated on a bench at an elevation about 15 feet above the flood plain of the river. The surface varies from being fairly smooth to slightly hummocky, and slopes gently toward the river.

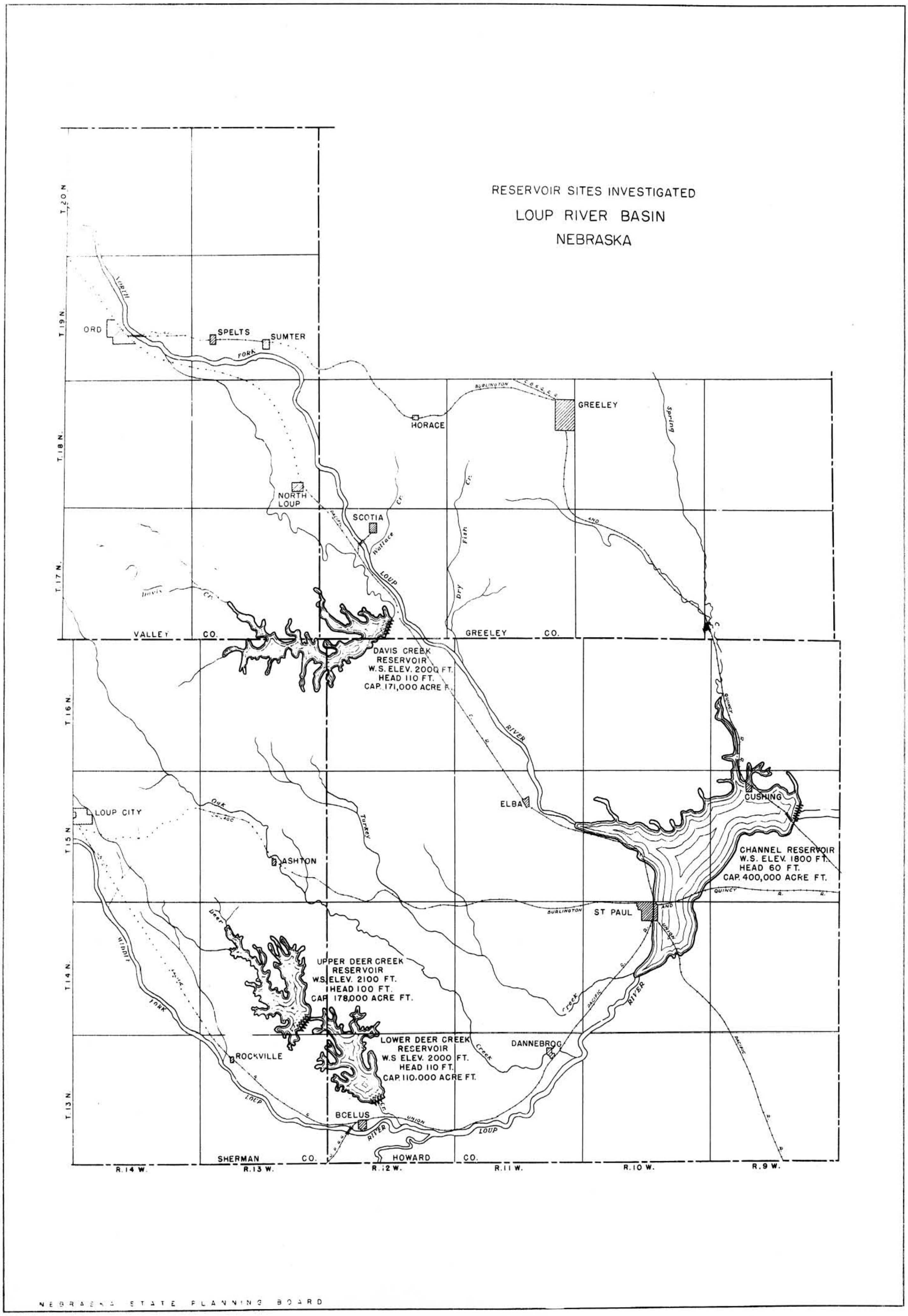
The soils of the irrigable area are either Valentine sands or Valentine fine sands with a low humus content. In its natural state the soil supports a good growth of grass that affords excellent pasture.

The Calamus Irrigation project provides that an earth fill diversion dam 29 feet high and 1,300 feet long, be constructed with suitable outlet works and spillway facilities to control the stream flow. From the structure, a main canal would extend downstream on the left side of the river, a total distance of about 78 miles, while on the right side the main canal would be about 32 miles long. No particularly difficult construction would be encountered on the entire system, but a considerable lined section would be necessary to prevent excessive seepage losses and maintenance would be expensive because of the sandy nature of the country traversed.

A reliable cost estimate is not available for this project because the plans are not yet sufficiently definite.

STORAGE POSSIBILITIES

A study of the stream-flow analysis of the Loup River Basin reveals the need for providing storage facilities if the surface water of the basin is to be conserved and utilized to the best advantage. If provisions are made for conserving the flood peaks, the power supply can be better equalized. This will result in a greater production of electric energy.


RESERVOIR SITES INVESTIGATED
LOUP RIVER BASIN
NEBRASKA
T.20 N.
T.19 N.
T.18 N.
T.17 N.
T.16 N.
T.15 N.
T.14 N.
T.13 N.
ORD
SPELTS
SUMTER
NORTH
FORK
HORACE
GREELEY
BURLINGTON
Spring
NORTH LOUP
SCOTIA
Wallace Cr.
Fish Cr.
Dry
LOUP
Davis Cr.
VALLEY CO.
GREELEY CO.
DAVIS CREEK RESERVOIR
W.S. ELEV. 2000 FT.
HEAD 110 FT.
CAP. 171,000 ACRE F.
RIVER
ELBA
CUSHING
CHANNEL RESERVOIR
W.S. ELEV. 1800 FT.
HEAD 60 FT.
CAP. 400,000 ACRE FT.
QUINCY
LOUP CITY
Oak
ASHTON
Turkey
BURLINGTON
ST PAUL
UNION
Deer
UPPER DEER CREEK RESERVOIR
W.S. ELEV. 2100 FT.
HEAD 100 FT.
CAP. 178,000 ACRE FT.
MIDDLE
FORK
Creek
PACIFIC
RIVER
LOWER DEER CREEK RESERVOIR
W.S ELEV. 2000 FT.
HEAD 110 FT.
CAP. 110,000 ACRE FT.
Creek
DANNEBROG
ROCKVILLE
LOUP
BOELUS
RIVER
UNION
LOUP
PACIFIC
SHERMAN CO.
HOWARD CO.
R.14 W.
R.13 W.
R.12 W.
R.11 W.
R.10 W.
R.9 W.
NEBRASKA STATE PLANNING BOARD

Consequential to the result of the stream-flow analysis, a field investigation was made to ascertain the storage possibilities of the basin. This investigation disclosed the existence of 4 reservoir sites. Two of these with potential capacities aggregating approximately 288,000 acre-feet are on Deer Creek, a tributary to the Middle Loup River; a third site with a potential capacity of 171,000 acre-feet is on Davis Creek, a tributary to the North Loup River; and a fourth with a potential capacity of 400,000 acre-feet is on the Loup River proper, 9 miles below the town of St. Paul.

The water impounded in the Davis Creek Reservoir comes from the North Loup River. A diversion dam and about 30 miles of canal are required to divert and conduct the excess water of the North Loup River to this reservoir. The Middle Loup River is the source of supply for the water impounded in the Upper and Lower Deer Creek reservoirs. A diversion dam and approximately 20 miles of the canal diverts and conducts the excess water of the Middle Loup River to these reservoirs. A storage dam 75 feet high and approximately 1.5 miles in length is necessary to create a channel reservoir with a 400,000 acre-foot capacity on the Loup River some 3 miles below the confluence of the North and Middle Loup rivers.

RESERVOIR CAPACITIES

DAVIS CREEK RESERVOIR

Contour	Head	Area in Acres	Capacity in Acre-feet
1,900	0	13	
1,920	20	154	1,670
1,940	40	614	9,350
1,960	60	1,434	29,830
1,980	80	3,226	76,430
2,000	100	6,195	170,640

UPPER DEER CREEK

Contour	Head	Area in Acres	Capacity in Acre-feet
2,000	0	102	
2,020	20	282	3,840
2,040	40	922	15,880
2,060	60	1,894	44,040
2,080	80	3,277	95,750
2,100	100	4,941	177,930

LOWER DEER CREEK

Contour	Head	Area in Acres	Capacity in Acre-feet
1,900	0	26	
1,920	20	205	2,310
1,940	40	947	13,830
1,960	60	1,894	32,770
1,980	80	3,149	64,260
2,000	100	4,557	109,830

LOUP CHANNEL RESERVOIR BELOW ST. PAUL

Contour	Head	Area in Acres	Capacity in Acre-feet
1,740	5	384	960
1,760	25	2,342	28,220
1,780	45	7,494	126,580
1,800	65	20,045	401,970

POWER DEVELOPMENT

The Loup River Basin has been developed for hydroelectric power at 37 different places but only 11 of these power plants are existing today. Hydroelectric power plants were constructed on the tributaries to the Loup River. Some of these were constructed at or near Columbus, Monroe, Boelus, Sargent, Ericson, Cedar Rapids, Fullerton, Arnold, Callaway, Ravenna, Litchfield, Mason City, Ansley, Loup City, Albion, St. Edward, and Spalding. The plants at Arnold, Ravenna, Litchfield, Mason City, Ansley, and Loup City, have been abandoned or destroyed by high water.

It is apparent from existing water power projects that the control of silt and ice are the most serious physical problems in the consideration of future water power developments. Numerous power possibilities exist at many points along the streams of the basin. The relatively uniform flow of the stream is conducive to economical water power production.

Two hydropower plants on the Loup River have recently been completed and are now in operation. One is located at Columbus with 39,450 kilowatts of installed capacity, and the other at Monroe with 8,250 kilowatts of installed capacity. Both of these are units of the Loup River Public Power and Irrigation District project. Complete descriptions are included elsewhere in this report.

LOUP RIVER PUBLIC POWER PROJECT

The Loup River Public Power Project includes the generation and transmission of electric energy. It differs from the other 2 major projects in the State in that it is designed solely for power purposes and that no major water-storage features are included. The characteristics of the normal flow of the Loup River are such that direct diversion offers a reliable source of potential power development. The water that is directly diverted is augmented with water stored in the regulating reservoir in order to meet successfully the fluctuations of daily power demands. The source of water supply is the Loup River.

(a) Headworks

(1) Diversion dam and intake--The diversion dam and canal intake works are located 5.5 miles southwest of the city of Genoa, Nebraska and divert water from the Loup River. The diversion dam, or control weir, is a low wall of reinforced concrete construction, 1,320 feet long, extending across the main channel. The crest elevation is about 2 feet above the normal water level of the river at this point. The intake structure, located on the north bank of the river, is of reinforced concrete construction and is comprised of a battery of 11 radial gates, each 24 feet long and designed to give a maximum opening of 5 feet. Downstream from and at angles to the canal intake works, are located 3 sluice gates, each 20 feet long with a maximum opening of 6 feet. Winter operation is insured by a boiler unit which supplies steam for thawing all gates.

(2) Settling basin--The settling basin, located downstream from the intake, receives the direct diversion of river flow. It serves as a stilling basin in which the sand and silt carried by the river water is allowed to settle before passing over the skimming weir into the canal. The basin is 200 feet wide on the bottom, 10,000 feet long and has a

maximum depth of 16 feet of water at a flow of 3,000 second-feet.

(4) Silt and sand deposited in the settling basin are removed by an electrically-driven floating dredge. This dredge has a 28-inch centrifugal pump driven by a 1,200 horsepower motor. Tests have demonstrated that this equipment can remove 1,200 cubic yards of silt and sand per hour. The discharge is carried through concrete and galvanized iron sludge flumes constructed on the "river side" berm of the stilling basin. The sludge is deposited at intervals downstream along the river bank where it is carried away by the flood waters. Power for the operation of the dredge is supplied through a 33,000 volt transmission line from the district powerhouse at Monroe.

(5) Skimming weir--The skimming weir, located at the downstream end of the desilting basin, is of reinforced concrete construction. It is designed so that the water elevation and velocity of flow through the desilting basin can be satisfactorily controlled.

(b) Canals

(1) High line canal--The high-line canal, which conveys water from the skimming weir to the Monroe powerhouse, is 11.5 miles long. It is designed to carry 3,000 second-feet of water. The canal has a bottom width of 39 feet,and water depth of 19.5 feet.

(2) Low-line canal--The low-line canal carries the tailrace water from the Monroe powerhouse to the regulating reservoir,a distance of 13 miles.It is designed to carry 3,000 second-feet of water, and has a bottom width of 39 feet and maximum water depth of 19.5 feet.

(3) Supply canal--The supply canal connects the regulating reservoir with the Columbus powerhouse and is designed to carry a sufficient amount of water to maintain all turbines operating under full load. Its designed capacity is 4,800 second-feet, with a bottom width of 100 feet and normal water depth of 22 feet. It is 1.5 miles long.

(4) Tailrace- The tailrace canal carries the residual water from the Columbus powerhouse to a point on the Platte River located approximately 1 mile below the confluence of the Platte and Loup rivers. Its designed capacity is 4,800 second-feet, with a bottom width of 42 feet and maximum water depth of 18.9 feet. The outlet discharge at the river is controlled by a reinforced concrete weir 700 feet long, the crest of which is fixed at an elevation sufficient to maintain the water seal on the draft tubes of the Columbus powerhouse.

(c) Powerhouses

(1) The Monroe powerhouse is located approximately 1.75 miles northwest of the town of Monroe, Nebraska. It is of reinforced concrete construction and is built directly across the canal. It contains 3 vertical-shaft Francis turbines of 3,200 horsepower each, directly connected to generators rated at 2,750 kilovolts, at 95 per cent power factor. The normal operating head on the plant is 32 feet. A 16-foot by-pass is provided at the north end of the powerhouse which is controlled by a radial gate automatically operated by a float-valve. The plant is equipped for complete control from the Columbus powerhouse.

(2) The Columbus power plant consists essentially of an intake structure built at the end of the forebay, the penstocks, and the powerhouse. The intake structure is built of reinforced concrete having 3 steel gates controlling the flow into the penstocks. Each gate is 20 feet square, of vertical-lift type, and is electrically operated. Steel trash racks are provided in order to catch debris which may be carried into the forebay. The penstocks leading from the intake to the scroll cases of the turbines, consist of 3 steel pipes each 20 feet in diameter and 385 feet long. The upper half of the penstocks is exposed while the lower half is embedded in screened gravel protected by tile drains.

(3) The Columbus powerhouse is located 2.5 miles northeast of the city of Columbus. It is of reinforced concrete construction and contains 3 vertical-shaft Francis turbines of 18,000 horsepower each, directly connected to generators rated at 14,000 kilovolts, at 95 per cent power factor. The normal operation head of this plant is 112 feet. The operator's room is equipped for complete control of both the Monroe and Columbus plants. Due to the storage facilities of the regulating reservoir the potential power in the daily canal flow may be augmented with available storage water in order to meet peak demands.

(d) Regulating Reservoir

The regulating reservoir, known as Lake Babcock, is located 3 miles north of the city of Columbus. It covers an area of 1,000 acres and has a total storage capacity of 11,000 acre-feet of which 6,000 acre-feet are effective in the generation of power. The purpose of this reservoir is to supplement the canal flow in order to meet the daily fluctuating demand for power.

(e) Transmission Lines

To provide a means of distributing the power developed through the operation of this project, the 2 power plants are interconnected and power from both plants is delivered over a transmission line system. The transmission system under construction consists of 3 lines all having their origin at the Columbus plant and terminating at Valley, Lincoln,and Norfolk, Nebraska. The lines to Valley and Lincoln operate at 115 kilovolts and the line to Norfolk is constructed for 115 kilovolts operation but is tentatively operated at 69 kilovolts.

In addition, 4 major 115-kilovolt transmission lines are being constructed in order to complete the district's quota of the 115-kilovolt system. These lines will be constructed from Columbus to Omaha; Lincoln to Omaha, Valley to Omaha; and Grand Island to Fulton Junction.

Substations will be located at several intermediate points along the above-mentioned lines.

(f) Substations

The main substation of the district is located at the Columbus powerhouse with terminal and intermediate substations located at Omaha, Lincoln, Norfolk, Fremont, Madison, and Seward, Nebraska. Several of these substations are under construction at the present time. These substations provide the delivery of power to distributing systems and to lower-voltage transmission lines serving the surrounding territory including rural electrification systems.

SUMMARY OF CONSTRUCTION DATA

Diversion dam

Control weir - 1,320 feet long extending across the channel of the Loup River.

Intake

Comprised of a battery of 11 radial gates each 24 feet long.

Sluiceway

Comprised of a battery of 3 radial gates, each 20 feet long.

Settling basin

10,000 feet long, 200 feet bottom width and maximum water depth of 16 feet.

Skimming weir

Located at downstream end of settling basin. Serves as a control of flow through stilling basin.

Power canal

Length 26.5 miles, capacity 3,000 second-feet.

Supply canal

Length 1.5 miles, capacity 4,800 second-feet.

Tailrace

Length 5.5 miles, capacity 4,800 second-feet.

Monroe powerhouse

Three units 3,200 horsepower or 2,750 kv. at 95 per cent power factor, each.

Columbus powerhouse

Three units 18,000 horsepower or 14,000 kv. at 95 per cent power factor, each.

Transmission lines

Under construction - 125 miles of 115 kv. line. Proposed - 240 miles of 115 kv. line.

Substations	Volts
Columbus plant substation	13,800/115,000 115,000/ 69,000
Lincoln substation	115,000/ 69,000 115,000/ 33,000
Norfolk substation	69,000/ 33,000
Fremont substation	115,000/ 33,000 115,000/ 13,800

POWER AND IRRIGATION DISTRICTS

THE NORTH LOUP PUBLIC POWER AND IRRIGATION DISTRICT

The North Loup Public Power and Irrigation project was originally planned to provide water for both irrigation and power by direct diversion from the natural flow of the North Loup River. However, only the irrigation phase of the project has been constructed and is now in operation.

The soils of the North Loup River Basin are loamy sand, sandy loams, silt, and clay loams. Topographically, the land varies from smooth to gently undulating with moderate slopes toward the river, and a general elevation decline downstream of about 7 or 8 feet per mile.

Even though the seasonal temperatures vary widely, the climate is well suited to the production of most staple crops, and also to the raising of cattle. General agriculture is practiced extensively throughout the North Loup River valley. The most important crops are: corn, small grains, alfalfa, potatoes, garden products, and popcorn. Much of the present farm activity is confined to the production of hay crops for winter stock feed.

The total irrigable acreage under this project approximates 37,850 acres. Two separate tracts lie on the right side of the stream and total approximately 26,850 acres. One tract of about 11,000 acres lies on the left side of the river. These 3 tracts of land are served by the following canals; Taylor-Ord, Ord-North Loup, and Burwell-Sumpter.

The headgate of the Taylor-Ord Canal is located on the south bank of the river in Loup County. From the point of diversion, the canal extends a distance of 35.8 miles, serving 17,710 acres of land in Loup, Custer, Garfield, and Valley counties.

The headgate of the Ord-North Loup Canal is located on the south bank of the river in Valley County. This canal, 16.8 miles in length, will irrigate 9,140 acres in Valley and Greeley counties.

MIDDLE LOUP PUBLIC POWER AND IRRIGATION DISTRICT

The Middle Loup Public Power and Irrigation project provides for the irrigation of land on both sides of the stream beginning at a point south of Sargent in Custer County and running almost continuously for approximately 40 miles downstream to a point about 8 miles south of Loup City in Sherman County. The proposed irrigated area lies in Custer, Valley, and Sherman counties. Water is directly diverted from the natural flow of the Middle Loup River at various points along the stream and by the pumping plants located on 2 of the canals.

On the left side of the stream the lands in the upper part of the district are smooth or only slightly undulating, while in the lower part the valley land is somewhat rough and the area is dissected by numerous dry coulees leading to the river channel. On the right side, the area varies from smooth to gently undulating. Throughout the district the lands generally have a moderate slope toward the river and an average downstream fall of about 7 feet per mile.

The soils of the lands included in the district are fine to medium sand, fine and very find sandy loams, and silt loams.

Seven canals, some of which are completed, will serve an irrigable area of 45,338 acres. Contracts were signed in 1933 by approximately 200 farmers, to take water for the irrigation of approximately 42,000 acres.

CANALS OF THE MIDDLE LOUP PUBLIC POWER AND IRRIGATION DISTRICT

Name of Canal	Length in Miles	Acres Served	Bank of River	Location of Headgate Land Description	County
No. 1	12.50	4,126	Right	SW 1/4, SW 1/4, 10-19-18	Custer
No. 3	26.00	12,990	do	NW 1/4, NW 1/4, 6-17-16	Valley
Lee Park*	13.25	6,087	do	NW 1/4, SW 1/4, 8-17-16	Valley
No. 2	17.00	5,069	Left	SW 1/4, SE 1/4, 10-19-18	Custer
No. 4	21.50	11,271	do	NW 1/4, SW 1/4, 14-18-17	Custer
No. 5	10.75	4,231	do	NW 1/4, SE 1/4, 2-15-15	Sherman
Wood Park**	6.00	1,564	do	SW 1/4, SW 1/4, 23-19-17	Custer
Totals	107.00	45,338			

* Pumping plant on Canal No. 3.
* Pumping plant on Canal No. 2.

Allowing one second-foot of water for each 140 acres of land, 324 second-feet will be required for the irrigation of the lands of the district.

The proposed Middle Loup hydroelectric plant and the dam would be constructed on the river approximately 5 miles below Comstock in the NE 1/4 of SE 1/4 Section 35, Township 18, Range 17, Custer County. For the operation of this plant an appropriation of 1,200 second-feet is desired.

The dam would be constructed across the Middle Loup River, to a height of 35 feet above foundation rock to maintain a maximum head of 20 feet at the low-water stage of the stream. The lake created by this dam would be 2.85 miles in length.

ALMERIA PUBLIC POWER AND IRRIGATION DISTRICT

The Almeria Public Power and Irrigation project was initiated by the Loup County Irrigation District which made application for the use of water for irrigation, August 28, 1934. This is the priority date for their claim. The rights acquired were assigned to the Almeria Public Power and Irrigation District on November 19, 1935.

Water will be diverted directly from the natural flow of the North Loup River into the Almeria Canal. The headgate is located about 4 miles northwest of Almeria on the right bank of the stream in the NW 1/4 of NW 1/4, Section 24, Township 22, Range 20, Loup County. The canal will be extended southeastward along the right side of the river for a distance of approximately 10 miles.

In this district which lies wholly within Loup County, there are approximately 1,692 acres of land susceptible to irrigation. Allowing one second-foot of water for the irrigation of each 140 acres of land, there would be required 12.09 second-feet of water for the irrigation of the land of the district.

Topographically, the land varies from gently rolling to smooth, with easy slopes toward the river and a general fall of about 6 to 8 feet per mile downstream. The soils of the lands in this district are loamy sand, very fine sandy loams, and silt loams.

The Almeria Canal will also carry water to the Spring Creek Power Plant which will be located 9 miles below the headgate, on Spring Creek in Section 14, Township 21, Range 19, Loup County. Here during non-irrigating seasons the water will be dropped 20 feet into a tailrace leading to the river and during irrigating seasons will be dropped 20 feet into a continuation of the Almeria Canal which will continue southeastward to a tailrace in Section 13, Township 21, Range 19, Loup County.

In order to furnish continuous service it is proposed to provide a Diesel plant to supplement the hydroelectric power to be generated by this project. A cost estimate is not available for the power plant and its appurtenances.

FLOOD PROBLEMS

The precipitation records reveal that this basin lies in the path of flood-producing storms which move in a general northeasterly direction. However, precipitation sufficiently great to cause flood conditions is very infrequent. When floods do occur the damage is relatively light. The pervious mantle-rock serves as a massive sponge. It absorbs and regulates the irregular precipitation and then releases it as uniform stream flow. This characteristic of the basin almost eliminates the occurrence of damaging floods.

The highest flood discharge of record occurred June 5, 1896. On this date rainfall of unprecedented intensity, amounting to 12 inches in places, fell in Valley, Greeley, Sherman, and Howard counties. Due to the fact that these counties lie below the sandhill section, the amount of run-off is much greater. The maximum discharge into the North Loup River at St. Paul was estimated at 90,000 second-feet, but due to the rapid rise and recession of the flood the large discharge was of short duration. The flood crest flattened considerably as it moved down its course. The peak was reduced to an estimated 70,000 second-feet by the time it reached the mouth of the river southeast of Columbus.

EROSION

The Loup River water shed presents serious erosion problems of varying intensity. In the upper region water erosion is not particularly active, but the wind erosion is a factor of vital concern. In the earlier days of agricultural development in the State, farming practices in the upper section have resulted in devastated stretches of sand hummocks and blowouts. As a result, most of this area is now used for grazing purposes. In the central and lower portions of the watershed the characteristics of the soils make them more adaptable for intensive cultivation. Having this quality, they are intensively cultivated and under the present farming practices, severe water erosion results.

SEDIMENT

The stream flows in the upper reaches of the principal tributaries are comparatively free from sedimentation. This condition results from the small surface run-off and the high absorption of precipitation by the soils of the watershed. The central and lower portions of the basin are more susceptible to water erosion, resulting in a greater sediment load, but the wind erosion in these areas is not so great as that in the upper portion. The Loup River system does, however, carry a large load of suspended sediment. It has been estimated that the Loup River at its mouth contributes 48 per cent of the total sediment transported by the Platte River. The average suspended concentration is 31,110 parts per million.

POLLUTION

Pollution of ground water is not yet a serious problem in the Loup River Basin, chiefly because no large centers of population are located within the region. The water supply is usually free of deleterious salts and it should prove well adapted to irrigation use. The streams are not used to any great extent for industrial purposes, therefore, the pollution of the waters is almost negligible. The only contamination results from intermittent sewage discharges.

The Soil Conservation Service is attempting to effect erosion control through farming practices. They hope to obtain a united effort of all farmers in adopting approved methods for minimizing and controlling the accelerated erosion which is so active in burying the fertile flood plains, in silting the streams, in polluting the natural habitat of aqueous wild life, and in distorting the scenic beauty of the landscape. It is believed that stabilization of the soils in the basin can be greatly increased by recommended practices.

Droughts have occurred at irregular intervals causing considerable loss to agriculture. Droughts greatly deplete the water supply of a basin, such as exhausting the soil moisture, reducing the volume of surface waters, and lowering the ground-water table. It is important that every possible effort be made to reduce the factors contributing to drought hazards. The conservation of the water resources within the basin tends to build up a reserve of water supply that will help to resist the devastations of drought.

A program for the conservation of the ground water should include the regulation of drainage of sand-hill lakes. Provision should also be made to control the waste of ground water which results from permitting artesian wells to flow unchecked. Although the supply of ground water in the region is large it is probably not inexhaustible and control should be exercised to prevent its being used more rapidly than it is replenished.

Every means should be taken to prevent untreated sewage and industrial waste from being discharged into the streams of the basin, because such waste will find easy access to the ground-water horizons of the region.

Investigation of storm frequencies and agricultural statistics has indicated the need for more definite determination of the variation in intensity of rainfall throughout small areas; such variation is not now indicated by the widely separated United States Weather Bureau stations.

REPUBLICAN RIVER BASIN

DESCRIPTION

The Republican River Basin, a portion of the Kansas River Basin, includes parts of Colorado, Nebraska, and Kansas. The river system, dendritic in pattern, has a marked regularity in the spacing and direction of drainage courses. The basin, measured along the Nebraska-Kansas line, is approximately 240 miles in length and is approximately 70 miles in width along the Colorado-Nebraska line. This width remains fairly constant for a distance of about 90 miles eastward, from where it gradually converges to a point at the Nebraska-Kansas line in western Thayer County, Nebraska. The basin as a whole, is irregular in shape. It is wide in the upper reaches and becomes narrower in the middle section. From there it remains comparatively narrow to the mouth of the river near Junction City, Kansas. This drainage area above a point where the river crosses the Nebraska-Kansas line, embraces approximately 23,100 square miles. The portion in Nebraska comprises 9,700 square miles, about 12 per cent of the area of the State. In Nebraska the basin has the shape of a right-angle triangle, and includes all or part of 17 counties in the southwestern part of the State.

The drainage area, a part of the Great Plains, consists of a smooth table surface, traversed by broad, shallow valleys. It is dissected by canyons caused by cross-drainage cutting deeply into the underlying rock. The basin is drained by the Republican River system, herein described under "Streams of the Basin." The southwestern portion includes a part of the precipitous plains and the sand-hill areas of eastern Colorado, and the northwestern part includes a portion of the sand-hill area of western Nebraska. Along the main course the terraces near the river are composed of fertile alluvial deposits, with scattered areas of sandy material which has been transported by floods from the headwaters of the stream.

The wooded areas, confined largely to the borders of the river, and to the rough valley sides, increase from west to east and follow closely the general course of the stream. These timbered areas consist principally of cottonwoods in the western section, and elm, oak, ash, willow, and cottonwoods in the eastern section. Divers kinds of grasses are found throughout the basin. Of these, buffalo grass is most important in the western portion and bluestem in the eastern portion.

The characteristics of the Republican River Basin and the North and South Platte River Basin, lying to the north of the Republican are similar, except that the Republican River does not rise in the mountainous country.

GENERAL GEOLOGY

Several bedrock formations are exposed along the principal valleys. The older and lower of the outcropping formations of Cretaceous Age are known as the Pierre shale. Niobrara Chalk, and Carlile shale. Lower in the section but not outcropping are the Greenhorn limestone, Graneros shale, Dakota beds, and the older sedimentary rock extending down to granite. In places the Pierre shale or top Cretaceous formation, which is exposed at many places along the sides of the valley, is overlain in the uplands by irregular sandy, limy deposits (Ogallala group) of Tertiary Age. The older sedimentary strata lie nearly horizontal with a regional dip westward except where they are warped upward about 300 feet in the Cambridge Arch.

Much of the upland is mantled with thick loess deposits and by 2 dunesand areas known as sand hills. The Loess Plains border, and the small areas along the valley side farther west and south of the river, are underlain below the loess by sand and gravel deposits of early Pleistocene Age. Sheets of colluvial silts and sands form the valley floors extending under the terraces, which are capped to variable depths by loess and colluvial wash.

All the region is underlain comparatively near the surface by such impervious formations as the Pierre, Niobrara, and Carlile. These are non water bearing and where exposed cause quick, heavy, surface run-off. The alluvial sands along the Republican Valley proper range from nothing to about 40 feet in depth. The alluvium rests on an impervious floor and carries ground water up to or above the level of the river. Similarly there is water storage under most of the terraces. There is no well-water supply in the shaly-land borders of the valley except in the Dakota sands at depths of several hundred feet. There is storage, however, in the upland where the Dakota sands are underlain by the Ogallala or Pleistocene sands.

The Ogallala beds erode as rough, stony lands, the Niobrara chalk as bluffs, and hills, the Pierre shale as clay slopes, and the loess deposits where excessively eroded, form canyon areas extending back into the upland plains. The terraces, which are nearly flat, are cut across by ravines, and are mantled on their bluffland borders by colluvial dams and slopes. During periods of overflow, some parts become scoured, silted, or sanded. In cross section, the trunk valley shows a belted arrangement of topography, soils, ground-water conditions and land use, closely related to the distribution of the geological formations.

Bedrock Formations

The bedrock formations which outcrop or form the bedrock platform of the area are herein described from oldest to youngest.

(a) Carlile Shale

Dark-gray argillaceous shale; thickness 150 feet in eastern region, thickening in subsurface westward to about 200 feet; forms impervious platform below mantlerock in southern Nuckolls County; present in subsurface of rest of basin, impervious, high surface run-off and little or no ground-water penetration.

(b) Niobrara Formation

Light-gray chalky shale and chalk, varies from 250 feet in thickness in eastern part of basin to over 600 feet in western part; outcrops in Republican Valley between Superior and Indianola, in Beaver Creek Valley below Danbury, and in Sappa Creek Valley; forms impervious platform below mantlerock on Ogallala in western Nuckolls, Webster, southern Franklin, southeastern Frontier, and central, western, and southern Furnas counties.

(c) Pierre Shale

Steel-gray to dark-gray argillaceous shale with some concretionary layers; thickness increases from a few feet in eastern part to 1,400 feet or more in western part; outcrops in Republican Valley between Naponee and a point east of Arapahoe, from Indianola westward to the Colorado-Nebraska line, and in Beaver Creek Valley above a point 6 miles east of Danbury; forms the impervious platform below the Ogallala group in much of the region west of Franklin County.

(d) Ogallala Group

Sandstones, limy sandstones, sands, gravels, and some clay up to 400 feet or more in thickness; are exposed or occur below mantlerock in most of the area from Webster County to the west, except in the valley of the Republican River system; generally porous favoring surface-water penetration and ground-water percolation.

Mantlerock Formations

In the area north of the Republican River Valley, mantlerock occurs overlying the bedrock platform. The mantlerock formations, from oldest to youngest, are as follows:

(a) Holdrege and Grand Island Sands and Gravels

Relatively unconsolidated sands and gravels in 2 deposits, each of which is up to 50 or 100 feet in thickness; the lower sand and gravel (Holdrege) is usually separated from the upper sand and gravel (Grand Island) by a dark-gray silt, and clay deposit known as the Fullerton formation; generally limited to eastern half of the area north of the Republican River, but similar deposits are present to the west as channel deposits; an important aquifer.

(b) Loess

A lower reddish, silty clay known as the Loveland formation up to 40 feet or more in thickness overlain by a gray to buff, silty clay known as the Peorian loess; 50 feet or more in thickness; generally occurs capping the upland north of the Republican River; relatively impervious and conducive to high surface run-off.

(c) Dunesand

There are 3 areas of dunesand in the northwestern part of the basin. The dunesand material is contemporaneous with the loess but differs from it in texture. Being porous it permits free penetration of surface water, with little or no surface run-off.

TOPOGRAPHY

The Republican River Basin lies wholly within the Interior Plains Region. The basin is comprised chiefly of the High Plains and Plains Border sections both within the Great Plains Province. In Nebraska the greater part of the basin lies within the High Plains section. The highest elevation of the basin is 5,500 feet and descends to an elevation of 1,100 feet at the mouth of the river. Across Nebraska the valley varies in elevation from 3,330 feet in the western section to 1,510 feet in the eastern section, with an average gradient of 7.5 feet per mile.

In Nebraska a considerable part of the area is hardpan and sand-hill land, and in Colorado it consists of tablelands broken by canyons and interspersed by low hills and rock-covered land. Throughout its course in Nebraska the valley is comparatively straight, relatively deep, and from 1 to 3 miles in width. Along the river in Nebraska the terraces are well-defined. Beyond the terraces the valley slopes gradually in places, while in other parts the rock escarpments are near the river. Ordinarily the loess plains are about 300 feet above the floor of the valley; but in many places this boundary is not well-defined.

STREAMS OF THE BASIN

The headwater tributaries of the Republican River system rise at an elevation of from 4,000 to 5,000 feet above mean sea level; the basin slopes in a general southeastward direction to an elevation of 1,100 feet near Junction City, Kansas, where the Republican converges with the Smoky Hill River to form the Kansas River. In Nebraska the elevation ranges from 3,330 feet at the Colorado-Nebraska state line to 1,510 feet at the Nebraska-Kansas state line.

The Republican River proper has its source at the confluence of the North Fork and Arikaree rivers a few miles east of the Colorado-Nebraska line. From this point, the river flows in an eastward direction for about 22 miles where it is joined by a third main branch, the South Fork, east of Benkelman. Buffalo, Rock, and Horse creeks enter the river in this section. The course of the river continues in a general northeastward direction to where Indian and Muddy creeks join the main stem of the stream between Benkelman and Trenton. The Frenchman River joins the Republican a short distance east of Culbertson. The river follows an eastward course and is joined by Red Willow Creek near Indianola and Medicine Creek near Cambridge. From this latter point the river flows in a southeastward direction and is joined by Beaver Creek near Orleans and by Prairie Dog Creek near Republican City. From the mouth of Prairie Dog Creek the Republican River flows eastward to Superior, where it turns to the southeast and crosses the Nebraska-Kansas line south of Hardy, Nebraska. At this point the mean annual flow is 658 second-feet. The Republican River has a course some 300 miles in length before entering Kansas.

The principal tributaries to the Republican River in Nebraska are the Frenchman River, and the Red Willow and Medicine creeks. The streams, originating in the northwestern portion of the basin, maintain a fairly constant flow. The run-off of the remaining tributaries is relatively light considering their length and the extent of their drainage areas.

The Republican is an intermittent, shallow, and a comparatively wide stream. In general, the river increases regularly in width and volume from its source to its egress from Nebraska in Nuckolls County. The normal width from the Colorado-Nebraska state line to McCook is approximately 200 feet, and from this point to the Nebraska-Kansas state line the normal width increases to approximately 400 feet. The river has a sandy bed, bordered by low, sandy banks.

The North Fork of the Republican River has its source in springs of the Sand-Hills Region in the west central part of Washington County, Colorado, about 60 miles west of the Colorado-Nebraska state line. The stream is intermittent through the first 40 miles of its course and then becomes well-defined about 20 miles west of the State line. It flows in an eastward direction to a few miles east of the State line where it converges with the Arikaree River at an elevation of 3,260 feet. This stream, approximately 66 miles in length, drains an area of 1,500 square miles. Due to the texture of the soils in its basin, the run-off is not excessive, the average flow of the stream at its mouth being 47 second-feet. The river gradient is 16 feet per mile. The average annual precipitation is 19 inches. The valley land, which averages about 1.5 miles in width, is very productive. Alfalfa, wild hay, sugar beets, and corn are the principal agricultural crops in the basin.

The Arikaree River has its source in the arid plains in the northwestern part of Lincoln County, Colorado, about 95 miles west of the Colorado-Nebraska state line. The river crosses the northwest corner of Kansas and enters Nebraska in the southwest corner of the State, flowing in a general northeastward direction to its junction with the North Fork, a few miles east of the State line. The stream, approximately 100 miles in length, drains an area of 1,780 square miles of which 15 per cent consists of sand hills and 85 per cent of precipitous plains. The river gradient is 19 feet per mile. The average discharge of the stream at its mouth is 24 second-feet. The average annual precipitation is 18 inches. Even under normal climatic conditions, flood flows occur several times annually, especially during May and June; the turgidity of the stream, however, is maintained for only a few hours. The alluvial valley land averages 2 miles in width. The agricultural development of the valley is limited, due to the topography and the deficient precipitation.

The South Fork of the Republican River has its source in the Plains Region of northeastern Lincoln County, Colorado. The river flows in a northeastward direction nearly parallel to the Arikaree River. It traverses the northwestern part of Kansas and enters Nebraska about 28 miles east of the southwest corner joining the Republican River east of Benkelman at an elevation of 2,960 feet. The stream, about 150 miles in length, drains 2,695 square miles. The river gradient is 15 feet per mile. The average discharge of the South Fork at its mouth is 64 second-feet. The soil structure of the bottomland is of the alluvial type and the uplands consist of the loess clay type. Most of the valley is under cultivation. A part of the area is served by gravity and pump irrigation. A considerable portion of the terrace and plains areas is adaptable to irrigation.

The Frenchman River has its source approximately 50 miles west of the Colorado-Nebraska state line in the eastern part of Logan County, Colorado. The river meanders in a southeastward direction crossing the Colorado-Nebraska line some 40 miles north from the southwest corner of Nebraska and about 75 miles from that point empties into the Republican River east of the town of Culbertson at an elevation of 2,550 feet. Stinking Water Creek, converging with the Frenchman River near Palisade, contributes a continuous flow which helps to stabilize the Frenchman River. Near Palisade, the valley becomes more spacious, and from there to its mouth it is several miles in width. The Frenchman River, approximately 150 miles in length, drains an area of 3,237 square miles. The river gradient is 12 feet per mile, and the average discharge of the stream at its mouth is relatively uniform at 115 second-feet. The average annual precipitation is 20 inches. Because of the dependable flow of the stream, irrigation has proved successful in the Frenchman River basin, especially in the lower course of the river between Palisade and its mouth where the land is more productive and better suited to irrigation practices.

Red Willow Creek has its source in the southwestern part of Lincoln County, Nebraska. The stream, about 70 miles in length, meanders in a southeastward direction to its mouth west of Indianola where it empties into the Republican River at an elevation of 2,470 feet. The drainage area of Red Willow Creek is 985 square miles. The river gradient is 7 feet per mile. The average flow of the stream at its mouth is 29 second-feet. The average annual precipitation amounts to 21 inches. The loess-clay soil types in the upper portion of the valley are such as to be conducive to profitable farming practices, but the valley as a whole is too narrow to be used on an extensive commercial scale. The broad irrigable valley at the mouth of the stream is composed chiefly of heavy alluvial soil. The soil is fertile but less productive because of deficient precipitation.

Medicine Creek has its source about 10 miles south of the Platte River in the south central part of Lincoln County, Nebraska. The stream, approximately 70 miles in length, flows in a general southeastward direction to join the Republican River at Cambridge at an elevation of 2,240 feet. The drainage area is 1,035 square miles. The stream gradient is 9 feet per mile. The average discharge of the stream at its mouth is 69 second-feet. The mean annual precipitation over the basin is 22 inches. The stream is subject to periodic flood discharges from its source to its confluence with the Republican River. The average width of the valley is approximately 1 mile. The lower portion of the valley is sufficiently wide for good agricultural development. The soil is of an alluvial type, and very fertile. There are out-croppings of shaly chalk in the precipitous valley walls.

SURFACE WATER

The precipitation over the Republican River basin is reflected in varying degrees by the stream flow of the river system, therefore the water supply in the basin fluctuates more or less proportionately with the precipitation. Most of the water from the sand-hill area, or the northwest portion of the basin, reaches the streams through an underground route which tends to stabilize the tributary stream flows. Only a small portion of the precipitation, occurring on the tributaries of the Plains Region or the southeast portion of the basin, migrates to the substratum, resulting in erratic run-off and less dependable stream flows. During periods of extreme drought many of the tributaries and the Republican River proper become dry, causing a recession of the water table.

The recorded extreme variation of river discharge at Hardy, ranged from zero second-feet August 9-19, 1934 inclusive, to 225,000 second-feet on June 2, 1935. The average run-off for the 27-year period, 1897-1914, 1930-1938 inclusive, is 658 second-feet. Approximately 56 per cent of the run-off occurs during the period from May to September inclusive.

GROUND WATER

In much of the Republican River basin, including parts of the sand-hill, southwest, Loess Plain and Republican Valley regions, comparatively rapid absorption and infiltration result in extension ground-water replenishment and subsurface-water movement. The areas of greatest infiltration yield a high rate of subsurface run-off, which stabilizes the flow of the streams draining that section. The basin is impervious, inasmuch as there is no loss of ground water to the underlying formations and no lateral underflow from the stem of the stream.

The Dakota sandstone, the Ogallala beds, the Holdrege and Grand Island sands, and the alluvial deposits are the main water-bearing formations of the Republican drainage basin. Water in the Dakota sandstone is quite heavily mineralized, especially west of the Cambridge Arch. Wells reach this horizon at depths ranging from 500 feet in the east to 2,000 feet in the west. The water in the Ogallala beds is medium hard and usually abundant, except where its storage has been reduced by drainage to the valleys. Wells reaching this horizon range between 80 and 300 feet in depth, depending upon the topographic position.

Good water is abundant in the Holdrege and Grand Island sands and is a supply for the small spring-fed streams north of the Republican. South of the river, where these sands are thin, much of the water has leaked to the valley over the impervious formation.

The alluvial fill along the Republican varies from zero to 40 feet or more in thickness, averaging 20 to 25 feet. It is water-filled to the river level. Wells here are naturally shallow. The water is an important rural and municipal supply. On the alluvial terraces the wells are deeper than those on the flood plain, but the water is about the same in quality.

Bordering the Republican River at points where the shale or the shaly chalk is exposed in the valley sides, are dry areas or zones in which no well water can be obtained except by drilling to the Dakota sandstones.

IRRIGATION DEVELOPMENT

Of the total of 37,800 acres now being irrigated in the Republican River basin, 29,000 acres or 76.7 per cent are in Nebraska. Development on the Frenchman has been more extensive than on any other stream in the Nebraska portion of the basin with 16,000 acres under irrigation. The South Fork and the North Fork of the Republican are the tributaries next in importance with reference to the amount of land now being irrigated. The area served each year varies according to the precipitation and the available water supply.

Irrigation is practiced quite extensively in the western portion of the basin, especially in the vicinity of Haigler. The flow of the streams during the irrigation season is often inadequate to supply the demands imposed by the existing irrigation projects, which depend almost entirely upon the direct flow of the streams for their water supply. The flows of the North Fork of the Republican River and Frenchman River are perennial and less erratic, due to the fact that they drain the sand-hill areas that are stabilized by underground flow. The Arikaree and South Fork of the Republican are intermittent streams at their sources and are most susceptible to fluctuating discharges.

On the streams draining the southwestern portion of the basin, the general practice is to give the land a heavy application of water in the spring when the supply is plentiful in an attempt to saturate the subsoil sufficiently to mature crops without additional irrigation. The method of partial irrigation has not proved satisfactory because the added expenditure for operation and maintenance is not commensurate with the returns. On the streams draining the northwest portion of the basin, especially on the North Fork of the Republican and Frenchman rivers the flow is relatively uniform, resulting in a satisfactory supply of water for growing crops. However, most of the dependable streams are over-appropriated to the extent that many junior rights are deprived of water during periods of droughts.

POTENTIAL IRRIGATION DEVELOPMENT

Since the existing irrigation projects, most of which are above McCook, have established rights to the low-water flow during the irrigation season, potential irrigation developments must depend upon impounding the non-seasonal flow and conserving it for future use. The ultimate agricultural development of the basin is limited by the water supply available for irrigation and the cost of irrigation systems rather than by the area of irrigable land. The main stream and practically all of the tributaries, except the Frenchman River and Medicine Creek, have very little dependable flow during a large part of the irrigation season.

The Army Engineers are reviewing their previous report on a flood-control plan for the Kansas River basin which includes the Republican River in Nebraska in order to consider an alternative plan of development for the entire valley to include a channel reservoir near Republican City, Nebraska, in combination with the upstream tributary reservoirs. They are working in close cooperation with the Bureau of Reclamation for the best possible means of developing irrigation in combination with flood control on the Republican River.

The Bureau of Reclamation's studies include a determination of the areas that are physically capable of being served by gravity-type irrigation, the soil classifications in these areas, the availability of the water supply, and the best possible methods of conserving and utilizing the surface water supply in each basin. According to the Bureau's latest tentative estimate based on a comprehensive basin-wide plan there are approximately 100,000 acres in Nebraska which meet all the requirements necessary for successful irrigation. The most favorable reservoir sites for development appear to be as follows: In Colorado, the Wray site on the North Fork of the Republican, Beecher Island on the Arikaree and the Hale on the South Fork of the Republican; in Nebraska the Enders on the Frenchman River, and sites on Buffalo, Rock, Red Willow, and Medicine creeks, and the Harlan County on the Republican River. All these sites except the Wray, Buffalo and Rock reservoirs which are for irrigation only, were selected by the Army Engineers as presenting the most favorable possibilities of development for flood control with reference to the ratio of cost to benefits. The eight tributary reservoirs would provide storage capacity aggregating 356,100 acre-feet of which 237,700 acre-feet could be utilized for flood control. The units of potential development are as follows:

Unit	Purpose
Wray Dam on North Fork of Republican River, 4 miles above Wray, Colorado	Storage to serve 4,000 acres now under irrigation along North Fork in Colo. and Nebr. and 2,000 acres of new land along Republican River in Nebr. near Haigler. (This unit comprises part of the Benkelman-Haigler-Arikaree project proposal).
Buffalo Cr. and Rock Cr. dams on these north side tributaries north of Parks in Nebr.	Storage for irrigation to serve 3,000 acres along Republican River near Max in Nebr. (This unit comprises part of the Benkelman-Haigler-Arikaree project proposal).
Beecher Is. Dam on Arikaree River 12 mi. above Colo.-Kans. line in Colorado	Storage for flood control and irrigation. To afford partial flood protection to Rep. River Basin and to irrigate 2,300 acres in Colo., Kans., and Nebr. along the Arikaree River.
Hale Dam on So. Fork of Rep. 2 miles above Colo.-Kans. line in Colorado	Storage for flood control and irrigation. To afford partial flood protection to Rep. River basin and to irrigate 8,500 acres in Kans. and 500 acres in Nebraska.
Enders Dam on Frenchman Cr. 13 mi. above Wauneta in Nebraska	Storage for flood control and irrigation. To afford partial flood protection to the Rep. River basin, and to serve 15,000 acres now under irrigation and 17,000 acres of new land along Frenchman and Rep. rivers in Nebr. (This unit is essentially the Imperial project proposal).
Red Willow and Medicine Cr. dams on these north side tributaries northeast of McCook in Nebr.	Storage for flood control and irrigation. To afford partial flood protection to the Rep. River basin, and to irrigate 42,000 acres along Rep. River between Red Willow Cr. and Orleans in Nebr. (This unit is essentially the United Project proposal).

Harlan County dam on Rep. River near Republican City, Nebr.	Storage for flood control and irrigation. To afford complete flood protection to 51% of the Rep. River basin and partial protection to the lower Kansas River basin, and to irrigate 33,000 acres between dam site and Nebr.-Kans. line in Nebr., and to irrigate an indeterminable acreage in Kansas.

POWER DEVELOPMENT

The Republican River Basin in Nebraska has been developed for hydropower at 33 different places. Many of these installations were originally for development of mechanical power for the operation of small mills and have since been abandoned.

Hydroelectric plants serving the public are in operation at 3 places at the present time. One of the plants takes water from the main channel of the Republican River at Superior. The other 2 installations are located along the Frenchman River at Imperial and Wauneta.

These 3 plants total only 910 kilowatts of installed generating capacity. The installations are all low head run of the river type, with practically no reservoir support to equalize the large fluctuation in stream discharge and the plants are of minor importance as a source of electric energy.

Any potential hydroelectric development in the basin must depend upon storage reservoirs to equalize the stream flow. The shortage of water for irrigation purposes on most of the streams, precludes the possibility of large-scale power developments except as such developments are an integral part of a flood control or irrigation plan and might prove to be economically feasible.

PROPOSED HYDROPOWER DEVELOPMENT

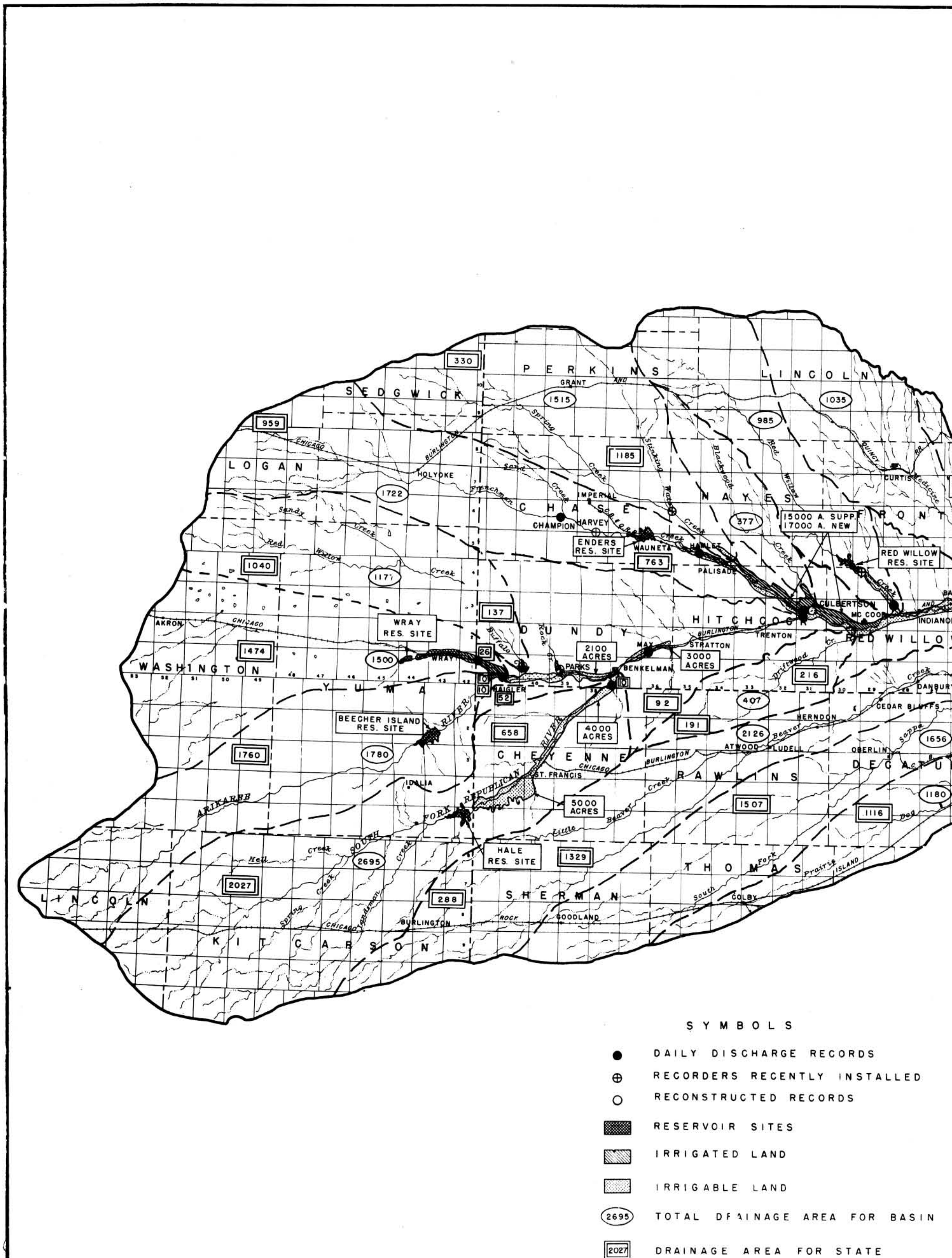
The only new proposal for the development of hydropower in the Republican Basin now pending is in connection with a proposed irrigation project on the Frenchman River near Imperial known as the Imperial Valley Public Power and Irrigation District. Plans submitted to the Public Works Administration contemplate the installation of 350 kilowatts of generating capacity to serve the needs of the immediate vicinity.

Power development in connection with proposed irrigation projects on the Republican River proper has been contemplated but is not now being considered in the pending proposal for development.

Minor quantities of electric energy can be produced in connection with the proposed irrigation development, but the unit cost of generation would probably be in excess of the wholesale cost of power that can be supplied to the basin by the major hydropower developments recently constructed in the State.

FLOODS

The Republican River Basin lies in the path of flood-producing storms. Damaging floods affecting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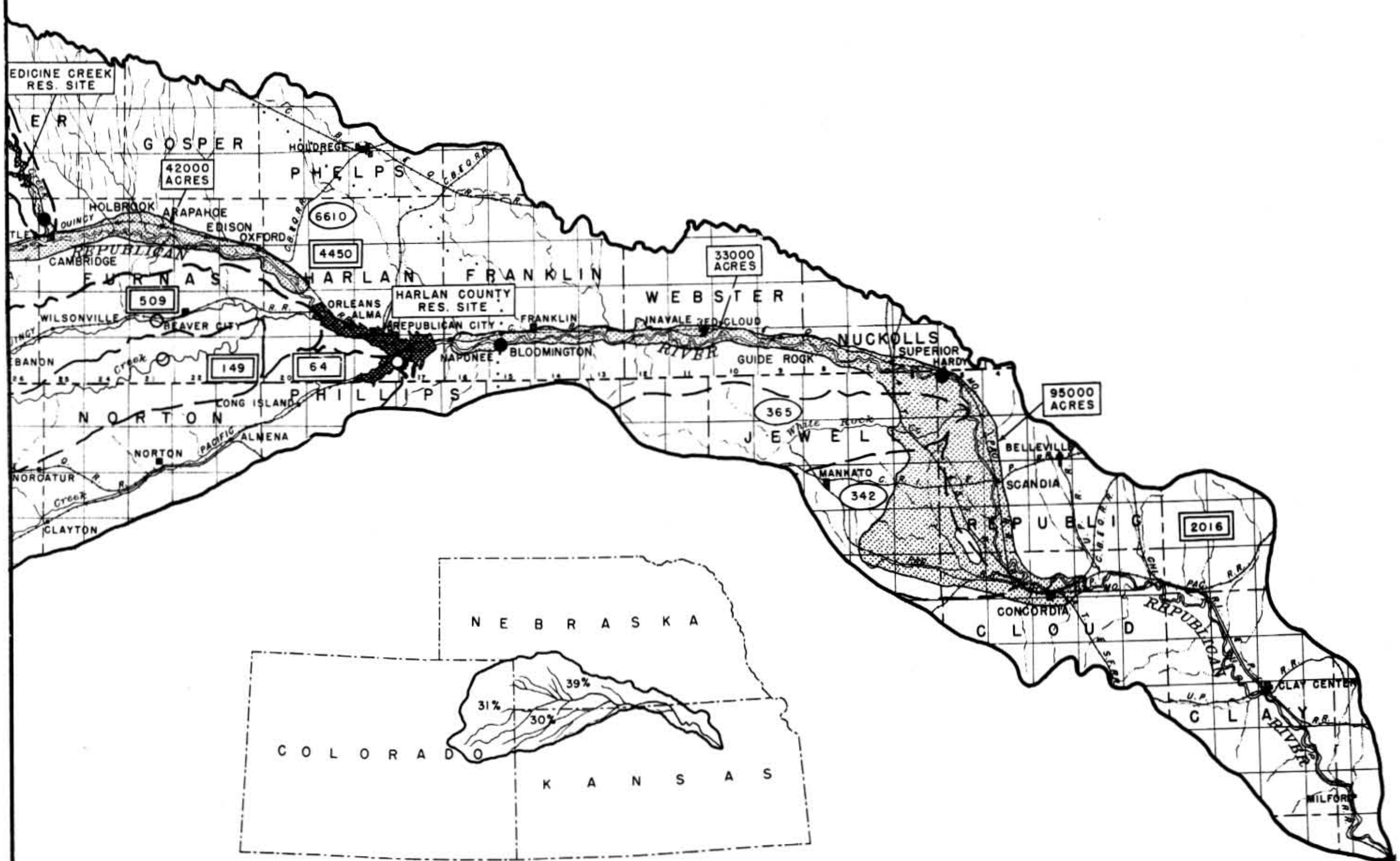
WAUNETA
HAMLET
PALISADE
CULBERTSON
MC COOK
INDIANOLA
CURTIS
AKRON
WRAY
PARKS
BENKELMAN
MAX
STRATTON
TRENTON
HAIGLER
DANBURY
CEDAR BLUFFS
HERNDON
ATWOOD
LUDELL
OBERLIN
ST. FRANCIS
IDALIA
COLBY
GOODLAND
BURLINGTON
ARIKAREE
SOUTH FORK REPUBLICAN RIVER
SYMBOLS
DAILY DISCHARGE RECORDS
RECORDERS RECENTLY INSTALLED
RECONSTRUCTED RECORDS
RESERVOIR SITES
IRRIGATED LAND
IRRIGABLE LAND
2695 TOTAL DRAINAGE AREA FOR BASIN
2027 DRAINAGE AREA FOR STATE
NEBRASKA STATE PLANNING BOARD

MAP SHOWING

UNIFIED PLAN OF DEVELOPMENT FOR FLOOD CONTROL AND IRRIGATION

REPUBLICAN RIVER BASIN



BASIN AREAS BY STATES

	ENTIRE BASIN			PORTION ABOVE HARDY
COLORADO	7878	SQ. MI.	31.0 %	34.7 %
KANSAS	7678	SQ. MI.	30.2 %	21.8 %
NEBRASKA	9888	SQ. MI.	38.8 %	43.5 %
TOTAL	25,444	SQ. MI.	100.0 %	100.0 %

the entire basin are not frequent but minor local floods occur more frequently. In the western part of the basin, the tributaries from the north drain a sand-hill area that does not contribute any appreciable amount of flashy run-off. The tributaries from the south, draining a precipitous plains region, are more subject to excessive run-off. The shape of the basin and the direction of its major axis which parallels the heavy storm paths, tend under certain climatic conditions to produce a large concentration of flood flow. The low sandy banks render the flood plains easily susceptible to inundations. Several floods of considerable magnitude have been recorded; one in 1903, one in 1905, another in 1915, and the greatest flood of record in May and June, 1935.

Floods in the Republican River Basin are invariably caused by excessive precipitation. The upper reaches of the basin do not extend sufficiently westward to receive the excessive fall of snow. Snow fall within the basin averages about 25 inches and occurs mostly during the months of December and February. Even the most westerly tributaries are not materially affected by the snow melting in the spring.

Storm paths over the Republican River Basin are generally from west to east or from southwest to northeast. An occasional storm path may be traced from northwest to southeast. March to July, inclusive, are the months of greatest storm frequency. Damaging floods of the basin have been confined largely to the period May 16 to July 15.

The largest floods have been the result of a period of generally heavy and widespread precipitation followed by precipitation of cloudburst intensity, the latter usually over a small area. The general rain tends to saturate the soil and brings the streams up to near capacity discharge, then the following cloudburst contributes a high percentage of run-off causing the streams to leave their banks.

May 1935 was a month of abnormally heavy precipitation in eastern Colorado and western Nebraska. From May 12th to 22nd from 2 to 5 inches of rain fell, and from May 26th to the 29th one inch or less fell. The storm from which the flood resulted, began just east of the Rocky Mountains during the forenoon of May 30th, and followed a general northeasterly course across the Republican River Basin, ending a few miles east of Curtis, May 31, 1935. Within the area the rainfall was concentrated chiefly in the Republican River Basin but extended along the lower ridge dividing it from the Arikaree and continued nearly to Benkelman. Rainfall in a portion of the South Fork of the Republican River drainage was as much as 15 inches or greater.

The areas of greatest intensity of precipitation were over the South Fork of the Republican and the Arikaree rivers. These streams were the principal sources of the flood waters. Below their junction heavy rainfall throughout the course of the Republican in Nebraska augmented the flood stages of the streams. It is estimated that the crest discharge between Cambridge and Arapahoe in June, 1935, reached 280,000 second-feet. The following table gives the maximum flood discharges occurring at various stations along the streams of the basin.

1935 FLOOD DISCHARGES
(Second-Feet)

Basin	Station	Date	Instantaneous	Daily Average
Blackwood Creek	At Mouth	May 31	15,000	
Frenchman River	Culbertson, Nebr.	" "	15,000	5,500
" "	Hamlet, Nebr.	May 27	2,200	176
" "	" "	" 28		1,120
Arikaree River	Cope, Colo.	" 31	25,000	-
" "	Haigler, Nebr.	" "	50,000	17,000
" "	Idalia, Colo.	" "	54,000	-
Repub. River North Fork	Colo.-Nebr.-Line	June 1	367	275
Republican River	Newton, Colo.	May 31	103,000	-
" "	Benkelman, Nebr.	" "	*150,000	-
" "	Max, Nebr.	" "	190,000	85,000
" "	Culbertson, Nebr.	" "	-	90,000
" "	McCook, Nebr.	" "	245,000	-
" "	Cambridge, Nebr.	" "	280,000	-
" "	Bloomington, Nebr.	June 1	260,000	116,000
" "	Hardy, Nebr.	" 2	225,000	117,000

* Above North Fork

PROGRESS OF FLOOD CREST

Point on River	Approximate time of crest (Central time)	Elapsed time (hours)	Distance (miles)	Rate of travel (miles per hour)	Crest discharge (sec.-ft.)
Newton, Colo.	May 31, 3 A.M.	0	0		
St. Francis, Kans.	4 A.M.	1	25	(a)	
Benkelman, Nebr.	9 A.M.	5	25	5.0	
Max	9:45 A.M.	.75	8	10.7	190,000
Trenton	Noon	2.25	20	8.9	
Culbertson	1:30 P.M.	1.5	10	6.7	
McCook	3:30 P.M.	2	10	5.5	245,000
Cambridge	8 P.M.	4.5	25	5.6	(b)
Oxford	June 1, 1 A.M.	5	28	5.6	
Bloomington	10:30 A.M.	9.5	36	3.8	260,000
Franklin	Noon	1.5	4	2.7	
Superior	June 2, 1 A.M.	13	49	3.8	
Hardy	2:30 A.M.	1.5	7	4.7	225,000

(a) Not comparable, as rainfall between stations increased the discharge.
(b) The maximum crest discharge occurred between Cambridge and Arapahoe, and is estimated as about 280,000 second-feet.

The river, normally from 200 to 400 feet in width in Nebraska, was from 1 to 4 miles in width during the flood. The maximum discharge was recorded just below the junction of Medicine Creek with the Republican. At Bloomington, Nebraska the maximum of 260,000 second-feet was just under the peak discharge occurring at Cambridge. It is said that the first rush of water came down the valley as a wall variously estimated at from 3 to 8 feet in height. The preceding table gives the progress of the flood crest to the Nebraska-Kansas line. Table below gives the mean daily discharge in second-feet at the principal stations along the stream for the period of May 10 to June 27, 1935.

FLOOD FLOWS

Previous to the flood of 1935 in the Republican River the maximum instantaneous discharge recorded above the Nebraska-Kansas line was 24,500 second-feet at Bostwick in 1905.

In the 70-year period since the valley was settled no other flood approaching the volume of the 1935 flood has occurred. It is known that a major flood occurred on the Kansas River of which the Republican is tributary in 1844, the magnitude of which on the Kansas River exceeds all occurrences since that date. No evidence is available to show whether the flood on the Republican at that time was as great in magnitude as the 1935 occurrence.

All consideration of flood flow in this report is confined to the flood of May and June, 1935, in the Republican River Basin and the probable magnitude of floods which might occur from a storm of equal intensity and distribution as occurred at that time if situated over any one of the minor tributaries of the basin.

PRECIPITATION OF TWENTY-FOUR HOUR PERIODS
DAILY CONTINUOUS STORMS OF TWO INCHES OR MORE
AND INDIVIDUAL STORMS OF FOUR INCHES OR MORE

Station	County	Years of Record	Year	Month	Day	Inches
Alma	Harlan	40	1911	August	2	7.55
"	"	"	1919	Sept.	18	4.83
Arapahoe	Furnas	4	1895	June	2	2.10
"	"	"	"	"	3	2.63
Bartley	Red Willow	5	1901	Sept.	8	7.00
Beaver City	Furnas	43	1905	July	1	4.64
"	"	"	"	"	2	2.00
"	"	"	1911	Aug.	2	4.69
Benkelman	Dundy	36	1924	July	17	6.20
"	"	"	1925	Aug.	5	4.28
"	"	"	1933	"	26	3.00
"	"	"	"	"	28	3.68
"	"	"	1935	May	30	4.65
Culbertson	Hitchcock	45	1914	June	12	2.58
"	"	"	"	"	13	2.10
Curtis	Frontier	38	1929	April	24	4.40
"	"	"	1935	May	31	5.05
Elsie	Perkins	22	1935	"	28	4.75
Franklin	Franklin	49	1900	Sept.	11	4.70
"	"	"	1902	"	22	3.60
"	"	"	"	"	23	3.00
"	"	"	1911	Aug.	2	4.04
"	"	"	1912	June	7	2.05
"	"	"	"	"	8	2.10
"	"	49	1915	"	2	5.00
"	"	"	1918	July	17	4.25
"	"	"	1919	Sept.	18	7.22
"	"	"	1923	May	23	4.66
Gosper	Gosper	34	1910	Aug.	16	4.00
"	"	"	1921	May	17	4.55
"	"	"	1933	April	20	6.63
Grant	Perkins	9	1912	July	25	4.63
Guide Rock	Webster	22	1919	Sept.	18	4.83
"	"	"	1928	Oct.	11	2.40
"	"	"	"	"	12	2.50
Hardy	Nuckolls	3	1918	Aug.	9	4.55
"	"	"	1919	Sept.	15	6.40
Hayes Center	Hayes	41	1895	May	31	2.20
"	"	"	"	June	2	3.00
Hendley	Furnas	5	1914	"	11	3.18
"	"	"	"	"	12	3.82
Holdrege	Phelps	46	1891	Sept.	8	4.00
"	"	"	1896	April	11	2.75
"	"	"	"	"	12	2.25
"	"	"	1899	May	20	4.00
"	"	"	1905	June	15	4.20
Imperial	Chase	45	1915	May	26	2.05
"	"	"	"	"	27	2.10
"	"	"	1919	June	13	6.98
Inavale	Webster	13	1881	May	10	4.00
Lebanon	Red Willow	10	1935	Aug.	25	4.15
McCook	"	40	1930	July	20	3.90
"	"	"	"	"	21	2.10
Orleans	Harlan	24	1923	May	24	4.10
"	"	"	1926	Aug.	9	3.65
"	"	"	"	"	10	3.02
Ough	Dundy	12	1891	June	14	4.20
Palisade	Hitchcock	"	1918	July	17	4.70
Red Cloud	Webster	43	1897	June	26	7.10
"	"	"	1919	Sept.	17	6.93
Republican	Harlan	4	1896	April	12	4.25
Sappa Valley	Furnas	9	1929	July	26	4.80
"	"	"	1930	Aug.	15	4.30
"	"	"	1936	May	3	4.50
Superior	Nuckolls	40	1889	July	20	3.20
"	"	"	"	"	21	2.20
Upland	Franklin	22	1918	"	17	4.50
Wauneta	Chase	29	1931	Aug.	8	4.40
Wilcox	Kearney	6	1892	"	28	2.10
"	"	"	"	"	29	2.25

MEAN DAILY DISCHARGE IN SECOND-FEET
FOR THE PERIOD MAY 10–JUNE 27, 1935

Day	Max.	Culbertson	Bloomington	Hardy	North Fork Colo.-Nebr. Line	Arikaree Haigler
10	87	114	242	345	14	18
11	74	114	266	350	14	19
12	78	114	2,930	302	14	23
13	70	100	1,480	728	14	17
14	82	90	772	2,180	17	17
15	100	126	418	1,240	48	24
16	104	138	369	744	26	28
17	109	146	472	562	32	33
18	137	171	654	562	41	44
19	244	285	1,170	1,000	65	70
20	327	409	2,150	3,540	110	63
21	318	409	2,970	2,180	102	40
22	291	548	1,660	3,910	86	40
23	238	505	1,350	2,430	82	33
24	190	345	1,170	1,870	74	40
25	180	305	1,040	1,450	72	150
26	250	315	911	1,270	68	36
27	300	225	1,020	1,320	58	35
28	8,740	5,000	2,550	4,260	108	48
29	8,500	7,800	10,400	3,200	90	37
30	11,000	11,000	8,230	8,790	86	3,500
31	85,000	90,000	15,900	9,780	256	17,000
1	22,000	25,000	116,000	12,000	265	5,000
2	8,000	11,000	47.000	117,000	165	4,000
3	3,800	5,500	17,700	45,100	147	2,000
4	2,500	3,800	9,300	12,600	119	800
5	2,100	2,600	3,420	7,960	110	400
6	1,600	2,700	2,610	6,170	98	289
7	1,200	2,000	2,730	5,000	92	275
8	1,000	1,600	2,580	4,050	90	266
9	860	1,400	1,660	3,390	88	232
10	790	1,200	1,840	2,850	74	228
11	700	850	1,910	2,350	72	224
12	800	1,100	1,660	1,950	165	911
13	650	1,000	1,720	1,870	134	470
14	640	980	1,540	1,780	86	322
15	700	900	3,300	1,660	59	192
16	5,000	7,000	2,200	3,230	63	188
17	12,000	13,000	4.350	3,990	86	383
18	3,200	4,000	14,000	5,100	67	208
19	1,500	2,000	8,500	13,200	56	115
20	1,800	2,300	5,010	11,000	58	112
21	1,550	1,950	4,060	7,820	61	118
22	1,300	1,700	5,410	5,350	48	78
23	1,050	1,400	4,090	6,540	58	73
24	910	1,100	2,710	5,310	43	73
25	620	880	2,820	3,620	26	60
26	774	760	1,930	3,050	43	357
27	417	565	1,680	3,390	88	112

No attempt has been made to determine the probable frequency of occurrence of a storm of the same magnitude as that causing the 1935 flood.

FLOOD DAMAGES

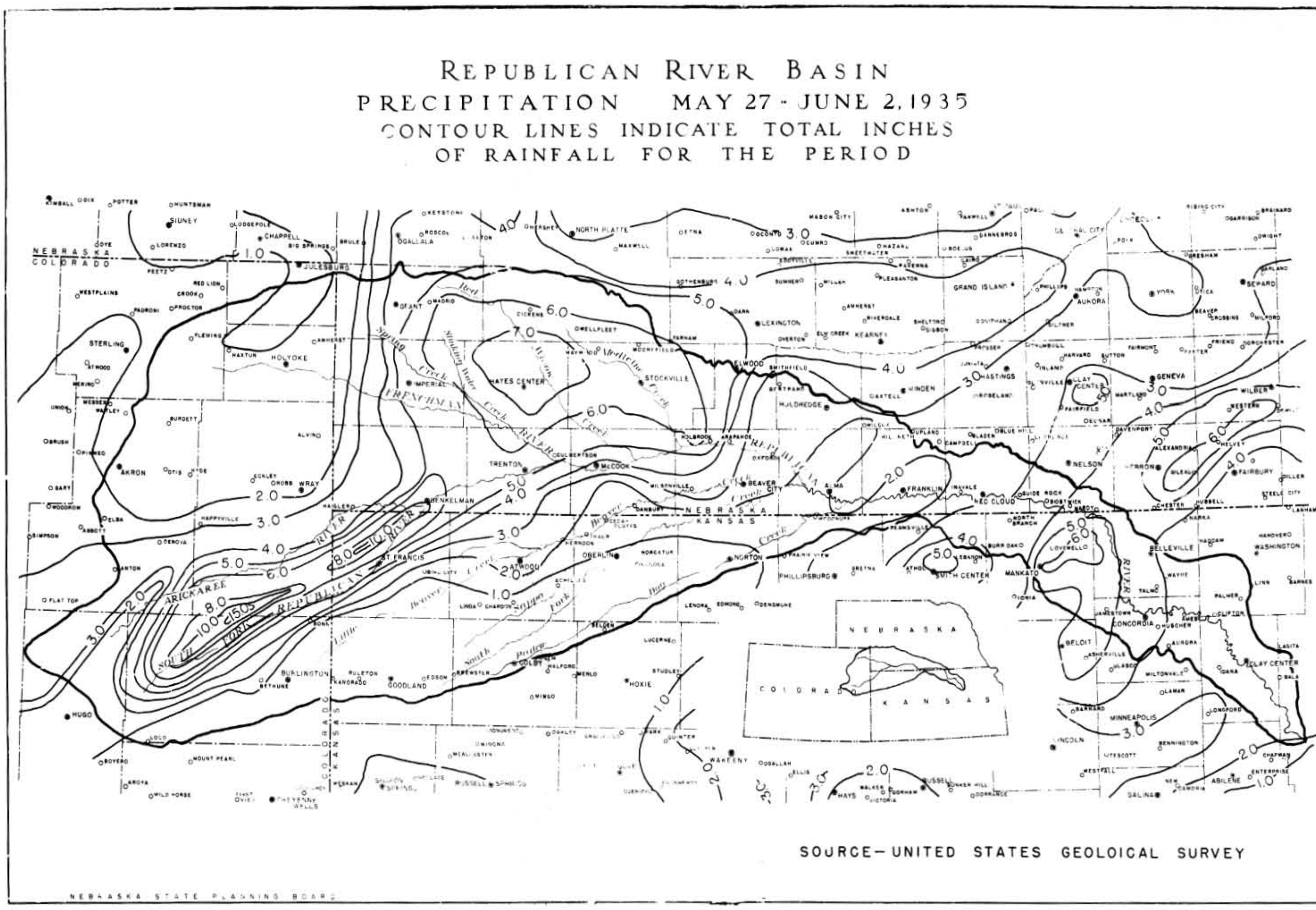
The flood resulting from storms of May 1935, was the cause of wide-spread destruction throughout the Missouri River Basin below Rulo, Nebraska. The flood on the Republican River, a tributary of the Kansas River which in turn flows into the Missouri River at Kansas City, was a major contributing factor to extensive damages in the Kansas and Missouri river bottoms.

Flood damage on the main stream of the Kansas River amounted to $3,600,000.00 and on the main stream of the Missouri River amounted to $5,542,000. The damage in the Republican River Valley above its confluence with the Kansas River amounted to $13,000,000.00 and was divided by states as follows:

Colorado	$ 80,000.00
Nebraska	8,113,000.00
Kansas	4,807,000.00
Total	13,000,000.00

The United States Corps of Engineers estimate the total damage caused by the flood in the Missouri River Basin at $26,190,000.00 . There were 105 lives lost in the Republican River valley; 100 deaths occurring in the Colorado and Nebraska portion of the valley where the flood flow reached maximum proportions.

Estimates of damage on the Republican River include the loss of 1,400 head of livestock 41,500 head of poultry, damage of 376 miles of highway of which 341 were in Nebraska, and damage to 353 bridges


REPUBLICAN RIVER BASIN
PRECIPITATION MAY 27 - JUNE 2, 1935
CONTOUR LINES INDICATE TOTAL INCHES
OF RAINFALL FOR THE PERIOD
NEBRASKA
COLORADO
KANSAS
FRENCHMAN
REPUBLICAN
ARICKAREE
SOURCE—UNITED STATES GEOLOICAL SURVEY
NEBRASKA STATE PLANNING BOARD

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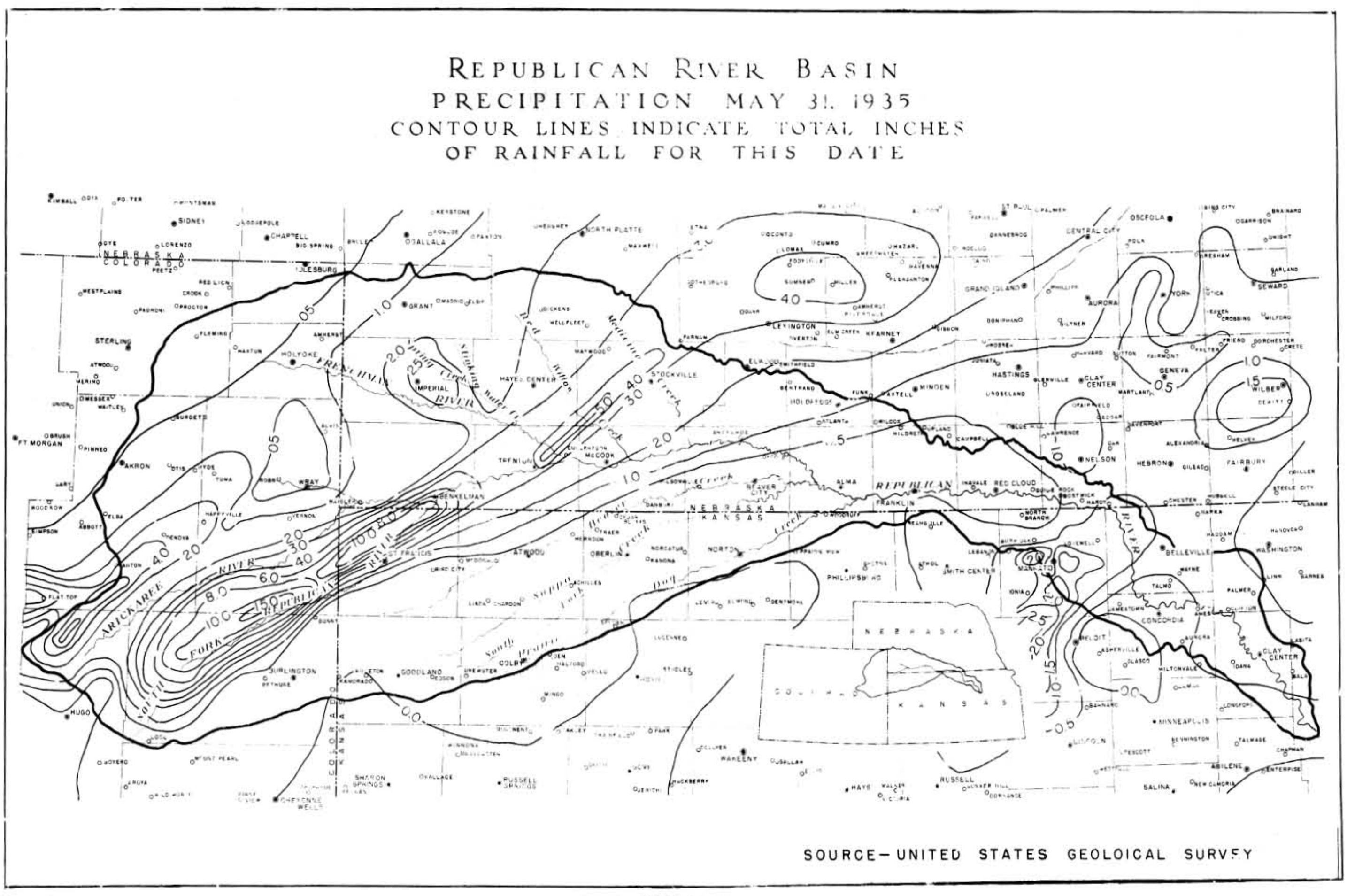

REPUBLICAN RIVER BASIN
PRECIPITATION MAY 31, 1935
CONTOUR LINES INDICATE TOTAL INCHES
OF RAINFALL FOR THIS DATE
NEBRASKA
COLORADO
KANSAS
REPUBLICAN
ARICKAREE
SOURCE—UNITED STATES GEOLOICAL SURVEY

CIII b

of which 307 were in Nebraska. Damage also occurred to 74,500 acres of farm land of which 43,000 acres were in crops at the time of the flood. The major portion of the damage, as indicated by the preceding estimates by states, was in Nebraska.

FLOOD SITUATION AND CHARACTERISTICS

Such a flood as that of 1935 on the Republican River could occur over any point in the basin and adequate flood-control measures must anticipate such an occurrence. An investigation of channel capacities indicates a maximum allowable non-destructive flow at Trenton of approximately 12,000 second-feet. It is believed that this capacity could be increased 50 per cent by means of channel straightening, removal of obstructions, and small levee work.

The capacity of the channel increases toward the lower end of the valley in Nebraska sufficiently to allow approximately 20,000 second-feet of discharge before inundating any but the lowest bottoms. It is believed that the capacity could be increased 25 per cent by minor improvement works.

The maximum recorded discharge prior to the 1935 flood was 24,500 second-feet at Bostwick in 1905, equaling only 9 per cent of the maximum discharge occurring at Cambridge on May 31, 1935. The 1935 flood flow covered the major portion of the valley bottom. The location and erection of levees adequate to carry such discharge without retention of excess flow would probably require the utilization of a major portion of the agricultural land of the river bottom which proposed levees are designed to protect. Flood protection by levees in the upper basin would only assist in dumping the flood flows into the lower reaches of the basin, to which the Republican is tributary, necessitating increased expenditures throughout the lower basin.

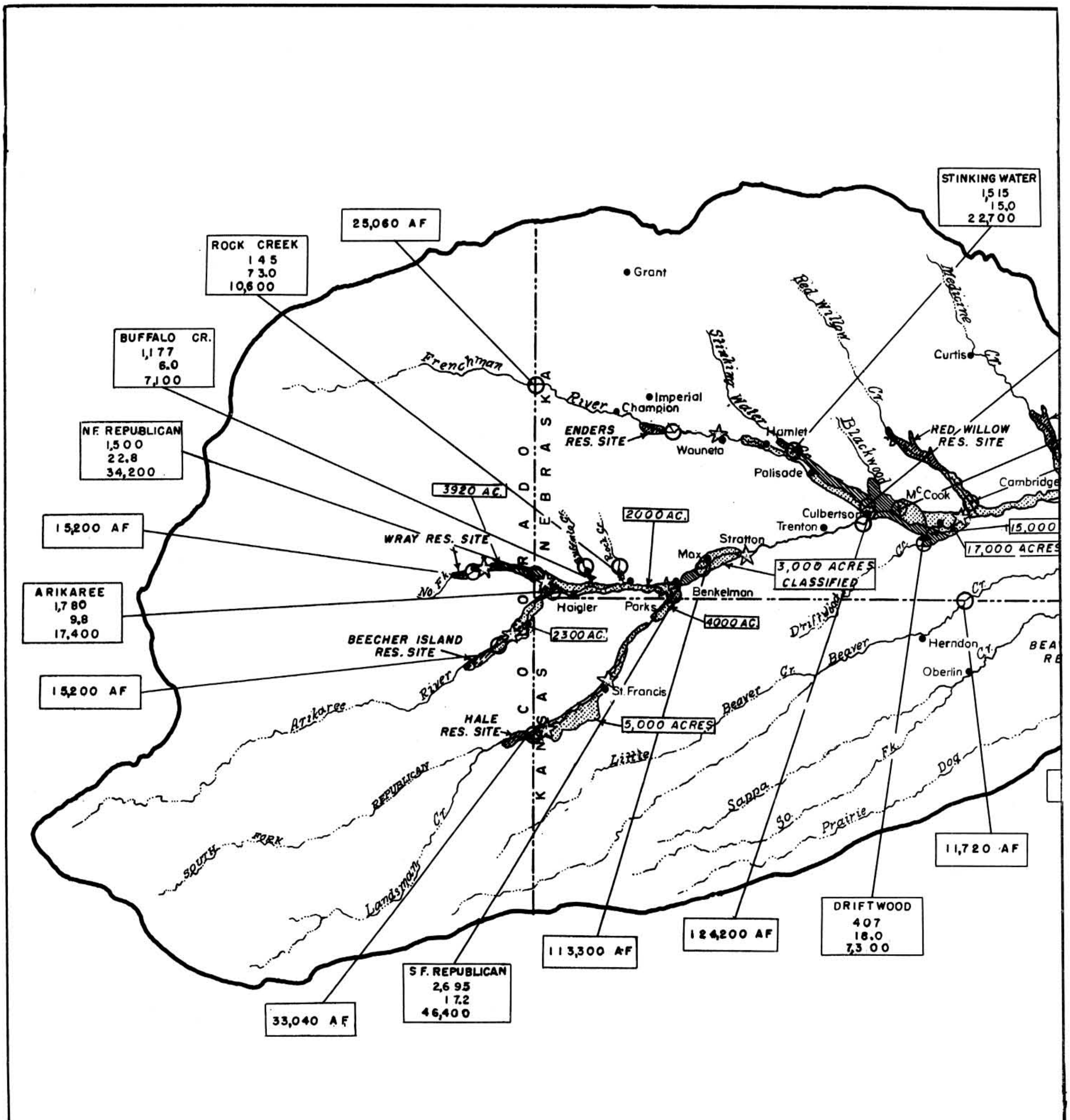
It is also apparent that the normal channel capacity is but slightly more than adequate to carry the run-off from a normal, general rainfall throughout the basin. For this reason, if retention works are provided as a flood-control measure, such retention works should be adequate to care for the entire run-off resulting from an additional small area, high intensity storm such as occurred May 31, 1935. There are no flood protection or control facilities provided in the Republican River Basin at the present time.

CAPACITIES AND COST DATA
FOR
SELECTED RESERVOIR SITES IN REPUBLICAN RIVER BASIN

Site	Stream	State	Reservoir Capacities in Acre-Feet			Total Net Investment		Construction Costs Chargeable to Irrigation	
			Total	Flood Control	Irrigation	Flood Control Only	Flood Control and Irrigation	Differential	(1) Proportional
Beecher Island	Arikaree	Colorado	72,200	54,000	18,200	$4,108,948	$8,598,056	$2,489,108	$1,660,000
Hale	So. Fork	Colorado	96,400	78,900	17,500	5,294,996	7,416,652	2,121,656	1,350,000
Enders	Frenchman	Nebraska	93,200	49,200	44,000	3,917,432	6,884,192	2,966,760	3,250,000
Red Willow	Red Willow	Nebraska	46,800	31,300	15,500	1,690,974	2,229,659	538,685	735,000
Medicine Cr.	Medicine	Nebraska	57,900	40,400	17,500	1,952,810	2,565,780	612,970	775,000
Trib.	Total		366,500	253,800	112,700	16,965,160	25,694,339	8,729,179	7,770,000
Harlan Co.	Republican	Nebraska	1,208,000	1,008,000	200,000	20,680,441	22,693,051	1,912,610	3,730,000
GRAND TOTAL			1,574,500	1,261,800	312,700	37,645,601	48,287,390	10,641,789	11,500,000

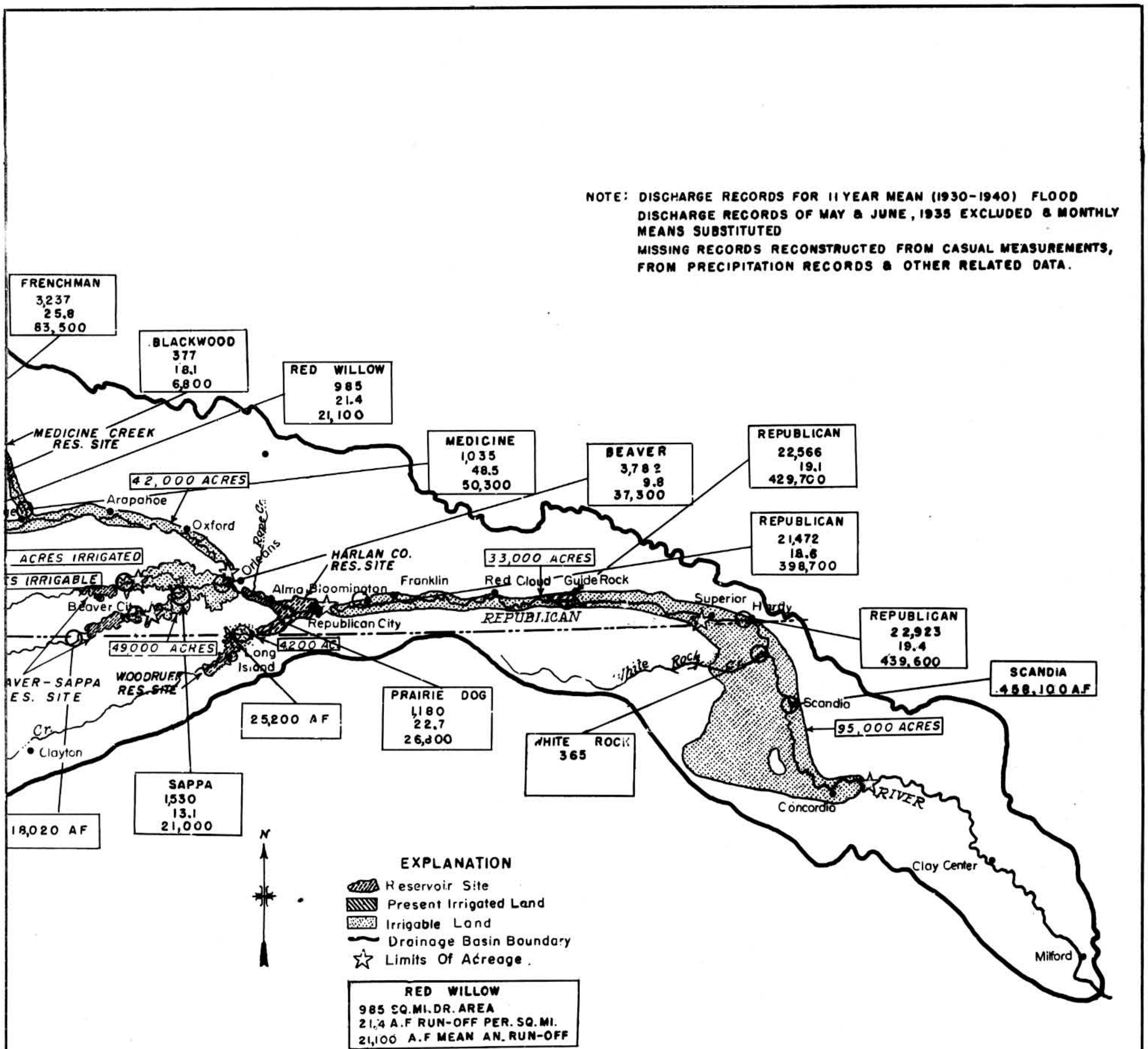
(1) Based on ratio of Storage Capacity designed for Irrigation to Total Capacity.

Source: Compiled from Army Engineers' Report on Survey For Flood Control Republican River Basin Nebraska and Kansas, Appendix II dated February 27, 1940.



SOURCES: ACREAGES - U.S. BUREAU OF RECLAMATION
DISCHARGES - NEBR. DEPT. OF ROADS & IRRIGATION

NEBRASKA STATE PLANNING BOARD



MAP SHOWING
MEAN ANNUAL DISCHARGES, RESERVOIR SITES AND IRRIGABLE LAND
REPUBLICAN RIVER BASIN

PROBABLE FLOOD RUN-OFF* FROM THE TRIBUTARIES OF THE REPUBLICAN RIVER

Tributary or Portion of Basin	Drainage Area (Sq.Mi.)	Applied Av.Depth Rainfall of 1935 Flood	Percentage of Run-Off	Probable Run-Off (Acre-Feet)
North Fork Rep.	1,500	6.8	10	54,500
Arikaree	1,780	6.9	20	130,800
Buffalo	1,177	6.0	10	37,600
Rock	145	9.0	20	13,900
South Fork Rep.	2,695	6.2	20	178,600
Frenchman	3,237	5.5	10	94,800
Blackwood	377	10.8	20	43,400
Driftwood	407	10.6	20	45,900
Red Willow	985	9.4	20	98,800
Medicine	1,035	8.7	20	96,000
Beaver	2,126	5.5	15	93,300
Prairie Dog	1,180	8.6	15	81,000
Rep. River drainage above Bloomington not listed	3,172	5.0	20	169,000
Total above Bloomington	21,472			1,232,800

*Run-off computed for 24-hour rainfall of intensity equal to flood of May 31, 1935 with areas of maximum intensity applied to each tributary.

SMALL HEADWATER RESERVOIRS ON MINOR TRIBUTARIES

Studies of the proposed major reservoirs on tributaries have received considerable attention in this report. While such reservoirs are, eventually, the only completely dependable means of reducing and controlling storm run-off, much can be accomplished by the construction of many small reservoirs in the canyon heads of the minor tributaries. Many sites are available for the small reservoirs which would serve both as stock watering ponds and as erosion control devices. They would prevent much of the silt resulting from excessive rainfall from reaching the major reservoirs. Furthermore, it is unlikely that all of the small reservoirs so constructed in the headwater canyons would be full at the time of the flood-producing storm. Were such reservoirs sufficiently numerous and well constructed the capacities of the proposed major reservoirs might logically be reduced, although it is believed that any saving effected by allowable reduction in the capacity of the major reservoirs would result in saving only a portion of the total cost of small reservoir construction.

LAND PLANNING AND ADJUSTMENT IN LAND USE

It is recognized that the flood-control plan contemplating the construction of reservoirs on the larger tributaries for the retention of maximum flood flows is not a complete plan within itself,but should be supplemented by a proper adjustment in land use throughout the entire basin. The development of water-conserving tillage practices and water-retarding factors such as contouring and revegetation are a very important part of a comprehensive flood prevention and control program. Such land planning and utilization practices will assist materially, not only by increasing the amount of precipitation absorbed and retained for crop use but will also reduce the rate of run-off resulting from intense storms and aid in minimizing erosion resulting from such storms. Erosion-control measures are of major importance in the proposed reservoir plan, because the rate of reservoir capacity reduction resulting from silting is directly reflected in the cost of constructing such works and limits their period of service.

While land planning is a very necessary and desirable part of a comprehensive flood-control program, special application of such planning in the flood plain should include the following points:

1. The relocation of threatened rural residence and buildings when feasible.

2. Local protection works for all threatened municipalities and other points where the potential loss is great.

3. An extensive well-planned and directed tree-planting program on lands which are now rendered unfit for tillage purposes.

4. The removal from private control of all lands rendered unfit for agricultural purposes by past floods and the development on these lands under governmental control, preferably Federal, of a protective strip of tree plantings for the purpose of reducing wind erosion, retarding future flood flows and, incidentally, providing a wild life refuge.

5. The creation of an organization authorized to issue official flood warnings so that there will be no procrastination in evacuating the threatened areas.

EROSION, SEDIMENT, AND POLLUTION

Erosion throughout the Republican River Basin is very pronounced with tributaries in the head waters cutting well into the table lands. While the rate of erosion is slow due to the semiarid climate of the basin, the erosion on the tilled lands is removing much of the fertile top soil.

The erratic flood flows of the river result in a heavy load of suspended sediment. On an average, the suspended sediment content amounts to approximately 5,400 parts per million. No figures are available concerning the concentration of sediment transported under major flood conditions.

The Republican River near Hardy at the Nebraska-Kansas line, transports annually an average of approximately 7,000,000 tons of suspended sediment.

Considerable pollution of the Republican River is resulting from the disposal of domestic sewage near the larger municipalities.

AGRICULTURAL AND INDUSTRIAL DEVELOPMENTS

The chief industry of the Nebraska portion of the Republican River Basin is agriculture. With the exception of a cement mill located near Superior in the extreme eastern portion of the basin, the industrial plants of major importance within the basin are agricultural products processing plants such as mills and creameries. Some of these processing plants are of major importance in their field of activity within the agricultural products processing industry.

The cities and towns of the basin are primarily marketing and distributing points for the neighboring farms.

To facilitate the compilation of statistical data relative to agriculture and livestock raising, it was found desirable to consider the following 12 counties as comprising the Nebraska portion of the Republican Valley watershed: Chase, Dundy, Franklin, Frontier, Furnas, Gosper, Harlan, Hayes, Hitchcock, Perkins, Red Willow, and Webster.

With the exception of a slight decrease in 1929, the number of farms increased from 11,804 in 1919 to 12,504 in 1934. There was no material or consistent change in the average size of farms during this period, the average size being 392,369, 390 and 385 acres respectively, in 1919, 1924, 1929, and 1934.

The total area in the 12 counties included in this report contains 5,044,480 acres. The proportion in farm land varies from 89 per cent in 1924 to 96 per cent in 1934. The utilization of the land in farms has been classified in 4 divisions: land in cultivated crops, land in wild hay, land in pasture, and other land.

There was a rather marked shift from wheat to corn from 1919 to 1929. The small acreage of cereal crops in 1934 was due to the drought. The increasing proportion of land devoted to intertilled crops has undoubtedly increased the erosion problem.

LIVESTOCK AND PASTURE

The pasture in the basin is for the most part native grass, which is located to a large extent on hilly and sandy land. The relatively small acreage of tame pasture consists mostly of alfalfa, sweet clover, sudan, and rye.

The principal kinds of livestock in the area are cattle, hogs, and horses. The number of cattle decreased from 307,696 in 1920 to 278,457 in 1930, and then increased to 281,587 in 1935. The number of hogs increased from 244,637 in 1920 to 387,296 in 1930, and then decreased to 165,111 in 1935. This decrease was probably due in large part to the drought and the agricultural adjustment program throughout the period. There was a consistent decrease in the number of horses throughout the period. The numbers of livestock in the area and per farm are reported in the following table:

NUMBER OF LIVESTOCK, 1920-1935

	1920	1925	1930	1935
Cattle	307,696	296,386	278,457	281,587
Per Farm	26	24	23	23
Hogs	244,637	335,904	387,296	165,111
Per Farm	21	28	32	13
Horses	116,154	104,159	87,735	70,949
Per Farm	9	8	7	5

As cattle and horses are the principal kinds of livestock grazed on the permanent pastures, the number of acres of pasture per head of livestock is an indication of the seriousness of the grazing problem. The acres of pasture per head of cattle and horses were 4.6 in 1919; 5.1 in 1924; 5.1 in 1929; and 6.2 in 1934. Although these data do not indicate it, there may have been some overgrazing where growing conditions were not favorable. The feed units per acre of pasture in this area are estimated to be the equivalent of approximately 6 bushels of corn.

CROP YIELDS

The range in yields by counties over a ten-year period was as follows: corn 18.9 to 24.3 bushels; wheat 11.2 to 16.0 bushels; oats 23.6 to 27.2 bushels; barley 21.9 to 26.6 bushels; rye 10.5 to 22.4 bushels; and alfalfa 2.0 to 2.9 tons.

VALUE OF LAND

The value of land decreased nearly 50 per cent from 1919 to 1934. The average value of the land was $52 per acre in 1919 and decreased continuously to $28 in 1934. The real estate investment in 1919 was $20,314 per farm and in 1934 was $10,934. The real estate in 1935 was estimated to be worth approximately the same as in 1934. The low point in real estate values was reached in 1933 when it was about 4 per cent less than in 1934. The value per farm was only a little higher in the western part than in the eastern part, although the farms were about twice as large in the western section.

FARM DEBT

Comparable data on farm indebtedness are available only for the years 1920 and 1930. Based on owner-operated farms, the farm debt averaged $4,931 per farm in 1920 and $5,028 in 1930. The amount of the mortgage increased in the eastern part of the area from 1920 to 1930, decreased in the western part, and remained practically without change in the middle part of the area.

TENANCY

The percentage of farm tenancy increased from 43 per cent in 1920 to 48 per cent in 1935. The increase was more rapid in the western part of the area than in the eastern part. The proportion of cash tenancy was 9 per cent in 1920, 6 per cent in 1929, and 8 per cent in 1930. No data on cash rent are available for 1935. There was a slight indication of a higher percentage of cash tenancy in the western part of the area than in the eastern part.

TYPE OF FARM

Farms classed as general constituted approximately 17 per cent of all farms in 1929, cash grain farms 44, animal specialty 30, and dairy less than 2 per cent. General farms were about 3 times as numerous in the eastern part as in the western, and animal specialty about twice as numerous. Cash grain farms were nearly twice as numerous in the western part as in the eastern part of the basin. Dairy farms were about as common in one part of the area as another.

INCOME

Farmers in the eastern part of the area depended more on the sale of livestock than on crops for their income, while farmers in the western part depended more on crops.

It is not possible to secure data for other years to indicate the trend in the proportion of income from different sources. In view of the increased acreage of corn and decreased acreage of wheat for the area as a whole, it is reasonable to assume that the source of income is shifting from crops to livestock.

ELKHORN RIVER BASIN

DESCRIPTION

The Elkhorn River Basin, a portion of the Platte River Basin, lies wholly within the boundaries of Nebraska and comprises an area of 7,025 square miles or approximately 9 per cent of the area of the State. The drainage basin includes all or parts of 23 counties in the northeastern part of the State. The basin is approximately 200 miles in length and averages about 25 miles in width for the upper 90 miles, and then increases to an average width of 55 miles for the next 90 miles. From this point it decreases in width to an average of 4 miles for the remaining 20 miles.

The area drained by the tributaries extends close to the Missouri River and consists of sand hills, prairie plains, loess plains, and loess hills. The main valley is comparatively narrow and flat, and is modified in places by low sand hills. It averages 1.5 miles in width.

The banks of the river are covered with a heavy growth of trees. Crop raising is chiefly limited to the area between Ewing and the mouth of the river. The area above Ewing is used chiefly for grazing and wild hay production.

GENERAL GEOLOGY

In general the Elkhorn Basin is a mantlerock area, with very little bedrock exposed. Bedrock forms a rigid platform upon which the mantlerock has accumulated.

Bedrock Formations

The bedrock which immediately underlies the mantlerock includes from oldest to youngest, the Dakota group, Graneros shale, Greenhorn limestone, Carlile shale, Niobrara formation, Pierre shale, and Ogallala group. All of these formations are Cretaceous in age with the exception of the Ogallala which is Tertiary.

(a) Dakota Group

An upper, gray to buff sandstone, 100 to 150 feet thick (Dakota sandstone); a middle, varicolored red and light-gray argillaceous shale, 50 feet or more thick (Fuson shale); a lower series of gray sandstone with some interbedded shale (Dakota sandstone); occurs below mantlereck in southeastern Dodge, western Washington, western Douglas, and northwestern Sarpy counties; upper and lower sandstones important aquifers, often source of artesian water, relatively high porosity permits penetration of surface water and relatively free percolation of ground water.

(b) Graneros Shale

Dark-gray shale, with some sandy and coaly material in lower part; thickness about 90 feet, thickening westward; occurs below mantlerock in a band extending northeastward in western Burt and central Dodge counties, present at greater depth in subsurface to west; relatively impervious, basal part forming upper confining layer to the ground water of the Dakota sandstone and upper surface forming impervious platform below mantlerock.

(c) Greenhorn Limestone

Gray, thin-bedded, fossiliferous limestone, in part chalky, interbedded with dark-gray shale; thickness about 30 feet; occurs below mantlerock in western Burt and central Dodge counties; present in subsurface to west; relatively impervious, locally the base is sandy and may yield a small supply of ground water.

(d) Carlile Shale

Gray to dark-gray plastic shale; about 150 feet thick; occurs below mantlerock in southern Dixon, western Thurston, eastern Wayne, Cuming, southeastern Stanton, northeastern Colfax, and northwestern Dodge counties; present in subsurface at greater depths to the west; forms an impervious platform below the mantlerock.

(e) Niobrara Formation

Light-gray chalky shale and chalk; thickness about 220 to 250 feet; occurs below mantlerock in southern Cedar, southwestern Dixon, eastern Pierce, central and western Wayne, central and eastern Madison, western Stanton, northern Platte, and northwestern Colfax counties; present in subsurface to west below Pierre shale; forms impervious platform below mantlerock.

(f) Pierre Shale

Steel-gray to dark-gray argillaceous shale, with some concretionary layers; occurs below the Ogallala group in western Pierce and Madison counties and to the west, forming the impervious platform restricting downward penetration of ground water; thickness from a few feet up to about 1,000 feet, increasing westward.

(g) Ogallala Group

A series of sand, sandstones and limy sand stones, with some gravels and a little clay; thickness up to 200 feet or more; occurs below the mantlerock in the western part of the area, unconformable overlying Pierre shale; relatively porous, favorable to penetration and percolation of ground water; an important aquifer.

Mantlerock Formations

The mantlerock of the Elkhorn Basin includes, from oldest to youngest, the Holdrege-Grand Island sands and gravels and contemporaneous glacial drift deposits, the Loess and contemporaneous dunesand and the alluvium.

(a) Holdrege-Grand Island Sands and Gravels

Relatively unconsolidated coarse sand with some gravel; usually separated into an upper and a lower sand and gravel by 20 to 50 feet of dark-gray silty clay (Fullerton formation); thickness up to 200 feet or more; limited to area west of glacial drift border where it occurs above the bedrock as a more or less continuous sheet; porous material favorable to surface-water penetration and ground-water percolation; an important aquifer and a good source of irrigation supplies where material is not too fine in texture; contemporaneous with glacial drift farther east.

(b) Glacial Drift and Associated Deposits

A heterogeneous mixture of clay, silt, some sand and boulders; in 2 sheets, each up to 100 feet in thickness; subglacial sands and gravels locally occur below the lower drift (Nebraskan); the upper drift (Kansan) is locally separated from the lower drift by intertill sands and gravels; drift sheets impervious, forming areas of high surface run-off; subglacial and intertill sands and gravels relatively porous and locally, reliable aquifers; contemporaneous with Holdrege-Grand Island formations.

(c) Loess

An upper gray to buff, silty clay, 20 to 100 feet thick (Peorian); a lower reddish-brown silty clay locally with some sandy material near base, zero to 75 feet thick (Loveland); widespread in occurrence in the uplands east of the Sand-Hill Region, relatively impervious forming area of high surface run-off; contemporaneous with the dunesand of the Sand-Hill Region.

(d) Dunesand

Fine-grained unconsolidated sand; from 50 to 150 feet thick; limited to Sand-Hill Region in western part of basin; relatively porous; forms areas of little or no surface run-off and free percolation of ground water which in turn is slowly fed to streams flowing at or near the water table; contemporaneous with Loess.

(e) Alluvium

Silt, sand, and clay; up to 50 feet in thickness; limited to bottom lands along drainages; relatively porous; important supply for shallow wells east of drift border.

Structure of Bedrock

The bedrock of the Elkhorn Basin dips gently to the west.

TOPOGRAPHY

The upper part of the Elkhorn River Basin lies partly in the Sand-Hill Region of Rock and Holt counties, and the remainder of this upper portion lies in the loess region to the east. The basin slopes southeastward to the mouth of the stream near Gretna. The main valley, with an average width of 1.5 miles, is relatively narrow and generally slightly rolling. The rise from the valley floor to the uplands is rather abrupt in some cases, but usually the valley tapers into a gentle slope. The river channel is relatively narrow and in most cases is confined to low sandy banks. The stream usually lies from 100 to 300 feet below the bordering uplands. At some points there is a dense growth of brush and timber bordering the stream and on the rough lands or slopes of the valley sides.

STREAMS OF THE BASIN

The Elkhorn River is formed by the confluence of the Middle and the South Forks at a point in the southeastern part of Holt County near the Holt-Antelope county line. The river follows a southeastward course, traversing Antelope and Madison counties to join the North Fork near Norfolk. To this point, the river is fed by numerous springs and tributaries, principally Cache, Cedar, and Battle creeks. After continuing its general southeastward course through Stanton, Cuming, Dodge, Washington, and Douglas counties to a point 7 miles northeast of Ashland, the Elkhorn joins the Platte River. Between Norfolk and the mouth are tributaries such as Humbug, Rock, Union, Plum, Cuming, Silver, Logan, Maple, and Bell creeks.

The river system rises at an elevation of approximately 2,300 feet and empties into the Platte River at an elevation of 1,085 feet. The characteristics of the Elkhorn River are similar to those of the Loup, although it has a greater tendency to overflow. The length of the river is 333 miles, with an average gradient of 3.4 feet per mile. The river system drains an area of 7,025 square miles. The mean annual precipitation over the drainage area is about 27 inches. The stream, meandering through a relatively narrow channel, is sluggish at its headwaters but becomes a swift, clear, beautiful stream farther on. It is subject to floods in its lower course. The mean annual discharge into the Platte is 776 second-feet.

The Middle Fork has its source in the Sand Hills in the central part of Rock County. The stream emerging from springs and artesian wells, meanders in a general southeastward direction until it converges with the South Fork near Ewing. Because of the stabilizing effect of the sandy soil, which absorbs water readily, the stream flow is not seriously affected by heavy rains. Under ordinary conditions the surface run-off is almost negligible. The mean annual precipitation for the basin is about 22 inches. The gradient is about 5 feet per mile. The mean discharge near the mouth is approximately 224 second-feet. This river, approximately 70 miles in length, drains an area of 1,460 square miles. At a point a few miles west of O'Neill there is neither a definite river channel nor an appreciable flow. The natural course of the river is obstructed in many places by thick undergrowth which causes the stream to traverse the adjoining fields. Many acres of hay land could be reclaimed by constructing a new channel and confining the water to a more definite course.

The South Fork has its source in the sand-hill ground water of the southern and western portions of Holt County. It flows eastward, draining a narrow sandy region containing numerous lakes, and converges with the Middle Fork near Ewing. The stream approximately 50 miles in length, drains an area of 409 square miles. The mean annual precipitation is about 23 inches. Practically all the precipitation is readily absorbed by the sandy soil; allowing very little surface run-off. The mean annual discharge at the mouth of the South Fork is approximately 70 second-feet.

The North Fork has its source in 2 areas, one in sandy land and the other in hard land capped by silty soils. The drainage from the western portion of the basin comes from sand-hill country in the eastern part of Antelope County and the western half of Pierce County where there are numerous springs that contribute to the constancy of the stream flow. The drainage from the eastern portion of the basin comes from the rolling clay hills in the eastern half of Pierce County. Because of the precipitous area and the type of soil, the rate of run-off is relatively high, causing flood conditions in the lower reaches of the river. This stream, 53 miles in length, drains an area of 710 square miles. The mean annual precipitation for the area is approximately 27 inches. Willow Creek, the principal tributary, joins the river at Pierce. The North Fork converges with the Elkhorn 3 miles below this point with a mean annual discharge of 155 second-feet. The chief economic use of the river is for watering livestock. Other uses are for the production of hydroelectric power, hunting, and fishing.

Logan Creek has its source in Pierce, Wayne, Cedar, and Dixon counties. Deer and Dog creeks the principal tributaries, empty into Logan Creek near Wakefield. Logan Creek is 112 miles in length and drains an area of 1,019 square miles of gently rolling land with soils consisting chiefly of loess clay. The stream converges with the Elkhorn River near Winslow; here its mean annual discharge is 212 second-feet. The mean annual precipitation over the basin is 28 inches. There is considerably more agricultural activity in this basin than in the other tributary basins of the Elkhorn drainage area, probably because there is a better distribution of the seasonal precipitation, and because of the extensive distribution of terrace lands, which are well suited to agricultural development.

GROUND WATER

The Elkhorn River Basin occurs in 4 general ground-water regions; namely, the Sand-Hill Region, the Central Region, the Northern Drift Region, and the Ainsworth-Holt Tableland Region.

In the Sand-Hill Region, the sand-hill formation overlies Pleistocene sands and gravels. The Ogallala formation makes up the bedrock floor and the Pierre shale forms the impervious platform. Water occurs within the Pleistocene sands and gravels and the Ogallala formation. The water table is generally high, the direction of underflow southeastward (except locally where it is toward the valleys) and replenishment is from rainfall in the sand hills which is largely percolated to ground-water storage. There are many shallow artesian wells in this region.

In the Central Region loess occurs as a cap over thick Pleistocene sands and gravels, which rest upon the Ogallala beds and Cretaceous chalks and shales. The impervious platform is on the Pierre shale and the Niobrara formation. Subsurface drainage is generally southeastward or southward. Adequate supplies of water occur in the Pleistocene sands and gravels.

Loess caps the glacial drift in the Northern Drift Region. Intertill sands and gravels, subglacial gravels, and the alluvium of the stream valleys furnish most of the water supply. In the western part of the region some wells are drilled to the Dakota bedrock. The intertill sands and gravels are erratic in their occurrence and are missing in many places. When the intertill sands and gravels are absent or fail to furnish an adequate supply of water it is necessary to test the subglacial gravels which are generally somewhat better developed. When both of these possibilities fail, it is necessary to prospect in the bottom lands of the larger drainages for a shallow supply in the alluvium, or it may be necessary to drill to the Dakota bedrock if it is not at a prohibitive depth. The Dakota bedrock is present at a depth of 250 feet or less in the southeastern part of the basin and gradually increases in depth westward up to about 600 feet or more near the western edge of the Northern Drift Region.

A small portion of the southern part of the Ainsworth-Holt Tableland Region is covered by the Elkhorn Basin. Conditions are somewhat similar to those of the Central Region except that the Tertiary bedrock is generally higher, and the Pleistocene sands and gravels are somewhat thinner.

Many shallow wells are found in the alluvium of the bottom lands in the region of the Elkhorn River and its tributaries. The depth to water usually varies from a few feet to 30 feet. Replenishment is from local rainfall and the direction of underflow is down-drainage.

AGRICULTURAL AND INDUSTRIAL DEVELOPMENT

The chief industry of the Elkhorn River Basin is agriculture. There is no manufacturing of importance with the exception of local milling and the generation of electric energy for the immediate needs of the basin.

Agriculture is much diversified in this area. Large quantities of corn, oats, and alfalfa are raised, and the eastern portion is the most intensive livestock-producing and feeding section of the State. Cattle and wild-hay production dominate in the western end of the basin. In 1934, 96.4 per cent of the land was in farms and 68.3 per cent of the farm land was under cultivation. In 1919, 89 per cent was in farms and 64.5 per cent of farm land under cultivation.

Corn yields more than any other feed grain, and from 50 to 60 per cent of the cultivated land is devoted to it. In 1934 the percentages of the cultivated land used for other crops were: oats, 22; barley, 3; alfalfa, 7; rye, 4; and wheat 3. During the past 15 years there has been an increase in barley acreage, a slight expansion of corn acreage, but a considerable decrease in wheat acreage. About the same proportions of cultivated land are now used for oats, rye, and alfalfa as in 1919.

The average size of farms was 189 acres in 1934 compared with 200 in 1919. There was a slight decrease in the number of large farms of 260 acres or more, and a slight increase in number of 160 - acre farms.

The average number of hogs and cattle per section are 80 and 62 respectively. This is approximately 15 more hogs and 10 more cattle per section than any other area in the State, and only the southeastern part of the State has more milk cows per section. Large numbers of hogs and cattle are shipped in and fattened for market. Although livestock production is very intensive there is a surplus of feed grains, and in most years 25 to 30 per cent of corn and oats are sold for cash and shipped out of the area.

The Elkhorn River Basin includes some of the best farm land in Nebraska. It is an area of intensive grain and livestock production; with corn, hogs, and beef cattle bringing the major returns from agriculture. The income from hogs and cattle is about equal, and amounts to approximately two-thirds of the whole. The sale of feed grain accounts for about one-fifth of the income. Wheat and other small grains are of little importance in the major part of this drainage basin.

The capital value of farms in this basin decreased about 30 per cent from 1920 to 1930. The decrease in real estate was approximately 31 per cent; in livestock 3 per cent, and in machinery 2 per cent. The capital value in real estate decreased 41 per cent during the 5-year period 1930 to 1935.

Tenancy in this drainage basin averages about 48 per cent. It is higher in the western part near the source of the Elkhorn River than in the eastern part although there are some counties in the eastern part where it is over 50 per cent. The percentage of tenancy has increased slowly since 1920. The proportion of cash tenancy is higher in this basin than in any other. It was nearly 45 per cent in 1930, only a slight decrease from that in 1920.

IRRIGATION DEVELOPMENT

Because of prevailing climatic conditions in the Elkhorn Basin there has been but slight demand for irrigation. The records of the State show only 19 appropriations, with a total grant of 155 second-feet of water for this purpose. Many of the projects initiated during dry years were later abandoned, as the rainfall was found to be sufficient to produce and mature crops, except during drought years. The increase in production due to irrigation during the dry years was not considered sufficient to warrant an expensive project.

Pumping plants installed on shallow wells have been used to some extent, and in many instances they are considered very satisfactory. The real merit of these installations is in their flexibility and small capital requirement.

POWER DEVELOPMENT

The streams of the Elkhorn River Basin have been developed for power at 24 definitely known points. Most of these developments were for small milling operations, and have since been abandoned. While there are some good available sites on the stream, the generally erratic flow precludes practicable development.

EROSION AND SEDIMENT

The Elkhorn River system is a heavy carrier of sediment. The average erosion in the Elkhorn drainage area was found by the Army Engineers to be approximately 3 times as great as that for the Platte drainage area. There is wide fluctuation in the quantity of sediment carried. The ratio of the minimum monthly load to the maximum was found to be 1 to 252 during the eight-month period of record. For this period, studies indicated that Elkhorn contributes 22.2 per cent of the sediment discharged by the Platte at its mouth. The average concentration of suspended sediment in the Elkhorn was 3,920 parts per million, which is higher than in any other stream in the Platte River Basin.

BLUE RIVER BASIN

DESCRIPTION

The Blue River Basin, lying in the states of Nebraska and Kansas, comprises an area of 9,883 square miles, of which 7,230 square miles or 73 per cent is in Nebraska. The area drained by the Blue River system in Nebraska is approximately 9 per cent of the area of the State. The drainage area has a length of approximately 160 miles and includes all or parts of 19 counties in Nebraska, lying between the Platte River Basin on the north and the Republican River Basin on the south. The basin varies in width from 129 miles in the northwestern portion to 10 miles near the confluence of the Blue and Kansas rivers at Manhattan, Kansas. The elevation varies from 2,200 to 1,000 feet, but in Nebraska the variation in the basin is from 2,200 to 1,160 feet. This system in Nebraska has 2 trunk valleys, the Big Blue, and the Little Blue. The rivers unite near Blue Rapids, Kansas, about 20 miles south of the Nebraska-Kansas line. The drainage pattern of the Big Blue River southeast of Dewitt is typically dendritic, but above this point all of the major tributaries enter the trunk valley from the west resulting in an asymmetric drainage pattern.

GENERAL GEOLOGY

The Blue River Basin is predominantly a mantlerock area, although bedrock is at or near the surface in the southeastern part. The bedrock areas include isolated patches near Smyrna, Nelson, and Angus in Nuckolls County, regions south of Rose Creek in southeastern Thayer County, the Little Blue River valley below Hebron in Thayer County, much of the area southwest of the Little Blue River in Jefferson County, the southern fourth of Gage County and southwestern Pawnee County.

Bedrock Formations

The bedrock platform is Tertiary in age in the western part of the basin. Progressing eastward, successively older Cretaceous formations form the bedrock floor, and Permo-Pennsylvanian rock either outcrop or are present below the mantelrock in the southeastern part. The outcropping bedrock formations are discussed from oldest to youngest.

(a) Permo-Pennsylvanian

Interbedded limestones, shales, and some sandstones about 250 feet exposed in Gage and southwest Pawnee counties, overlying about 2,000 feet of sediments of the same general age; overlies in the subsurface, yet older sedimentary rock, which rests upon Pre-Cambrian; generally impervious, forming areas of high surface run-off; locally furnishes some water to wells, but unreliable; generally water is of poor quality.

(b) Dakota Group

An upper gray to buff sandstone with some gray shale in middle part, about 100 to 150 feet thick (Dakota Sandstone); a middle varicolored red and light-gray shale, 50 feet or more thick (Fuson shale); a lower series of sandstones, with some interbedded dark-gray shales, about 200 feet thick (Dakota sandstone); outcrops or present below mantlerock in western Gage and central and eastern Jefferson counties; upper and lower sandstones important aquifers, but ground water becomes highly mineralized westward.

(c) Graneros Shale

Gray to dark-gray shale, with some sandy and coaly material in lower part; about 90 feet in thickness; outcrops in western Jefferson and eastern Thayer counties; forms impervious platform below the mantlerock in central-eastern Saline and Seward counties and north-central Jefferson County; present in subsurface to west; forms area of high surface run-off where exposed.

(d) Greenhorn Limestone

Thin beds of gray, fossiliferous limestone, with interbedded dark-gray shale; about 30 feet thick; outcrops in eastern Thayer and western Jefferson counties and near Milford in Seward County; occurs below mantlerock in north-trending band across central Saline and Seward counties.

(e) Carlile Shale

Gray to dark-gray plastic shale; 150 to 200 feet thick; occurs below mantlerock in central and western Thayer, northwestern Jefferson, central and eastern Fillmore, western Saline, eastern York, western Seward, eastern Polk and central and western Butler counties; where it forms an impervious platform; present in subsurface to west.

(f) Niobrara Formation

Light-gray chalky shale and chalk; about 250 to 350 feet thick; occure in impervious platform below mantlerock in eastern Webster, Nuckolls, Clay, northwestern Fillmore, eastern Hamilton, western York and western Polk counties; present in subsurface to west at greater depth.

(g) Pierre Shale

Steel-gray to dark-gray, argillaceous shale, with some concretionary layers; about 200 feet of the lower part present in subsurface in western part of the basin, thinning eastward; present as impervious platform in western part of basin.

The formations from the Dakota Group to the Pierre shale, inclusive, are Cretaceous in age. They were extensively folded and eroded prior to the deposition of the Ogallala group of Tertiary age.

(h) Ogallala Group

Sandstones, limy sandstones, sands, gravels. and some clay; probably not in excess of 50 to 100 feet in subsurface of this basin; occurs below mantlerock in Kearney and parts of Franklin, Adams, and Hall counties; generally porous, permitting free penetration and percolation of ground water.

Mantlerock Formation

The Blue River Basin is divided into 2 general regions on a mantlerock basis. In the larger area of the central and western parts loess occurs above Holdrege and Grand Island sands and gravels. In the smaller area in the southeastern part of the basin loess occurs above glacial drift and associated deposits. The formations comprising the mantlerock are herein discussed from oldest to youngest.

(a) Holdrege and Grand Island Sands and Gravels

A lower sand and gravel sheet (Holdrege), up to 100 feet or more in thickness, separated from an upper sand and gravel sheet (Grand Island) of about the same thickness by a dark-gray silt and clay (Fullerton formation), 30 to 65 feet thick and locally non-continuous; porous nature of sands and gravels permits free penetration and percolation of ground water; an important aquifer furnishing supplies to irrigation wells; contemporaneous with glacial drift and associated deposits of the southeastern part of the basin.

(b) Glacial Drift and Associated Deposits

Heterogeneous clay, silt, with some sand and boulders; occurs in lower (Nebraskan) and upper (Kansan drift-sheets), both of which are up to 100 feet in thickness; a subglacial sand and gravel occurs locally below the lower drift sheet and an intertill sand and gravel separates the upper and lower drifts in a number of places; limited to area east of the Big Blue River with the exception of lobes extending west of the river in the vicinity of Seward and Staplehurst, south of the river in southeastern Polk County, and in central and southern Saline and northeastern Jefferson counties; drift proper relatively impervious, forming areas of high surface run-off; associated sands and gravels furnish supplies to farm wells but their non-continuous nature makes them unreliable sources in many localities; contemporaneous with the Holdrege and Grand Island sands and gravels.

(c) Loess

A lower pink to reddish-brown silty clay, locally sandy near base, about 15 to 40 feet thick (Loveland formation); an upper gray to buff, sandy clay, 20 to 50 feet thick (Peorian loess); occurs capping the upland in the region east of the drift border and forming the Loess Plains Region to the west; generally impervious causing high surface run-off.

(d) Alluvium

Silt, sand, clay, and some gravel; up to 30 feet or more in thickness; limited to bottom land of the drainages; relied upon as a source of shallow water in glaciated area where possibilities at greater depth are limited.

Structure of the Bedrock

The bedrock dips gently westward in this basin and generally the slope of the bedrock floor is southeastward.

TOPOGRAPHY

The upper portion of the Blue River Basin in Nebraska is in the Loess Plains Region. The lower portion in this State is in the Southern Drift Region in which the valleys are clearly outlined and bordered by the well-defined, loess-capped terraces. The flood plains of the Little and Big Blue rivers are relatively small. The streams, especially the Big Blue, are well adapted to water power.

STREAMS OF THE BASIN

The Blue River System rises in proximity to the Platte River and flows southeastward to its confluence with the Kansas River near Manhattan, Kansas. The tributaries head on the flat lands south of the Platte, the water coming from springs and precipitation. The Big Blue River, about 283 miles in length, has its source in central Hamilton County. It flows northeastward to a point near Osceola, in Polk County, where its course is changed abruptly to a southeastward direction, which is maintained throughout the remainder of its course. The river enters Kansas at a point about 3 miles south of Barnston, Nebraska. It rises at an elevation of 1,800 feet and descends to an elevation of 1,000 feet at its mouth, with an average gradient of 2.8 feet per mile. Principal tributaries to the Big Blue River are the Davis, Prairie, Keysor, Lincoln, Plum, West Fork, Squaw, Turkey, Swan, Clatonia, Cub, Indian, Big Indian, Soap, Snake, Bear, Cedar, Mud, Wildcat, Wolf, Mission, Bottle, Bills, Walnut, Coon, Crooked, Clark, North Branch, and the Northwest Fork creeks. The West Fork, about 100 miles length, has its source in northeastern Adams County and flows eastward to its confluence with the Big Blue River above Crete, Nebraska. Principal tributaries to the West Fork are the Beaver, Indian, Johnson, School, Korgen, and Walnut creeks. The average annual discharge of the Big Blue River near the Nebraska-Kansas State line is about 373 second-feet.

The Little Blue River, about 208 miles in length originates in eastern Kearney and western Adams counties and flows generally southeastward to enter Kansas at a point about 2 miles south of Steele City, in southeastern Jefferson County, thence in the same general direction to a point near Waterville, Kansas, where it unites with the Big Blue River. It has an elevation of 2,200 feet at its headwaters, 1,100 feet at its mouth, with an average gradient of 5.3 feet per mile. Principal tributaries to the Little Blue River are the Sand, Cottonwood, Spring, Thirty-two Mile, Pawnee, Walnut, Elk, Oak, Turtle, Thanes, Dry, Big Sandy, Little Sandy, Rose, Rock, Horseshoe, Smith, Brawners, Whiskey, Ox Box, Liberty, Ash, Dove, and Flat creeks. The average annual discharge of the Little Blue River near the Nebraska-Kansas State line is about 287 second-feet.

GROUND WATER

The western border of the Glacial Drift Area divides the Blue River Basin into 2 general ground-water regions; namely, the Loess Plains(8^1 and 8^2)* and the Southern Drift (11). These regions may be further subdivided on a basis of presence or absence of certain water-bearing formations.

The Loess Plains Region lies to the west of the till border and is capped by loess. In the southern part of the region (8^2) the bedrock is near the surface and the mantlerock is thin or absent. Where the Pleistocene sands and gravels occur they may be relied upon for a water supply, but where they are absent it is generally necessary to prospect the alluvium of the bottom lands for water. Within the bedrock the conditions are not favorable, but some farm wells are supplied from the jointed and fractured Fort Hays limestone at the base of the Niobrara formation. The Dakota bed is generally too deep to be relied upon for farm-water supplies, except in the eastern half of this subregion. In the central and western part of the area the Dakota bed may be expected at about 500 to 600 feet.

The main subdivision of the Loess Plains Region (8^1) is generally underlain by thick Holdrege and Grand Island sands and gravels, except in local areas where the bedrock is high, as between Angus and Edgar, northeast of Clay Center and near Giltner. These areas of high bedrock may represent a series of "hogbacks" in the Niobrara formation, which serve as a divide between the Hastings and Aurora basins, where the Pleistocene sands and gravels are thick. In the western part of this region the bedrock is again relatively high between Campbell and Minden, and between Minden and Kearney forming a divide between the Hastings and Holdrege basins.

A large supply of good quality water is present in the Holdrege and Grand Island sands and gravels, except over areas of high bedrock. The direction of underflow is southeastward, recharge is from the sand hills and, to a lesser degree, from the Platte River. Many of the streams are flowing at the water table and are supplied by ground water.

The Southern Drift Region is mantled by deposits of glacial drift. Along its western edge the subglacial sands and gravels are often well developed and furnish adequate supplies of water. The intertill sands and gravels are less reliable. West of the southeast limit of the Dakota sandstone a deep source of water is found in the sandstones of the Dakota group, at depths of 300 feet. In the extreme southeastern corner of this region (11^3) the bedrock is at or near the surface and the Dakota is not present. A little water is sometimes found in the Permo-Pennsylvanian bedrock, but it is often of poor quality and unreliable. Therefore, it is necessary to rely on the shallow supplies in the alluvium of the stream valleys.

*See Plate LXXII

A number of analyses have been made of water from wells within this basin. These analyses vary from 150 to 508 parts per million of mineral matter.

AGRICULTURAL AND INDUSTRIAL DEVELOPMENT

The chief industry of the Blue River Basin is agriculture. There is no manufacturing of importance, with the exception of milling and the generation of electric energy. The streams are well adapted to hydropower development, and several flour and feed mills utilize these developments to operate milling equipment as well as to generate electric power for public consumption.

This basin has a high percentage of tillable land and approximately 76 per cent of the farm land is now under cultivation. Only a small portion, 18.5 per cent, is in pasture.

Wheat and corn are the chief cultivated crops. Wheat has more dependable yields than corn over a period of years, but because of more returns from livestock during a period from 1919 to 1934 there was a decline in wheat acreage and an increase in corn. Thirty-six per cent of the cultivated land was used for corn in 1919 as compared with 44 per cent in 1934, whereas the wheat acreage decreased from 40 per cent in 1919, to 28 per cent in 1934. There has been but little variation in the proportion of other crops. In 1934 oats occupied 12 per cent of the cultivated land, barley 1 per cent, rye 0.4 per cent, and alfalfa 8 per cent.

Droughts have made crop yields uncertain in this basin. In this area there is a greater variation in the yields of corn and oats than in any other part of the State. Corn was almost a complete failure in 1934, and was below average yield in 1926, 1933, and 1935. There is also a wide variation from year to year in the yields of other crops.

Hogs are the most important livestock and show a tendency to increase in number with an increase in corn acreage. This area is exceded only by the northeastern and southeastern section of the State in number of dairy cattle per acre, but ranks lower in beef cattle.

The average size of farms was 186 acres in 1934, which is practically the same as in 1919.

The chief types of farming in the Blue River Basin are cash-grain and livestock production. Slightly over one-half of the farms are classed as livestock farms and one-fifth as general farms. About two-fifths of the income is from the sale of livestock and livestock products and about one-third from the sale of grains, wheat being the principal one.

The estimated capital value of farms decreased 31 per cent from 1920 to 1930. The value of real estate decreased around 34 per cent, machinery 3 per cent and livestock 14 per cent. The real estate value decreased nearly 40 per cent from 1930 to 1935. In 1935 the capital valuation of real estate was less than half of the value of 1920.

The percentage of tenancy in this basin is higher than in any other drainage basin in Nebraska, averaging over 50 per cent, and has not changed appreciably since 1920. The type of farming is such as to encourage tenancy rather than to discourage it. Because so large a proportion of the income is from cash crops, cash tenancy is comparatively unimportant. About 6 per cent of the farm tenancy is on a cash basis and its relative importance has remained fairly constant since 1920.

IRRIGATION DEVELOPMENT

With the exception of occasional years, the rainfall in the Blue River Basin has been sufficient and properly distributed through the growing season to produce satisfactory crop yields without the artificial application of water. As a result very few applications have been made for the appropriation of water from the Blue rivers for irrigation purposes.

Since irrigation would generally be of value only during an occasional dry season, in most cases the applications have been for pump projects, which require a relatively low capital investment and maintenance cost because of intermittent operation.

The State records as of October 1, 1938, show 39 appropriations for the irrigation of 2,902 acres in the basin of the Little Blue, and 76 appropriations for the irrigation of 3,375 acres in the basin of the Big Blue. A number of these appropriations would be canceled, if contested, because of nonuse. Of the 39 appropriations of water from the Little Blue, 34 are for pump projects for the irrigation of 2,452 acres and of the 76 appropriations from the Big Blue, 74 are for pump projects for 3,004 acres. All filings of recent years have been for pump irrigation.

The recent droughts have greatly stimulated the development of irrigation. The records show that 81 of the 115 appropriations or 70 per cent, carry priority dates of 1934 to 1938.

CONTEMPLATED IRRIGATION DEVELOPMENT

Due to the climatic conditions of the basin of the Blue rivers, the needs seem to be best met by pump irrigation. As a result, no comprehensive plan for development is now being contemplated.

POWER DEVELOPMENT

The Blue River Basin in Nebraska has been developed for hydropower production at 15 definitely known locations. The earlier developments were all for mechanical power for small milling enterprises. Later developments have been largely replacements of old mechanical power plants by new dams and equipment for electric power generation. Most of the hydro developments for mechanical power have been abandoned.

The developments are all low-head run-of-the-river type, with practically no reservoir support, and standby mechanical generation is used to assure firm power to the market supplied. The cross-section form of the stream channel is well adapted to low-head developments, and the discharge, while not uniform, is dependable for economical power generation. No details of the potential power sites are available for plans for increased use of the streams for power production. Approximately 3,186 killowatts of generating capacity is installed in the present operating hydroelectric developments.

FLOOD PROBLEMS

The flood plains of the Big Blue are narrow and the valley is deeply intrenched in most places. The valley is, however, subject to some floods, but the damage is usually not great, because the towns, railroads, and farms are generally on the high terraces.

The Little Blue River shifts its course easily because of the sandy nature of its banks, and although it has a steady flow of ground water, it is subject to floods from heavy rains on the surrounding loess capped upland.

SEDIMENT

The Big Blue River carries on the average a comparatively heavy load of sediment, but there is a great fluctuation in the quantity. The Army Engineers Report shows the ratio of the minimum daily sediment discharge to the maximum was 1:29,600 during the period August 26, 1929, to November 30, 1930. This great fluctuation is probably due to the reservoirs of hydroelectric plants acting at times as sediment basins and at other times unloading their accumulation of silt.

While the sediment content of the waters of the stream is heavy, this does not present a difficult problem as the Blue River and the Kansas River into which the former empties can readily transport the load.

NIOBRARA RIVER BASIN

DESCRIPTION

The Niobrara River Basin, lying in the states of Wyoming, South Dakota, and Nebraska, comprises an area of 13,000 square miles. The portion of this area in Nebraska is about 9,795 square miles, which is 75 per cent of the entire drainage basin and 13 per cent of the total area of the State. The basin, elongated in shape, has a length of approximately 345 miles and an average width of approximately 30 miles and includes all or part of 12 counties in the northern part of Nebraska. The uplands of the basin vary in elevation from 5,300 feet near the headwaters to 1,500 feet at the mouth.

The drainage area includes mountainous areas and tablelands in eastern Wyoming. In Nebraska, the tablelands at the western extremity of the basin soon change to sand hills which extend throughout the middle portion of the drainage area. The sandy plains of the lower part of the basin are interspersed by outcroppings from the underlying beds of shale. On tributaries, especially in the lower courses of the streams, the walls of the valley are, for the most part, precipitous and often rise to heights of 100 to 200 feet above the river. There are several beautiful waterfalls in the tributaries in Cherry, Brown, and Holt counties. The main valley is usually narrow and its elevation is approximately 300 feet below the bordering uplands.

On the terraces, which lie from 10 to 20 feet above the flood plain, wild fruit trees and shrubs grow to a limited extent. On the uplands very little timber exists, either on the tablelands or in the sand-hill area. There is little farming activity throughout the basin, due to the fact that the valley bottom is very narrow. The principal agricultural pursuit in the valley is stock raising.

GENERAL GEOLOGY

The Niobrara drainage system is a region of extensive bedrock and of less extensive, generally thin, areas of mantlerock.

Bedrock Formations

The outcropping bedrock includes, from oldest to youngest, the Niobrara formation and the Pierre shale of Cretaceous age and the Chadron, Brule, Arikaree-Gering and Ogallala formations of Tertiary age. Below the Niobrara formation, in the subsurface, occur the Carlile, Greenhorn, Graneros, and Dakota formations of the Cretaceous overlying yet older sedimentary rocks.

(a) Niobrara Formation

Light-gray chalky shale and chalk; about 220 feet thick in its outcrop area, thickening westward in subsurface; the upper 50 feet outcrops at the mouth of the Niobrara River and occurs in the lower parts of the valley proper as far west as the western edge of Knox County; present in subsurface of the rest of the area; relatively impervious, with high surface run-off.

(b) Pierre Shale

Steel-gray to dark-gray or brownish-gray argillaceous shale, with some chalky shale; thickness from a few feet in eastern part, where much of the formation has been eroded, to 2,300 feet or more in western part; outcrops in Niobrara and Keya Paha valleys east of Cherry County; present in the subsurface to the west and under the upland in the eastern part of the basin; high surface run-off where exposed; forms the impervious platform arresting downward penetration of ground water where it is overlain by the Ogallala group or Pleistocene sands and gravels.

The Cretaceous rocks were folded and base-leveled by erosion, prior to the accumulation of the Tertiary.

(c) Chadron Formation

Greenish-gray clay, with some sandy material in lower part; thickness zero to 50 feet or more; does not outcrop in the basin but undoubtedly present in subsurface in western part of basin.

(d) Brule Clay

Flesh-colored to light-gray silty clay; thickens westward from about 50 feet to 500 feet or more; exposed in Niobrara Valley between Valentine and Meadville and present in the subsurface to the west; rests upon Pierre shale in eastern occurrence and overlies Chadron to the west; generally impervious with high surface run-off; forms the impervious platform from Meadville to the west.

(e) Arikaree-Gering Formation

Gray sands and sandstones, in part lime-cemented, fine to medium-grained, coarser in lower part thickness about 700 feet in western part of basin thinning eastward to wedge out between the Ogallala group above and the Brule clay below; exposed in western part of basin; relatively porous, permitting penetration of surface water and percolation of ground water; an important aquifer in western part of Niobrara Basin.

(f) Ogallala Group

Series of hard and soft layers of sandstones and limy sandstone with some clay and gravel; thickness 50 to 250 feet or more; limited in occurrence to central part of basin and in the upland of the eastern part; in its western extent rests upon Arikaree formation, farther to the east is found to overlie Brule clay and occurs above Pierre shale in the eastern part of the basin; relatively porous, easily penetrated by surface water, relatively free percolation of ground water; an important aquifer.

Mantlerock Formations (See Mantlerock Map.)

The mantlerock is limited to the Holdrege-Grand Island sands and gravels of the Ainsworth and Holt tables, the dunesand of the Sand-Hill Region, the loess of the eastern part of the basin, and the alluvium of the stream valleys. A small area of glacial drift occurs along the eastern edge of the basin.

(a) Holdrege-Grand Island Sands and Gravels

Relatively unconsolidated sands and gravels; thickness up to 100 feet or more; occur below the dunesand in the Valentine area and to the east, present near the surface or below a loess cap in the Ainsworth Table, underlie the Holt Table with little or no loess above; porous material, easily penetrated by surface water, rate of percolation of ground water dependent on coarseness of material; an important aquifer.

In a small area east of the Verdigre Creek glacial drift occurs below the loess. It is contemporaneous with the Holdrege-Grand Island sands and gravels and is relatively impervious.

(b) Loess

Gray to buff silty clay; up to 50 feet in thickness; limited to eastern part of area in the Ainsworth Table, in scattered patches in the Holt Table, a small area southeast of Springview, and east of the Verdigre Creek; relatively impervious forming area of high surface run-off.

(c) Dunesand

Fine-grained unconsolidated sand; up to 150 feet thick; limited to Sand-Hill Region and a few scattered areas in Keya Paha, Rock, and eastern Brown counties; relatively porous, favors penetration of surface water with little or no run-off and relatively free percolation of ground water; contemporaneous with the loess.

Structure of the Bedrock

The bedrock of the Niobrara River Basin dips gently southwestward, locally rising over the northern extension of the Cambridge Arch in central-western Cherry County, and again dipping westward in Sheridan, Dawes, Box Butte, and Sioux counties.

TOPOGRAPHY

The upper part of the Niobrara River Basin lies in the High Plains Region of eastern Wyoming and western Nebraska. The predominating flat tablelands of this section are modified in many places by hilly and rough areas that have been eroded from the plains by the main stream of the Niobrara and its tributaries. This region is bordered on the north by the Pine Ridge, a modified portion of the tableland of the Great Plains Region. The valley floor lies from 300 to 400 feet below the level of the tableland. The river is bordered by low terraces, with a valley varying from one-fourth mile to one mile in width.

The middle part of the Niobrara River Basin traverses the northern part of the Sand-Hill Region of western Nebraska. Through this section the valley varies from 1,000 feet to 2,500 feet in width with very precipitous slopes. The valley is bordered with narrow strips of tableland lying at varying levels, which in general are 100 to 200 feet above the valley floor. The sand hills border the Niobrara Valley and lie some 300 feet above the benchlands which border the river on each side. The region is practically covered by grass, although there are frequent blowouts caused by wind erosion. Except in the upper stretches of the Snake and Boardman valleys, there are few lakes adjacent to the Niobrara Valley.

In the lower part of the basin, the topography resembles the upper portion. Benchlands from 100 to 200 feet above the river adjoin the valley, and then at a higher elevation and beyond, there are the typical tablelands. The tables and benches are occasionally broken by wind-made sand hills or by rough lands eroded by the river or its tributaries. Near its junction with the Missouri, the basin is bordered by hills eroded from the beds of shale which underlie the entire basin. From the eastern edge of the sand hills to the western boundary of Holt County the river valley is very narrow with steep sides. Through Holt County and downstream to the Missouri Valley, the Niobrara Valley gradually widens and the slope of the sides becomes more gradual until at the mouth of the river, the valley is approximately 1 mile wide.

STREAMS OF THE BASIN

The Niobrara River rises about 35 miles west of the Wyoming-Nebraska state line in the southeastern portion of Niobrara County in the mountains and eroded tablelands of central eastern Wyoming. The river enters Nebraska about 25 miles south of the northwest corner of the State in Sioux County and traverses the western tablelands, the Sand-Hills Region, and the northern tablelands. The Niobrara also receives some water from South Dakota, but most of the supply is contributed within the limits of Nebraska. It follows a general eastward direction with only slight departures from the parallel of 42°, 40' throughout its course as it traverses the northern part of Nebraska. The stream heads at an elevation of approximately 5,230 feet and enters the State at an elevation of 5,000 feet then converges with the Missouri River at an elevation of 1,210 feet. The length of the main course of the river in Nebraska is 375 miles. The average gradient of the stream throughout its course is about 9 feet per mile. The river is shallow and maintains a high velocity. The mean annual discharge of the river at its mouth is approximately 1,400 second-feet, with only slight fluctuations. The principal tributaries contributing to the flow of the Niobrara River are Minichaduza, Plum, Bone and Verdigre Creeks, and Snake and Keya Paha rivers.

Snake River has its source in the Sand-Hill Region in the east central portion of Sheridan County, about 30 miles south of the South Dakota-Nebraska line. The stream flow becomes discernible about 4 miles west of Hinchley. The stream meanders eastward to its junction with Boardmans Creek in the central part of Cherry County. Boardmans Creek, the principal tributary to the Snake River also has its source in the sand hills of eastern Sheridan County. Below its junction with Boardmans Creek, the Snake River flows northeastward to its mouth, 4 miles northeast of Burge. The Snake River, approximately 80 miles in length, drains an area of 1,599 square miles and is similar in most respects to the western portion of the Niobrara. Little damage is done by floods for the sand hills that form a large part of the drainage area, do not favor high surface run-off. The texture of the soils is such that the precipitation, which averages about 19 inches, is readily absorbed and infiltrated to ground water, thus reducing the surface run-off to a minimum. This water then migrates through a subsurface course to the stream channel where it reappears at a uniform rate as surface flow. The river gradient is approximately 12 feet per mile. The rate of run-off is comparatively great, amounting to approximately 190 second-feet near the mouth of the river. The fertility of the valley land embraced in this drainage basin varies greatly from place to place, and the fertile areas are not sufficiently contiguous to permit a concentration of agricultural activity. There is considerable forest covering in the valleys and on the rough lands bordering the valleys in the middle and lower parts of the basin. The chief economic use of the river is for production of hydroelectric power; many good sites exist along its course.

Minichaduza Creek has its source in Todd County in the southern part of South Dakota, about 5 miles from the State line. The stream meanders southeastward and joins the Niobrara River about 4 miles northeast of Valentine. The Minichaduza system drains an area of 430 square miles, of which about 240 square miles lie in Nebraska and the remaining portion in South Dakota. The mean annual precipitation is about 19 inches. The valley is very narrow and the gradient averages about 20 feet per mile. The mean annual discharge of the stream at its confluence with the Niobrara River is about 50 second-feet and is relatively uniform. The chief use made of the river is the watering of livestock, although a hydroelectric plant is in operation on Minichaduza Creek north of Valentine.

Plum Creek has its source in the sand-hill and lake region in the east central part of Cherry County. The stream flows northeastward to its confluence with the Niobrara River near Meadville. The stream drains a sand-hill area of 727 square miles. There is a mean annual precipitation of approximately 21 inches. The stream maintains an unusually constant flow with a mean daily discharge of about 80 second-feet. The chief uses of the water of the stream are for the production of hydroelectric power, watering livestock and for various domestic purposes.

Bone Creek has its source in the sand hills of the central part of Brown County, and flows northeastward through Brown and Rock counties, where it joins the Niobrara River near Riverview. The principal tributaries are fed by springs and contribute a comparatively uniform rate of flow throughout the year. The area of this drainage is approximately 531 square miles. The mean annual precipitation is approximately 22 inches. The mean annual discharge is approximately 60 second-feet at the mouth of the stream. Principal uses of the water are for hydroelectric power, watering livestock and domestic purposes.

The Keya Paha River has its source in the precipitous hill country in Todd, Tripp, and Gregory counties of South Dakota. In the upper reaches of the basin, the stream is made up of numerous spring-fed tributaries. The stream follows a general southeastward direction to its confluence with the Niobrara River about 8 miles northwest of Burton in Keya Paha County. The area of this drainage is approximately 1,800 square miles of which 39 per cent lies in Nebraska and the remaining portion in South Dakota. The mean annual precipitation is about 21 inches. Since the river drains a precipitous region, especially in its headwaters, the stream flow is subject to relatively wide variations. Seven of the 10 principal tributaries empty into the Keya Paha River above the South Dakota-Nebraska state line. The valley is rolling, with a gradient of about 10 feet per mile. The mean annual discharge of the river at its mouth is approximately 200 second feet.

Verdigre Creek, one of the most important tributaries to the Niobrara River, has its source in the Sand-Hill Regions of Antelope and Holt counties. This stream is composed chiefly of 3 main tributaries, the North, Middle, and South branches. The tributaries and the main stream follow a general northeastward direction. The Verdigre empties into the Niobrara River about 4 miles southwest of Niobrara. The mean annual precipitation is approximately 22 inches. The springs from the sand-hill area contribute a constant stream flow through the tributaries. The drainage area is approximately 614 square miles and the valley has a gradient of about 10 feet per mile. The mean annual flow of Verdigre Creek is approximately 70 second-feet.

GROUND WATER

The ground-water regions included within the basin are the Western Tablelands, the Sand-Hill Region, the Northern Tablelands, the North Shale land Region, and the Central Region.

The Western Tablelands Region (3^1)* includes the southern part of the Pine Ridge Table and the northern part of the Box Butte Table. The Arikaree sandstones are at or near the surface. The impervious platform is on the Brule clay and ground water occurs within the overlying Arikaree and associated beds, at depths of 100 to 300 feet or more. The walls are relatively strong and the water medium hard.

The Sand-Hill Region (4^1)*is underlain by unconsolidated sand to varying depths. Most of the rainfall percolates to ground-water storage. The Brule clay forms the impervious platform in most of the region and water is found in the overlying Tertiary sands and gravels or within the sand-hill formation. Subsurface drainage is generally toward the valleys. Many of the sand-hill lake basins are alkaline but fresh water occurs below at depths of 50 feet or more.

The Northern Tableland Region (3^5, 3^6)* is underlain by the Ogallala beds resting upon an impervious shale platform which is relatively high above the Niobrara Valley bottom. Water is found in the Ogallala group at depths of 50 feet or more. Replenishment is dependent on local rainfall. There is leakage through springs at places around the edges of the uplands. In the Ainsworth-Holt Table (3^8) the Pleistocene sands and gravels occur at or near the surface resting upon a platform of Tertiary bedrock. In parts of the Ainsworth Table this mantlerock is capped with loess, but over most of the Holt Table the loess cap is absent or very thin. Where the loess cap is absent the sand and gravel occur at or near the surface causing the area to be droughty. Ground water occurs in the Pleistocene sands and gravels and in the underlying Tertiary bedrock. The impervious platform is on the Brule clay to the west and Pierre shale to the east.

Ground-water conditions in the North Shaleland Region (2)* are generally poor because of the occurrence of shale bedrock at or near the surface. A little water occurs in shallow sandy and silty accumulations on the bedrock surface and some is supplied by springs in the edges of the upland. Surface water may be relied upon as another source of supply. The Dakota sandstone is available as a deep source of water, occurring at depths of from 400 feet in the eastern part of the region to 1,000 feet or more in the western part.

The Central Region (5)* is loess-capped and generally underlain by Pleistocene sands and gravels which usually furnish adequate supplies of water. The depth to water is from about 50 to 100 feet.

The alluvium deposits of silt and sand under the bottom lands of the larger drainages furnish water to shallow wells at depths of 50 feet or less. Underflow is down drainage and replenishment is dependent on local rainfall and from spring-fed streams.

*See Plate LXXII

AGRICULTURAL AND INDUSTRIAL DEVELOPMENTS

The chief industry of the Niobrara River Basin is agriculture. There is no manufacturing of importance with the exception of local milling and the generation of electric energy for the immediate needs of the locality and portions of adjacent areas.

The headwaters of the Niobrara River and a large portion of the middle basin are in a range livestock area. The mouth of the basin is an area characterized by a large amount of wild hay. The range livestock areas are similar to the western part of the Loup River Basin, having approximately 83 per cent of the land in pasture, 7 per cent in cultivated crops and 9 per cent in wild hay. Cattle predominate and furnish most of the income.

The eastern part of the basin has more wild hay and more land in cultivation than any other portion. The 1934 census showed 70 per cent of the farm land in pasture, 16.3 per cent under cultivation and 12 per cent in wild hay. The sale of large quantities of wild hay constitutes one of the important sources of income.

Corn is the principal cultivated crop and occupies from 40 to 50 per cent of the cultivated acres. Rye is relatively important in this area and occupied 6 per cent of the crop land in 1934. The acreage and relative importance of wheat increased from 13 per cent of the cultivated land in 1919 to 14 per cent in 1934. Oats occupied 9 per cent of the cultivated acres in 1934, barley 6 of 1 per cent, and alfalfa 7 per cent.

There has been but little change in the importance of oats, barley, and rye during the past 15 years. Rye is the least variable in yields but there were low yields of all crops in 1926, 1931, 1933, and 1934. There was a low yield of corn in 1932.

Beef cattle rank first and hogs second in importance. Other livestock enterprises are dairying, poultry, and sheep.

There are several types of farming in the Niobrara River drainage basin. In the eastern part of the basin livestock and cash grain production are dominant; in the middle part wild hay and cattle grazing predominate; and in the western part cash grain, potato, and cattle production are the prevailing types. Most of the income from livestock throughout the area is from the sale of cattle. In the eastern part of the area most of the income from crops is from the sale of wild hay. In the western part the sale of small grain and potatoes contributes to the income from crops.

The estimated capital value of the farms decreased 40 per cent from 1920 to 1930. The decrease in real estate was 47 per cent, in livestock 12 per cent and in machinery 2 per cent. The decreased valuation in real estate from 1930 to 1935 was 26 per cent. In this particular basin the decrease in real estate values since 1930 has been at a slower rate than in most of the other basins of the State, but the decrease from 1920 to 1930 was faster.

Except for the extreme eastern end of the basin, farm tenancy is as low as in any other drainage basin in the State. In the middle and western part tenancy averages approximately 40 per cent. In the middle part of the basin where cattle grazing and wild hay are important, the proportion of cash to total tenancy is higher than in the other parts of the basin. The proportion of cash tenancy to all tenancy increased slightly from 1920 to 1930.

IRRIGATION DEVELOPMENT

Thirty small canals, serving about 7,500 acres of wild hay and alfalfa lands, were diverting water from the Niobrara River and its tributaries in 1912-1914, the period when irrigation was practiced most extensively. Since that time, general irrigation practices have been on the decline. Many projects have been abandoned and no new ones have been undertaken since 1902. Because of the lack of continuity of the bottom land suitable for irrigation, the area served is confined entirely to scattered tracts in the upper portions of the basin, especially west of the town of Valentine. Since no storage facilities have been provided on the river, the lands are irrigated by direct flow diversions. The land to which the water is applied lies only a few feet above the normal water surface. During the irrigation season there are numerous places where the entire flow of the river is diverted, but a short distance below the point of diversion, the water reappears and again forms a live stream, thus causing the stream flow to be intermittent. The normal flow of the stream is appropriated and, during many of the summer months , the irrigation demand exceeds the supply of water. Irrigation water is applied chiefly to prairie hay, alfalfa, and grain crops for stock-feeding purposes. The chief agricultural pursuit in the valley is stock raising.

POTENTIAL IRRIGATION DEVELOPMENT

The characteristics of the Niobrara River Basin are unfavorable to any large-scale irrigation development. Throughout most of the basin, the river has cut its channel several hundred feet below the surrounding country and the irrigable area consists of high, irregular-shaped tablelands surrounded by sand hills and cut by rough broken canyons. To convey the water to the land, conveniently located, high-lift pumping plants or long lines of supply canals traversing rough, broken and sandy country would be required. It would be necessary to line the canals with concrete or some other impervious substance throughout practically the entire length in order to deliver any appreciable portion of the water to the lands. It is questionable whether the benefits from irrigating any of the tableland would justify the expenditure involved. A serious difficulty would arise in dividing water rights between additional irrigation diversions and the power plants now in operation. However, a general description of the following projects is included to show the existing irrigation and power possibilities within the basin.

(a) O'Neill Project - The construction data on the O'Neill project are very meager. The point of diversion would be south of Gordon, with a canal extending about 15 or 20 miles across a sanddune area to a point on the upper Snake River. From here the water would be rediverted somewhere above the mouth of Boardmans Creek and carried in a canal eastward across the sand hills to a series of swampy lakes, where some storage would have to be developed, particularly near Marsh Lake. From here a canal would be constructed eastward across about 140 miles of sandy country to O'Neill. It is estimated that approximately 100,000 acres would be reclaimed. Because of the porosity of the soil, it would be necessary to line the entire length of the canal. The question of this project conflicting with the existing power rights at Valentine and Spencer together with the unsuitable physical and economic conditions, render the development of the project unlikely.

(b) Boiling Springs Project - The tableland in the basin consists of 3 flat areas that are susceptible of irrigation. They lie from 150 to 250 feet above the river bed near the mouth of Bear Creek and are known as the "Boiling Springs Flat", the "Missouri Flat" and the "Conley Flat". In the aggregate the irrigable area is about 14,000 acres. The physical features of this area are such that the development of the project is unlikely. The normal flow of the stream at the proposed point of diversion is sufficient to provide for the irrigation requirements of this area, but such diversion would conflict with the established rights of the Valentine power plant.

(c) Springview Project - The area under the Springview project would amount to about 50,000 acres of sandy tableland lying at an elevation between 200 and 600 feet above the river. This area extends from a point near Prentice to Pinecamp with a gradient of 8 feet per mile. This scheme would involve a storage reservoir on Minichaduza Creek, about 7 miles west of Valentine from which supply the water could be conveyed through a gravity canal. Because of the existing power rights, the only supply available for this project would be that derived from storage and conservation of the infrequent flood crests. An alternative would be to install a pumping plant on the Niobrara River a few miles south of Prentice with which to lift the water approximately 300 feet to the supply canal. The water supply is considerably greater at this point and the plant would not interfere with either of the interstate hydroelectric plants near Valentine, however it would conflict with the senior rights of the Spencer plant.

(d) Niobrara Project - The Niobrara project as contemplated would divert water from the Niobrara River by means of a low dam about 8 miles upstream from the town of Niobrara and carry it in a canal located along the edge of the tableland north and west of the river to a point a mile above the mouth of the river. This point is due west of the town of Niobrara, where the power house is to be located. About 1,400 acres of bottom land lie below the proposed power canal and the river. The water supply at the point of diversion appears adequate to meet both the power and irrigation requirements.

Mirage Flats Project--This project is situated on the upper Niobrara River just below the town of Dunlap, Nebraska. A storage reservoir of 30,000 acre-feet will be provided to serve the 12,000 acres under the project. The site of the diversion dam is eleven miles south of Hay Springs. From here 15 miles of main canal will be built.

This project proposal received Presidential approval on April 28, 1940. The total estimated cost is $2,560,000 of which $885,000 is reimbursable from the Great Plains fund and the balance will be furnished by the Work Projects Administration. The project is now under construction, and it is estimated that three or four years will be required to bring it to completion.

POWER DEVELOPMENTS

Some 45 hydroelectric power plants have been installed in the Niobrara River system. Of this number, only 5 are now in operation, 2 on the main stream of the Niobrara and 3 on its tributaries. The design of these plants is such that no further increase in power production would be feasible either by increasing the head or the capacity of the turbine generator installation. The plant on the Minichaduza is the most modern of the group. It has been operating for only a short period of time and is well designed and constructed. The Valentine plant on the main stream and the Long Pine Creek plant are older types of developments. The Plum Creek plant is of more recent construction. There are 3 Diesel type internal combustion plants in the basin in Nebraska.

Electric power service to the several Niobrara valley consuming centers is afforded mainly through 3 separate groups of interconnected transmission lines, owned and maintained by public utility companies. Some of these lines are energized by sources located outside the watershed boundaries.

There are no important or extensive industrial activities established in the Niobrara Basin depending upon electric power. The dearth of natural resources, sparseness of population, and the great distance from any large market centers, all tend to make the basin an agricultural rather than an industrial area. Any increase in electrical production would not appreciably extend the rate of demand since the use of electric energy is not essential to the economics of the basin. It was estimated that 12,000,000 kilowatt-hours of electric energy were consumed within the Niobrara Basin during 1930.

POTENTIAL POWER DEVELOPMENT

Potentially there are several feasible sites for additional hydropower developments on the stream. Until a market can be foreseen for such additional energy as would be produced, these potential developments have not been considered economical.

NAVIGATION

The characteristics of the Niobrara River are such as to render commercial navigation impracticable. The lower portion of the river has a gradient of about 7 feet per mile and a minimum recorded flow of 134 second-feet. The sediment content is such as to render ineffective any attempt to develop a navigable channel by slack-water methods.

FLOOD PROBLEMS

The uniform discharge is one of the outstanding characteristics of the Niobrara River system. The absorbent qualities of the soil preclude the occurrence of any large amount of direct run-off during a storm period. The topography and geological characteristics of the basin tend to reduce the flood problems to a minimum. The small amount of rainfall occurring in the basin is not sufficiently intense to produce flood flows.

The lowlands are occasionally flooded as a result of the impounding of water by ice gorges. The climatic conditions are such that ice gorges are likely to form at any place on a stream that has a channel with obstructions or sharp turns. The river has sufficient gradient (9 feet per mile) that the backwater effect above an ordinary ice gorge cannot extend for a very great distance, nor can it cause any appreciable damage to the low sandy benches that border the main stem of the stream. No artificial structures are required for the protection of the lands in the basin against the overflow from the river or from its tributaries.

EROSION AND SEDIMENT

Bank erosion is of minor importance on the Niobrara River because erosion is confined almost entirely to the flood plain which is seldom more than one-fourth mile in width.

The waters of the stream are turbid, but the extent of the load of sediment is limited because the topography and soil characteristics of the basin are such as to retard erosion. The sediment load is fairly constant due tc the uniformity of the run-off. Since the soils of the basin are generally fine sandy and silty loams, the sediment of the stream is composed of a large percentage of coarse soil particles and a comparatively small percentage of fine particles. An analysis shows 48.7 per cent of clay and silt and 38.4 per cent of particles smaller than 1/64 millimeter in diameter.

The sediment contributed by the Niobrara is so small compared with that of the Missouri that the influence on the latter stream is negligible. Field studies made in 1929 and 1930 by the army engineers showed that the ratio, by weight, of the total sediment discharge to the total water discharge of the Niobrara was 1:1680. Though the bed sediment transported by the river is small in quantity, it is detrimental to reservoirs because a large percentage of it is too coarse to be sluiced out.

DESCRIPTION

The Missouri River Basin in Nebraska north of the Platte River has an area of about 3,324 square miles, a little more than 4 per cent of the area of the State. It includes parts of Boyd, Knox, Cedar, Dixon, Dakota, Thurston, Burt, Washington, Douglas, and Sarpy counties. The main tributaries are Ponca, Bazile, Bow, Aowa, Omaha, Blackbird, Tekamah, and Papillion creeks.

The Missouri River flows through a broad plain bordered by bluffs of bedrock and mantlerock. The main channel of the Missouri River is the natural boundary line of Nebraska on the east, but the river changes its course from time to time. Usually these changes can be attributed to the sandy character of the lowlands along the stream.

GENERAL GEOLOGY

This area is largely underlain by mantlerock, but bedrock is exposed at many places along the bluffs bordering the Missouri River bottom land. Bedrock is also at or near the surface in much of the Ponca Creek drainage basin.

Bedrock Formations

The bedrock formations make the rigid platform upon which the mantlerock has been laid and are exposed where the mantlerock has been removed by erosion. They include, from oldest to youngest, the Permo-Pennsylvanian, the Dakota group, Graneros shale, Greenhorn limestone, Carlile shale, Niobrara formation, Pierre shale, and the Ogallala group.

(a) Permo-Pennsylvanian

Interbedded limestone and shale; exposed in places along the Missouri River in Douglas and Sarpy counties and in some of the tributaries of Papillion Creek; present as impervious platform below the mantlerock in eastern Douglas, Sarpy and Washington counties; locally yields some water but generally impervious and not a reliable source, underlain in the subsurface by rocks of Mississippian, Devonian, Silurian, Ordovician, and Cambrian age which rests upon Pre-Cambrian.

(b) Dakota group

An upper gray to buff sandstone; with some shale in middle, 100 to 150 feet thick (Dakota sandstone); a middle vari-colored red and light-gray argillaceous shale, 50 feet or more thick (Fuson shale) a lower series of gray sandstones with some interbedded shales, about 200 feet thick (Dakota sandstone); outcrops in Missouri River bluffs between Blair and a point west of Sioux City, Iowa; occurs below mantlerock in central and western Sarpy, central and western Washington, central and eastern Burt, eastern Thurston, and eastern Dakota counties; rests upon Permo-Pennsylvanian rocks unconformably; the upper and lower sandstones generally porous and form important aquifers, often yielding artesian water and some flowing wells.

(c) Graneros shale

Dark-gray shale with sandy and coaly material in lower part; 85 to 90 feet thick; outcrops in Missouri River bluffs between Sioux City and a point 5 miles north of Ponca; occurs as an impervious platform; an area of high surface run-off.

(d) Greenhorn limestone

Thin-bedded, gray, fossiliferous limestones and dark-gray shales; thickness about 30 feet; outcrops along Missouri River bluffs from northeastern Thurston County to Ionia (10 miles northwest of Ponca); occurs below mantlerock in western Dakota and Thurston counties, and present at greater depths to west; occasionally sandy at base and locally yields small supplies of water to wells.

(e) Carlile shale

Dark-gray plastic shale; 150 to 170 feet or more thick; outcrops in Missouri River bluffs from Ionia westward to vicinity of St. Helena; present in subsurface to west; forms impervious platform where it occurs below mantlerock.

(f) Niobrara formation

Light-gray chalky shale and chalk rock; about 200 to 225 feet thick exposed along Missouri River bluffs and in part of upland between the northwest corner of Dixon County and the South Dakota-Nebraska line; generally impervious, causing high surface run-off, forming impervious platform where it occurs below the mantlerock.

(g) Pierre shale

Steel-gray to dark-gray argillaceous shale, with some concretionary layers and some chalk; outcrops in higher parts of Missouri River bluffs between a point south of Yankton and the South Dakota-Nebraska line; at or near the surface in much of the Ponca Creek valley; generally impervious forming areas of high surface run-off and making up the impervious platform, where it occurs below the mantlerock and the Ogallala group.

(h) Ogallala group

A series of sandstone, limy sandstone, gravels and some clay; up to 100 feet or more in thickness; overlies the older rocks with great unconformity; occurs in higher upland of Boyd County between Ponca Creek and the Missouri River and present below mantlerock in Knox County and southwestern Cedar County; generally porous, favorable to surface-water penetration and ground-water percolation.

Mantlerock Formations

The mantlerock, from oldest to youngest, is glacial drift and associated deposits, Loveland formation, Peorian loess, and alluvium.

(a) Glacial drift and associated deposits

Heterogeneous mixtures of clay, silt, some sand, and occasional boulders with some associated accumulations of sand and gravel; composed of an earlier and a later drift sheet each up to 100 feet in thickness, subglacial sands and gravels occur below the older and lower drift (Nebraskan) in some places and, locally, the older drift is separated from the younger drift (Kansas) by intertill sands and gravels; drift proper forms areas of high surface run-off; subglacial and intertill sands and gravels furnish farm-water supplies but discontinuous nature makes these supplies somewhat unreliable.

(b) Loveland Formation

Reddish-brown, silty clay, locally with sandy material in lower part; thickness up to 40 feet; generally impervious.

(c) Peorian Loess

Gray to buff silty clay; 20 to 100 feet in thickness caps most of upland in Loess Hills region; relatively impervious material conducive to high surface run-off.

(d) Alluvium

Silt, sand, and clay with some gravel; up to 50 feet in thickness; limited to bottom land along the drainages, where material is sufficiently coarse for free ground-water percolation; it is a source of good shallow wells.

Structure of Bedrock

The bedrock of the area dips gently westward,

GROUND WATER

The ground-water regions of this area include the Missouri River Lowlands, the Northern Drift, the Northern Shaleland and the Northern Tableland.

The alluvium of the Missouri River Lowlands furnishes water for most of the wells in this area, although some flowing wells are secured in the underlying Dakota sandstone where water is present at not too great a depth. The water supply in the alluvium is generally adequate, but of only fair quality. The Dakota sandstone wells often flow in this region as a result of the hydrostatic pressure of the water in a confined aquifer. Flowing wells are rather common between Santee and southeastern Dakota counties. In some cases the water from the Dakota sandstone is quite highly mineralized.

The Northern Drift Region is capped by loess and underlain by glacial drift deposits. The intertill and subglacial sands and gravels furnish farm-water supplies in many places, but these sands and gravels are not everywhere present. In the absence of intertill and subglacial sands and gravels it is necessary to depend upon the shallow water in the alluvium of the drainages. Except in eastern Washington, Burt, and Sarpy counties, the Dakota sandstone is available as a deep source of water occurring at depths of from 200 to 250 feet in the eastern part of the area and at increasingly greater depths farther to the west, being present in Boyd County at depths of 1,000 feet or more.

The Northern Shaleland Region has little or no mantlerock and the Cretaceous shales are at or near the surface. The surface run-off is high in this region and, except for some sandy accumulations in places, there is little water-bearing material near the surface. Pleistocene sands and gravels are present at places in the Ponca Creek valley and they will furnish a water supply; the alluvium of the valley, where it is not too thin, also may be relied upon.

In the absence of sandy material above the shale and in the area where the Dakota sandstone is deeply buried, the impounding of surface water is necessary.

Within the Northern Tableland Region there is usually good opportunity to find a water supply in the sandier members of the Ogallala beds, especially immediately above the impervious shale platform, which is relatively high above the bottom land. There is considerable leakage from the springs around the edges of the tableland. The wells are not strong in this area, but are usually adequate for a farm supply.

AGRICULTURAL AND INDUSTRIAL DEVELOPMENTS

With the exception of the sugar beet industry the major portion of Nebraska manufacturing is along the eastern border of the State. Most of these industries are in the Omaha area, in the lower end of this basin.

The leading manufactured products in order of their commercial value are: meats, butter, other milk products, and grain products such as flour and feed.

The South Omaha packing industry and livestock market, one of the largest of its type in the world, employs about 15,000 persons.

The manufacturing industry of the basin is largely the outgrowth of Nebraska's livestock production and is confined generally to the preparation of commodities for markets.

The basin is a part of the intensive corn and livestock producing area of the State. Yields of all crops are high and dependable with comparatively low variations for most crops.

In 1934 approximately 95 per cent of the land was in farms, 70 per cent of the land was in cultivation, 22 per cent was in pasture and 4 per cent in wild hay. Of the cultivated land, corn occupied 54 per cent, wheat 2 per cent, oats 22 per cent, barley 7 per cent, rye 1 per cent and alfalfa 7 per cent. The average size of farms was 187 acres in 1919, and 180 acres in 1934.

During the past 15 years there were increases in acreages of corn and barley, a considerable decrease in wheat, but only slight changes in the acreages of other crops.

Large numbers of hogs and cattle are produced and they contribute about equally to the farm income. Dairy cattle, sheep, and poultry are also important sources of farm income. There have been no indications of shifting in livestock production during the past 15 years.

A considerable amount of the lowland directly adjacent to the Missouri River is not suited to cultivation and is used for the production of hay. Approximately 55 per cent of the farms are classed as livestock farms and 27 per cent as cash grain farms. Corn is the principal crop sold on these cash grain farms. About 58 per cent of the income is from sale of livestock and 22 per cent from sale of crops.

The estimated capital value of the farm decreased about 34 per cent from 1920 to 1930. During this period the value of the real estate decreased 37 per cent, livestock 13 per cent, and there was a slight decrease in the value of farm machinery. From 1930 to 1935 the value of the real estate decreased about 40 per cent, a greater rate than for the period 1920 to 1930.

This drainage basin has an unusually high percentage of farm tenancy. It varies from 42 per cent in Douglas County to 59 per cent in Knox County. Forty-five per cent of the farm rent was cash and 55 per cent was on a share basis. There has been little change in the proportion of cash tenancy since 1920. One reason for so much cash tenancy is the large amount of land along river bottoms, which is better suited to the production of hay than other crops.

IRRIGATION DEVELOPMENT

The climate of this section of the State is humid and there has been little demand for irrigation. The records of the State show a total of 4 appropriations for the use of 1.26 second-feet of water for the irrigation of 88 acres.

The majority of the projects provide for the pumping of water because of the economy of that method for intermittent irrigation.

The power supplying the present markets in the basin is being generated by steam or internal combustion plants, totaling approximately 108,640 kilowatts of installed capacity.

MINOR MISSOURI BASIN BELOW PLATTE RIVER

DESCRIPTION

The Missouri River Basin in Nebraska south of the Platte River covers an area of about 2,783 square miles, which is 3.5 per cent of the area of the State. It includes all of Otoe, Johnson, Nemaha, and Richardson counties, most of Pawnee, northeastern Gage, southeastern Lancaster and southern Cass counties. It is within the area of greatest rainfall in the State.

There are 3 main tributaries to the Missouri in this region. Weeping Water Creek heads in southwestern Cass County, flows southeastward, emptying into the Missouri in the northeastern corner of Otoe County. The Little Nemaha River heads in southeastern Lancaster County and flows southeastward across Otoe County and Nemaha County to join the Missouri in southeastern Nemaha County. The Big Nemaha River heads in southern Lancaster County, flows southeastward across Johnson County, northeastern Pawnee and Richardson counties, to join the Missouri in the southeastern corner of the State. Small drainages which enter the Missouri River directly, include, from north to south, Rock, Rakes, Walnut, Table, Fourmile, Camp, Buck, Honey, Meadow, Gouche Hollow, and Winnebago creeks.

Drainages tributary to Weeping Water Creek are; Stove, South Cedar, North Branch, and South Branch creeks. Hooper, Silver, Russet, Owl, Brownell, Muddy, South Fork, Spring, North Fork, Sand, Jones, Houchens, Rock, Long, Indian, Happy Hollow, Jivers and Whiskey Run creeks empty into the Little Nemaha River. The Big Nemaha River receives drainage from North Fork, Hooker, Deer, Lost Branch, Badger Branch, Corson Branch, Clear, Dry Branch, Long Branch, Muddy, South Fork. and Turkey creeks.

These streams are on alluvial deposits underlain by comparatively impervious formations. They sometimes overflow, but drainage canals along the Big and Little Nemaha rivers usually take care of excess rainfall. However, these canals are so deep that the water table in their vicinity has been considerably lowered. Along the Missouri River only the bottom lands are subject to overflow. At many times in the past, during periods of flood, this stream has shifted materially. The flow of the river is being controlled and stabilized by the Fort Peck Reservoir. The extension and improvement of navigation facilities will tend to confine the river discharge to a definite channel. A program of river improvement and flood control in the Missouri River is being carried on by the United States Army Engineers at the present time.

GENERAL GEOLOGY

Bedrock is relatively near the surface in this basin and many of the drainages have cut through the mantlerock into the underlying bedrock. Extensive bedrock areas occur in the southern part.

Bedrock Formations

The outcropping bedrock of the area is Permo-Pennsylvanian limestone and shale, with a small area in the northwestern part underlain by the Dakota group of Cretaceous age. These rocks are discussed, from oldest to youngest.

(a) Permo-Pennsylvanian

A series of interbedded limestones and shales with some sandstones; about 1,000 feet exposed, underlain by about 600 to 1,200 feet of sediments of the same general age; exposed in Missouri River bluffs and in the valleys of Weeping Water Creek and the Big and Little Nemaha rivers; generally impervious, forming areas of high surface run-off.

(b) Dakota group

An upper buff to gray sandstone with some shale in middle part, 100 to 150 feet thick (Dakota sandstone); a middle vari-colored red and gray argillaceous shale, 50 feet or more thick (Fuson shale); a lower series of gray sandstone with some interbedded dark gray shales, about 200 feet (Dakota sandstone); limited to northwestern part of the region; upper and lower sandstones important aquifers except near eastern edge of their outcrop where they are often drained.

Structure of the Bedrock

The Permo-Pennsylvanian rocks of this area have been extensively folded. The Table Rock Arch occurs in eastern Pawnee and Johnson counties, trending from south to north and underlain at relatively shallow depths of igneous rock of Pre-Cambrian age. To the east of the arch, the beds dip sharply or are downwarped into the Forest City Basin and west of the arch they dip gently into the Irving syncline. The Nehawka anticline of eastern Cass County upwarps and trends from north to south. It may be continuous with the Table Rock Arch. This structural pattern is modified by a cross structure, the Redfield Arch, which trends west-southwestward and is well shown in southeastern Cass County. Moreover, there is a general northward rise in structure, bringing older beds to the surface in a northward direction.

Mantlerock Formations

Mantlerock underlies most of the higher topography of the basin except for the southern part of the area where there is little or no mantlerock. The mantlerock formations, from oldest to youngest, are the Glacial drift and associated deposits, the Loveland formation, the Peorian loess and the alluvium.

(a) Glacial drift and associated deposits. A heterogeneous mixture of clay, silt, with some sand and boulders; in 2 sheets, each of which is up to 100 feet in thickness; below the lower drift (Nebraskan) subglacial sand and gravel occurs locally and intertill sand and gravel is often found separating the lower from the upper drift (Kansas); relatively impervious, forming regions of high run-off; the subglacial and intertill sands and gravels are porous and allow free percolation of ground water, but are discontinuous.

(b) Loess. A lower reddish brown silty clay, locally sandy at base, up to 40 feet and locally 75 feet thick, known as Loveland formation; an upper gray to buff silty clay, generally up to 50 feet in thickness, known as Peorian loess; occurs extensively in upland along Missouri River, and caps higher topography in rest of mantlerock area; generally impervious, favoring high surface run-off.

(c) Alluvium. Silt, sand, clay, and some gravel; up to 30 feet or more in thickness; limited to bottom land of the valley; relatively porous, furnishing water supplied to many shallow bottom land wells; an important aquifer in this region because of unreliability of bedrock, and the other mantlerock.

GROUND WATER

The Missouri River Basin south of the Platte occupies 3 ground-water regions, namely; the Missouri River Lowland, Southeastern Bedrock and the Drift Hill.

Alluvium occurs within the Missouri River Lowland Region to the east of the bluff line. Water generally occurs at shallow depths, and in relatively large quantities. The rate of delivery largely depends upon the coarseness of the water-bearing materials and the configuration of the bedrock floor upon which the alluvium has been deposited. Replenishment is from the Missouri River and from local rainfall. Since the Missouri River Lowland is an area with considerable fluctuation of water level, wells should be drilled to the top of the bedrock to assure water during periods of low water table.

The Southeastern Bedrock Region is in southern Pawnee, southern and eastern Richardson, and eastern Nemaha counties. There is little or no mantlerock, and there is difficulty in securing a water supply. Locally, some beds in the Permo-Pennsylvanian bedrock will furnish a small supply of water, but usually it is necessary to prospect in the alluvium of the stream drainages to find the most favorable location for a shallow well. The most successful wells can be drilled where the alluvium is coarsest and thickest. Replenishment is from local rainfall and underflow is down drainage. In the alluvium of the Big Nemaha River there are some areas where the quality of water is not good, because of the large amount of organic matter in the alluvium.

Over half of the basin is included in the Drift Region. Locally, intertill and subglacial sands and gravels furnish a farm water supply and occasionally water occurs in the base of the drift immediately above the impervious bedrock. When these sources fail, it is necessary to prospect the alluvium of the stream bottom lands for a shallow water supply. It is generally not worth while to drill far into the underlying bedrock since the water may be scanty and is usually of poor quality. In the northwestern part of the Drift Hill Region the Dakota sandstone is available at depths of from about 200 to 250 feet and furnishes a good supply of water where the sandstone occurs in sufficient thickness. The Dakota water is generally hard, and locally, is rather highly mineralized.

AGRICULTURAL AND INDUSTRIAL DEVELOPMENT

The principal development of the area is agricultural. Industrial development consists chiefly of preparation of agricultural products for retail markets of the nation. The largest cannery in the State is located at Nebraska City, in the eastern portion of this area. This area ranks next to northeastern Nebraska in intensity of livestock production. Approximately 95 per cent of the land is in farms. Sixty-seven per cent of the farm land is in cultivation, 26 per cent in pasture, and 2 per cent in wild hay.

Corn is the most important cultivated crop and occupied 54 per cent of the cultivated land in 1934. Wheat is a more dependable crop than corn and is its chief competitor in importance. Wheat occupies from 10 to 20 per cent of the cultivated land, increasing or decreasing according to its advantage as compared with corn. There has been but little change in the acreages of oats, barley, rye, and alfalfa during the last 15 years, with oats occupying 14 per cent of the acreage, barley 0.3 per cent, rye 0.3 per cent, and alfalfa 7 per cent in 1934.

The average size of farms in 1934 was 169 acres, compared with 165 acres in 1918.

Beef cattle and hogs are the most important classes of livestock but sheep and dairy cattle are relatively more important in this area than in the northeastern part of the State.

Rather high-grade general farming is the predominating type. No particular type of production is dominant in the basin. About one-third of the farms are classed as animal specialty, a little over one-third as cash-grain, and about one-fourth as general farms. Less than one-half of the income is from the sale of livestock and livestock products; a little over one-fourth is from crops, mostly wheat; and the remainder comes from other sources, including products of orchards and vineyards.

The estimated capital of the farm decreased 32 per cent from 1920 to 1930. There was a decrease in the value of the real estate of 34 per cent, livestock 16 per cent, and of farm machinery 9 per cent. The decrease in the value of real estate was 39 per cent from 1930 to 1935, a greater relative decrease than from 1920 to 1930.

The percentage of farm tenancy in this basin is nearly 50 per cent. There is as great variation in the proportion of cash tenancy considering the counties in this basin, as in the proportion of all tenancy in the area.

IRRIGATION DEVELOPMENT

The greatest mean annual precipitation of the State occurs in this area, in southeastern Nebraska. The rainfall has usually been distributed through the growing season favorably to the production of good crops. The State records show but 4 appropriations, for 3.09 second-feet of water for irrigation of 216 acres, in the basin of the Big Nemaha River. Three of the 4 are pump projects. The senior appropriation carries a priority date of 1930, while the other 3 carry priority date of 1934.

POWER DEVELOPMENT

The Lower Minor Missouri drainage area in Nebraska has been developed for power at 36 definitely known locations, but all developments have been abandoned. They were, in general, for the production of mechanical power for small milling enterprises. Due to erratic flow of the streams, further development of hydropower would be uneconomical.

The power supplying the present markets in the basin is being generated by steam or internal combustion plants, and totals approximately 7,573 kilowatts of installed capacity.

WHITE RIVER AND HAT CREEK BASINS

DESCRIPTION

WHITE RIVER

The White River Basin lies chiefly in South Dakota with the headwater section extending into northwestern Nebraska. The drainage area is elongated in shape and has a length of 240 miles, and a width varying from 10 to 70 miles, averaging approximately 50 miles. The streams in this system drain an area of 10,200 square miles of which 1,662 square miles, or 16 per cent, are in Nebraska. That portion of the basin within Nebraska includes eastern Sioux, northern Dawes, and northwestern Sheridan counties. It is about 100 miles long and 25 miles wide and lies between the Hat Creek Basin on the north and the Niobrara Basin on the south.

From the headwater section near Harrison, Nebraska, the main stem of the White River flows through a comparatively wide and fertile valley to the point of egress at the Nebraska-South Dakota line. The river valley in Nebraska averages about 1 mile in width. In many places the stream has intrenched itself deeply into the surrounding terraces. The general slope of the basin is northeast with an average gradient of approximately 15 feet per mile.

HAT CREEK

Hat Creek, dendritic in pattern is a part of the Cheyenne River system and lies in the states of Nebraska, Wyoming, and South Dakota. Hat Creek and its tributaries drain an area of 1,050 square miles, of which 502 square miles, or 47 per cent lies in Nebraska. The portion of the basin in Nebraska is 20 miles wide at the Wyoming-Nebraska line and maintains this width for 20 miles eastward. Then it gradually narrows to a point on the Nebraska-South Dakota line about 30 miles east of the north-western corner of Nebraska. The drainage area lying in Nebraska is limited to the northern part of Sioux County and a small area in the northwestern corner of Dawes County. Hat Creek Basin is the most southern portion of the Cheyenne River Basin of South Dakota and Wyoming.

GENERAL GEOLOGY

The White River and Hat Creek basins are typical bedrock areas. The mantlerock is limited to shallow accumulations of alluvium in the bottom lands of the larger drainages. The regional dip of the strata is southward away from the Black Hills uplift.

Bedrock Formation

The exposed bedrock of these basins is in part Cretaceous and partly Tertiary in age. The Cretaceous rocks were folded and eroded prior to deposit of the Tertiary. Cretaceous formations which outcrop in the White River Basin are, from oldest to youngest, Graneros shale, Greenhorn limestone, Carlile shale, Niobrara formations, and Pierre shale, while the only Cretaceous formation outcropping in the Hat Creek Basin in Nebraska is the Pierre shale. The Pierre shale is underlain in the subsurface by the Niobrara formation about 250 feet thick; Carlile shale, 375 feet; Greenhorn limestone, 30 feet or more; Graneros shale, 650 to 700 feet; Dakota group, about 300 feet; Morrison shale, 200 to 230 feet; Sundance formation up to 300 feet and yet older sedimentary rocks. The Tertiary is represented in both basins, from oldest to youngest by the Chadron formation Brule Clay, Gering, and Arikaree formations.

(a) Graneros shale - Gray to dark gray shale, with some sandy material in lower part; 550 to 950 feet; upper 60 feet exposed in a small area on crest of Chadron dome in northeastern Dawes County; impervious material, outcrop area a region of high surface run-off.

(b) Greenhorn limestone - Gray, thin-bedded limestones, interbedded with dark gray chalky shales; thickness 30 feet or more; generally impervious although locally sandy near base; outcrops on flanks of Chadron dome and present at varying depth in remainder of the area.

(c) Carlile shale - Dark gray, plastic shale; thickness 350 to 500 feet or more, outcrops in northeastern Dawes County flanking the Chadron dome, present in subsurface of remainder of the area; impervious, high surface run-off.

(d) Niobrara formation - Light gray, buff-weathering, chalky shale and chalk; thickness about 200 to 250 feet; outcrops in northeastern Dawes County, present in subsurface to west and south; impervious; high surface run-off.

(e) Pierre shale - Steel-gray to dark gray plastic shale; with some concretionary layers; thickness up to 1,200 feet or more, thickening southward; outcrops in area north of tablelands except in northeastern Dawes County where underlying rocks are exposed; impervious material; high surface run-off.

(f) Chadron formation - Light greenish-gray sandy to silty clay, with some sand and gravel at base; thickness 30 to 60 feet or more; outcrops in lower slopes along north edge of tablelands; relatively impervious with a large per cent of run-off; there is some intake of rain water in the sandy beds at base.

(g) Brule clay - Flesh colored to light gray silty clay; thickness 350 feet near Chadron thickening to 650 feet in western part; outcrops in slopes along north edge of tablelands and present in subsurface to south; relatively impervious, forming areas of high surface run-off; forms impervious floor restricting downward penetration of ground water in tableland region.

(h) Gering formation - Cross-bedded sands, pebbly at base; about 100 to 115 feet thick rests uncomformably upon eroded Brule clay; outcrops in north slopes of tablelands, present in subsurface to the west; porous material, rain water penetration and ground water percolation relatively high; an important aquifer in tableland region.

(i) Arikaree formation - Light gray, fine to medium grained sands and sandstones, in part lime-cemented; maximum thickness about 500 feet; at or near the surface in Tableland region; rests upon Gering formation or upon Brule clay where the Gering is absent; relatively porous material, rain water penetration and ground water percolation relatively high; an important aquifer in Tableland region.

TOPOGRAPHY

The drainage tributaries of the White River Basin in Nebraska head in the Pine Ridge Region and emerge to join the White River before it passes into South Dakota. Hat Creek also has its source in the Pine Ridge Region. The canyons cut by these streams along Pine Ridge form an area of rough lands. Adjoining this area are long interstream slopes with occasional badlands cut across by small narrow bottom lands and well defined terraces. Below this is the well defined Pierre Hill area. All of these regions extend northeastward into South Dakota where the land is largely Pierre Hills, beyond which are considerable areas of bad lands. In Nebraska the valleys are narrow rarely exceeding 1.5 miles in width.

GROUND WATER

The White River Basin occupies 2 main ground water regions, namely, the Northwest Shale-land region and the Northwest Tableland region.

Within the Northwest Shale-land region impervious shale is at or near the surface and run-off from rainfall is very high. There is little or no sandy material at or near the surface in which water may accumulate except for the shallow alluvium of the stream bottom lands. Water of poor quality occurs wholly within the upper surface of the Pierre shale. The Dakota sandstone is present in the subsurface, but at too great a depth to permit economical drilling of wells. It occurs at depth of 1,000 feet or more. In general, this area is one with a scant supply of water, usually of poor quality. Replenishment is from local rainfall. It is often necessary to depend upon impounded surface waters in this locality. The Brule-Chadron region has relatively high run-off, but the Chadron sands are generally available as a source of water at depths of 25 to 200 feet or more. The streams flowing through this region are generally spring-fed from leakage along the top of the impervious Brule clay which contributes to the surface waters.

Ground water is found in the Northwest Tableland region in the Gering and Arikaree formations. The impervious platform is on the Brule clay. The depth to water varies from 200 to 350 feet or more. A better than average supply of good, medium hard water is generally encountered. Many springs occur along the northern edge of this region, issuing from Gering-Arikaree sandstones and gravels immediately over-lying the impervious Brule clay. Spring-fed streams are of importance as a source of water supply in the area north of Pine Ridge.

STREAMS OF THE BASIN

The White River has its source in Pine Ridge, at an elevation of about 4,560 feet, near the town of Harrison in the north central portion of Sioux County, Nebraska about 25 miles south of the Nebraska-South Dakota line. The stream flows northeastward into South Dakota.

Tributary drainage include Soldiers, Little Cottonwood, Hooker, Ash, Big Cottonwood, Indian, Chadron, Trunk Butte, Dead Horse, Lone Tree, Rush, Maiden, Bordeaux, and Beaver creeks. White Clay Creek drains the eastern part of the area, emptying into White River in South Dakota. The White River Basin includes an area where run-off from rainfall is unusually high and erosion rapid. The tributaries on the south emerge from canyons, then cross slope lands to the river. Many of the tributaries in the headwaters are beautiful clear rivulets flowing down the ravines formed on the side of the tablelands bordering the valley. Much of the annual run-off occurs in early spring, immediately following the first thaws. The mean annual discharge of the White River near Chadron is 29 second-feet. The clayey soils, prevailing throughout most of the basin, do not absorb water very rapidly and have a relatively small capacity for storage and release through seepage. As a result, the flow of the streams during the late spring, summer and fall is negligible, except where very heavy rains occur.

Hat Creek rises about 20 miles south of the Nebraska-South Dakota line in the Pine Ridge eroded tableland of central Sioux County. The creek flows northeastward to the point of egress from Nebraska, about 18 miles east of the northwest corner of the State, and continues in the same general direction for about 25 miles, then converges with the Cheyenne River below Edgemont, South Dakota. The stream rises at an elevation of about 4,500 feet and empties into the Cheyenne River at an elevation of 3,300 feet having an approximate gradient of 11 feet per mile. In certain portions of the headwater region the streamflow is perennial, but the surface flow disappears for a few miles below, leaving a dry creek channel several months each year. The mean annual discharge of the stream at the Nebraska-South Dakota line is about 53 second-feet, with wide variations from the flood flows in the spring to the dry stream bed in the late summer. Mean annual precipitation is about 18 inches. Drainage tributaries to Hat Creek are Indian, Antelope, Squaw, Jim, Warbonnet, Monroe, Prairie Dog, Spring, Sowbelly, West Hat, East Hat, and Whitehead creeks.

AGRICULTURAL AND INDUSTRIAL DEVELOPMENTS

The chief industry of the basins is agriculture. There is no manufacturing of importance. Approximately 9 per cent of the farm land in the White River Basin and 4 per cent in the Hat Creek Basin is under cultivation with 96 per cent and 91 per cent respectively in pasture. The acreage under cultivation in both basins has increased during the past 15 years partly due to an increase in the area of land in farms. In the White River Basin the average farm increased from 954 acres in 1929 to 1003 acres in 1934 while the increase in the Hat Creek Basin was from 1306 acres in 1929 to 1402 acres for the average farm in 1934.

Crops in the White River and the Hat Creek Basins occupied the following percentages of cultivated land in 1934:

WHITE RIVER BASIN

Crop	Per Cent of Cultivated Land
Corn	41
Wheat	17
Oats	4
Barley	4
Alfalfa	9
Forage, Potatoes, and Sugar Beets	25
Total	100

HAT CREEK BASIN

Crop	Per Cent of Cultivated Land
Corn	29
Wheat	5
Oats	4
Barley	4
Alfalfa	17
Forage, Potatoes, and Sugar Beets	41
Total	100

For the 10-year period, 1920 - 1929, the average crop yield in bushels for these basins was as follows: Corn 21, wheat 16, oats 31, barley 29, and rye 14. Alfalfa averaged 1.9 tons per acre in the White River Basin and 2.4 tons in the Hat Creek Basin. All yields in both basins were low in 1931 to 1935, inclusive, because of drought. The lowest yields were in 1934 with 1931 next lowest.

There has been a pronounced increase in the number of hogs and sheep in these basins since 1919 but not much change in the number of cattle. The number of horses has declined as elsewhere in the State. Fewer hogs are raised per acre in the White River and Hat Creek basins than in any other area of the State excepting the sand hills.

The low carrying capacity of pastures limits livestock to only one cow to 15 or 20 acres. Most of the cattle are sold as stockers or feeders rather than fattened beef.

The types of farming in these basins consist mainly of cash-grain farming, livestock raising, and some potato production. Potatoes, wheat, and barley are the sources of cash income from crops. The livestock income is mostly from the sale of cattle, although some hogs are sold.

The estimated value of farms decreased 29 per cent in the White River Basin from 1920 to 1930 and 40 per cent in the Hat Creek Basin. The decrease in the value of livestock was 8 per cent in the White and 35 per cent in the Hat, while the value of machinery increased 52 per cent in the White and 12 per cent in the Hat. From 1920 to 1935 the estimated value of real estate decreased 40 per cent in the White River Basin and 9 per cent in the Hat Creek Basin.

About 43 per cent of the farms in each basin are rented, without much change since 1930. About one-fourth of the tenant farms are rented for cash and three-fourths on a share basis. The proportion of those renting for cash has decreased since 1920.

IRRIGATION DEVELOPMENT

WHITE RIVER BASIN

The Whitney Irrigation District was organized in 1922 for the purpose of irrigating land lying on the west side of the White River in the vicinity of Big Cottonwood Creek. The district was granted 10,000 acre-feet of storage and 29.01 second-feet of natural flow for the reclamation of 9,792 acres.

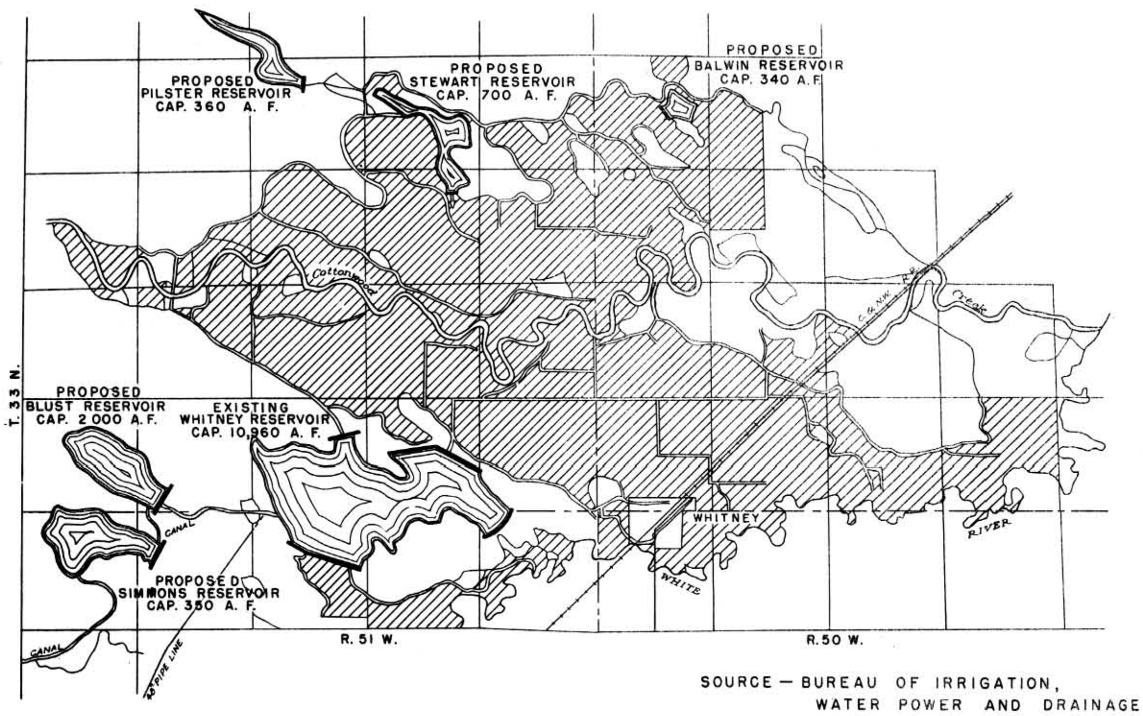
The Whitney storage reservoir has a capacity of 10,960 acre-feet with a surface area of 984 acres. The water is held by 4 dikes, aggregating 8,100 feet in length with heights varying from 11 to 19 feet. Water is diverted to the reservoir by a diversion dam across the White River about 3 miles below Crawford, Nebraska. A wooden-stave pipe 6.25 miles in length conveys the water to the Whitney reservoir. The land is served by 2 distributing canals, one 16 miles long and the other 7 miles. Only about 60 per cent of the irrigable area has been brought under irrigation.

Following its organization in 1922 the district issued $392,000 worth of 20-year, six per cent bonds for the purpose of financing construction. Construction costs amounted to approximately $40.00 per acre. However, only $362,000 worth of the bonds were sold. The entire area within the district was owned by 20 individuals, the largest separate holding amounting to 2,800 acres. Some of the larger holdings were subdivided and placed on the market, the price of land varying from $35 to $55 per acre, while water rights were contracted at $40 per acre. The district became delinquent in its payments in 1925 and was refinanced under a 40-year bond issue. Under the refinancing plans interest will vary as follows: the first two-year period, 1 per cent per annum; the remaining 36 years, 4 per cent per annum. The Reconstruction Finance Corporation later refinanced this project in the amount of $101,000 by taking over the warrants, bonds, and outstanding indebtedness at approximately 22 per cent of their face value.

POTENTIAL IRRIGATION DEVELOPMENT

The characteristics of the White River Basin are such that irrigation would materially increase crop production. Because of the inadequacy of the run-off during the months from June to September, it would be necessary to construct reservoirs having capacities nearly equal to the annual demand. With the exception of the reservoir sites within the Whitney Irrigation District, there does not appear to be any storage sites along the White River suitable for additional irrigation development. However, a thorough investigation has not been made. The land classifications show that the larger part of the land suitable for intensive cultivation is on the upland plains, necessitating the construction of long and expensive canals in addition to storage reservoirs. The low valley lands generally have inferior soils, mostly heavy clays, which are unsuitable for irrigated crops. These valley areas are divided into comparatively small sections by the meandering streams. Where the valley soils are suitable the long canals necessary for the development of comparatively small areas would prove excessively high in

WHITNEY IRRIGATION DISTRICT
PROPOSED
SUPPLEMENTAL STORAGE DEVELOPMENT



SOURCE — BUREAU OF IRRIGATION,
WATER POWER AND DRAINAGE

NEBRASKA STATE PLANNING BOARD

W. P. A. O. P. NO. 165-81-6999

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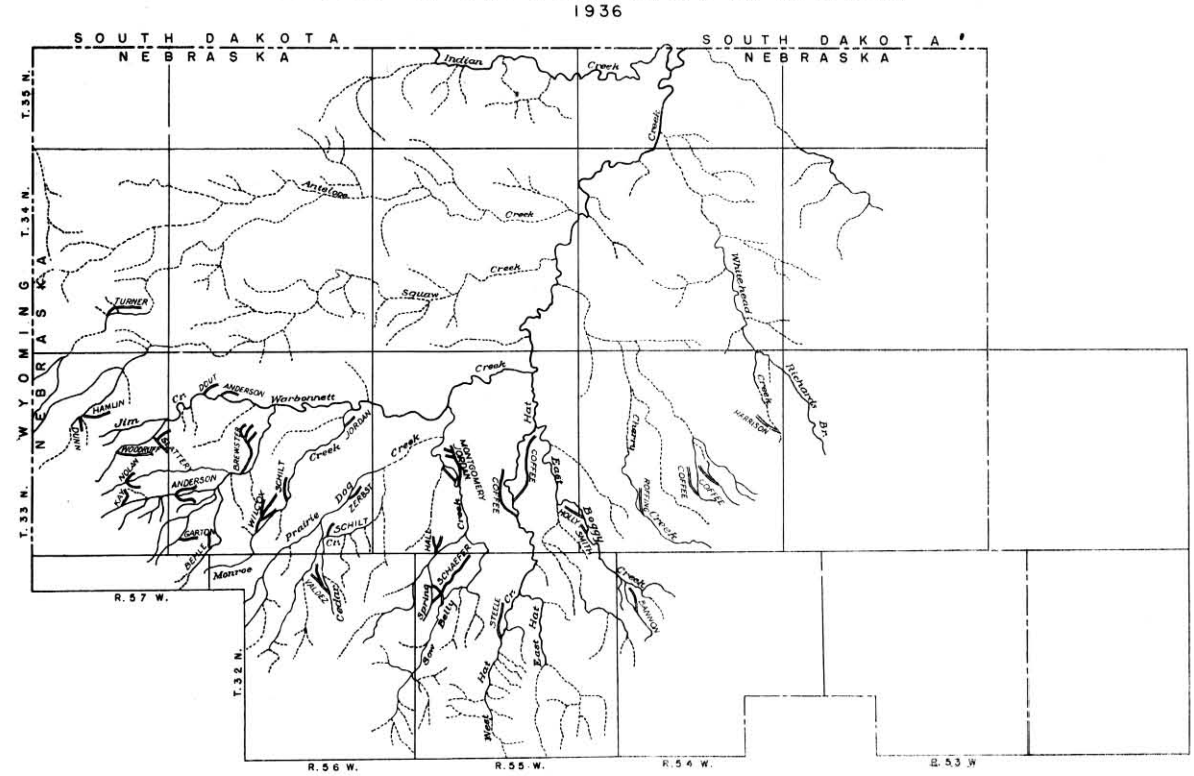
IRRIGATION SYSTEMS IN
PORTION OF HAT CREEK BASIN IN NEBRASKA
1936



SOURCE — BUREAU OF IRRIGATION,
WATER POWER AND DRAINAGE.
NEBRASKA

NEBRASKA STATE PLANNING BOARD

W. P. A. O. P. NO. 165-81-6999

cost. Shorter canals would necessitate pumping. Moreover, to place any extensive area under any one pumping system would still require the use of excessively long canals, and the costs would be prohibitive.

The streamflow records indicate that the water supply of the basin is practically all appropriated and most of the desirable land is either under irrigation or has been irrigated and abandoned.

(a) Whitney Irrigation District Storage Extension - The Whitney Irrigation District is contemplating the extension of its water storage system to augment the available water supply now inadequate because of increased acreage under cultivation and irrigation. Because of the exhaustion of irrigation water, the many acres of sugar beets, corn, and alfalfa, have been seriously affected, thus materially reducing the crop production of the district. It is hoped to increase the available water supply, now limited to 9,000 acre-feet of storage, by constructing 6 reservoirs in which the flood crests may be conserved for future uses. The streamflow record indicated that there is always available a sufficient quantity of water to fill, twice each season, the 6 additional reservoirs with a capacity aggregating 3,758 acre-feet, which supply will greatly enhance agricultural operations in the basin.

HAT CREEK BASIN

IRRIGATION DEVELOPMENT

There are several direct flow irrigation projects in the upper portion of the Hat Creek Basin in Nebraska that divert the entire flow of the stream. The records show that 92.31 second-feet of water have been appropriated from the stream in this State. Ordinarily, the water supply is inadequate for the irrigation demand in this area. The lower portion of the drainage area in Nebraska is too rough and precipitous to be irrigated advantageously.

POTENTIAL IRRIGATION

Practically the entire area suitable for irrigation in the Hat Creek Basin is now covered by water appropriations. Some unused water passes out of the section. However, no particular advantage could be gained by impounding the water below a point where irrigation is now practiced, because this land is not suitable for irrigation. Benefits to the present irrigation systems might be attained by providing storage facilities to conserve the nonseasonal runoff and release it when needed to supplement the limited amount of direct flow.

POWER DEVELOPMENT

There are but 2 power plants operating in the Nebraska portion of the White River Basin. They are located at Crawford and Chadron. The present and potential development of power generating facilities is limited because of sparse population both rural and urban. The present market is adequately served from power sources whether in or adjacent to the area.

FLOOD PROBLEMS

The White River in general is confined within a narrow valley and the channel has comparatively high run-off banks, which seldom overflow. The run-off of the drainage area in Nebraska is not large enough to cause serious flood hazards, although at times a portion of the river bottom is flooded.

EROSION AND SEDIMENT

The White River as a whole transports a large amount of sediment. The clay and shale formations lying north of the Nebraska-South Dakota line contribute heavily to the sediment load of the White River. Bank erosion in the Nebraska portion of the basin is of minor consequence. The high sediment concentration results from the high average rate of erosion over the entire drainage area, rather than from heavy erosion of the river banks.

APPENDIX

PRECIPITATION

PRECIPITATION DATA
SEASONAL, ANNUAL, AND PROGRESSIVE 5-YEAR MEANS
SELECTED STATIONS-PLATTE RIVER BASIN
NEBRASKA 1900-1938

KIMBALL

Year	May - September			Annual		
	Total	Percentage of Mean	Progressive 5-year Mean	Total	Percentage of Mean	Progressive 5-year Mean
1900	5.17	50		15.22	92	
1901	9.60	92		15.92	96	
1902	11.63	112		17.06	103	
1903	10.34	99		15.74	95	
1904	10.10	97	9.37	12.82	77	15.35
1905	15.57	149	11.45	25.73	155	17.45
1906	11.17	107	11.76	16.77	101	17.62
1907	11.11	107	11.66	15.52	94	17.32
1908	10.81	104	11.75	14.94	90	17.16
1909	12.55	120	12.24	18.79	113	18.35
1910	8.86	85	10.90	13.11	79	15.83
1911	5.38	52	9.74	8.50	51	14.17
1912	13.71	132	10.26	20.73	125	15.21
1913	8.87	85	9.87	13.58	82	14.94
1914	6.56	63	8.68	12.53	76	13.69
1915	11.57	111	9.22	22.18	134	15.50
1916	9.87	95	10.12	15.12	91	16.83
1917	11.92	114	9.76	18.46	111	16.37
1918	11.60	111	10.30	18.48	111	17.35
1919	12.00	115	11.39	18.08	109	18.46
1920	7.53	72	10.68	17.41	105	17.51
1921	10.12	97	10.63	14.45	87	17.38
1922	6.97	67	9.64	14.54	88	16.59
1923	14.66	141	10.26	21.01	127	17.10
1924	9.96	96	9.85	17.20	104	16.92
1925	10.86	104	10.51	14.64	88	16.37
1926	11.39	109	10.77	16.21	98	16.72
1927	9.11	87	11.20	20.03	121	17.82
1928	17.36	167	11.74	20.96	126	17.81
1929	8.82	85	11.51	18.42	111	18.05
1930	11.56	111	11.65	19.83	120	19.09
1931	6.92	66	10.75	12.04	73	18.26
1932	8.93	86	10.72	15.22	92	17.29
1933	13.95	134	10.04	19.22	116	16.95
1934	7.28	70	9.73	10.94	66	15.45
1935	10.87	104	9.59	17.47	105	14.98
1936	6.13	59	9.43	11.22	68	14.81
1937	8.90	85	9.43	12.44	75	14.26
1938	16.78	161	9.99	24.08	145	15.23
Mean	10.42			16.58		

SCOTTSBLUFF

Year	May - September			Annual		
	Total	Percentage of Mean	Progressive 5-year Mean	Total	Percentage of Mean	Progressive 5-year Mean
1900	7.53	74		15.15	94	
1901	10.92	107		16.20	100	
1902	12.90	126		18.86	116	
1903	9.24	90		14.24	88	
1904	8.32	81	9.78	11.10	69	15.11
1905	15.22	149	11.32	22.99	142	16.68
1906	12.95	127	11.73	19.28	119	17.29
1907	10.86	106	11.32	16.85	104	16.89
1908	10.75	105	11.62	13.82	85	16.81
1909	13.15	129	12.59	20.62	127	18.71
1910	7.52	74	11.05	11.74	73	16.46
1911	7.56	74	9.97	13.30	82	15.27
1912	14.77	145	10.75	21.85	135	16.27
1913	11.33	111	10.87	16.10	99	16.72
1914	3.85	38	9.01	12.00	74	15.00
1915	18.79	184	11.26	26.88	166	18.03
1916	8.39	82	11.43	12.01	74	17.77
1917	12.49	122	10.97	18.67	115	17.13
1918	15.66	153	11.84	20.61	127	18.03
1919	7.03	69	12.47	12.41	77	18.12
1920	9.67	95	10.65	19.25	119	16.59
1921	7.85	77	10.54	11.54	71	16.50
1922	8.68	85	9.78	16.70	103	16.10
1923	14.60	143	9.57	19.96	123	15.97
1924	6.34	62	9.43	12.53	77	16.00
1925	10.38	102	9.57	14.81	91	15.11
1926	9.24	90	9.85	16.04	99	16.01
1927	11.60	114	10.43	22.13	137	17.09
1928	10.33	101	9.58	13.88	86	15.88
1929	9.61	94	10.23	17.92	111	16.96
1930	11.55	113	10.47	16.94	105	17.38
1931	3.94	39	9.41	9.57	59	16.09
1932	7.75	76	8.64	15.86	98	14.83
1933	8.84	87	8.34	15.21	94	15.10
1934	8.09	79	8.03	11.35	70	13.79
1935	12.36	121	8.20	19.10	118	14.22
1936	6.66	65	8.74	11.12	69	14.53
1937	7.57	74	8.70	12.22	75	13.80
1938	13.83	135	9.70	20.41	126	14.84
Mean	10.21			16.19		

NORTH PLATTE

Year	May - September			Annual		
	Total	Percentage of Mean	Progressive 5-year Mean	Total	Percentage of Mean	Progressive 5-year Mean
1900	7.31	59		13.94	76	
1901	11.00	89		16.08	88	
1902	21.08	171		25.07	137	
1903	15.00	121		19.73	107	
1904	18.61	151	14.60	21.76	119	19.32
1905	17.57	142	16.65	27.23	148	21.97
1906	16.45	133	17.74	24.69	134	23.70
1907	16.93	137	16.91	23.38	127	23.36
1908	14.00	113	16.71	17.03	93	22.82
1909	15.00	121	15.99	22.78	124	23.02
1910	8.63	71	14.24	13.67	74	20.31
1911	9.73	79	12.90	13.92	76	18.16
1912	9.87	80	11.48	21.73	118	17.83
1913	10.88	88	10.85	17.04	93	17.83
1914	10.97	89	10.05	17.37	95	16.75
1915	19.64	159	12.21	32.38	176	20.49
1916	8.68	70	12.00	13.37	73	20.38
1917	12.59	102	12.55	18.81	102	19.79
1918	8.47	69	12.07	13.42	73	19.07
1919	13.78	112	12.63	20.99	114	19.79
1920	12.84	104	11.27	21.94	119	17.71
1921	7.65	62	11.07	12.34	67	17.50
1922	11.57	94	10.86	15.86	86	16.91
1923	17.44	141	12.66	22.59	123	18.74
1924	7.78	63	11.46	12.96	71	17.14
1925	6.93	56	10.27	12.35	67	15.22
1926	11.49	93	11.04	14.70	80	15.69
1927	12.90	104	11.31	19.54	106	16.43
1928	14.38	116	10.69	17.01	93	15.31
1929	14.27	116	11.99	22.73	124	17.27
1930	14.00	113	13.41	20.61	112	18.92
1931	5.08	41	12.13	15.15	83	19.02
1932	13.36	108	12.22	17.58	96	18.63
1933	10.18	82	11.38	17.19	94	18.66
1934	11.12	90	10.77	13.90	76	16.90
1935	12.79	104	10.51	18.81	102	16.54
1936	7.35	60	10.96	11.66	64	15.83
1937	7.65	62	9.82	11.62	63	14.64
1938	16.68	135	11.12	23.01	125	15.80
Mean	12.35			18.36		

PRECIPITATION DATA
SEASONAL, ANNUAL, AND PROGRESSIVE 5-YEAR MEANS
SELECTED STATIONS-PLATTE RIVER BASIN
NEBRASKA 1900-1938

KEARNEY

Year	May - September			Annual		
	Total	Percentage of Mean	Progressive 5-year Mean	Total	Percentage of Mean	Progressive 5-year Mean
1900	12.09	77		20.71	89	
1901	17.33	111		27.60	119	
1902	26.34	168		32.66	140	
1903	29.38	188		39.55	170	
1904	19.75	126	20.98	24.26	104	28.96
1905	30.25	193	24.61	40.99	176	33.01
1906	19.50	125	25.04	29.91	128	33.47
1907	15.46	99	22.87	22.77	98	31.50
1908	17.75	113	20.54	20.69	89	27.72
1909	12.09	77	19.01	17.70	76	26.41
1910	14.71	94	15.90	20.34	87	22.28
1911	14.55	93	14.91	18.49	79	20.00
1912	10.39	66	13.90	18.55	80	19.15
1913	8.91	57	12.13	18.09	78	18.63
1914	13.12	84	12.34	22.33	96	19.56
1915	31.31	200	15.66	41.36	178	23.76
1916	15.46	99	15.84	22.10	95	24.49
1917	13.81	88	16.52	19.45	84	24.67
1918	12.66	81	17.27	19.40	83	24.93
1919	18.57	119	18.36	29.88	128	26.44
1920	11.05	71	14.31	22.20	95	22.61
1921	13.13	84	13.84	21.77	94	22.54
1922	13.09	84	13.70	17.13	74	22.08
1923	18.46	118	14.86	28.37	122	23.87
1924	14.68	94	14.08	20.12	86	21.92
1925	10.73	69	14.02	17.65	76	21.01
1926	13.85	88	14.16	18.94	81	20.44
1927	10.68	68	13.68	21.89	94	21.39
1928	13.91	89	12.77	17.39	75	19.20
1929	8.71	56	11.58	16.98	73	18.57
1930	18.15	116	13.06	32.42	139	21.52
1931	12.68	81	12.83	23.44	101	22.42
1932	15.66	100	13.82	24.99	107	23.04
1933	14.32	92	13.90	24.95	107	24.56
1934	6.86	44	13.53	12.05	52	23.57
1935	21.52	138	14.21	26.75	115	22.44
1936	10.29	66	13.73	13.90	60	20.53
1937	14.40	92	13.48	19.16	82	19.36
1938	14.78	94	13.57	21.12	91	18.60
Mean	15.65			23.28		

SCHUYLER

Year	May - September			Annual		
	Total	Percentage of Mean	Progressive 5-year Mean	Total	Percentage of Mean	Progressive 5-year Mean
1900	21.91	122		32.89	123	
1901	16.06	89		24.63	92	
1902	23.57	131		29.74	111	
1903	26.32	146		36.69	137	
1904	18.23	101	21.23	24.74	92	29.74
1905	26.02	145	22.04	35.87	134	30.33
1906	19.43	108	22.71	30.37	113	31.48
1907	18.58	103	21.72	26.43	98	30.82
1908	24.62	137	21.38	31.36	117	29.75
1909	22.98	128	22.33	28.96	108	30.60
1910	15.65	87	20.25	23.18	86	28.06
1911	11.37	63	18.64	19.12	71	25.81
1912	12.03	67	17.33	24.74	92	25.47
1913	18.12	101	16.03	25.98	97	24.40
1914	22.06	123	15.85	32.37	121	25.06
1915	29.35	163	18.59	41.28	154	28.70
1916	12.50	70	18.81	17.50	65	28.37
1917	14.03	78	19.21	22.45	84	27.92
1918	10.64	59	17.72	14.72	55	25.66
1919	17.66	98	16.82	32.42	121	25.67
1920	11.29	63	13.20	25.68	96	22.55
1921	16.56	103	13.42	29.24	109	24.90
1922	14.98	83	13.61	23.10	86	25.03
1923	24.87	138	16.45	36.41	136	29.37
1924	20.26	113	16.99	25.96	97	28.08
1925	18.27	102	18.39	25.79	96	28.10
1926	23.48	131	20.37	28.34	106	27.92
1927	14.51	81	20.28	26.04	97	28.51
1928	16.26	90	18.56	18.26	68	24.88
1929	16.98	94	17.90	32.22	120	26.13
1930	18.45	103	17.94	28.65	107	26.70
1931	16.60	92	16.56	23.69	88	25.77
1932	20.05	112	17.67	33.03	123	27.17
1933	15.71	87	17.56	25.03	93	28.52
1934	12.74	71	16.71	18.21	68	25.72
1935	16.29	91	16.28	25.13	94	25.02
1936	9.38	52	14.83	15.31	57	23.34
1937	13.65	76	13.55	20.57	77	20.85
1938	17.59	98	13.93	30.57	114	21.96
Mean	17.97			26.84		

ASHLAND

Year	May - September			Annual		
	Total	Percentage of Mean	Progressive 5-year Mean	Total	Percentage of Mean	Progressive 5-year Mean
1900	20.77	115		30.47	115	
1901	18.13	100		26.81	101	
1902	33.91	187		39.73	150	
1903	27.50	152		38.99	147	
1904	18.17	100	23.70	26.17	99	32.43
1905	22.04	122	23.95	31.43	119	32.63
1906	22.44	124	24.81	34.12	129	34.09
1907	24.96	138	23.02	33.05	125	32.75
1908	27.76	153	23.07	34.35	130	31.82
1909	17.53	97	22.95	24.35	92	31.46
1910	13.07	72	21.15	25.54	97	30.28
1911	10.72	59	18.81	17.00	64	26.86
1912	14.79	82	16.77	22.90	87	24.83
1913	17.74	98	14.77	27.78	105	23.51
1914	18.81	104	15.03	29.92	113	24.63
1915	23.91	132	17.19	34.42	130	26.40
1916	13.27	73	17.70	19.93	75	26.99
1917	16.23	90	17.99	24.80	94	27.37
1918	11.31	62	16.71	14.98	57	24.81
1919	18.51	102	16.65	31.88	120	25.16
1920	13.48	74	14.56	23.46	89	22.97
1921	18.35	101	15.58	27.82	105	24.55
1922	12.85	71	14.90	18.40	70	23.27
1923	21.60	119	16.96	30.35	115	26.34
1924	16.45	91	16.55	20.36	77	24.08
1925	15.92	88	17.03	22.43	85	23.87
1926	22.10	122	17.78	27.38	103	23.78
1927	12.64	70	17.74	24.75	94	25.05
1928	20.55	113	17.53	24.09	91	23.80
1929	13.28	73	16.90	24.99	94	24.73
1930	14.67	81	16.65	24.32	92	25.11
1931	21.29	117	16.49	26.49	100	24.93
1932	20.42	113	18.04	34.77	131	26.93
1933	15.38	85	17.01	20.65	78	26.24
1934	7.08	39	15.77	10.83	41	23.41
1935	19.29	106	16.69	28.23	107	24.19
1936	10.07	56	14.45	20.81	79	23.06
1937	17.80	98	13.92	23.58	89	20.82
1938	21.81	120	15.21	29.67	112	22.62
Mean	18.12			26.46		

PRECIPITATION DATA
SEASONAL, ANNUAL, AND PROGRESSIVE 5-YEAR MEANS
SELECTED STATIONS-LOUP RIVER BASIN
NEBRASKA 1900-1938

PURDUM

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	15.19	106		25.69	115	
1901	20.57	143		28.14	126	
1902	21.25	148		28.18	126	
1903	15.04	105		22.89	102	
1904	18.93	132	18.20	21.97	98	25.37
1905	12.84	90	17.73	24.81	111	25.20
1906	13.81	96	16.37	23.68	106	24.31
1907	13.61	95	14.85	22.70	101	23.21
1908	15.16	106	14.87	18.89	84	22.41
1909	12.67	88	13.62	20.53	92	22.12
1910	11.93	83	13.44	18.53	83	20.87
1911	13.74	96	13.42	21.29	95	20.39
1912	12.76	89	13.25	26.60	119	21.17
1913	11.17	78	12.45	17.29	77	20.88
1914	14.76	103	12.87	21.78	97	21.10
1915	19.26	134	14.34	34.96	156	24.38
1916	11.37	79	13.86	16.96	76	23.52
1917	13.14	92	13.94	20.82	93	22.36
1918	12.32	86	14.17	17.48	78	22.40
1919	11.01	77	13.42	20.44	91	22.13
1920	15.13	106	12.60	28.70	128	20.88
1921	15.41	107	13.40	22.54	101	22.00
1922	12.68	88	13.31	19.28	86	21.69
1923	22.34	156	15.31	28.97	129	23.99
1924	11.14	78	15.34	16.48	74	23.19
1925	15.84	110	15.48	21.71	97	21.80
1926	17.87	125	15.97	23.02	103	21.89
1927	17.33	121	16.90	29.78	133	23.99
1928	14.82	103	15.40	18.26	82	21.85
1929	14.22	99	16.02	24.60	110	23.47
1930	13.41	94	15.53	22.03	98	23.54
1931	7.14	50	13.38	18.20	81	22.57
1932	15.34	107	12.99	22.02	98	21.02
1933	16.20	113	13.26	25.71	115	22.51
1934	12.32	86	12.88	16.33	73	20.86
1935	12.67	88	12.73	21.81	97	20.81
1936	10.32	72	13.37	18.47	83	20.87
1937	10.84	76	12.47	16.30	73	19.72
1938	13.53	94	11.94	25.08	112	19.60
Mean	14.34			22.38		

ERICSON

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	15.63	114		23.31	113	
1901	14.12	103		20.84	101	
1902	24.80	180		35.00	169	
1903	20.46	149		27.30	132	
1904	16.21	118	18.24	22.31	108	25.75
1905	23.00	167	19.72	37.74	182	28.64
1906	13.65	99	19.62	25.80	125	29.63
1907	13.77	100	17.41	21.59	104	26.96
1908	19.98	145	17.32	21.73	105	25.83
1909	13.62	99	16.80	18.79	91	25.13
1910	17.35	126	16.67	22.14	107	22.01
1911	11.38	83	15.22	19.55	94	20.76
1912	11.65	85	14.79	22.33	108	20.91
1913	13.50	98	13.50	19.60	95	20.48
1914	11.74	85	13.12	19.39	94	20.60
1915	20.48	149	13.75	28.25	137	21.82
1916	14.27	104	14.32	18.07	87	21.53
1917	9.69	70	13.94	16.52	80	20.37
1918	10.57	77	13.35	14.57	70	19.36
1919	9.28	67	12.86	21.07	102	19.70
1920	17.62	128	12.29	29.99	145	20.04
1921	10.24	74	11.48	16.14	78	19.66
1922	9.82	71	11.61	13.64	66	19.08
1923	18.83	137	13.16	23.60	114	20.89
1924	10.53	77	13.41	13.87	67	19.45
1925	9.66	70	11.82	14.21	69	16.29
1926	15.89	115	12.95	19.34	93	16.93
1927	7.48	54	12.48	15.32	74	17.27
1928	10.50	76	10.81	12.41	60	15.03
1929	9.97	72	10.70	17.44	84	15.74
1930	12.28	89	11.22	22.07	107	17.32
1931	11.30	82	10.31	19.88	96	17.42
1932	13.39	97	11.49	21.70	105	18.70
1933	14.64	106	12.32	20.38	99	20.29
1934	7.99	58	11.92	10.60	51	18.93
1935	16.61	121	12.79	27.65	134	20.04
1936	6.77	49	11.88	12.80	62	18.63
1937	17.09	124	12.62	21.48	104	18.58
1938	10.89	79	11.81	18.55	90	18.22
Mean	13.76			20.69		

ST. PAUL

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	18.64	111		26.28	109	
1901	12.72	76		21.70	90	
1902	30.74	183		38.18	159	
1903	27.91	166		37.49	156	
1904	19.15	114	21.83	23.44	97	29.42
1905	32.33	192	24.57	42.56	177	32.67
1906	15.25	91	25.08	26.49	110	33.63
1907	18.56	110	22.64	26.30	109	31.26
1908	23.97	143	21.85	28.69	119	29.50
1909	15.56	93	21.13	20.85	87	28.98
1910	11.77	70	17.02	18.68	78	24.20
1911	13.88	83	16.75	18.91	79	22.69
1912	13.07	78	15.65	23.03	96	22.03
1913	13.97	83	13.65	21.50	89	20.59
1914	17.27	103	13.99	26.17	109	21.66
1915	21.80	130	16.00	30.71	128	24.06
1916	13.17	78	16.86	16.91	70	23.66
1917	15.93	95	16.43	22.15	92	23.49
1918	11.53	69	15.94	16.34	68	22.46
1919	17.34	103	15.95	27.55	114	22.73
1920	18.06	107	15.21	29.75	124	22.54
1921	19.09	113	16.39	28.89	120	24.94
1922	17.26	103	16.66	21.30	88	24.77
1923	20.06	119	18.36	26.11	108	26.72
1924	20.48	122	18.99	24.05	100	26.02
1925	12.44	74	17.87	19.56	81	23.98
1926	15.52	92	17.15	19.52	81	22.11
1927	10.96	65	15.89	23.62	98	22.57
1928	14.61	87	14.80	16.11	67	20.57
1929	13.03	77	13.31	21.67	90	20.10
1930	18.87	112	14.60	29.63	123	22.11
1931	10.03	60	13.50	17.17	71	21.64
1932	20.02	119	15.31	28.17	117	22.65
1933	15.52	92	15.49	22.91	95	23.91
1934	6.98	41	14.28	12.94	54	22.16
1935	16.36	97	13.78	23.87	99	21.01
1936	9.13	54	13.60	16.17	67	20.81
1937	16.60	99	12.92	20.14	84	19.21
1938	16.55	98	13.12	23.66	98	19.36
Mean	16.82			24.08		

PRECIPITATION DATA
SEASONAL, ANNUAL, AND PROGRESSIVE 5-YEAR MEANS
SELECTED STATIONS-REPUBLICAN RIVER BASIN
NEBRASKA 1900-1938

IMPERIAL

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	12.37	87		21.93	102	
1901	10.92	77		18.48	86	
1902	17.77	125		23.07	107	
1903	12.06	85		19.24	89	
1904	20.06	142	14.63	23.87	111	21.32
1905	22.08	156	16.57	33.71	157	23.67
1906	12.11	86	16.82	24.76	115	24.93
1907	13.56	96	15.97	19.93	93	24.30
1908	18.91	134	17.34	21.19	98	24.69
1909	12.11	86	15.75	21.11	98	24.14
1910	9.61	68	13.26	15.73	73	20.54
1911	9.47	67	12.73	13.60	63	18.31
1912	14.61	103	12.94	27.01	125	19.73
1913	8.46	60	10.85	14.04	65	18.30
1914	12.52	88	10.93	19.78	92	18.03
1915	24.99	176	14.01	35.81	166	22.05
1916	13.46	95	14.81	18.89	88	23.11
1917	16.75	118	15.24	26.02	121	22.91
1918	11.14	79	15.77	17.84	83	23.67
1919	20.20	143	17.31	31.38	146	25.99
1920	14.55	103	15.22	26.80	124	24.19
1921	10.65	75	14.66	16.83	78	23.77
1922	9.81	69	13.27	17.19	80	22.01
1923	17.04	120	14.45	22.03	102	22.86
1924	14.26	101	13.26	22.90	106	21.15
1925	10.32	73	12.42	18.74	87	19.54
1926	14.75	104	13.24	20.20	94	20.21
1927	11.21	79	13.52	22.29	104	21.23
1928	19.17	135	13.94	22.85	106	21.40
1929	14.89	105	14.07	25.98	121	22.01
1930	19.95	141	15.99	27.63	128	23.79
1931	9.68	68	14.99	22.57	105	24.26
1932	11.28	80	14.99	18.93	88	23.59
1933	16.96	120	14.55	22.28	103	23.48
1934	11.60	81	13.67	15.12	70	21.31
1935	16.80	119	13.24	20.20	94	19.82
1936	12.14	86	13.74	16.31	76	18.57
1937	11.12	79	13.70	13.64	63	17.51
1938	13.01	92	12.91	19.70	92	16.99
Mean	14.16			21.53		

BEAVER CITY

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	7.73	53		17.38	81	
1901	11.55	79		19.60	91	
1902	21.00	145		24.47	114	
1903	22.82	157		30.90	143	
1904	12.48	86	15.12	16.45	76	21.74
1905	32.39	223	20.05	41.41	192	26.55
1906	10.87	75	19.91	20.86	97	26.82
1907	9.18	63	17.55	16.98	79	25.32
1908	13.09	90	15.60	17.11	79	22.56
1909	13.70	94	15.85	22.40	104	23.75
1910	10.20	70	11.41	15.86	74	18.64
1911	22.72	156	13.78	25.84	120	19.64
1912	10.19	70	13.98	17.58	82	19.76
1913	8.86	61	13.14	17.98	83	19.93
1914	14.89	102	13.38	22.63	105	19.98
1915	21.19	146	15.57	28.54	132	22.51
1916	13.69	94	13.77	18.63	86	21.07
1917	15.87	109	14.90	21.87	102	21.93
1918	13.56	93	15.04	18.96	88	22.13
1919	13.64	94	15.59	24.63	114	22.53
1920	14.99	103	14.35	23.66	110	21.55
1921	14.51	100	14.51	22.84	106	22.39
1922	12.17	84	13.77	17.78	83	21.57
1923	20.06	138	15.07	26.91	125	23.16
1924	13.52	93	15.05	20.86	97	22.41
1925	9.79	67	14.01	18.34	85	21.35
1926	13.32	92	13.77	16.80	78	20.14
1927	14.12	97	14.16	26.76	124	21.93
1928	17.53	121	13.66	21.18	98	20.79
1929	15.38	106	14.03	25.60	119	21.74
1930	18.52	127	15.77	28.05	130	23.68
1931	8.14	56	14.74	19.16	89	24.15
1932	11.38	78	14.19	18.41	85	22.48
1933	12.18	84	13.12	18.86	88	22.22
1934	9.31	64	11.91	13.87	64	19.67
1935	17.70	122	11.74	22.45	104	18.55
1936	12.43	86	12.60	15.85	74	17.89
1937	16.74	115	13.67	21.78	101	18.56
1938	15.11	104	14.26	21.01	98	18.99
Mean	14.53			21.54		

RED CLOUD

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	11.07	72		21.34	92	
1901	15.92	103		24.57	106	
1902	32.81	212		37.45	162	
1903	22.85	148		30.95	134	
1904	19.09	123	20.35	26.67	115	28.20
1905	23.62	153	22.86	32.51	141	30.43
1906	11.32	73	21.94	21.57	93	29.83
1907	14.54	94	18.28	20.63	89	26.47
1908	27.05	175	19.13	31.44	136	26.56
1909	20.44	132	19.39	25.06	108	26.24
1910	15.24	99	17.72	23.49	102	24.44
1911	19.11	124	19.28	25.48	110	25.22
1912	13.86	90	19.14	21.72	94	25.44
1913	11.71	76	16.07	17.29	75	22.61
1914	15.36	99	15.06	24.77	107	22.55
1915	30.39	196	18.09	39.17	170	25.69
1916	13.82	89	17.03	18.05	78	24.20
1917	11.45	74	16.55	17.21	75	23.30
1918	15.90	103	17.38	21.90	95	24.22
1919	18.26	118	17.96	35.14	152	26.29
1920	12.05	78	14.30	23.52	102	[illegible]
1921	11.71	76	13.87	21.93	95	23.94
1922	8.32	56	13.31	14.25	62	23.35
1923	17.69	114	13.67	25.75	111	24.12
1924	9.80	63	11.97	16.51	71	20.39
1925	16.10	104	12.78	22.65	98	20.22
1926	17.97	116	14.04	22.38	97	20.31
1927	14.93	97	15.30	26.99	117	22.86
1928	14.91	96	14.74	18.81	81	21.47
1929	9.79	63	14.74	21.62	94	22.49
1930	11.70	76	13.86	22.51	97	22.46
1931	12.76	82	12.82	22.35	97	22.46
1932	8.42	54	11.52	18.37	80	20.73
1933	9.21	60	10.38	17.35	75	20.44
1934	7.01	45	9.82	12.04	52	18.52
1935	19.22	124	11.32	22.74	98	18.57
1936	10.15	66	10.80	16.10	70	17.32
1937	11.46	74	11.41	16.56	72	16.96
1938	15.86	103	12.74	22.11	96	17.91
Mean	15.47			23.10		

PRECIPITATION DATA
SEASONAL, ANNUAL, AND PROGRESSIVE 5-YEAR MEANS
SELECTED STATIONS-ELKHORN RIVER BASIN
NEBRASKA 1900-1938

NEWPORT

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	15.99	103		25.18	110	
1901	22.07	142		31.11	136	
1902	20.83	134		27.38	119	
1903	23.40	150		31.01	135	
1904	18.74	120	20.21	22.91	100	27.52
1905	16.96	109	20.40	25.70	112	27.62
1906	14.15	91	18.82	24.56	107	26.31
1907	20.52	132	18.75	27.48	120	26.33
1908	18.11	116	17.70	21.25	92	24.38
1909	17.72	114	17.49	23.93	104	24.58
1910	15.87	102	17.27	23.50	102	24.14
1911	11.14	72	16.67	16.92	74	22.62
1912	14.58	94	15.48	27.28	119	22.58
1913	10.80	69	14.02	16.45	72	21.62
1914	14.98	96	13.47	22.62	98	21.36
1915	29.60	190	16.22	40.57	176	24.77
1916	15.44	99	17.08	20.27	88	25.44
1917	15.00	96	17.16	21.26	92	24.23
1918	11.72	75	17.36	15.98	70	24.14
1919	16.84	108	17.72	24.27	106	24.47
1920	16.95	109	15.19	28.31	123	22.02
1921	17.62	113	15.63	23.01	100	22.57
1922	15.36	99	15.70	20.23	88	22.36
1923	21.06	135	17.57	28.69	125	24.00
1924	16.47	106	17.49	24.26	106	24.90
1925	15.54	100	17.21	21.98	96	23.63
1926	15.35	99	16.76	17.92	78	22.62
1927	10.22	66	15.73	22.88	100	23.15
1928	10.38	67	13.59	14.05	61	20.22
1929	17.57	113	13.81	28.74	125	21.11
1930	11.11	71	12.93	20.11	87	20.74
1931	11.26	72	12.11	22.00	96	21.56
1932	10.78	69	12.22	18.45	80	20.67
1933	11.54	74	12.45	16.07	74	21.25
1934	11.43	73	11.22	15.59	68	18.62
1935	11.79	76	11.36	19.25	87	18.59
1936	10.26	66	11.16	18.96	82	17.98
1937	13.44	86	11.69	19.05	83	18.10
1938	14.41	93	12.27	25.92	113	19.89
Mean	15.56			22.99		

OAKDALE

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	17.43	104		26.68	108	
1901	18.85	113		25.98	105	
1902	21.16	127		28.63	116	
1903	28.58	171		35.13	142	
1904	18.76	112	20.96	24.66	100	28.22
1905	26.79	160	22.83	37.24	150	30.33
1906	16.21	97	22.30	26.65	108	30.46
1907	14.41	86	20.95	22.57	91	29.25
1908	22.88	137	19.81	26.63	108	27.65
1909	21.37	128	20.33	27.99	113	28.22
1910	12.36	74	17.45	19.79	80	24.73
1911	15.38	92	17.28	22.11	89	23.82
1912	13.51	81	17.10	24.75	100	24.25
1913	11.83	71	14.89	21.55	87	23.24
1914	17.16	103	14.05	23.58	95	22.36
1915	25.10	150	16.60	34.26	138	25.25
1916	17.15	103	16.95	22.28	90	25.28
1917	15.98	96	17.45	25.04	101	25.34
1918	12.62	76	17.61	16.71	67	24.37
1919	12.20	73	16.61	23.39	94	24.34
1920	21.62	129	15.91	39.80	161	25.44
1921	16.25	97	15.73	25.06	101	26.00
1922	18.63	111	16.26	24.39	98	25.87
1923	24.74	148	18.69	32.49	131	29.03
1924	16.18	97	19.48	22.24	90	28.60
1925	15.25	91	18.21	22.85	92	25.41
1926	23.79	142	19.72	28.45	115	26.08
1927	19.28	115	19.85	32.72	132	27.75
1928	10.80	65	17.06	14.70	59	24.19
1929	13.78	82	16.58	23.88	96	24.52
1930	15.44	92	16.62	25.22	102	24.99
1931	10.34	62	13.93	17.82	72	22.67
1932	15.49	93	13.17	25.65	104	21.45
1933	13.56	81	13.72	21.81	88	22.88
1934	10.79	65	13.12	14.57	59	21.01
1935	13.67	82	12.77	23.75	96	20.72
1936	7.15	43	12.13	15.72	63	20.30
1937	11.81	71	11.40	17.54	71	15.68
1938	13.33	80	11.35	21.64	87	18.64
Mean	16.71			24.77		

WEST POINT

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	24.94	121		34.91	115	
1901	19.65	95		28.02	92	
1902	26.99	131		33.68	111	
1903	32.12	156		40.60	134	
1904	20.15	98	24.77	26.50	87	32.78
1905	23.24	113	24.43	34.36	113	32.67
1906	18.64	91	24.23	30.77	101	33.22
1907	20.01	97	22.83	26.58	87	31.80
1908	24.62	120	21.33	32.18	106	30.08
1909	25.42	123	22.39	34.01	112	31.58
1910	27.26	132	23.19	35.72	117	31.85
1911	14.19	69	22.30	22.15	73	30.13
1912	15.64	76	21.43	28.13	93	30.44
1913	15.76	77	19.65	28.62	94	29.73
1914	27.73	135	20.12	38.89	128	30.70
1915	35.98	175	21.86	48.49	160	33.26
1916	20.13	98	23.05	26.98	89	34.22
1917	20.40	99	24.00	31.65	104	34.93
1918	17.26	84	24.30	25.96	85	34.39
1919	17.16	83	22.18	36.61	120	33.94
1920	21.08	102	19.20	40.61	134	32.40
1921	26.74	130	20.53	38.34	126	34.67
1922	18.94	92	20.23	28.78	95	34.10
1923	27.85	135	22.35	40.91	135	37.09
1924	24.61	120	23.88	33.91	112	36.55
1925	16.52	80	22.97	22.22	73	32.83
1926	20.36	99	21.70	28.55	94	30.87
1927	17.16	83	21.34	30.09	99	31.14
1928	15.64	76	18.90	18.05	59	26.56
1929	14.66	71	16.87	25.96	85	24.97
1930	22.10	107	17.99	30.95	102	26.72
1931	18.28	89	17.57	25.64	84	26.14
1932	23.28	113	18.79	36.55	120	27.43
1933	10.76	52	17.82	19.73	65	27.77
1934	13.45	65	17.57	18.96	62	26.37
1935	17.05	83	16.56	27.43	90	25.66
1936	10.79	52	15.06	17.68	58	24.07
1937	13.29	65	13.06	23.58	78	21.48
1938	22.90	111	15.49	32.37	106	24.00
Mean	20.59			30.40		

PRECIPITATION DATA
SEASONAL, ANNUAL, AND PROGRFSSIVE 5-YEAR MEANS
SELECTED STATIONS-BLUE RIVER BASIN
NEBRASKA 1900-1938

HASTINGS

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	17.95	109		27.63	112	
1901	15.19	92		22.50	91	
1902	31.12	189		36.75	149	
1903	29.79	181		39.26	159	
1904	14.38	88	21.69	20.92	85	29.41
1905	26.23	160	23.34	38.36	156	31.56
1906	11.71	71	22.66	23.24	94	31.71
1907	15.78	96	19.58	22.60	92	28.88
1908	24.99	152	18.62	32.26	131	27.48
1909	15.36	93	18.81	19.92	81	27.28
1910	17.25	105	17.02	26.76	109	24.96
1911	17.75	108	18.23	23.29	94	24.97
1912	15.04	92	18.08	24.78	100	25.40
1913	10.16	62	15.11	20.85	85	23.12
1914	17.72	108	15.58	27.58	112	24.65
1915	32.29	197	18.59	41.81	170	27.66
1916	11.17	68	17.28	18.33	74	26.67
1917	14.90	91	17.26	21.91	89	26.10
1918	8.84	54	16.98	15.87	64	25.10
1919	19.43	118	17.33	33.85	137	26.35
1920	15.39	94	13.95	28.72	116	23.74
1921	11.54	70	14.02	22.67	92	24.60
1922	9.45	58	12.93	16.10	65	23.44
1923	21.03	128	15.37	28.76	117	26.02
1924	17.12	104	14.91	22.83	93	23.82
1925	13.08	80	14.44	20.23	82	22.12
1926	10.29	63	14.19	15.46	63	20.68
1927	16.17	98	15.54	27.09	110	22.87
1928	14.96	91	14.32	17.76	72	20.67
1929	8.57	52	12.61	19.13	78	19.93
1930	16.51	100	13.30	27.71	112	21.43
1931	11.03	67	13.45	19.72	80	22.28
1932	18.80	114	13.97	30.95	126	23.05
1933	15.39	94	14.06	24.55	100	24.41
1934	9.22	56	14.19	13.89	56	23.36
1935	18.83	115	14.65	27.18	110	23.26
1936	9.51	58	14.35	13.11	53	21.94
1937	15.46	94	13.68	19.66	80	19.68
1938	21.54	131	14.91	27.65	112	20.30
Mean	16.43			24.66		

FAIRBURY

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	18.63	97		31.31	108	
1901	14.84	77		22.46	77	
1902	39.01	202		44.39	153	
1903	24.11	125		34.89	120	
1904	19.30	100	23.18	29.46	102	32.50
1905	25.95	135	24.64	33.03	114	32.85
1906	15.77	82	24.83	28.15	97	33.98
1907	25.71	133	22.17	33.85	117	31.88
1908	35.71	185	24.49	44.03	152	33.70
1909	22.85	119	25.20	31.47	108	34.11
1910	18.18	94	23.64	31.12	107	33.72
1911	18.36	95	24.16	26.03	90	33.30
1912	14.09	73	21.84	27.64	95	32.06
1913	18.57	96	18.41	27.42	95	28.74
1914	17.45	91	17.33	30.06	104	28.45
1915	23.98	124	18.49	37.02	128	29.63
1916	16.63	86	18.14	27.96	96	30.02
1917	11.78	61	17.68	19.67	68	28.43
1918	17.49	91	17.47	23.62	81	27.67
1919	19.20	100	17.81	36.63	126	28.98
1920	15.60	81	16.14	27.21	94	27.02
1921	14.18	74	15.65	24.29	84	26.28
1922	18.47	96	16.99	27.27	94	27.80
1923	19.76	103	17.44	30.94	107	29.27
1924	15.07	78	16.62	22.38	77	26.42
1925	22.96	119	18.09	31.73	109	27.32
1926	16.53	86	18.56	23.24	80	27.11
1927	24.61	128	19.79	38.20	132	29.30
1928	22.06	114	20.25	27.92	96	28.69
1929	12.22	63	19.68	26.63	92	29.54
1930	15.36	80	18.16	29.67	102	29.13
1931	20.46	106	18.94	30.73	106	30.63
1932	21.02	109	18.22	33.58	116	29.71
1933	14.83	77	16.78	21.75	75	28.47
1934	9.22	48	16.18	12.40	43	25.63
1935	25.47	132	18.20	33.12	114	26.32
1936	11.42	59	16.39	18.87	65	23.94
1937	13.33	69	14.85	21.28	73	21.48
1938	21.42	111	16.17	30.02	103	23.14
Mean	19.27			29.01		

SEWARD

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	25.28	125		38.03	127	
1901	17.99	89		27.20	91	
1902	29.98	148		34.95	117	
1903	29.10	144		41.36	138	
1904	20.87	103	24.64	31.25	104	34.56
1905	21.25	105	23.64	31.30	105	33.21
1906	22.32	111	24.70	40.79	136	35.93
1907	24.24	120	23.56	31.80	106	35.30
1908	38.13	189	25.36	43.37	145	35.70
1909	20.22	100	25.23	26.04	87	34.66
1910	24.45	126	26.07	37.87	126	35.97
1911	17.00	84	25.01	24.86	83	32.79
1912	19.22	95	24.00	31.20	104	32.67
1913	14.37	71	19.25	27.37	91	29.47
1914	22.60	112	19.73	35.59	119	31.38
1915	28.13	139	20.26	40.21	134	31.85
1916	18.91	94	20.55	27.03	90	32.28
1917	16.32	81	20.07	25.86	86	31.21
1918	13.34	66	19.86	19.19	64	29.58
1919	21.79	108	19.70	37.16	124	29.89
1920	15.38	76	17.15	27.34	91	27.32
1921	20.65	102	17.50	31.98	107	28.31
1922	16.07	80	17.45	23.53	79	27.84
1923	25.35	126	19.85	35.49	119	31.10
1924	18.60	92	19.21	22.57	75	28.18
1925	16.75	83	19.48	23.78	79	27.47
1926	19.42	96	19.24	28.14	94	26.70
1927	19.02	94	19.82	32.44	108	28.48
1928	16.89	84	18.14	21.41	72	25.57
1929	13.76	68	17.17	29.12	97	26.98
1930	21.87	108	18.19	33.30	111	28.88
1931	20.55	102	18.42	29.03	97	29.06
1932	18.99	94	18.41	31.56	105	28.88
1933	21.13	105	19.26	28.85	96	30.37
1934	7.97	39	18.10	13.94	47	27.34
1935	24.70	122	18.67	33.09	111	27.29
1936	10.60	53	16.68	19.90	66	25.47
1937	12.71	63	15.42	19.33	65	23.02
1938	20.62	102	16.32	30.61	102	23.37
Mean	20.19			29.94		

PRECIPITATION DATA
SEASONAL, ANNUAL, AND PROGRESSIVE 5-YEAR MEANS
SELECTED STATIONS-NIOBRARA RIVER BASIN
NEBRASKA 1900-1938

HAY SPRINGS

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	11.21	92		18.36	89	
1901	14.93	123		22.71	110	
1902	12.56	103		23.14	112	
1903	19.13	157		26.83	130	
1904	13.16	108	14.20	15.94	77	21.40
1905	17.11	141	15.38	27.71	134	23.27
1906	13.36	110	15.06	21.22	103	22.97
1907	12.50	103	15.05	17.97	87	21.93
1908	14.29	117	14.08	17.99	87	20.17
1909	15.86	130	14.62	26.58	129	22.29
1910	7.98	66	12.80	16.81	81	20.11
1911	8.68	71	11.86	15.36	74	18.94
1912	12.39	102	11.84	19.78	96	19.30
1913	10.01	82	10.98	16.79	81	19.06
1914	7.14	59	9.24	16.00	78	16.95
1915	16.59	136	10.96	25.84	125	18.75
1916	14.46	119	12.12	23.50	114	20.38
1917	11.13	91	11.87	18.98	92	20.22
1918	12.88	106	12.44	22.65	110	21.39
1919	7.12	59	12.44	15.65	76	21.32
1920	14.40	118	12.00	26.53	129	21.46
1921	11.98	98	11.60	18.14	88	20.39
1922	14.18	117	12.11	26.16	127	21.83
1923	16.65	137	12.87	27.09	131	22.71
1924	8.61	71	13.16	18.23	88	23.23
1925	14.55	120	13.19	23.77	115	22.68
1926	13.01	107	13.40	22.74	110	23.60
1927	14.02	115	13.37	27.83	135	23.93
1928	12.10	99	12.46	18.15	88	22.14
1929	13.93	114	13.52	25.07	122	23.51
1930	12.97	107	13.21	23.58	114	23.47
1931	9.07	75	12.42	15.98	77	22.12
1932	9.36	77	11.49	17.77	86	20.11
1933	12.42	102	11.55	21.97	106	20.87
1934	6.57	54	10.08	11.96	58	18.25
1935	12.79	105	10.04	24.39	118	18.41
1936	3.82	31	8.99	9.39	46	17.10
1937	12.72	105	9.66	18.81	91	17.30
1938	8.83	73	8.95	17.19	83	16.35
Mean	12.17			20.63		

VALENTINE

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	15.97	131		22.96	123	
1901	17.68	145		22.86	122	
1902	9.03	74		14.18	76	
1903	13.70	112		18.94	101	
1904	17.43	143	14.76	19.63	105	19.71
1905	19.91	163	15.55	26.27	140	20.38
1906	15.77	129	15.17	24.79	132	20.76
1907	13.04	107	15.97	20.05	107	21.94
1908	12.11	99	15.65	15.72	84	21.29
1909	13.74	112	14.91	22.54	120	21.87
1910	14.05	115	13.74	19.69	105	20.56
1911	8.78	72	12.34	14.25	76	18.45
1912	10.15	83	11.77	19.83	106	18.41
1913	11.79	96	11.70	17.83	95	18.83
1914	12.11	99	11.38	18.26	98	17.97
1915	19.38	158	12.44	28.66	153	19.77
1916	13.29	109	13.34	17.46	93	20.41
1917	10.44	85	13.40	16.23	87	19.69
1918	7.61	62	12.57	12.58	67	18.64
1919	8.29	68	11.80	13.05	70	17.60
1920	16.86	138	11.30	26.84	143	17.23
1921	11.00	90	10.84	16.29	87	17.00
1922	11.12	91	10.98	18.18	97	17.39
1923	15.30	125	12.51	21.70	116	19.21
1924	11.46	94	13.15	17.04	91	20.01
1925	11.09	91	11.99	16.66	89	17.97
1926	10.71	88	11.94	15.52	83	17.82
1927	11.19	91	11.95	20.82	111	18.35
1928	11.61	95	11.21	18.42	98	17.69
1929	16.96	139	12.31	27.10	145	19.70
1930	10.91	89	12.28	22.90	122	20.95
1931	9.85	81	12.10	17.38	93	21.32
1932	10.74	88	12.01	15.87	85	20.33
1933	11.52	94	12.00	18.66	100	20.38
1934	7.29	60	10.06	10.72	57	17.11
1935	9.68	79	9.82	17.86	96	16.10
1936	6.53	53	9.15	11.62	62	14.95
1937	7.59	62	8.52	11.34	61	14.04
1938	11.31	92	8.48	19.04	102	14.12
Mean	12.23			18.71		

AINSWORTH

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	9.75	65		16.00	70	
1901	17.31	116		22.07	99	
1902	14.46	97		19.58	85	
1903	14.78	99		21.50	94	
1904	15.57	104	14.37	18.26	79	19.60
1905	16.26	109	15.68	21.56	94	20.72
1906	14.67	98	15.15	24.49	107	21.08
1907	19.31	129	16.12	28.09	122	22.78
1908	23.58	158	17.88	29.31	128	24.35
1909	20.27	136	18.82	30.18	131	26.73
1910	10.77	72	17.72	20.07	87	26.43
1911	15.21	102	17.83	23.56	103	26.24
1912	15.94	107	17.15	32.48	141	27.12
1913	15.31	102	15.50	24.00	104	26.06
1914	16.08	108	14.66	23.63	103	24.75
1915	28.93	194	18.29	45.01	196	29.74
1916	12.49	84	17.75	20.06	87	29.04
1917	17.85	119	18.13	28.81	125	28.30
1918	11.90	80	17.45	18.28	80	27.16
1919	12.91	86	16.81	21.76	95	26.78
1920	19.91	133	15.01	34.47	150	24.68
1921	15.95	107	15.70	24.42	106	25.55
1922	14.28	96	14.99	21.25	92	24.04
1923	22.69	152	17.15	31.20	136	26.62
1924	14.89	100	17.54	23.43	102	26.95
1925	13.62	91	16.29	19.83	86	24.03
1926	14.53	97	16.00	20.62	90	23.27
1927	9.68	65	15.08	22.30	97	23.48
1928	12.19	82	12.98	14.64	64	20.16
1929	16.88	113	13.38	24.78	108	20.43
1930	10.16	68	12.69	19.85	86	20.44
1931	14.94	100	12.77	25.16	110	21.35
1932	14.36	96	13.71	21.22	92	21.13
1933	11.10	74	13.49	18.34	80	21.87
1934	9.81	66	12.07	13.61	59	19.64
1935	10.97	73	12.24	18.56	81	19.38
1936	7.58	51	10.76	14.14	62	17.17
1937	10.93	73	10.08	14.76	64	15.88
1938	15.14	101	10.89	24.23	105	17.06
Mean	14.95			22.98		

PRECIPITATION DATA
SEASONAL, ANNUAL, AND PROGRESSIVE 5-YEAR MEANS
SELECTED STATIONS-UPPER MISSOURI RIVER BASIN
NEBRASKA 1900-1938

HARTINGTON

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	20.18	112		32.43	119	
1901	21.89	122		30.64	112	
1902	19.52	108		29.63	109	
1903	23.21	129		30.16	110	
1904	19.22	107	20.80	26.55	97	29.88
1905	24.49	136	21.67	34.61	127	30.32
1906	23.56	131	22.00	38.41	141	31.87
1907	19.47	108	21.99	27.42	100	31.43
1908	19.98	111	21.34	26.68	98	30.73
1909	23.10	128	22.12	33.50	123	32.12
1910	14.87	83	20.20	21.24	78	29.45
1911	15.91	88	18.67	21.42	78	26.05
1912	14.94	83	17.76	26.96	99	25.96
1913	17.37	97	17.24	27.99	103	26.22
1914	18.10	101	16.24	23.27	85	24.15
1915	28.72	160	19.01	38.56	141	27.64
1916	19.79	110	19.78	29.86	109	29.33
1917	15.46	86	19.89	26.21	96	29.18
1918	19.68	109	20.35	26.09	96	28.80
1919	15.26	85	19.78	28.69	105	29.88
1920	16.65	92	17.37	32.15	118	28.60
1921	18.23	101	17.05	25.94	95	27.82
1922	13.12	73	16.59	21.55	79	26.88
1923	28.91	161	18.43	38.35	140	29.34
1924	16.98	94	18.78	24.08	88	28.41
1925	11.54	64	17.75	19.77	72	25.94
1926	16.77	93	17.46	20.60	75	24.87
1927	18.36	102	18.51	33.47	123	27.25
1928	14.22	79	15.57	20.74	76	23.73
1929	19.19	107	16.02	31.51	115	25.22
1930	16.22	90	16.95	24.67	90	26.20
1931	8.13	45	15.22	18.78	69	25.83
1932	17.47	97	15.05	27.91	102	24.72
1933	16.17	90	15.44	23.20	85	25.21
1934	14.98	83	14.59	20.41	75	22.99
1935	14.43	80	14.24	24.71	91	23.00
1936	11.61	64	14.93	21.90	80	23.63
1937	13.95	77	14.23	23.50	86	22.74
1938	20.37	113	15.09	31.12	114	24.33
Mean	18.00			27.30		

WALTHILL

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	22.24	124		30.44	114	
1901	17.04	95		25.31	95	
1902	22.80	127		29.77	112	
1903	30.87	173		38.49	145	
1904	18.96	106	22.38	24.45	92	29.69
1905	20.33	114	22.00	30.40	114	29.66
1906	20.07	112	22.61	31.04	117	30.83
1907	18.68	104	21.76	27.00	102	30.28
1908	19.30	108	19.45	26.49	100	27.88
1909	21.04	118	19.86	26.19	98	28.22
1910	15.99	89	19.00	23.92	90	26.93
1911	12.52	70	17.49	19.29	73	24.58
1912	17.90	100	17.35	29.76	112	25.13
1913	14.77	83	16.44	26.72	100	25.18
1914	17.44	97	15.72	24.07	90	24.75
1915	31.03	173	18.73	43.11	162	28.59
1916	15.29	85	19.29	21.74	82	29.08
1917	17.15	96	19.14	29.08	109	28.94
1918	12.35	69	18.65	18.17	68	27.23
1919	19.73	110	19.11	36.13	136	29.65
1920	20.24	113	16.95	33.11	124	27.65
1921	18.61	104	17.62	27.86	105	28.87
1922	13.06	73	16.80	21.12	79	27.28
1923	28.57	160	20.04	40.67	153	31.78
1924	22.97	128	20.69	29.93	113	30.54
1925	14.14	79	19.47	21.17	80	28.15
1926	19.01	106	19.55	24.06	90	27.39
1927	13.90	78	19.72	28.42	107	28.85
1928	14.55	81	16.91	20.46	77	24.81
1929	19.46	109	16.21	31.12	117	25.05
1930	14.24	80	16.23	22.10	83	25.23
1931	15.46	86	15.52	21.11	79	24.64
1932	19.51	109	16.64	32.08	121	25.37
1933	8.81	49	15.50	16.63	63	24.61
1934	12.36	69	14.08	18.50	70	22.08
1935	13.36	75	13.90	21.88	82	22.04
1936	10.15	57	12.84	16.90	64	21.20
1937	16.18	90	12.17	23.65	89	19.51
1938	17.71	99	13.95	25.17	95	21.22
Mean	17.89			26.60		

OMAHA

Year	May - September Total	May - September Percentage of Mean	May - September Progressive 5-year Mean	Annual Total	Annual Percentage of Mean	Annual Progressive 5-year Mean
1900	19.29	116		30.09	118	
1901	17.90	108		27.87	109	
1902	21.86	132		27.50	108	
1903	27.30	165		37.31	146	
1904	18.17	110	20.90	25.76	101	29.69
1905	16.43	99	20.33	25.12	99	28.70
1906	17.52	106	20.26	31.08	122	29.35
1907	18.10	109	19.50	25.02	98	28.86
1908	20.30	123	18.10	27.34	107	26.86
1909	21.87	132	18.84	28.73	113	27.46
1910	12.75	77	18.11	24.50	96	27.33
1911	7.98	48	16.20	15.45	61	24.21
1912	18.07	109	16.19	27.69	109	24.74
1913	13.27	80	14.79	23.67	93	24.01
1914	16.06	97	13.63	26.54	104	23.57
1915	21.86	132	15.45	33.94	133	25.46
1916	12.10	73	16.27	19.65	77	26.30
1917	15.38	93	15.73	24.02	94	25.56
1918	9.81	59	15.04	14.34	56	23.70
1919	14.96	90	14.82	31.64	124	24.72
1920	12.89	78	13.02	24.18	95	22.77
1921	19.16	116	14.44	28.69	113	24.57
1922	12.95	78	13.95	20.14	79	23.80
1923	22.92	138	16.57	33.46	131	27.62
1924	20.11	121	17.60	26.14	103	26.52
1925	13.81	83	17.79	19.72	77	25.63
1926	18.61	112	17.66	25.22	99	24.94
1927	11.06	67	17.28	20.38	80	24.98
1928	19.57	118	16.61	24.16	95	23.12
1929	13.61	82	15.31	28.08	110	23.51
1930	12.26	74	15.00	21.43	84	23.85
1931	18.49	112	14.99	24.40	96	23.69
1932	26.16	158	18.01	43.53	171	28.32
1933	12.36	75	16.57	19.81	78	27.45
1934	7.52	45	15.35	11.99	47	24.23
1935	14.29	86	15.76	22.25	87	24.40
1936	15.14	91	15.09	23.65	93	24.25
1937	14.03	85	12.66	21.00	82	19.74
1938	20.01	121	14.19	29.14	114	21.61
Mean	16.56			25.50		

PRECIPITATION DATA
SEASONAL, ANNUAL, AND PROGRESSIVE 5-YEAR MEANS
SELECTED STATIONS—LOWER MISSOURI RIVER BASIN
NEBRASKA 1900–1938

TECUMSEH

Year	May - September: Total	May - September: Percentage of Mean	May - September: Progressive 5-year Mean	Annual: Total	Annual: Percentage of Mean	Annual: Progressive 5-year Mean
1900	24.82	126		38.21	126	
1901	13.59	69		21.32	70	
1902	34.77	176		40.69	134	
1903	28.14	142		41.88	138	
1904	21.76	110	24.62	32.85	108	34.99
1905	20.73	106	23.80	29.20	96	33.19
1906	22.74	115	25.63	32.74	108	35.47
1907	19.93	101	22.66	26.53	88	32.64
1908	28.97	147	22.83	38.57	127	31.98
1909	20.21	102	22.52	29.51	97	31.31
1910	18.61	94	22.09	32.05	106	31.88
1911	12.35	63	20.01	21.07	70	29.55
1912	11.41	58	18.31	27.70	91	29.78
1913	14.18	72	15.35	25.26	83	27.12
1914	22.40	113	15.79	36.35	120	28.49
1915	33.06	167	18.68	46.75	154	31.43
1916	20.68	105	20.34	28.13	93	32.84
1917	18.80	95	21.82	28.33	93	32.96
1918	16.57	84	22.30	22.00	73	32.33
1919	17.39	88	21.30	33.15	109	31.69
1920	16.41	83	17.97	29.19	96	28.18
1921	18.34	93	17.50	25.92	86	27.74
1922	16.99	86	17.14	26.76	88	27.43
1923	20.02	101	17.83	32.05	106	29.41
1924	14.73	75	17.30	22.68	75	27.32
1925	25.79	131	19.17	37.43	124	28.97
1926	24.79	126	20.46	29.87	99	29.76
1927	17.11	87	20.49	31.70	105	30.75
1928	20.39	103	20.56	28.66	95	30.07
1929	18.69	95	21.35	37.44	124	33.02
1930	17.46	88	19.69	32.42	107	32.02
1931	18.42	93	18.41	28.28	93	31.70
1932	18.59	94	18.71	33.66	111	32.09
1933	15.19	77	17.67	23.21	77	31.00
1934	14.47	73	16.83	18.64	62	27.24
1935	22.52	114	17.64	31.64	104	27.09
1936	15.24	77	17.20	28.84	95	27.20
1937	11.95	61	16.87	21.63	71	24.79
1938	22.01	112	17.24	29.45	97	26.04
Mean	19.75			30.30		

WEEPING WATER

Year	May - September: Total	May - September: Percentage of Mean	May - September: Progressive 5-year Mean	Annual: Total	Annual: Percentage of Mean	Annual: Progressive 5-year Mean
1900	24.85	134		37.72	131	
1901	15.66	84		24.49	85	
1902	29.65	160		37.28	130	
1903	24.10	130		35.32	123	
1904	15.22	82	21.90	26.11	91	32.18
1905	25.94	140	22.11	32.55	113	31.15
1906	16.22	87	22.23	26.93	94	31.64
1907	20.11	108	20.32	29.69	103	30.12
1908	27.86	150	21.07	37.33	130	30.52
1909	21.92	118	22.41	31.14	108	31.53
1910	19.73	106	21.17	35.43	123	32.10
1911	11.97	64	20.32	21.01	73	30.92
1912	15.86	85	19.47	28.33	98	30.65
1913	18.28	98	17.55	29.16	101	29.01
1914	14.27	77	16.02	29.43	102	28.67
1915	31.09	167	18.29	44.54	155	30.49
1916	19.61	106	19.82	27.18	94	31.73
1917	23.67	127	21.38	34.02	118	32.87
1918	11.48	62	20.02	16.68	58	30.37
1919	19.50	105	21.07	37.43	130	31.97
1920	13.03	70	17.46	22.90	80	27.64
1921	22.21	120	17.98	29.75	103	28.16
1922	10.27	55	15.30	18.78	65	25.11
1923	12.72	68	15.55	22.32	78	26.24
1924	15.41	83	14.73	20.75	72	22.90
1925	17.93	97	15.71	26.65	93	23.65
1926	19.14	103	15.09	25.79	90	22.86
1927	12.67	68	15.57	25.98	90	24.30
1928	22.88	123	17.61	28.26	98	25.49
1929	20.99	113	18.72	36.12	126	28.56
1930	14.71	79	18.08	27.80	97	28.79
1931	23.25	125	18.90	32.42	113	30.12
1932	22.36	120	20.84	39.89	139	32.90
1933	16.64	90	19.59	26.09	91	32.46
1934	9.69	52	17.33	14.81	51	28.20
1935	22.99	124	18.99	33.57	117	29.36
1936	11.14	60	16.56	23.61	82	27.59
1937	12.82	69	14.66	21.44	75	23.90
1938	16.81	90	14.69	23.35	81	23.36
Mean	18.58			28.77		

FALLS CITY

Year	May - September: Total	May - September: Percentage of Mean	May - September: Progressive 5-year Mean	Annual: Total	Annual: Percentage of Mean	Annual: Progressive 5-year Mean
1900	22.51	105		37.76	112	
1901	13.80	64		25.95	77	
1902	31.99	149		40.63	121	
1903	30.26	141		43.01	128	
1904	27.40	128	25.19	40.33	120	37.54
1905	20.80	97	24.85	29.32	87	35.85
1906	19.42	91	25.97	33.77	101	37.41
1907	24.79	116	24.53	32.16	96	35.72
1908	28.30	132	24.14	38.98	116	34.91
1909	23.11	108	23.28	31.00	92	33.05
1910	18.74	88	22.87	32.78	98	33.74
1911	16.24	76	22.24	26.59	79	32.30
1912	16.46	77	20.57	32.62	97	32.39
1913	12.16	57	17.34	25.07	75	29.61
1914	22.11	103	17.14	41.02	122	31.62
1915	35.19	164	20.43	49.51	147	34.96
1916	26.31	123	22.45	35.63	106	36.77
1917	18.25	85	22.80	29.70	88	36.19
1918	16.17	76	23.61	22.41	67	35.65
1919	24.08	112	24.00	43.49	130	36.15
1920	16.41	77	20.24	29.19	87	32.08
1921	20.49	96	19.08	30.52	91	31.06
1922	16.12	75	18.65	26.66	79	30.46
1923	20.58	96	19.54	32.72	97	32.52
1924	15.42	72	17.80	23.11	69	28.44
1925	25.05	117	19.53	36.82	107	29.77
1926	22.67	106	19.97	31.61	94	29.99
1927	22.75	106	21.29	41.75	124	33.00
1928	29.47	138	23.07	41.04	122	34.67
1929	22.88	107	24.56	41.55	124	38.35
1930	18.21	85	23.20	33.26	99	37.84
1931	19.95	93	22.65	30.00	89	37.52
1932	25.52	119	23.21	46.36	138	38.45
1933	15.58	73	20.43	24.43	73	35.12
1934	17.61	82	19.37	23.27	69	31.47
1935	27.68	129	21.27	39.84	119	32.78
1936	15.91	74	20.46	29.93	89	32.77
1937	12.36	58	17.83	22.59	67	28.01
1938	22.24	104	19.16	33.63	100	29.85
Mean	21.41			33.57		

PRECIPITATION DATA
SEASONAL, ANNUAL, AND PROGRESSIVE 5-YEAR MEANS
WHITE RIVER-HAT CREEK BASINS
NEBRASKA 1900–1938

FORT ROBINSON

Year	May - September: Total	May - September: Percentage of Mean	May - September: Progressive 5-year Mean	Annual: Total	Annual: Percentage of Mean	Annual: Progressive 5-year Mean
1900	11.40	108		19.72	114	
1901	11.60	110		19.31	112	
1902	11.31	107		19.01	110	
1903	11.40	108		19.11	110	
1904	10.99	104	11.34	14.47	84	18.32
1905	13.09	124	11.68	18.35	106	18.05
1906	14.58	138	12.27	21.64	125	18.52
1907	11.99	113	12.41	20.75	120	18.86
1908	12.44	118	12.62	15.41	89	18.12
1909	12.47	118	12.91	17.50	101	18.75
1910	7.90	75	11.88	13.73	79	17.81
1911	6.96	66	10.35	13.19	76	16.12
1912	10.89	103	10.13	18.58	107	15.68
1913	10.66	101	9.78	14.87	86	15.57
1914	5.59	53	8.40	14.89	86	15.05
1915	20.38	193	10.90	29.07	168	18.12
1916	6.05	57	10.71	11.08	64	17.70
1917	6.17	58	9.77	13.95	81	16.77
1918	12.14	115	10.07	16.28	94	17.05
1919	5.13	48	9.97	12.30	71	16.54
1920	9.48	90	7.78	21.20	123	14.98
1921	11.85	112	8.95	16.86	97	16.13
1922	12.59	119	10.24	19.68	114	17.28
1923	18.03	170	11.42	23.74	137	18.77
1924	9.93	94	12.30	15.71	91	19.45
1925	10.73	101	12.63	17.18	99	18.65
1926	7.58	72	11.77	13.72	79	18.02
1927	15.94	151	12.44	25.50	147	19.19
1928	5.90	56	10.02	10.58	61	16.55
1929	15.20	144	11.07	20.38	118	17.49
1930	10.39	98	11.00	18.45	107	17.74
1931	6.57	62	10.80	12.65	73	17.53
1932	8.04	76	9.22	16.15	93	15.66
1933	10.27	97	10.09	20.55	119	17.65
1934	4.95	47	8.04	10.43	60	15.66
1935	11.78	111	8.32	22.81	132	16.53
1936	9.17	87	8.84	13.36	77	16.67
1937	9.33	88	9.10	13.46	78	16.15
1938	11.67	110	9.38	19.12	111	15.85
Mean	10.58			17.30		

PRECIPITATION DATA
MONTHLY MEANS, PERCENTAGE OF ANNUAL MEANS, MAXIMA, AND MINIMA
1900 - 1938
SELECTED STATIONS

PLATTE RIVER BASIN
West of 100th Meridian

Station	County	OCTOBER				NOVEMBER				DECEMBER				JANUARY				FEBRUARY				MARCH			
		Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.
Kimball	Kimball	.94	5	3.42	.10	.44	3	2.17	.05	.59	4	2.53	.15	.31	2	1.40	.05	.62	4	1.70	.10	1.01	6	2.65	.10
Scottsbluff	Scotts Bluff	1.08	7	2.79	.04	.46	3	2.66	.01	.57	4	2.22	.05	.32	2	1.17	.03	.53	3	1.78	.04	.87	5	2.99	.01
North Platte	Lincoln	1.08	6	4.15	.01	.54	3	2.83	.01	.54	3	3.09	.01	.32	2	.90	.03	.54	3	1.61	.02	.86	5	3.08	.10

Station	County	APRIL				MAY				JUNE				JULY				AUGUST				SEPTEMBER			
		Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.
Kimball	Kimball	2.25	14	7.62	.37	2.58	15	6.42	.49	2.40	14	6.96	.23	2.14	13	4.69	.18	1.94	12	6.70	.27	1.35	8	4.87	.22
Scottsbluff	Scotts Bluff	2.14	13	4.41	.19	2.83	17	7.70	.67	2.45	15	4.56	.32	1.85	11	5.33	.11	1.53	10	5.66	.08	1.65	10	4.12	.09
North Platte	Lincoln	2.11	11	7.10	.04	2.87	16	7.98	.47	2.96	16	7.63	.57	2.63	14	6.79	.34	2.34	13	6.17	.11	1.56	8	5.41	.17

PLATTE RIVER BASIN
East of 100th Meridian

Station	County	OCTOBER				NOVEMBER				DECEMBER				JANUARY				FEBRUARY				MARCH			
		Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.
Kearney	Buffalo	1.58	7	4.46	.05	.85	4	4.00	.03	.68	3	4.62	.02	.39	1	1.78	.01	.65	3	2.25	.01	.99	4	2.90	.05
Schuyler	Colfax	1.67	6	4.37	.04	1.15	4	4.39	.02	.81	3	2.95	.03	.60	2	2.96	.05	.95	4	3.66	.05	1.16	4	3.79	.02
Ashland	Saunders	1.77	7	4.49	.14	1.31	5	7.66	.01	.81	3	3.06	.06	.63	2	2.93	.05	.82	3	2.45	.02	.93	4	2.21	.09

Station	County	APRIL				MAY				JUNE				JULY				AUGUST				SEPTEMBER			
		Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.
Kearney	Buffalo	2.50	11	6.78	.24	3.64	16	10.00	.54	3.63	16	8.44	.58	3.12	13	8.66	.59	2.92	12	7.19	.33	2.35	10	6.32	.27
Schuyler	Colfax	2.52	10	6.01	.10	3.79	14	11.47	.31	4.24	16	9.04	.65	3.20	12	9.47	.19	3.59	14	8.99	.66	3.16	12	7.05	.46
Ashland	Saunders	2.08	8	5.17	.11	3.47	13	10.67	.38	4.17	16	11.66	.54	3.69	14	13.86	.05	3.35	12	7.29	.25	3.44	13	8.84	.31

LOUP RIVER BASIN

Station	County	OCTOBER				NOVEMBER				DECEMBER				JANUARY				FEBRUARY				MARCH			
		Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.
Purdum	Blaine	1.34	6	6.13	.07	.68	3	4.16	.02	.81	4	2.21	.01	.54	2	1.55	.02	.75	3	2.22	.10	1.36	6	5.20	.09
Ericson	Wheeler	1.38	7	4.70	.02	.71	3	3.56	.05	.69	3	3.66	.05	.45	2	2.00	.06	.62	3	1.85	.05	.80	4	3.21	.08
St. Paul	Howard	1.58	7	4.50	.02	.84	4	3.20	.02	.60	2	4.19	.01	.39	1	1.44	.02	.67	3	2.80	.01	.90	4	3.78	.03

Station	County	APRIL				MAY				JUNE				JULY				AUGUST				SEPTEMBER			
		Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.
Purdum	Blaine	2.57	12	6.60	.18	3.44	16	6.44	.53	3.18	14	6.70	.67	2.96	13	6.76	.09	2.99	13	6.98	.47	1.76	8	6.46	.23
Ericson	Wheeler	2.27	11	7.11	.05	3.27	15	7.90	.83	3.15	15	9.32	.73	2.66	13	6.35	.15	2.49	12	7.06	.20	2.19	11	6.53	.06
St. Paul	Howard	2.27	9	6.17	.02	3.73	16	8.09	.31	4.13	17	10.30	1.16	3.66	15	9.00	.14	2.92	12	10.04	.87	2.38	10	5.92	.62

REPUBLICAN RIVER BASIN

Station	County	OCTOBER				NOVEMBER				DECEMBER				JANUARY				FEBRUARY				MARCH			
		Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.
Imperial	Chase	1.36	6	4.22	.11	.69	3	3.34	.10	.75	3	3.85	.01	.39	2	1.37	.04	.67	3	2.75	.02	1.15	5	3.82	.13
Beaver City	Furnas	1.36	6	3.83	.02	.90	4	2.71	.02	.63	3	4.75	.01	.30	1	.88	.01	.61	3	1.85	.02	.96	5	2.55	.02
Red Cloud	Webster	1.43	6	4.93	.07	.90	4	3.28	.03	.63	3	4.11	.01	.46	2	1.78	.01	.81	4	4.03	.07	1.03	5	3.26	.02

Station	County	APRIL				MAY				JUNE				JULY				AUGUST				SEPTEMBER			
		Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.
Imperial	Chase	2.36	11	5.97	.14	3.34	16	9.21	.57	3.55	17	13.73	.52	2.90	13	6.38	.36	2.74	13	9.59	.17	1.62	8	4.57	.02
Beaver City	Furnas	2.25	10	6.79	.16	3.34	16	11.05	.70	3.13	15	8.09	.65	3.22	15	13.90	.22	2.87	13	9.97	.10	1.97	9	3.92	.14
Red Cloud	Webster	2.38	10	5.71	.19	3.37	14	10.85	.68	3.60	15	13.12	.26	3.16	14	13.52	.33	2.74	12	6.92	.13	2.60	11	8.41	.28

ELKHORN RIVER BASIN

Station	County	OCTOBER				NOVEMBER				DECEMBER				JANUARY				FEBRUARY				MARCH			
		Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.
Newport	Rock	1.50	6	6.95	.01	.60	2	2.15	.04	.64	3	2.70	.04	.54	2	1.34	.06	.68	3	2.28	.08	1.10	4	2.60	.15
Oakdale	Antelope	1.61	6	5.26	.01	.83	3	2.90	.02	.72	3	2.25	.01	.53	2	1.72	.04	.81	3	3.03	.09	1.18	5	3.76	.17
West Point	Cuming	1.95	6	7.94	.24	1.28	4	4.97	.10	.91	3	2.70	.07	.73	2	3.50	.05	.88	3	3.62	.06	1.26	4	3.48	.10

Station	County	APRIL				MAY				JUNE				JULY				AUGUST				SEPTEMBER			
		Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.
Newport	Rock	3.37	14	6.05	.11	3.64	15	7.65	.93	3.70	16	11.20	.70	3.31	14	11.97	.25	2.85	12	8.74	.24	2.05	9	6.68	.30
Oakdale	Antelope	2.38	10	8.04	.10	3.70	15	9.58	.41	3.84	16	10.20	.64	3.28	13	8.12	.13	2.97	12	7.80	.70	2.93	12	9.28	.68
West Point	Cuming	2.81	9	7.31	.12	4.04	14	10.08	.85	4.79	16	11.40	.73	3.95	13	12.81	.17	4.14	14	13.31	1.22	3.67	12	7.56	.18

BLUE RIVER BASIN

Station	County	OCTOBER				NOVEMBER				DECEMBER				JANUARY				FEBRUARY				MARCH			
		Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.
Hastings	Adams	1.61	6	4.11	.18	1.11	5	3.89	.03	.72	3	4.93	.01	.50	2	1.76	.06	.84	3	2.60	.05	1.00	4	3.02	.10
Fairbury	Jefferson	1.95	7	5.09	.16	1.28	4	6.73	.02	.84	3	4.20	.04	.65	2	2.19	.05	1.14	4	3.05	.02	1.23	4	2.76	.09
Seward	Seward	2.12	7	8.16	.13	1.30	4	5.67	.02	.88	3	4.11	.10	.61	2	1.98	.02	1.06	4	4.11	.02	1.23	4	3.64	.04

Station	County	APRIL				MAY				JUNE				JULY				AUGUST				SEPTEMBER			
Hastings	Adams	2.53	10	5.77	.06	3.56	15	10.92	.47	3.81	16	11.71	.38	3.22	13	10.62	.60	3.04	12	9.86	.37	2.81	11	8.35	.40
Fairbury	Jefferson	2.65	9	5.83	.14	4.51	16	13.27	.99	4.39	16	16.72	.68	3.52	12	9.33	.09	3.68	13	13.13	.80	3.19	11	6.41	.58
Seward	Seward	2.55	9	5.91	.32	4.30	14	13.60	.21	4.04	13	13.74	.70	4.06	14	9.65	.25	4.02	13	10.65	.49	3.76	13	8.70	.79

NIOBRARA RIVER BASIN

Station	County	OCTOBER				NOVEMBER				DECEMBER				JANUARY				FEBRUARY				MARCH			
		Mean	% An. Mean	Max.	Min.	Mean	% An. Mean	Max.	Min.	Mean	% An. Mean	Max.	Min.	Mean	% An. Mean	Max.	Min.	Mean	% An. Mean	Max.	Min.	Mean	% An. Mean	Max.	Min.
Ainsworth	Brown	1.43	6	6.78	.01	.65	3	2.93	.02	.87	4	3.14	.04	.59	3	1.68	.04	.78	3	3.21	.04	1.38	6	3.87	.10
Valentine	Cherry	1.19	7	4.81	.02	.55	4	2.74	.01	.59	3	1.56	.03	.49	4	1.61	.04	.46	2	1.35	.04	1.15	6	2.87	.16
Hay Springs	Sheridan	1.43	7	3.71	.10	.73	4	4.05	.10	.76	4	2.42	.05	.67	3	2.32	.10	.76	4	2.10	.03	1.44	7	3.76	.12

Station	County	APRIL				MAY				JUNE				JULY				AUGUST				SEPTEMBER			
Ainsworth	Brown	2.34	10	5.68	.15	3.76	16	9.24	.62	3.50	15	8.36	.25	2.85	13	9.26	.28	2.78	12	6.29	.61	2.06	9	5.13	.08
Valentine	Cherry	2.05	11	4.70	.12	2.85	15	8.18	.56	2.78	15	8.18	.32	2.82	15	7.97	.04	2.42	13	5.02	.42	1.37	7	4.06	.11
Hay Springs	Sheridan	2.68	13	6.48	.20	3.16	15	6.25	.46	2.96	14	5.96	.49	2.77	13	8.92	.23	1.88	9	5.09	.28	1.40	7	3.82	.23

UPPER MISSOURI RIVER BASIN

Station	County	OCTOBER				NOVEMBER				DECEMBER				JANUARY				FEBRUARY				MARCH			
		Mean	% An. Mean	Max.	Min.	Mean	% An. Mean	Max.	Min.	Mean	% An. Mean	Max.	Min.	Mean	% An. Mean	Max.	Min.	Mean	% An. Mean	Max.	Min.	Mean	% An. Mean	Max.	Min.
Walthill	Thurston	1.71	6	4.43	.08	1.15	4	4.41	.01	.83	3	2.35	.05	.62	2	2.91	.06	.88	3	4.80	.10	1.16	4	3.71	.08
Hartington	Cedar	1.68	6	5.18	.04	1.07	4	3.93	.03	.81	3	2.35	.10	.75	3	2.90	.07	1.12	4	3.70	.05	1.33	5	3.64	.05
Omaha	Douglas	1.90	6	5.43	.23	1.29	5	6.24	.03	.88	3	3.33	.07	.77	3	2.80	.01	.91	3	2.62	.03	1.22	5	3.95	.11

Station	County	APRIL				MAY				JUNE				JULY				AUGUST				SEPTEMBER			
Walthill	Thurston	2.38	9	7.70	.19	3.79	15	10.90	.97	4.22	16	9.39	1.05	3.22	12	8.88	.14	3.27	13	7.87	.57	3.38	13	7.97	.60
Hartington	Cedar	2.54	9	7.25	.18	4.13	15	9.05	.81	4.01	15	6.93	1.65	3.20	12	10.24	.09	3.39	12	10.75	.89	3.27	12	10.97	.72
Omaha	Douglas	1.99	8	5.19	.23	3.01	12	8.32	.55	3.91	15	9.08	.25	3.13	12	7.75	.45	3.10	12	12.50	.18	3.43	14	9.32	.26

LOWER MISSOURI RIVER BASIN

Station	County	OCTOBER				NOVEMBER				DECEMBER				JANUARY				FEBRUARY				MARCH			
		Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.
Tecumseh	Johnson	2.31	8	6.86	.12	1.55	5	7.83	.01	.95	3	3.75	.04	.72	2	2.27	.02	1.07	3	3.60	.05	1.34	4	3.14	.05
Weeping Water	Cass	1.99	7	5.49	.28	1.57	6	9.20	.10	.99	3	3.96	.05	.86	3	2.65	.10	1.09	4	3.00	.04	1.33	5	3.71	.10
Falls City	Richardson	2.66	8	6.97	.89	1.89	6	9.49	.08	.99	2	4.24	.05	.85	2	4.63	.02	1.16	4	4.60	.05	1.57	5	4.12	.06

Station	County	APRIL				MAY				JUNE				JULY				AUGUST				SEPTEMBER			
Tecumseh	Johnson	2.61	9	6.47	.07	4.10	14	12.82	.60	4.55	15	12.44	.46	3.57	12	9.95	.10	3.40	11	8.93	.22	4.13	14	11.05	.43
Weeping Water	Cass	2.31	8	5.71	.10	3.48	12	9.17	.55	4.32	15	12.24	.39	3.30	11	10.26	.26	3.79	13	10.00	.42	3.70	13	9.10	.63
Falls City	Richardson	3.04	9	9.05	.08	4.46	13	12.36	1.07	4.21	12	8.43	1.06	4.16	12	12.51	.31	3.89	12	8.73	.47	4.70	14	13.77	.46

WHITE RIVER - HAT CREEK BASINS

Station	County	OCTOBER				NOVEMBER				DECEMBER				JANUARY				FEBRUARY				MARCH			
		Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.	Mean	% Ann. Mean	Max.	Min.
Fort Robinson	Dawes	1.32	8	2.79	.09	.47	3	3.13	.02	.64	4	2.65	.06	.47	3	1.65	.04	.63	4	1.75	.01	.98	6	2.80	.10

Station	County	APRIL				MAY				JUNE				JULY				AUGUST				SEPTEMBER			
Fort Robinson	Dawes	2.21	13	6.60	.46	2.78	16	5.75	.16	2.51	14	6.15	.50	2.10	12	5.25	.11	1.65	9	5.52	.29	1.54	8	5.14	.10

POPULATION OF NEBRASKA
By Counties
1860 - 1940

County	1860	1870	1880	1890	1900	1910	1920	1930	1940
Adams	-	19	10,235	24,303	18,840	20,900	22,621	26,275	24,556
Antelope	-	-	3,953	10,399	11,344	14,003	15,243	15,206	13,273
Arthur	-	-	-	-	-	-	1,412	1,344	1,045
Banner	-	-	-	2,435	1,114	1,444	1,435	1,676	1,403
Blackbird	-	31	109	-	-	-	-	-	-
Blaine	-	-	-	1,146	603	1,672	1,778	1,584	1,538
Boone	-	-	4,170	8,683	11,689	13,145	14,146	14,738	12,015
Box Butte	-	-	-	5,494	5,572	6,131	8,407	11,861	10,657
Boyd	-	-	-	695	7,332	8,826	8,243	7,169	6,045
Brown	-	-	-	4,359	3,470	6,083	6,749	5,772	5,953
Buffalo	114	193	7,531	22,162	20,254	21,907	23,787	24,338	23,290
Burt	338	2,847	6,937	11,069	13,040	12,726	12,559	13,062	12,545
Butler	27	1,290	9,194	15,454	15,703	15,403	14,606	14,410	13,081
Calhoun	41	-	-	-	-	-	-	-	-
Cass	3,369	8,151	16,683	24,080	21,330	19,786	18,029	17,684	16,967
Cedar	246	1,032	3,899	7,028	12,467	15,191	16,225	16,427	15,123
Chase	-	-	70	4,807	2,559	3,613	4,939	5,484	5,201
Cherry	-	-	-	6,428	6,541	10,414	11,753	10,898	9,627
Cheyenne	-	190	1,558	5,693	5,570	4,551	8,405	10,187	9,464
Clay	165	54	11,294	16,310	15,735	15,729	14,486	13,571	10,417
Colfax	-	1,424	6,588	10,453	11,211	11,610	11,624	11,434	10,625
Cuming	67	2,964	5,569	12,265	14,584	13,782	13,769	14,327	13,560
Custer	-	-	2,211	21,677	19,758	25,668	26,407	26,189	22,397
Dakota	819	2,040	3,213	5,386	6,286	6,564	7,694	9,505	9,827
Dawes	-	-	-	9,722	6,215	8,254	10,160	11,493	10,108
Dawson	16	103	2,909	10,129	12,214	15,961	16,004	17,875	17,887
Deuel	-	-	-	2,893	2,630	1,786	3,282	3,992	3,576
Dixon	247	1,345	4,177	8,084	10,535	11,477	11,815	11,586	10,407
Dodge	309	4,212	11,263	19,260	22,298	22,145	23,197	25,273	23,793
Douglas	4,328	19,982	37,645	158,008	140,590	168,546	204,524	232,982	246,923
Dundy	-	-	37	4,012	2,432	4,098	4,869	5,610	5,110
Fillmore	-	238	10,204	16,022	15,087	14,674	13,671	12,971	11,396
Franklin	-	26	5,465	7,693	9,455	10,303	10,067	9,094	7,725
Frontier	-	-	934	8,497	8,781	8,572	8,540	8,114	6,413
Furnas	-	-	6,407	9,840	12,373	12,083	11,657	12,140	10,080
Gage	421	3,359	13,164	36,344	30,051	30,325	29,721	30,242	29,493
Garden	-	-	-	-	-	3,538	4,572	5,099	4,679
Garfield	-	-	-	1,659	2,127	3,417	3,496	3,207	3,444
Gosper	-	-	1,673	4,816	5,301	4,933	4,669	4,287	3,684
Grant	-	484	-	458	763	1,097	1,486	1,427	1,327
Greeley	-	-	1,461	4,869	5,691	8,047	8,685	8,442	6,765
Green	16	-	-	-	-	-	-	-	-
Hall	116	1,057	8,572	16,513	17,206	20,361	23,720	27,117	27,442
Hamilton	-	130	8,267	14,096	13,330	13,459	13,237	12,159	9,962
Harlan	-	-	6,086	8,158	9,370	9,578	9,220	8,957	7,130
Hayes	-	-	119	3,953	2,708	3,011	3,327	3,603	2,957
Hitchcock	-	-	1,012	5,799	4,409	5,415	6,045	7,269	6,390
Holt	-	-	3,287	13,672	12,224	15,545	17,151	16,509	16,525
Hooker	-	-	-	426	432	981	1,378	1,180	1,253
Howard	-	-	4,391	9,430	10,343	10,783	10,739	10,020	8,414
Jackson	-	9	-	-	-	-	-	-	-
Jefferson	-	2,440	8,096	14,850	15,196	16,852	16,140	16,409	15,547
Johnson	528	3,429	7,595	10,333	11,197	10,187	8,940	9,157	8,651
Jones	122	-	-	-	-	-	-	-	-
Kearney	474	58	4,072	9,061	9,866	9,106	8,583	8,094	6,840
Keith	-	-	194	2,556	1,951	3,692	5,294	6,721	8,332
Keya Paha	-	-	-	3,920	3,076	3,452	3,594	3,203	3,232
Kimball	-	-	-	959	758	1,942	4,498	4,675	3,911
Knox	-	-	3,666	8,582	14,343	18,358	18,894	19,110	16,473
Lancaster	153	7,074	28,090	76,395	64,835	73,793	85,902	100,324	100,437
L'Eau Qui Court	152	261	-	-	-	-	-	-	-
Lincoln	-	17	3,632	10,441	11,416	15,684	23,420	25,627	25,388
Logan	-	-	-	1,378	960	1,521	1,596	2,014	1,739
Loup	-	-	-	1,662	1,305	2,188	1,946	1,818	1,776
Madison	-	1,138	5,589	13,669	-	19.101	22,511	26,037	24,237

(Continued)

POPULATION OF NEBRASKA (Concluded)
By Counties
1860 - 1940

County	1860	1870	1880	1890	1900	1910	1920	1930	1940
McPherson	-	-	-	401	517	2,470	1,692	1,358	1,175
Merrick	109	557	5,341	8,758	9,255	10,379	10,763	10,619	9,315
Monroe	-	235	-	-	-	-	-	-	-
Morrill	-	-	-	-	-	4,584	9,151	9,950	9,425
Nance	-	-	1,212	5,773	8,222	8,926	8,712	8,718	7,651
Nemaha	3,139	7,593	10,451	12,930	14,952	13,095	12,547	12,356	12,779
Nuckolls	22	8	4,235	11,417	12,414	13,019	13,236	12,629	10,397
Otoe	4,211	12,345	15,727	25,403	22,288	19,323	19,494	19,901	18,969
Pawnee	882	4,171	6,920	10,340	11,770	10,582	9,578	9,423	8,498
Perkins	-	-	-	4,364	1,702	2,570	3,967	5,834	5,225
Phelps	-	-	2,447	9,869	10,772	10,451	9,900	9,261	8,448
Pierce	-	152	1,202	4,864	8,445	10,122	10,681	11,080	10,205
Platte	782	1,899	9,511	15,437	17,747	19,006	19,464	21,181	20,186
Polk	19	136	6,846	10,817	10,542	10,521	10,714	10,092	8,722
Red Willow	-	-	3,044	8,837	9,604	11,056	11,434	13,859	11,936
Richardson	2,835	9,780	15,031	17,574	19,614	17,448	18,968	19,826	19,136
Rock	-	-	-	3,083	2,809	3,627	3,703	3,366	3,966
Saline	39	3,106	14,491	20,097	18,252	17,866	16,514	16,356	14,994
Sarpy	1,201	2,913	4,481	6,875	9,080	9,274	9,370	10,402	10,829
Saunders	-	4,547	15,810	12,577	22,085	21,179	20,589	20,167	17,883
Scotts Bluff	-	-	-	1,888	2,552	8,355	20,710	28,644	33,875
Seward	-	2,953	11,147	16,140	15,690	15,895	15,867	15,938	14,159
Sheridan	-	-	-	8,687	6,033	7,328	9,625	10,793	9,858
Sherman	-	-	2,061	6,399	6,550	8,278	8,877	9,122	7,753
Shorter	117	-	-	-	-	-	-	-	-
Sioux	-	-	699	2,452	2,055	5,599	4,528	4,667	4,257
Stanton	-	636	1,813	4,619	6,959	7,542	7,756	7,809	6,885
Taylor	-	97	-	-	-	-	-	-	-
Thayer	-	-	6,113	12,738	14,325	14,775	13,976	13,684	12,253
Thomas	-	-	-	517	628	1,191	1,773	1,510	1,549
Thurston	-	-	-	3,176	6,517	8,704	9,539	10,462	10,253
Valley	-	-	2,324	7,092	7,339	9,480	9,823	9,523	8,153
Washington	1,249	4,452	863	11,869	13,086	12,738	12,180	12,095	11,727
Wayne	-	182	813	6,169	9,862	10,397	9,725	10,566	9,869
Webster	-	16	7,104	11,210	11,619	12,008	10,922	10,210	8,063
Wheeler	-	-	644	1,683	1,362	2,292	2,531	2,335	2,168
York	-	634	11,170	17,279	18,205	18,721	17,146	17,239	14,850
Nebraska	28.841	122,993	452,402	1,058,910	1,066,300	1,192,214	1,296,372	1,377,963	1,313,468

Compiled from U. S. Census Records.

POPULATION OF NEBRASKA BY RIVER BASINS

	Area		Total		Rural-Farm			
Basin	Sq. Miles	% of State Total	Number	Per Sq. Mile	Number	Per Sq. Mile	Rural Non-Farm	Urban
Platte River	19,991	26	363,280	18.2	146,754	7.3	57,640	158,886
Loup River	15,744	20	119,676	7.6	75,547	4.8	34,516	9,613
Republican River	9,464	12	105,165	11.1	60,262	6.4	31,908	12,995
Elkhorn River	7,025	9	140,195	20.0	81,641	11.6	47,837	10,717
Blue River	7,230	9	202,318	28.0	102,252	14.1	51,378	48,688
Niobrara River	9,795	13	42,368	4.3	26,815	2.7	15,553	0
Upper Minor Missouri River	3,324	4	306,121	92.1	57,266	17.2	28,131	220,724
Lower Minor Missouri River	2,783	4	85,563	30.7	44,404	16.0	21,281	19,878
White River	1,662	2	12,526	7.5	5,718	3.4	2,202	4,606
Hat Creek	502	1	751	1.5	689	1.4	62	0
Totals	77,520	100	1,377,963	17.8	601,348	7.8	290,508	486,107

Source: 1930 Census

Revised Population Statistics 6/15/39

POPULATION OF NEBRASKA
1950 Census

County	Total	Rural Farm	Rural Non Farm	Urban	Area Sq. Miles	Total Population Per Sq.Mi.	Rural Farm Population Per Sq.Mi.
Adams	26,275	8,793	1,992	15,490	570	46.1	15.[illegible]
Antelope	15,206	9,992	5,214	-	881	17.3	[illegible].3
Arthur	1,344	1,143	201	-	727	1.8	1.6
Banner	1,676	1,589	87	-	749	2.2	2.1
Blaine	1,584	1,299	285	-	718	2.2	1.8
Boone	14,738	9,454	5,284	-	698	21.1	13.5
Box Butte	11,861	3,990	1,202	6,669	1,086	10.9	3.7
Boyd	7,169	4,809	2,360	-	540	13.3	8.9
Brown	5,772	3,201	2,571	-	1,246	4.6	2.6
Buffalo	24,338	10,500	5,263	8,575	954	25.5	11.0
Burt	13,062	7,705	5,357	-	480	27.2	16.1
Butler	14,410	8,751	5,659	-	588	24.5	14.9
Cass	17,684	8,657	5,234	3,793	543	32.[illegible]	15.9
Cedar	16,427	11,091	5,336	-	742	22.1	14.9
Chase	5,484	3,398	2,086	-	907	6.0	3.7
Cherry	10,898	3,941	3,957	-	6,037	1.8	1.1
Cheyenne	10,187	5,105	1,776	3,306	1,205	8.5	4.2
Clay	13,571	7,155	6,416	-	584	23.2	12.3
Colfax	11,434	5,972	2,874	2,588	409	28.0	14.6
Cuming	14,327	9,544	4,783	-	582	24.6	16.4
Custer	26,189	17,666	5,808	2,715	2,612	10.0	6.8
Dakota	9,505	4,018	1,560	3,927	255	37.3	15.8
Dawes	11,493	4,544	2,343	4,606	1,415	8.1	3.2
Dawson	17,875	9,161	5,752	2,962	994	18.0	9.2
Deuel	3,992	2,336	1,656	-	443	9.0	5.3
Dixon	11,586	7,246	4,340	-	476	24.3	15.2
Dodge	25,273	8,381	5,485	11,407	536	47.2	15.6
Douglas	232,982	10,216	8,760	214,006	333	699.6	30.7
Dundy	5,610	3,516	2,094	-	936	6.0	3.8
Fillmore	12,971	7,933	5,038	-	581	22.3	13.7
Franklin	9,094	5,584	3,510	-	583	15.6	9.6
Frontier	8,114	5,726	2,388	-	984	8.2	5.8
Furnas	12,140	6,443	5,697	-	728	16.7	8.9
Gage	30,242	13,440	3,825	12,977	870	34.8	15.4
Garden	5,099	3,582	1,517	-	1,704	3.0	2.1
Garfield	3,207	2,037	1,170	-	580	5.5	3.5
Gosper	4,237	3,613	674	-	468	9.2	7.7
Grant	1,427	743	684	-	787	1.8	0.9
Greeley	8,442	5,614	2,828	-	576	14.7	9.7
Hall	27,117	6,516	2,560	18,041	532	51.0	12.2
Hamilton	12,159	7,795	1,649	2,715	543	22.4	14.4
Harlan	8,957	5,324	3,633	-	579	15.5	9.2
Hayes	3,603	3,167	436	-	729	4.9	4.3
Hitchcock	7,269	4,153	3,116	-	731	9.9	5.7
Holt	16,509	10,609	5,900	-	2,416	6.8	4.4
Hooker	1,180	616	564	-	729	1.6	0.8
Howard	10,020	6,774	3,246	-	566	17.7	12.0
Jefferson	16,409	7,792	2,425	6,192	584	28.1	13.3
Johnson	9,157	5,485	3,672	-	377	24.3	14.5
Kearney	8,094	5,214	2,880	-	521	15.5	10.0
Keith	6,721	3,654	3,067	-	1,07[illegible]	6.2	3.4
Keya Paha	3,203	2,405	798	-	782	4.1	3.1
Kimball	4,675	2,344	2,331	-	967	4.8	2.4
Knox	19,110	12,779	6,331	-	1,124	17.0	11.4
Lancaster	100,324	17,203	3,529	79,592	861	116.5	20.0
Lincoln	25,627	10,840	2,726	12,061	2,560	10.0	4.2
Logan	2,014	1,330	684	-	578	3.5	2.3
Loup	1,818	1,506	312	-	581	3.1	2.6
McPherson	1,358	998	360	-	872	1.6	1.1
Madison	26,037	10,341	4,979	10,717	581	44.6	17.8
Merrick	10,619	6,157	4,462	-	468	22.7	13.2
Morrill	9,950	6,357	3,593	-	1,430	7.0	4.4
Nance	8,718	5,563	3,155	-	450	19.4	12.4
Nemaha	12,356	6,781	2,507	3,068	393	31.4	17.3
Nuckolls	12,629	6,725	2,86[illegible]	3,044	586	21.6	11.5
Otoe	19,901	9,688	2,98[illegible]	7,[illegible]30	612	32.5	15.8
Pawnee	9,423	6,055	3,368	-	435	21.7	13.9
Perkins	5,834	3,860	1,974	-	894	6.5	4.3
Phelps	9,261	4,805	1,193	3,263	543	17.1	8.8
Pierce	11,080	7,439	3,641	-	582	19.0	12.8
Platte	21,181	11,381	2,902	6,898	679	31.2	16.8
Polk	10,092	6,556	3,536	-	434	23.3	15.1
Red Willow	13,859	5,158	2,013	6,688	727	19.1	7.1
Richardson	19,826	9,797	4,242	5,787	550	36.0	17.8
Rock	3,366	2,190	1,176	-	1,013	3.3	2.2
Saline	16,356	8,661	4,830	2,865	578	28.3	15.0
Sarpy	10,402	7,458	2,944	-	242	43.0	30.8
Saunders	20,167	11,773	5,705	2,689	763	26.4	15.4
Scotts Bluff	28,644	12,396	5,252	10,996	730	39.2	17.0
Seward	15,938	9,996	3,205	2,737	580	27.5	17.2
Sheridan	10,793	6,002	4,791	-	2,492	4.3	2.4
Sherman	9,122	6,448	2,674	-	578	15.8	11.2
Sioux	4,667	4,070	597	-	2,074	2.3	2.0
Stanton	7,809	5,752	2,057	-	435	18.0	13.2
Thayer	13,684	7,566	6,118	-	584	23.4	13.0
Thomas	1,510	813	697	-	723	2.1	1.1
Thurston	10,462	6,797	3,665	-	390	26.8	17.4
Valley	9,533	5,839	3,694	-	575	16.6	10.2
Washington	12,095	7,429	1,875	2,791	384	31.5	19.3
Wayne	10,566	6,809	3,757	-	454	23.3	15.0
Webster	10,210	6,385	3,825	-	583	17.5	11.0
Wheeler	2,335	1,910	425	-	583	4.0	3.3
York	17,239	8,899	2,628	5,712	580	29.7	15.3
Total	1,377,963	601,248	290,608	486,107	77,520	17.8	[illegible].3

AGRICULTURE

ACREAGE, YIELD, AND PRODUCTION OF CORN
Nebraska, 1866-1938

Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)	Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)	Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)
1866	72	29.3	2,124	1890	5,525	20.0	110,500	1914	7,350	24.5	180,075
1867	90	38.0	3,420	1891	6,150	37.5	230,625	1915	7,350	31.0	227,850
1868	115	28.0	3,200	1892	5,975	32.0	191.200	1916	7,600	27.0	205,200
1869	125	38.5	4,812	1893	6,400	26.5	169,600	1917	8,358	27.0	225,666
1870	155	33.5	5,192	1894	6,825	7.0	47,775	1918	7,000	18.0	126,000
1871	225	38.0	8,550	1895	7,300	16.5	120,450	1919	7,080	24.0	169,920
1872	295	37.0	10,915	1896	7,425	37.5	278,438	1920	7,660	33.2	254,312
1873	370	22.0	8,180	1897	7,500	30.0	225,000	1921	7,520	27.0	203,040
1874	380	15.0	5,700	1898	7,000	21.0	147,000	1922	7,440	24.0	178,560
1875	625	31.0	19,375	1899	7,380	28.8	212,544	1923	8,500	32,0	272,000
1876	730	32.0	23,360	1900	7,350	26.0	191,000	1924	8,718	21.5	187,437
1877	1,130	34.0	38,420	1901	7,175	14.0	100,450	1925	9,200	25.0	230,000
1878	1,340	41.0	54,940	1902	7,350	32.5	238,875	1926	9,290	15.0	139,350
1879	1,631	40.1	65,402	1903	7,075	27.5	194,562	1927	9,160	32.1	294,036
1880	1,270	31.0	39,370	1904	7,275	33.0	240,075	1928	9,250	22.0	203,500
1881	2,150	29.5	63,425	1905	7,200	34.0	244,800	1929	9,516	25.2	239,803
1882	2,460	38.0	93,480	1906	7,075	34.0	240,550	1930	9,564	25.0	239,100
1883	2,990	37.5	112,125	1907	7,075	24.0	169,800	1931	10,042	17.0	170,714
1884	3,500	41.0	143,500	1908	7,150	27.0	183,050	1932	10,644	25.0	266,100
1885	3,910	40.0	156,400	1909	7,327	24.8	181,710	1933	10,431	22.5	234,698
1886	4,380	31.0	135,780	1910	7,425	26.0	193,050	1934	6,676	3.2	21,363
1887	4,740	27.5	130,350	1911	7,350	21.5	158,025	1935	8,078	13.2	106,630
1888	5,120	38.0	194,560	1912	7,500	27.0	202,500	1936	7,674	3.5	26,859
1889	5,480	39.4	215,912	1913	7,650	15.0	114,750	1937	7,904	10.5	82,992
								1938	7,430	14.5	107,735

ACREAGE, YIELD, AND PRODUCTION OF ALL WHEAT
Nebraska, 1866-1938

Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)	Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)	Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)
1866	43	14.0	602	1891	2,150	15.0	32,250	1916	3,600	18.5	66,775
1867	83	10.5	872	1892	2,225	13.5	30,038	1917	975	12.5	12,188
1868	123	12.0	1,476	1893	2,425	8.5	20,612	1918	3,826	11.3	43,198
1869	160	14.0	2,240	1894	2,125	7.0	14,875	1919	4,427	13.2	58,304
1870	170	11.5	1,955	1895	2,075	12.0	24,900	1920	3,593	16.8	60,480
1871	225	8.5	1,913	1896	1,650	14.0	23,100	1921	3,967	15.1	59,814
1872	285	12.0	3,420	1897	2,200	14.5	31,900	1922	4,177	13.8	57,775
1873	515	15.5	7,982	1898	2,475	16.5	40,838	1923	3,252	9.9	32,168
1874	640	11.5	7,360	1899	2,539	9.8	24,882	1924	3,033	18.4	55,807
1875	790	9.5	7,505	1900	2,750	13.7	37,800	1925	2,771	12.1	33,529
1876	890	11.0	9,790	1901	2,875	17.2	49,397	1926	3,146	13.1	41,290
1877	850	16.0	13,600	1902	3,000	19.4	58,265	1927	3,733	19.3	72,188
1878	1,250	13.0	16,250	1903	2,750	16.5	45,300	1928	3,757	18.0	67,466
1879	1,470	9.4	13,818	1904	2,350	14.8	34,780	1929	3,700	15.0	55,403
1880	1,520	8.5	12,920	1905	2,425	19.5	47,367	1930	3,974	18.8	74,848
1881	1,550	7.5	11,625	1906	2,500	21.8	54,620	1931	3,420	16.6	56,943
1882	1,450	13.0	18,850	1907	2,600	17.4	45,232	1932	2,277	12.3	27,958
1883	1,550	17.5	27,125	1908	2,625	17.1	44,768	1933	2,437	12.0	29,206
1884	1,700	16.5	28,050	1909	2,663	17.9	47,694	1934	2,251	7.8	17,543
1885	1,650	13.5	22,275	1910	2,855	15.8	45,170	1935	3,070	12.6	38,675
1886	1,450	11.0	15,950	1911	3,265	12.3	40,018	1936	3,338	14.2	47,339
1887	1,700	10.0	17,000	1912	3,335	15.8	52,850	1937	3,601	13.1	47,184
1888	1,600	10.0	16,000	1913	3,410	17.6	59,950	1938	4,691	11.9	55,714
1889	1,675	13.2	22,110	1914	3,650	17.6	64,075				
1890	1,975	12.0	23,700	1915	3,800	18.3	69,675				

ACREAGE, YIELD, AND PRODUCTION OF OATS
Nebraska, 1866-1938

Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)	Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)	Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)
1866	15	38.5	578	1890	1,550	22.5	34,875	1914	2,050	31.0	63,550
1867	17	31.5	536	1891	1,750	32.5	56,875	1915	2,125	30.5	64,312
1868	27	30.5	824	1892	1,860	26.5	49,290	1916	2,175	33.5	72,862
1869	46	35.0	1,610	1893	1,840	16.0	29,440	1917	2,980	34.5	102,810
1870	53	31.0	1,643	1894	1,750	15.0	26,250	1918	2,531	20.0	50,620
1871	62	27.5	1,705	1895	1,850	26.0	48,100	1919	2,138	29.5	62,924
1872	71	37.5	2,662	1896	1,950	19.0	37,050	1920	2,400	33.0	79,200
1873	104	30.0	3,120	1897	1,740	31.0	53,940	1921	2,585	26.5	68,502
1874	110	23.0	2,530	1898	1,830	32.0	58,560	1922	2,408	22.5	54,180
1875	162	27.5	4,455	1899	1,925	30.1	57,942	1923	2,456	30.5	74,908
1876	180	20.0	3,600	1900	1,950	22.0	42,900	1924	2,456	26.7	65,575
1877	175	33.5	5,862	1901	1,850	19.0	35,150	1925	2,699	25.0	67,475
1878	228	28.0	6,384	1902	1,680	33.5	56,280	1926	2,580	20.0	51,600
1879	250	26.2	6,550	1903	1,960	28.5	55,860	1927	2,441	26.5	64,686
1880	275	21.0	5,775	1904	2,150	30.5	65,515	1928	2,392	30.0	71,760
1881	305	31.5	9,608	1905	2,420	31.0	75,020	1929	2,480	30.5	75,640
1882	410	34.0	13,940	1906	2,440	29.0	70,760	1930	2,485	29.0	72,065
1883	500	33.0	16,500	1907	2,490	20.0	49,800	1931	2,311	21.5	49,686
1884	650	28.0	18,200	1908	2,360	22.0	51,920	1932	2,473	29.5	72,954
1885	780	32.6	25,350	1909	2,366	22.6	53,472	1933	2,226	10.5	23,373
1886	920	30.0	27,600	1910	2,400	27.0	64,800	1934	859	7.4	6,357
1887	1,110	28.5	31,635	1911	2,325	14.0	32,350	1935	2,551	28.5	72,704
1888	1,300	27.5	35,750	1912	2,100	24.0	50,400	1936	1,658	11.5	19,067
1889	1,504	29.2	43,917	1913	2,025	26.0	52,650	1937	1,697	21.0	35,637
								1938	1,867	29.5	55,076

ACREAGE, YIELD, AND PRODUCTION OF BARLEY
Nebraska, 1866-1938

Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)	Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)	Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)
								1914	112	19.5	2,184
1866	6	24.5	147	1890	185	13.5	2,498	1915	110	25.0	2,750
1867	7	20.0	140	1891	148	23.5	3,478	1916	110	21.5	2,365
1868	8	19.5	156	1892	118	19.0	2,242	1917	213	16.5	3,514
1869	10	22.5	225	1893	111	13.0	1,443	1918	343	11.0	3,773
1870	14	19.0	266	1894	96	5.0	480	1919	217	21.0	4,557
1871	24	15.5	372	1895	87	20.5	1,784	1920	256	25.0	6,400
1872	35	24.0	840	1896	89	21.5	1,914	1921	199	20.5	4,080
1873	45	19.0	855	1897	92	24.0	2,208	1922	242	15.0	3,630
1874	58	17.0	986	1898	93	21.5	2,000	1923	339	23.0	7,797
1875	70	12.0	840	1899	92	22.1	2,033	1924	251	17.6	4,418
1876	83	17.5	1,452	1900	90	17.0	1,530	1925	233	18.0	4,194
1877	89	25.5	2,270	1901	89	11.0	979	1926	227	16.5	3,746
1878	109	19.5	2,126	1902	83	21.5	1,784	1927	246	26.0	6,396
1879	115	15.1	1,736	1903	86	21.0	1,806	1928	430	28.0	12,040
1880	90	12.0	1,080	1904	97	23.0	2,231	1929	648	23.7	15,358
1881	80	19.5	1,560	1905	100	22.5	2,250	1930	726	25.5	18,513
1882	72	25.5	1,836	1906	97	22.0	2,134	1931	820	16.0	13,120
1883	89	23.0	2,047	1907	100	15.5	1,550	1932	918	19.5	17,901
1884	121	21.0	2,541	1908	108	17.5	1,890	1933	299	10.5	3,140
1885	151	23.5	3,548	1909	114	17.5	1,995	1934	209	8.7	1,818
1886	148	21.5	3,182	1910	118	14.0	1,652	1935	670	22.0	14,740
1887	200	13.5	2,700	1911	118	5.0	590	1936	586	10.0	5,860
1888	182	18.0	3,276	1912	112	20.5	2,296	1937	645	16.5	10,642
1889	140	22.1	3,094	1913	108	12.5	1,350	1938	916	23.5	21,526

ACREAGE, YIELD, AND PRODUCTION OF RYE
Nebraska, 1866-1938

Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)	Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)	Year	Acreage (1,000's)	Average Yield (bu.)	Production (1,000 bu.)
1866	1	15.0	15	1890	93	12.0	1,116	1914	174	10.0	1,740
1867	1	14.5	15	1891	111	14.0	1,554	1915	212	11.0	2,332
1868	1	15.0	15	1892	120	13.0	1,560	1916	149	10.0	1,490
1869	1	15.0	15	1893	114	9.5	1,083	1917	215	8.5	1,828
1870	2	14.0	28	1894	91	4.0	364	1918	345	8.0	2,760
1871	3	13.5	40	1895	64	9.5	608	1919	360	10.0	3,600
1872	4	16.0	64	1896	69	12.5	862	1920	220	11.0	2,420
1873	4	15.5	62	1897	174	12.0	2,088	1921	230	11.0	2,530
1874	7	13.5	95	1898	175	13.5	2,362	1922	155	10.0	1,550
1875	15	13.0	195	1899	179	10.6	1,897	1923	165	11.0	1,815
1876	23	15.0	345	1900	151	11.0	1,161	1924	159	10.0	1,590
1877	30	15.5	465	1901	157	12.0	1,884	1925	180	10.0	1,800
1878	35	14.5	508	1902	175	16.0	2,800	1926	230	7.5	1,725
1879	34	12.4	422	1903	170	10.0	1,700	1927	250	11.0	2,750
1880	32	9.5	304	1904	145	11.5	1,688	1928	230	10.5	2,415
1881	38	13.5	513	1905	134	13.0	1,742	1929	244	11.3	2,757
1882	53	16.0	848	1906	83	15.0	1,245	1930	317	11.5	3,646
1883	64	14.5	928	1907	82	11.0	902	1931	333	8.0	2,664
1884	67	15.0	1,005	1908	81	10.5	850	1932	206	9.0	1,854
1885	69	13.5	932	1909	63	10.5	662	1933	161	7.0	1,127
1886	85	13.5	1,148	1910	67	8.0	536	1934	122	4.4	537
1887	91	11.0	1,001	1911	86	6.0	516	1935	429	12.5	5,362
1888	94	13.5	1,269	1912	115	10.0	1,150	1936	459	7.5	3,442
1889	95	13.3	1,264	1913	160	9.0	1,440	1937	390	10.0	3,900
								1938	417	11.5	4,796

ACREAGE, YIELD, AND PRODUCTION OF ALL TAME HAY
Nebraska, 1866-1938

Year	Acreage (1,000's)	Average Yield (tons)	Production (1,000 tons)	Year	Acreage (1,000's)	Average Yield (tons)	Production (1,000 tons)	Year	Acreage (1,000's)	Average Yield (tons)	Production (1,000 tons)
1866	20	1.70	34	1890	381	1.30	495	1914	1,380	1.70	2,346
1867	18	1.85	33	1891	423	1.95	825	1915	1,580	2.10	3,318
1868	19	2.10	40	1892	440	1.75	770	1916	1,660	1.70	2,822
1869	35	2.00	70	1893	432	1.35	583	1917	1,400	1.20	1,680
1870	50	1.35	68	1894	440	.75	330	1918	1,540	1.15	1,771
1871	50	1.75	88	1895	435	1.30	566	1919	1,661	1.86	3,097
1872	65	1.70	111	1896	470	1.95	916	1920	1,629	1.96	3,187
1873	70	1.90	133	1897	460	2.00	920	1921	1,560	1.69	2,633
1874	75	1.75	131	1898	480	1.95	936	1922	1,566	1.62	2,538
1875	125	1.70	212	1899	484	1.87	905	1923	1,607	1.94	3,116
1876	135	1.80	243	1900	510	1.75	892	1924	1,658	1.75	2,895
1877	150	1.95	292	1901	530	1.55	822	1925	1,595	1.61	2,569
1878	165	1.95	322	1902	620	2.00	1,240	1926	1,668	1.40	2,340
1879	170	1.52	258	1903	685	2.00	1,370	1927	1,721	1.79	3,075
1880	205	1.60	328	1904	780	1.95	1,521	1928	1,536	1.61	2,473
1881	220	2.00	440	1905	900	1.90	1,710	1929	1,549	1.74	2,690
1882	225	2.00	450	1906	975	1.60	1,560	1930	1,561	1.73	2,708
1883	250	2.00	500	1907	1,080	1.70	1,836	1931	1,614	1.23	1,985
1884	280	1.95	546	1908	1,210	1.90	2,299	1932	1,552	1.68	2,601
1885	300	1.95	585	1909	1,334	1.85	2,468	1933	1,820	1.31	2,388
1886	320	1.80	576	1910	1,330	1.00	1,330	1934	1,446	.89	1,294
1887	340	1.40	476	1911	1,250	.85	1,062	1935	1,538	1.65	2,544
1888	350	1.90	665	1912	1,275	1.35	1,721	1936	1,660	.97	1,617
1889	360	1.70	612	1913	1,320	1.35	1,782	1937	1,410	1.06	1,500
								1938	1,170	1.46	1,709

Source:
Nebraska Cooperative Crop and Livestock Reporting Service Bulletins Issued by
Nebraska Department of Agriculture and Inspection, Division of Agricultural Statistics
United States Department of Agriculture-- Agricultural Marketing Service.

ESTIMATED NUMBER OF LIVESTOCK ON NEBRASKA FARMS
January 1, 1867-1938
(In Thousands)

Year	Horses	Mules	Hogs	Stock Cattle	Milk Cows	Stock Sheep	Total
1867	23	4	250	101	14	29	421
1868	28	4	270	107	15	35	459
1869	35	4	300	119	17	40	515
1870	40	5	340	129	28	36	578
1871	50	7	360	164	38	36	655
1872	60	8	395	201	46	36	746
1873	75	10	475	244	52	39	895
1874	95	11	580	292	57	42	1,077
1875	102	12	500	316	59	50	1,039
1876	110	14	510	366	65	75	1,140
1877	127	15	720	442	75	105	1,484
1878	150	16	925	567	90	126	1,874
1879	180	18	1,025	681	106	168	2,178
1880	212	21	1,300	853	147	244	2,777
1881	240	23	1,226	891	164	325	2,869
1882	255	26	1,389	1,231	189	425	3,515
1883	300	31	2,275	1,618	212	580	5,016
1884	347	35	2,600	1,944	256	530	5,712
1885	380	37	2,090	2,114	286	475	5,382
1886	425	40	1,791	2,076	309	369	5,010
1887	470	43	2,028	1,866	334	277	5,018
1888	535	44	2,095	1,443	357	222	4,696
1889	587	45	2,238	1,350	400	204	4,824
1890	667	47	2,920	1,788	420	204	6,046
1891	695	47	2,765	1,816	435	204	5,962
1892	715	47	2,190	1,781	430	184	5,347
1893	750	49	2,167	1,592	418	193	5,169
1894	775	50	2,385	1,499	401	212	5,322
1895	750	50	1,792	1,395	405	201	4,593
1896	748	50	2,040	1,330	420	250	4,838
1897	747	50	2,710	1,455	445	325	5,732
1898	749	51	3,180	1,725	450	350	6,505
1899	753	52	3,160	1,952	448	385	6,750
1900	775	54	2,969	2,348	460	380	6,986
1901	790	51	2.680	2.488	465	415	6,889
1902	775	50	2,600	2,604	470	350	6,849
1903	798	50	2,640	2,755	475	330	7,048
1904	854	56	3,622	3,057	500	355	8,444
1905	896	61	3,765	3,071	525	375	8,693
1906	932	64	3,745	2,992	535	370	8,638
1907	935	69	4,020	2,910	550	350	8,834
1908	982	72	4,135	2,720	570	350	8,829
1909	1,001	77	3,290	2,653	575	325	7,921
1910	1,010	82	2,960	2,382	590	319	7,343
1911	1,038	87	3,435	2,193	560	395	7,708
1912	1,050	92	3,805	2,031	530	301	7,809
1913	1,050	97	3,230	2,031	530	300	7,238
1914	1,050	105	2,975	2,209	555	270	7,164
1915	1,038	112	3,440	2,465	575	174	7,804
1916	1,028	117	3,690	2,668	585	200	8,288
1917	1,018	118	3,670	2,983	595	240	8,624
1918	1,050	115	4,110	3,158	600	300	9,333
1919	1,050	109	4,005	2,807	575	232	8,778
1920	961	100	3,436	2,619	535	241	7,892
1921	924	107	3,558	2,413	540	195	7,737
1922	892	120	4,100	2,432	594	180	8,318
1923	882	120	5,638	2,618	606	170	10,034
1924	852	121	5,983	2,774	612	175	10,517
1925	862	120	5,200	2,689	625	180	9,676
1926	340	120	4,405	2,541	650	190	8,746
1927	815	118	4,660	2,150	669	209	8,621
1928	788	112	5,340	2,090	676	215	9,221
1929	772	106	5,305	2,255	676	230	9,344
1930	757	99	5,010	2,380	680	258	9,184
1931	734	95	4,820	2,555	687	270	9,161
1932	712	91	5,334	2,616	714	275	9,742
1933	681	88	4,534	2,842	768	280	9,193
1934	666	83	5,010	3,160	820	295	10,034
1935	651	75	2,034	2,482	750	274	6,266
1936	618	70	2,238	2,771	720	288	6,705
1937	569	66	1,567	2,353	684	271	5,510
1938	523	61	1,598	2,195	629	274	5,280

Source: Nebraska Cooperative Crop and Livestock Reporting Service Bulletins
Issued by
Nebraska Department of Agriculture

AVERAGE NUMBER OF LIVESTOCK ON FARMS AND RANCHES
1930-1934

PLATTE RIVER BASIN

County	Hogs	Milk Cows	Other Cattle	Sheep	Horses	Mules
Arthur	2,600	800	22,340	320	2,520	80
Banner	5,200	900	11,620	4,100	1,940	100
Box Butte	12,900	2,900	17,500	2,400	4,780	200
Buffalo	30,500	6.200	28,100	8,500	11,000	1,100
Butler	20,800	6,400	16,000	1,200	9,040	1,360
Cheyenne	16,400	2,900	14,480	4,500	4,900	280
Dawson	37,700	5,600	41,900	11,100	10,580	1,020
Deuel	6,600	1,900	5,600	2,500	1,760	140
Garden	11,600	2,500	57,260	2,200	5,660	260
Hall	20,200	7,000	17,800	15,700	6,660	1,020
Keith	14,500	2,200	29,700	1,700	4,600	340
Kimball	4,100	1,000	5,200	6,800	1.540	120
Lancaster	29,300	15,300	23,200	2,900	12.080	2,200
Lincoln	27,400	4,100	73,200	1,600	13,480	1,000
McPherson	3,400	600	16,180	300	3,080	180
Merrick	18,600	6,200	19,900	6,000	5,900	800
Morrill	8,500	2,000	36,400	5,000	6,740	380
Phelps	20,900	3,000	17,000	1,200	5,020	460
Platte	48,700	10,700	25,380	1,100	8,500	1,000
Sarpy	14,500	3.800	12,000	11,900	3,720	920
Saunders	27,300	10,000	22,600	1,700	11,580	1,560
Scotts Bluff	7,200	6,500	15,100	19,300	7,720	720

LOUP RIVER BASIN

County	Hogs	Milk Cows	Other Cattle	Sheep	Horses	Mules
Blaine	1,900	1,100	11,660	400	2,083	163
Boone	42,300	9,400	23,220	1,180	9,100	1,200
Brown	5,500	1,400	22,900	1,100	4,520	340
Custer	65,600	15,200	83,200	7,100	21,300	1,500
Garfield	4,600	1,700	12,600	300	2,500	200
Grant	500	700	42,720	500	2,280	39
Greeley	18,000	4,700	19,500	1,000	5,500	700
Hooker	800	500	11,020	500	1,736	84
Howard	25,900	9,900	20,700	900	6,700	700
Logan	6,200	1,000	13,380	800	2,277	177
Loup	3,300	700	9,540	800	2,300	200
Nance	23,000	4,700	17,760	4,800	6,600	700
Sherman	20,400	8,000	15,200	2,200	7,400	300
Thomas	800	300	8,120	800	1,625	72
Valley	27,700	5,800	22,700	2,600	6,700	500
Wheeler	4,000	1,300	13,500	2,000	6,513	218

REPUBLICAN RIVER BASIN

County	Hogs	Milk Cows	Other Cattle	Sheep	Horses	Mules
Chase	14,000	1,800	15,800	1,100	4,120	500
Dundy	17,100	1,900	19,000	800	5,140	720
Franklin	17,900	2,700	16,700	300	5,860	1,140
Frontier	27,200	3,600	31,400	1,100	7,900	860
Furnas	22,700	5,100	22,300	2,300	6,740	1,300
Gosper	15,900	3,100	14,700	800	4,380	680
Harlan	17,100	4,100	16,700	1,200	5,980	1,240
Hayes	15,300	1,600	15,900	100	3,780	580
Hitchcock	17,700	3,200	15,700	400	5,000	520
Perkins	14,400	3,000	9,000	2,100	3,600	200
Red Willow	19,600	3,500	17,900	800	5,060	780
Webster	23,100	4,700	16,400	500	6,720	1,160

ELKHORN RIVER BASIN

County	Hogs	Milk Cows	Other Cattle	Sheep	Horses	Mules
Antelope	34,660	8,900	23,960	2,300	9,800	1,000
Colfax	31,600	5,200	19,300	600	6,600	500
Cuming	64,000	8,300	46,740	3,100	8,500	900
Dodge	31,900	6,800	23,180	2,500	8,300	900
Holt	18,700	4,800	71,600	6.700	12,040	1,160
Madison	45,100	7,600	27,120	2,800	9,600	700
Pierce	33,000	7,000	23,940	2,800	7,700	700
Rock	1,700	2,700	22,740	4,700	3,780	220
Stanton	33,900	4,900	25,940	1,600	6,300	600
Wayne	42,000	6,300	28,440	2,200	6,500	700

BLUE RIVER BASIN

County	Hogs	Milk Cows	Other Cattle	Sheep	Horses	Mules
Adams	16,100	6,000	8,200	1,100	7,820	1,280
Clay	22,500	6,200	9,600	900	7,700	1,060
Fillmore	21,400	6,800	12,100	1,600	8,420	1,220
Gage	40,600	12,900	23,200	2,200	11,900	2,900
Hamilton	30,000	6,500	14,800	6,100	8.000	860
Jefferson	24,000	8,000	20,100	900	6,440	1,280
Kearney	16,800	4,700	10,900	1,900	5,180	720
Nuckolls	28,600	5,800	17,500	900	6,400	1,600
Polk	30,200	5,500	14,600	1,600	6,940	1,040
Saline	27,080	5,300	17,100	2,100	8,860	980
Seward	26,140	7,980	14,600	1,800	9,340	1,020
Thayer	25,200	6,500	15,600	800	8.340	1,680
York	36,500	6,900	18,700	3,900	8,820	1,020

NIOBRARA RIVER BASIN

County	Hogs	Milk Cows	Other Cattle	Sheep	Horses	Mules
Cherry	13,600	3,400	202,920	4,200	19,120	600
Keya Paha	6,300	3,400	21,400	3,900	3,960	240
Sheridan	21,900	3,500	72,660	5,500	9,300	560

(Continued)

County	Hogs	Milk Cows	Other Cattle	Sheep	Horses	Mules
			MISSOURI RIVER BASIN ABOVE PLATTE RIVER			
Boyd	13,300	2,800	16,000	1,300	4,900	480
Burt	56,800	6,400	23,420	3,100	6,800	1,400
Cedar	59,600	8,700	32,620	2,500	11,200	800
Dakota	15,200	3,100	8,040	1,400	3,500	400
Dixon	40,300	5,400	18,600	2,300	7,700	600
Douglas	10,000	7,200	7,940	3,000	3,900	900
Knox	44,100	8,400	37,680	1,600	12,500	1,200
Thurston	25,900	4,700	14,460	1,000	7,000	900
Washington	29,000	7,700	14,940	3,100	6,000	1,000
			MISSOURI RIVER BASIN BELOW PLATTE RIVER			
Cass	25,000	7,200	16,900	2,300	7,820	1,580
Johnson	19,900	5,10C	11,200	1,800	5,100	1,100
Nemaha	25,300	5,300	12,000	900	5,100	1,600
Otoe	27,300	8,000	17,700	2,000	8,14C	2,900
Pawnee	27,300	3,200	18,200	3,800	5,400	900
Richardson	41,200	6,400	20,700	5,100	7,100	2,100
			WHITE RIVER - HAT CREEK BASINS			
White Dawes County	11,400	1,300	25,920	13,800	5,100	240
Hat Sioux County	4,500	2,000	41,640	16,400	4,360	420

SOURCES OF FARM INCOME 1929

PLATTE RIVER BASIN

County	Crops	Live-stock	Livestock Products	Forest Products	Farm Products Consumed	Other	Total
Arthur	$ 299	$ 3,264	$ 481	$	$ 281	$ 5	$ 4,330
Banner	3,061	1,099	177		341	3	4,681
Box Butte	3,077	1,740	310		237	2	5.366
Buffalo	694	1,256	411	6	231	6	2,604
Butler	1,436	965	303	1	398	2	3,105
Cheyenne	2,395	1,093	254	1	272	4	4,019
Dawson	1,224	2,403	296	1	222	3	4,149
Deuel	2,463	1,430	286		299	4	4,482
Garden	1,508	2,674	208	2	296	2	4,690
Hall	786	1,763	433	3	313	2	3,300
Keith	2,082	2,967	234		343	23	5,649
Kimball	3,750	751	239		274	2	5,014
Lancaster	1,243	952	569	3	307	5	3,079
Lincoln	1,017	2,279	287	1	226	3	3,813
McPherson	350	3,098	224		211	4	3,887
Merrick	585	2.694	430	2	303	2	4,016
Morrill	1,568	1,723	245		263	2	3,801
Phelps	741	1,124	352	2	232	2	2,453
Platte	600	1,789	403	1	349	2	3,144
Sarpy	1,350	1,639	469	6	273	3	3,740
Saunders	1,327	959	312	3	325	2	2,928
Scotts Bluff	3,990	2,170	346		271	1	6,778

LOUP RIVER BASIN

County	Crops	Live-stock	Livestock Products	Forest Products	Farm Products Consumed	Other	Total
Blaine	$ 269	$ 1,721	$ 369	$	$ 265	$ 9	$ 2,633
Boone	686	2,058	350	1	368	2	3,465
Brown	357	1,375	441	5	308	14	2,500
Custer	520	1,897	370	2	318	4	3,111
Garfield	274	1,558	418	1	221	3	2,455
Grant	193	12,038	403		635	5	13,274

(Continued)

County	Crops	Livestock	Livestock Products	Forest Products	Farm Products Consumed	Other	Total
Greeley	457	2,135	371	2	348	2	3,315
Hooker	176	1,953	275		288	1	2,693
Howard	311	1,309	456	2	304	2	2,384
Logan	677	2,794	293		227		3,991
Loup	240	1,434	418		230	3	2,325
Nance	646	2,185	405	5	313	2	3.556
Sherman	326	1.253	410	4	361	3	2,357
Thomas	175	1,323	321	1	307	6	2,133
Valley	479	1,910	413	3	311	3	3,119
Wheeler	266	2.081	357	1	282	4	2,991

REPUBLICAN RIVER BASIN

County	Crops	Livestock	Livestock Products	Forest Products	Farm Products Consumed	Other	Total
Chase	$ 2,190	$ 1,595	$ 199	$	$ 229	$ 2	$ 4,215
Dundy	2,251	1,645	198		265	4	4,363
Franklin	440	983	366	2	302	2	2,095
Frontier	529	1,476	301	2	298	5	2,611
Furnas	1,203	1,678	337		276	1	3,495
Gosper	830	1,483	284		277	3	2,877
Harlan	1,119	1,049	326		348	1	2,843
Hayes	2,069	1,394	193		283	3	3,942
Hitchcock	1,874	1,377	279		278	3	3,811
Perkins	3,264	738	198		279	2	4,481
Red Willow	1,202	1,452	323	2	279	3	3,261
Webster	620	1,358	348		246	3	2,575

ELKHORN RIVER BASIN

County	Crops	Livestock	Livestock Products	Forest Products	Farm Products Consumed	Other	Total
Antelope	$ 617	$ 1,808	$ 397	$ 2	$ 360	$ 2	$ 3,186
Colfax	656	1,839	376	1	432	3	3,307
Cuming	514	3,966	399	4	417	3	5,303
Dodge	1,273	2,963	436	3	363	1	5,039
Holt	385	1,417	400	3	285	8	2,498
Madison	611	1,919	452	4	424	2	3,412
Pierce	684	1,640	424	6	276	3	3,033
Rock	332	1,462	444	2	316	6	2,562
Stanton	593	3,114	374		385	1	4,467
Wayne	898	3.398	388	1	313	3	5,001

BLUE RIVER BASIN

County	Crops	Livestock	Livestock Products	Forest Products	Farm Products Consumed	Other	Total
Adams	$ 1,010	$ 724	$ 382	$ 2	$ 238	$ 3	$ 2,359
Clay	1,490	972	400	2	319	1	3,184
Fillmore	1,296	1,004	367	3	347	3	3,020
Gage	844	992	454	3	260	1	2,554
Hamilton	981	1,681	361	1	256	2	3,282
Jefferson	747	1,383	472	3	333	4	2,942
Kearney	775	938	330	1	257	1	2,302
Nuckolls	841	1,781	397	2	327	3	3,351
Polk	1,109	1,937	295	2	274	4	3,621
Saline	1,111	899	384	3	413	3	2,813
Seward	1,210	890	369	2	356	4	2,831
Thayer	699	1,883	498	1	344	1	3,426
York	1,109	1.705	367	1	350		3,532

NIOBRARA RIVER BASIN

County	Crops	Livestock	Livestock Products	Forest Products	Farm Products Consumed	Other	Total
Cherry	$ 343	$ 4,424	$ 318	$ 6	$ 343	$ 86	$ 5,520
Keya Paha	218	1,257	396	9	337	10	2,827
Sheridan	1,526	3,064	326	5	356	4	5,281

MISSOURI RIVER BASIN ABOVE PLATTE RIVER

County	Crops	Livestock	Livestock Products	Forest Products	Farm Products Consumed	Other	Total
Boyd	$ 665	$ 1,267	$ 354	$ 1	$ 330	$ 3	$ 2,620
Burt	924	3,563	382	2	318	5	5,194
Cedar	697	2,222	362	6	392	4	3,683
Dakota	946	2,798	337	6	317	11	4,415
Dixon	830	2,560	371	2	365	2	4,129
Douglas	1,218	1,942	898	2	245	11	4,316
Knox	599	1,606	339	3	363	2	2,910
Thurston	1,325	2,175	324	7	290	1	4,122
Washington	908	1,775	506	7	333	3	3,532

County	Crops	Live-stock	Livestock Products	Forest Products	Farm Products Consumed	Other	Total
MISSOURI RIVER BASIN BELOW PLATTE RIVER							
Cass	$ 1,530	$ 1,140	$ 337	$ 6	$ 288	$ 2	$ 3,303
Johnson	674	1,156	411	3	302	2	2,548
Nemaha	799	1,394	332	4	375	1	2,905
Otoe	1,138	952	407	4	313	1	2,815
Pawnee	372	1,483	420	6	338	3	2,622
Richardson	610	2,357	358	11	343	2	3,681
WHITE RIVER - HAT CREEK BASINS							
White Dawes County	1,225	1,602	361	12	280	4	3,484
Hat Sioux County	1,516	2,245	313	6	291	6	4,377

ASSESSED VALUATION PER ACRE
OF IMPROVED FARM REAL ESTATE

County	1920	1930	1933
PLATTE RIVER BASIN			
Arthur	$ 5.13	$ 4.52	$ 2.98
Banner	9.48	7.25	5.43
Box Butte	10.26	12.46	8.54
Buffalo	55.15	46.43	30.55
Butler	126.34	97.27	64.80
Cheyenne	26.27	22.10	14.64
Dawson	48.57	42.61	29.02
Deuel	30.72	26.48	17.81
Garden	11.49	7.33	5.51
Hall	71.69	64.43	42.93
Keith	16.61	11.90	8.65
Kimball	21.11	15.90	10.95
Lancaster	115.69	101.71	62.56
Lincoln	15.70	10.02	7.45
McPherson	6.79	3.52	2.66
Merrick	73.64	61.64	41.04
Morrill	11.68	10.37	7.25
Phelps	59.32	47.12	30.75
Platte	116.98	98.69	64.86
Sarpy	123.85	108.34	72.35
Saunders	128.59	104.08	69.62
Scotts Bluff	44.00	37.51	25.77
LOUP RIVER BASIN			
Blaine	$ 5.48	$ 4.40	$ 3.36
Boone	82.90	71.55	47.22
Brown	10.50	7.88	5.26
Custer	24.47	20.06	13.16
Garfield	15.91	9.69	6.35
Grant	4.34	4.38	3.27
Greeley	48.82	37.40	24.36
Hooker	6.79	3.44	2.63
Howard	53.02	45.05	29.83
Logan	9.82	9.25	6.84
Loup	9.17	6.05	4.56
Nance	79.64	66.49	43.65
Sherman	41.46	34.29	22.76
Thomas	5.70	3.37	2.57
Valley	47.65	38.93	25.69
Wheeler	15.37	9.29	6.55
REPUBLICAN RIVER BASIN			
Chase	$ 14.40	$ 13.00	$ 9.00
Dundy	12.32	11.37	7.23
Franklin	46.53	38.23	25.27
Frontier	19.98	18.10	12.04
Furnas	34.56	30.00	20.34
Gosper	33.82	29.72	34.88
Harlan	38.03	31.47	20.67
Hayes	14.82	12.47	6.58
Hitchcock	21.23	20.62	13.73
Perkins	21.64	16.63	10.99
Red Willow	25.20	22.08	14.58
Webster	52.83	42.65	28.06
ELKHORN RIVER BASIN			
Antelope	$ 60.34	$ 44.06	$ 29.46
Colfax	132.45	108.76	71.54
Cuming	143.01	110.80	72.52
Dodge	140.32	112.28	73.53
Holt	18.63	12.00	8.00
Madison	102.54	85.27	56.35
Pierce	90.42	71.26	47.06
Rock	10.68	6.95	4.73
Stanton	115.90	93.48	62.20
Wayne	133.78	106.62	70.38
BLUE RIVER BASIN			
Adams	$ 84.48	$ 68.74	$ 47.60
Clay	91.25	75.47	48.21
Fillmore	99.51	85.29	57.24
Gage	91.35	81.96	53.83
Hamilton	101.25	87.17	56.86
Jefferson	81.33	70.62	46.86
Kearney	60.36	50.58	33.26
Nuckolls	68.03	59.12	39.63
Polk	113.61	94.04	62.00
Saline	109.81	90.07	59.06
Seward	110.66	94.08	60.72
Thayer	72.43	62.65	41.30
York	108.27	92.72	60.70
NIOBRARA RIVER BASIN			
Cherry	$ 6.26	$ 4.41	3.09
Keya Paha	12.65	9.33	6.08
Sheridan	8.63	6.20	4.15
MISSOURI RIVER BASIN ABOVE PLATTE RIVER			
Boyd	$ 51.54	$ 28.71	$ 17.71
Burt	142.14	90.54	65.49
Cedar	114.75	93.29	49.42
Dakota	112.92	90.87	56.71
Dixon	99.00	71.22	48.27
Douglas	167.36	142.71	96.49
Knox	62.63	39.21	24.44
Thurston	134.81	82.29	51.71
Washington	148.00	114.28	79.68

MISSOURI RIVER BASIN BELOW PLATTE RIVER

Cass	$ 132.49	$ 108.74	$ 71.03
Johnson	95.60	78.15	51.85
Nemaha	119.07	93.92	62.32
Otoe	124.40	100.86	66.57
Pawnee	80.96	68.73	47.05
Richardson	106.34	89.95	59.47

WHITE RIVER - HAT CREEK BASINS

White			
Dawes County	$ 2.08	$10.16	$ 6.95
Hat			
Sioux County	8.71	5.80	4.09

Note: These figures represent the average valuation per acre

NUMBER OF FARMS

PLATTE RIVER BASIN

County	1919	1924	1929	1934
Arthur	291	281	238	230
Banner	301	307	342	383
Box Butte	641	715	914	932
Buffalo	2,376	2,439	2,429	2,585
Butler	1,850	1,872	1,883	1,968
Cheyenne	854	1,070	1,116	1,321
Dawson	1,934	1,990	2,086	2,123
Deuel	384	323	500	544
Garden	714	645	710	765
Hall	1,556	1,625	1,628	1,658
Keith	673	778	779	807
Kimball	456	527	600	631
Lancaster	3,259	3,202	3,170	3,328
Lincoln	2,024	2,198	2,189	2,262
McPherson	355	281	275	319
Merrick	1,364	1,474	1,390	1,402
Morrill	957	1,054	1,081	1,127
Phelps	1,271	1,219	1,196	1,210
Platte	2,131	2,141	2,174	2,323
Sarpy	979	933	1,062	1,153
Saunders	2,697	2,668	2,699	2,790
Scotts Bluff	1,391	1,513	1,793	1,977

LOUP RIVER BASIN

Blaine	289	252	278	291
Boone	1,859	1,915	1,985	2,037
Brown	738	765	706	797
Custer	3,708	3,822	3,735	3,842
Garfield	490	521	445	499
Grant	151	138	121	115
Greeley	1,165	1,223	1,173	1,157
Hooker	189	155	144	158
Howard	1,523	1,541	1,553	1,624
Logan	168	314	288	295
Loup	347	333	317	331
Nance	1,102	1,156	1,197	1,216
Sherman	1,337	1,419	1,466	1,444
Thomas	216	188	174	219
Valley	1,295	1,351	1,300	1,371
Wheeler	420	445	371	436

REPUBLICAN RIVER BASIN

County	1919	1924	1929	1934
Chase	705	676	766	779
Dundy	661	734	709	936
Franklin	1,394	1,390	1,398	1,421
Frontier	1,347	1,388	1.367	1,401
Furnas	1,493	1,616	1,549	1,589
Gosper	882	902	846	869
Harlan	1,320	1,200	1,257	1,300
Hayes	605	670	646	662
Hitchcock	776	912	942	950
Perkins	585	784	1,034	958
Red Willow	1,091	1,135	1,189	1,229
Webster	1,530	1,519	1,535	1,568

ELKHORN RIVER BASIN

Antelope	2,083	2,231	2,154	2,184
Colfax	1,392	1,362	1,393	1,462
Cuming	1,859	1,855	1,943	1,936
Dodge	1,794	1,845	1,878	1,921
Holt	2,263	2,372	2,410	2,471
Madison	1,647	1,832	1,986	2,010
Pierce	1,381	1,631	1,602	1,651
Rock	553	600	531	610
Stanton	1,151	1,189	1,225	1,249
Wayne	1,287	1,393	1,482	1,523

BLUE RIVER BASIN

Adams	1,688	1,670	1,715	1,759
Clay	1,791	1,720	1,782	1,781
Fillmore	1,975	1,937	1,872	1,930
Gage	2,918	2,812	2,898	2,997
Hamilton	1,882	1,889	1,766	1,831
Jefferson	1,827	2,018	1,716	1,936
Kearney	1,306	1,335	1,249	1,222
Nuckolls	1,638	1,638	1,587	1,610
Polk	1,476	1,517	1,507	1,541
Saline	2,070	2,103	2,087	2,188
Seward	2,130	2,184	2,132	2,232
Thayer	1,889	1,807	1,713	1,833
York	2,042	2,114	1,999	2,010

NIOBRARA RIVER BASIN

Cherry	1,664	1,401	1,480	1,450
Keya Paha	582	595	576	571
Sheridan	1,063	1,249	1,303	1,320

MISSOURI RIVER BASIN ABOVE PLATTE RIVER

Boyd	1,078	1,079	1,048	1,114
Burt	1,417	1,577	1,569	1,602
Cedar	2,064	2,248	2,193	2,283
Dakota	740	842	844	846
Dixon	1,441	1,462	1,530	1,527
Douglas	1,709	1,725	1,883	1,851
Knox	2,407	2,665	2,632	2,704
Thurston	1,105	996	1,234	1,289
Washington	1,488	1,468	1,612	1,637

MISSOURI RIVER BASIN BELOW PLATTE RIVER

Cass	1,946	1,926	2,060	2,051
Johnson	1,167	1,189	1,303	1,334
Nemaha	1,524	1,551	1,511	1,577
Otoe	2,253	2,199	2,280	2,252
Pawnee	1,339	1,292	1,409	1,404
Richardson	1,974	1,907	1,964	2,081

WHITE RIVER - HAT CREEK BASINS

County	1919	1924	1929	1934
White				
Dawes County	728	811	870	886
Hat				
Sioux County	842	779	785	818

PERCENTAGE OF LAND IN FARMS

PLATTE RIVER BASIN

County	1919	1924	1929	1934
Arthur	81.0	90.2	92.9	93.4
Banner	94.3	73.2	78.1	89.1
Box Butte	93.9	84.6	98.0	92.7
Buffalo	94.4	92.1	96.1	97.7
Butler	94.4	94.6	97.0	98.0
Cheyenne	67.2	79.6	84.6	96.6
Dawson	90.6	97.5	94.2	96.2
Deuel	72.1	57.2	93.3	99.1
Garden	81.9	84.9	87.9	96.7
Hall	92.6	92.1	96.0	92.5
Keith	90.0	86.5	92.8	97.3
Kimball	56.7	63.0	78.0	86.9
Lancaster	93.0	90.5	91.9	93.3
Lincoln	85.3	73.5	85.7	93.7
McPherson	74.8	74.0	80.6	93.5
Merrick	92.8	92.1	97.5	96.7
Morrill	71.4	86.0	83.5	86.1
Phelps	93.9	90.9	94.7	96.4
Platte	96.1	93.0	96.4	98.5
Sarpy	88.6	81.4	90.3	93.1
Saunders	94.7	94.6	95.6	96.9
Scotts Bluff	60.8	73.4	81.8	90.9

LOUP RIVER BASIN

County	1919	1924	1929	1934
Blaine	24.0	24.5	22.0	17.2
Boone	66.9	71.6	70.9	69.9
Brown	28.6	31.0	28.5	29.7
Custer	45.2	46.4	43.8	43.0
Garfield	31.0	38.9	32.7	35.0
Grant	10.2	11.3	9.8	10.6
Greeley	57.5	59.0	55.5	56.6
Hooker	19.0	22.2	16.4	12.0
Howard	61.4	60.9	57.6	61.5
Logan	31.0	32.9	30.3	26.1
Loup	24.5	26.5	25.0	23.7
Nance	66.3	70.2	66.3	67.2
Sherman	57.2	59.3	57.9	59.6
Thomas	17.4	19.9	23.1	18.7
Valley	55.6	58.8	56.4	56.7
Wheeler	36.2	41.0	36.8	34.1

REPUBLICAN RIVER BASIN

County	1919	1924	1929	1934
Chase	27.8	40.4	46.8	46.3
Dundy	28.3	34.1	35.5	37.2
Franklin	57.8	59.3	59.9	58.1
Frontier	41.9	42.9	43.2	43.1
Furnas	59.9	60.8	61.6	62.0
Gosper	55.5	56.7	57.0	54.9
Harlan	62.9	63.7	64.1	61.8
Hayes	33.8	37.7	42.7	44.4
Hitchcock	40.0	45.6	50.1	52.2
Perkins	37.2	59.2	73.8	73.4
Red Willow	52.2	55.4	58.5	57.2
Webster	66.4	66.8	66.7	66.3

ELKHORN RIVER BASIN

County	1919	1924	1929	1934
Antelope	92.9	96.8	95.8	96.9
Colfax	97.0	93.8	96.0	98.3
Cuming	97.4	91.5	97.8	97.1
Dodge	94.9	95.3	95.8	95.0
Holt	87.2	81.4	88.1	93.7
Madison	87.7	92.0	97.3	96.3
Pierce	83.0	88.5	92.8	94.6
Rock	71.8	80.2	83.0	94.2
Stanton	96.1	90.8	95.7	96.1
Wayne	86.1	88.7	98.7	98.1

BLUE RIVER BASIN

County	1919	1924	1929	1934
Adams	95.9	92.7	96.1	95.7
Clay	94.8	90.1	97.0	96.5
Fillmore	95.2	95.1	96.9	98.8
Gage	93.3	92.6	96.9	97.1
Hamilton	98.2	96.4	98.2	98.3
Jefferson	94.9	96.4	95.1	96.2
Kearney	93.5	95.0	93.1	97.3
Nuckolls	92.2	90.9	93.6	94.5
Polk	97.0	90.0	98.4	99.4
Saline	96.8	95.0	99.5	98.5
Seward	94.1	92.9	97.2	98.6
Thayer	94.9	93.6	95.5	97.4
York	94.2	95.8	98.1	97.3

NIOBRARA RIVER BASIN

County	1919	1924	1929	1934
Cherry	18.2	19.8	18.0	16.4
Keya Paha	29.2	33.2	31.5	26.2
Sheridan	17.5	21.7	26.1	26.2

MISSOURI RIVER BASIN ABOVE PLATTE RIVER

County	1919	1924	1929	1934
Boyd	93.0	83.2	93.2	95.2
Burt	86.7	88.8	94.5	96.8
Cedar	91.5	95.5	95.3	98.0
Dakota	87.6	90.0	90.2	93.7
Dixon	90.9	91.1	96.2	95.3
Douglas	82.3	79.9	82.5	82.3
Knox	87.5	92.1	95.3	96.9
Thurston	76.9	82.3	89.1	90.1
Washington	94.4	89.1	97.2	99.9

MISSOURI RIVER BASIN BELOW PLATTE RIVER

County	1919	1924	1929	1934
Cass	92.7	93.5	98.5	98.6
Johnson	86.2	88.6	97.2	98.3
Nemaha	95.2	95.8	98.3	101.2
Otoe	96.8	95.4	97.3	98.0
Pawnee	89.7	87.6	93.3	94.6
Richardson	91.7	90.2	93.5	96.9

WHITE RIVER AND HAT CREEK BASINS

County	1919	1924	1929	1934
White				
Dawes County	91.6	85.7	92.5	99.0
Hat				
Sioux County	82.1	78.7	77.9	91.6

TRENDS IN FARM TENANCY

PERCENTAGE OF ALL FARMS IN COUNTY OPERATED BY TENANTS

PLATTE RIVER BASIN

County	1920	1925	1930	1935
Arthur	8.9	26.0	23.1	33.0
Banner	23.6	36.5	37.4	39.4
Box Butte	30.7	40.3	41.2	45.2
Buffalo	49.6	46.9	48.1	47.9
Butler	42.3	43.7	41.1	44.4
Cheyenne	31.0	49.2	45.1	51.3
Dawson	45.2	48.9	52.7	51.5

County	1920	1925	1930	1935
Deuel	36.7	48.6	43.6	43.6
Garden	28.2	37.1	43.5	44.4
Hall	47.8	48.3	48.0	49.7
Keith	35.2	45.5	46.5	49.8
Kimball	34.9	48.4	46.0	52.3
Lancaster	45.8	47.0	46.0	47.4
Lincoln	33.7	43.3	45.6	48.4
McPherson	21.7	31.0	34.5	44.5
Merrick	40.6	43.5	44.6	45.6
Morrill	37.4	45.4	51.7	52.4
Phelps	53.2	55.0	51.8	52.2
Platte	38.2	40.7	40.2	43.3
Sarpy	46.1	44.7	43.7	43.3
Saunders	37.5	38.6	38.3	
Scotts Bluff	46.2	50.1	53.4	54.3

LOUP RIVER BASIN

Blaine	28.7	29.0	36.0	40.2
Boone	44.2	51.1	54.4	58.8
Brown	30.2	45.0	45.2	46.9
Custer	40.2	46.9	48.2	52.5
Garfield	30.8	45.3	45.2	52.7
Grant	17.9	15.9	18.2	17.4
Greeley	40.7	46.5	48.7	51.9
Hooker	19.0	25.2	45.1	48.7
Howard	35.5	37.2	38.1	41.5
Logan	30.4	43.3	42.4	47.8
Loup	23.3	39.0	36.0	42.9
Nance	49.5	52.7	51.4	58.2
Sherman	38.3	41.2	46.0	51.7
Thomas	22.2	26.1	33.3	43.8
Valley	38.4	45.4	44.7	48.7
Wheeler	29.0	41.8	46.9	53.9

REPUBLICAN RIVER BASIN

Chase	38.4	42.0	48.2	48.8
Dundy	35.1	44.0	46.4	45.8
Franklin	43.7	43.8	44.9	45.4
Frontier	42.5	46.5	47.4	49.0
Furnas	45.4	45.8	45.3	49.0
Gosper	45.4	50.1	53.7	52.0
Harlan	51.1	47.5	49.6	48.5
Hayes	38.2	48.1	42.1	43.6
Hitchcock	37.5	44.0	41.3	41.8
Perkins	34.7	50.1	44.4	49.5
Red Willow	43.1	49.6	45.9	45.0
Webster	45.9	47.9	52.6	53.5

ELKHORN RIVER BASIN

Antelope	43.2	47.8	49.3	53.4
Colfax	31.7	34.4	32.9	37.3
Cuming	41.3	45.0	45.7	43.0
Dodge	43.9	47.3	46.4	48.1
Holt	36.1	41.1	44.5	48.2
Madison	44.4	43.7	44.3	49.1
Pierce	44.1	50.0	53.7	56.3
Rock	36.7	40.7	46.0	49.2
Stanton	37.5	42.2	44.1	43.2
Wayne	53.1	55.1	58.6	56.9

BLUE RIVER BASIN

Adams	49.8	51.7	51.7	53.3
Clay	50.6	49.0	50.3	52.8
Fillmore	58.5	56.2	55.8	54.9
Gage	51.5	51.1	49.7	51.8
Hamilton	53.7	54.4	52.4	53.2
Jefferson	45.0	51.7	45.6	50.9
Kearney	53.8	51.2	49.1	46.3
Nuckolls	52.1	55.5	54.8	57.6
Polk	50.7	50.0	51.1	51.8

County	1920	1925	1930	1935
Saline	34.7	37.9	35.1	35.5
Seward	49.0	49.1	48.4	48.8
Thayer	49.8	49.4	50.4	51.7
York	55.8	54.7	53.0	53.4

NIOBRARA RIVER BASIN

Cherry	20.2	29.8	33.4	35.3
Keya Paha	30.2	38.7	40.8	41.1
Sheridan	28.6	37.9	36.3	39.5

MISSOURI RIVER BASIN ABOVE PLATTE RIVER

Boyd	36.6	43.6	46.9	54.6
Burt	48.5	53.6	57.3	
Cedar	52.6	49.6	50.8	56.1
Dakota	45.8	50.5	50.9	52.0
Dixon	41.8	46.1	52.9	53.7
Douglas	41.4	42.1	40.5	41.6
Knox	42.2	47.8	52.0	59.3
Thurston	50.3	63.1	57.1	62.2
Washington	42.9	43.9	45.8	46.9

MISSOURI RIVER BASIN BELOW PLATTE RIVER

Cass	44.9	47.8	48.6	48.6
Johnson	45.0	47.1	48.7	49.9
Nemaha	48.0	49.2	50.2	47.7
Otoe	52.5	53.8	50.4	51.7
Pawnee	41.7	39.1	43.2	44.3
Richardson	46.6	47.5	49.1	

WHITE RIVER - HAT CREEK BASINS

White				
Dawes County	27.5	38.3	42.6	43.4
Hat				
Sioux County	20.4	26.4	33.5	39.1

PERCENTAGE OF FARM LAND IN CROPS

PLATTE RIVER BASIN

County	1919	1924	1929	1934
Arthur	15.9	16.2	15.7	15.0
Banner	13.5	24.9	41.6	41.2
Box Butte	18.4	28.0	50.0	51.3
Buffalo	64.6	65.9	66.8	65.7
Butler	76.9	78.4	76.5	77.3
Cheyenne	39.5	59.4	65.4	66.0
Dawson	58.0	54.0	59.5	57.8
Deuel	41.0	54.0	68.7	70.0
Garden	15.1	18.2	21.6	21.5
Hall	70.7	71.6	73.0	73.3
Keith	24.9	33.3	37.2	38.3
Kimball	22.6	42.0	61.7	64.6
Lancaster	71.9	75.2	73.5	73.7
Lincoln	31.5	37.2	35.5	32.8
McPherson	23.4	25.0	23.0	24.1
Merrick	63.8	71.1	65.4	68.6
Morrill	19.9	24.9	28.7	28.6
Phelps	72.7	74.2	75.4	75.1
Platte	70.7	75.5	74.7	73.9
Sarpy	73.5	72.5	76.3	73.1
Saunders	75.7	77.5	75.4	76.5
Scotts Bluff	46.2	52.9	53.3	53.9

LOUP RIVER BASIN

Blaine	24.0	24.5	22.0	17.2
Boone	66.9	71.6	70.9	69.9
Brown	28.6	31.0	28.5	29.7
Custer	45.2	46.4	43.8	43.0

County	1919	1924	1929	1934
Garfield	31.0	38.9	32.7	35.0
Grant	10.2	11.3	9.8	10.6
Greeley	57.5	59.0	55.5	56.6
Hooker	19.0	22.2	16.4	12.0
Howard	61.4	60.9	57.6	61.5
Logan	31.0	32.9	30.3	26.1
Loup	24.5	26.5	25.0	23.7
Nance	66.3	70.2	66.3	67.2
Sherman	57.2	59.3	57.9	59.6
Thomas	17.4	19.9	23.1	18.7
Valley	55.6	58.8	56.4	56.7
Wheeler	36.2	41.0	36.8	34.1
REPUBLICAN RIVER BASIN				
Chase	27.8	40.4	46.8	46.8
Dundy	28.3	34.1	35.5	37.2
Franklin	57.8	59.3	59.9	58.1
Frontier	41.9	42.9	43.2	43.1
Furnas	59.9	60.8	61.6	62.0
Gosper	55.5	56.7	57.0	54.9
Harlan	62.9	63.7	64.1	61.8
Hayes	33.8	37.7	42.7	44.4
Hitchcock	40.0	45.6	50.1	52.2
Perkins	37.2	59.2	73.8	73.4
Red Willow	52.2	55.4	58.5	57.2
Webster	66.4	66.8	66.7	66.3
ELKHORN RIVER BASIN				
Antelope	61.6	65.8	66.1	67.8
Colfax	73.4	76.0	76.4	74.5
Cuming	68.9	74.0	75.1	72.9
Dodge	73.7	76.6	78.7	76.6
Holt	45.4	51.8	47.9	45.6
Madison	68.3	72.9	74.9	71.9
Pierce	69.0	72.3	72.6	71.9
Rock	39.1	39.2	35.1	34.9
Stanton	62.9	68.5	70.8	66.6
Wayne	75.0	77.8	79.0	75.9
BLUE RIVER BASIN				
Adams	77.6	77.8	78.5	78.4
Clay	79.5	80.4	82.4	83.1

County	1919	1924	1929	1934
Fillmore	78.8	80.9	79.9	81.9
Gage	74.2	74.6	70.6	73.9
Hamilton	79.1	81.8	81.1	83.3
Jefferson	68.3	68.4	68.2	66.7
Kearney	73.3	74.0	75.7	73.7
Nuckolls	70.0	69.6	70.7	69.7
Polk	75.8	82.1	79.0	78.4
Saline	75.0	76.5	73.6	75.9
Seward	74.7	76.3	77.0	75.3
Thayer	72.3	73.6	70.7	71.7
York	77.9	81.1	77.6	81.2
NIOBRARA RIVER BASIN				
Cherry	18.2	19.8	18.0	16.4
Keya Paha	29.2	33.2	31.5	26.2
Sheridan	17.5	21.7	26.1	26.2
MISSOURI RIVER BASIN ABOVE PLATTE RIVER				
Boyd	54.0	57.7	55.9	53.6
Burt	71.1	77.2	78.1	76.5
Cedar	67.9	72.2	74.0	72.0
Dakota	69.2	73.7	75.1	70.8
Dixon	70.0	73.5	75.1	72.0
Douglas	70.8	74.1	75.9	74.4
Knox	59.3	61.3	61.4	59.8
Thurston	76.8	80.0	78.7	76.6
Washington	71.1	74.4	76.6	72.9
MISSOURI RIVER BASIN BELOW PLATTE RIVER				
Cass	74.0	73.5	73.6	73.0
Johnson	65.4	68.0	65.0	69.4
Nemaha	65.9	70.5	70.8	68.0
Otoe	71.9	73.9	73.7	70.2
Pawnee	61.7	63.1	59.4	57.3
Richardson	61.8	67.3	67.6	63.0
WHITE RIVER - HAT CREEK BASINS				
White Dawes County	13.0	20.2	25.4	23.0
Hat Sioux County	8.6	10.4	12.4	9.4

PLATTE RIVER BASIN

County	1934 ACREAGE: Area	Farm Land	Crop Land	ACRES OF IMPORTANT CROPS 1930-1934 AVERAGE: Corn	Wheat	Oats	Alfalfa	Wild Hay
Arthur	461,440	431,204	63,482	10,220	180	880	4,820	28,800
Banner	474,880	422,942	174,492	27,800	52,200	9,700	3,300	2,300
Box Butte	688,640	638,458	327,236	58,600	97,400	19,900	7,400	15,200
Buffalo	604,800	591,023	388,010	183,800	37,400	23,400	43,800	28,200
Butler	373,120	365,618	282,650	132,400	54,400	52,000	9,300	10,000
Cheyenne	764,160	738,121	487,108	96,600	190,600	23,600	3,200	2,900
Dawson	630,400	606,262	350,021	174,800	24,000	20,800	51,600	16,400
Deuel	280,960	278,560	195,021	43,000	58,000	5,400	2,000	700
Garden	1,079,680	1,044,222	224,846	61,200	38,200	8,000	5,500	50,000
Hall	337,920	312,526	228,929	98,600	45,800	20,000	28,200	19,400
Keith	683,520	664,998	254,647	83,200	61,800	7,200	7,600	37,600
Kimball	613,120	532,637	344.048	23,400	110,600	6,900	2,200	1,300
Lancaster	545,920	509,309	375,297	177,200	58,600	47,400	25,800	19,000
Lincoln	1,623,040	1,521,233	498,635	209,800	54,000	20,600	15,800	143,000
McPherson	552,960	517,215	124,815	19,800	80	1,600	380	60,000
Merrick	296,320	286,443	196,553	84,000	29,400	21,600	13,200	23,400
Morrill	906,880	780,780	223,188	66,800	31,000	9,100	9,700	44,200
Phelps	344,320	331,963	249.347	120,600	65,400	7,600	6,400	8,200
Platte	430,720	424,300	313.711	168,200	17,000	62,400	21,400	14,000
Sarpy	153,600	143,018	104,605	63,200	3,400	14,800	6,200	1,200
Saunders	483,840	468,632	358,661	191,200	40,000	58,200	10,600	18,600
Scotts Bluff	462,720	420,819	226,495	32,400	14,400	12,300	36,600	7,600

County	Area	Farm Land	Crop Land	Corn	Wheat	Oats	Alfalfa	Wild Hay
			LOUP RIVER BASIN					
Blaine	455,040	385,790	65,458	14,800	240	1,340	460	49,000
Boone	442,880	435,595	304,539	164,800	6,000	56,600	30,200	7,400
Brown	790,400	714,526	212,073	41,600	2,320	12,200	1,700	79,600
Custer	1,656,320	1,611,624	693,089	327,000	24,200	76,600	49,000	94,800
Garfield	368,000	337,845	118,283	24,600	500	6,500	3,000	48,200
Grant	499,200	698,410	73,994	1,960	20	480	5,440	50,800
Greeley	365,440	254,064	200,339	73,000	3,400	29,200	19,200	26,800
Hooker	462,080	317,897	38,280	7,240		280	320	26,800
Howard	359,040	347,427	213,506	88,800	23,800	24,400	24,000	17,600
Logan	366,720	335,812	88,550	27,200	2,160	7,080	11,360	27,400
Loup	368,640	254,354	60,169	19,000	440	4,780	3,680	22,800
Nance	385,440	281,899	189,346	96,000	16,200	25,200	19,000	8,200
Sherman	366,720	349,247	208,214	92,200	13,600	24,400	24,600	28,600
Thomas	458,240	338,379	63,246	6,900		600	500	34,800
Valley	364,800	355,558	201,750	104,400	4,300	22,000	24,400	17,200
Wheeler	369,920	339,082	115,500	17,200	400	8,500	1,200	48,000
			REPUBLICAN RIVER BASIN					
Chase	575,360	539,485	252,706	116,200	54,400	2,800	2,800	4,400
Dundy	593,280	569,161	211,837	120,800	18,800	1,400	3,700	11,200
Franklin	369,920	354,327	205,825	108,600	34,000	16,400	7,300	13,000
Frontier	624,000	608,134	262,029	159,000	24,800	9,900	2,200	13,400
Furnas	401,440	439,745	272,480	159,800	40,200	4,400	8,200	6,800
Gosper	296,960	284,163	156,122	105,200	14,500	7,000	2,300	9,500
Harlan	367,360	356,635	220,454	125,000	42,600	10,700	7,000	8,600
Hayes	462,080	441,036	195,922	101,800	30,800	3,600	2,600	7,100
Hitchcock	463,360	431,153	225,250	99,000	53,800	4,300	5,100	4,800
Perkins	567,040	542,582	398,522	134,400	152,200	9,800	2,800	3,100
Red Willow	460,800	441,619	252,528	128,400	48,200	5,420	5,400	4,460
Webster	369,920	352,694	224,005	124,400	36,000	19,400	15,000	23,500
			ELKHORN RIVER BASIN					
Antelope	558,080	540,523	366,250	180,200	5,000	45,600	27,000	43,400
Colfax	259,200	254,722	189,766	92,400	14,900	44,200	10,600	15,400
Cuming	369,280	358,547	261,364	139,600	1,200	67,400	18,400	20,400
Dodge	339,840	322,877	247,250	132,400	24,400	51,600	10,700	17,400
Holt	1,531,520	1,435,057	654,891	138,600	4,060	40,800	10,300	295,400
Madison	368,640	354,978	255,354	142,200	3,600	60,000	18,400	13,800
Pierce	369,280	349,408	251,250	125,400	1,600	56,200	9,200	21,000
Rock	642,560	604,989	211,200	24,000	400	5,400	1,600	132,000
Stanton	275,840	265,180	176,715	96,400	1,200	45,200	15,200	12,400
Wayne	288,000	282,448	214,426	119,000	300	54,000	18,800	6,800
			BLUE RIVER BASIN					
Adams	361,600	345,942	271,288	107,200	93,400	24,000	12,400	9,600
Clay	370,560	357,594	297,290	118,800	94,000	28,000	14,000	10,700
Fillmore	368,640	364,168	298,076	124,000	83,400	39,800	15,400	13,400
Gage	551,680	535,691	396,026	173,200	83,200	54,000	24,000	13,600
Hamilton	344,320	338,380	281,974	128,400	62,800	31,200	20,200	4,600
Jefferson	369,920	355,906	237,492	99,800	59,000	31,600	16,400	17,000
Kearney	330,240	321,273	236,673	92,400	85,200	15,200	9,800	12,600
Nuckolls	370,560	350,280	244,102	123,800	47,200	30,400	16,200	9,300
Polk	275,200	273,575	214,553	107,000	36,000	30,400	11,400	6,500
Saline	366,720	361,070	273,946	99,600	80,200	38,000	15,400	12,600
Seward	367,360	362,248	272,880	128,400	60,200	43,800	14,800	6,300
Thayer	369,920	360,389	258,298	106,800	70,600	33,200	14,800	8,800
York	368,000	357,889	290,519	156,000	50,200	39,000	20,000	4,000
			NIOBRARA RIVER BASIN					
Cherry	3,826,560	3,511,661	574,228	71,400	3,460	16,080	11,600	400,000
Keya Paha	496,000	471,305	123,641	39,200	1,600	9,600	4,800	63,000
Sheridan	1,580,160	1,580,056	414,101	100,200	60,000	30,200	21,200	72,600

MISSOURI RIVER BASIN ABOVE PLATTE RIVER

County	Area	Farm Land	Crop Land	Corn	Wheat	Oats	Alfalfa	Wild Hay
Boyd	342,400	326,085	174,662	76,600	5,800	27,800	7,800	22,100
Burt	304,000	294,368	225,273	127,800	7,000	42,800	18,200	4,700
Cedar	470,400	460,775	331,875	177,400	1,900	80,400	16,000	18.000
Dakota	161,920	151,748	107,450	36,200	1,500	17,600	7,100	2,700
Dixon	302,080	287,947	207,249	115,800	1,000	49,400	11,500	10,300
Douglas	211,840	174,267	129,708	74,000	3,300	20,400	8,400	2,000
Knox	712,960	691,140	413,647	194,800	4,700	80,800	19,600	48,800
Thurston	247,680	223,193	171,039	100,400	1,000	37,000	9,400	3,600
Washington	243,200	243.026	177.252	91.600	10,500	41.400	10.600	4.000

MISSOURI RIVER BASIN BELOW PLATTE RIVER

County	Area	Farm Land	Crop Land	Corn	Wheat	Oats	Alfalfa	Wild Hay
Cass	344,320	339,482	247,900	150,800	20,200	36,600	10,100	4,500
Johnson	239,360	235,305	163,307	73,600	26,000	21,600	6,500	6,400
Nemaha	248,960	251,902*	171,220	94,000	25,400	21,200	9,800	2,400
Otoe	387,840	380,115	266,744	141,400	34,600	41,800	9,500	9,600
Pawnee	275,840	261,079	149,682	77,200	15,400	19,400	7,700	9,900
Richardson	348,600	338,149	212,889	120,200	22,800	25,800	14,000	2,400

WHITE RIVER - HAT CREEK BASINS

County	Area	Farm Land	Crop Land	Corn	Wheat	Oats	Alfalfa	Wild Hay
White Dawes County	897,280	888,359	204,696	52,000	43,000	16,200	14,600	9,500
Hat Sioux County	1,315,200	1,204,140	113,766	20,400	13,000	9,800	13,900	15,600

* When area of farm land exceeds the area of the county, the tracts operated within this county extend into adjoining counties.

CROP PRODUCTION-YIELDS PER ACRE 1920-1929

PLATTE RIVER BASIN

County	Corn bu.	Wheat bu.	Barley bu.	Rye bu.	Oats bu.	Alfalfa tons
Arthur	20.1	13.0	23.9	11.9	25.3	2.1
Banner	18.9	18.0	27.2	15.0	27.8	1.9
Box Butte	20.1	17.5	27.3	13.2	30.1	1.7
Buffalo	20.9	13.1	23.8	13.9	28.1	2.4
Butler	32.5	18.6	31.0	17.4	31.2	2.8
Cheyenne	17.2	15.3	26.6	13.2	28.9	1.9
Dawson	23.3	13.0	25.6	12.2	28.6	2.9
Deuel	19.2	17.4	27.2	14.3	28.5	2.2
Garden	22.4	17.2	25.8	14.7	31.8	2.4
Hall	23.8	15.3	27.6	16.0	30.5	2.6
Keith	22.2	16.3	29.0	8.8	29.2	2.7
Kimball	16.7	16.1	26.9	13.0	26.6	1.9
Lancaster	28.6	17.9	30.6	16.6	28.9	2.4
Lincoln	20.9	13.1	24.3	12.0	26.0	2.7
McPherson	19.7	11.6	21.6	11.2	24.8	1.9
Merrick	26.8	16.5	27.9	15.7	30.6	2.6
Morrill	22.0	16.6	33.7	14.9	33.8	2.6
Phelps	18.0	11.1	22.2	13.0	24.0	1.9
Platte	32.6	18.4	29.4	17.4	30.0	2.8
Sarpy	35.4	18.6	27.7	18.7	29.3	2.8
Saunders	33.0	19.8	28.6	21.1	30.1	2.9
Scotts Bluff	26.5	20.9	44.7	16.5	42.3	2.8

LOUP RIVER BASIN

County	Corn bu.	Wheat bu.	Barley bu.	Rye bu.	Oats bu.	Alfalfa tons
Blaine	20.6	5.9	22.1	11.5	24.2	2.1
Boone	27.8	15.9	26.7	14.7	26.4	2.3
Brown	19.2	9.4	21.6	11.4	24.2	2.0
Custer	23.2	12.4	23.1	13.2	27.4	2.1
Garfield	23.5	12.2	24.1	11.6	25.6	2.2
Grant	19.7	13.0	23.4	12.4	25.7	2.1
Greeley	25.2	13.1	26.3	12.7	26.5	2.1
Hooker	19.4	11.2	21.6	10.7	22.8	2.0
Howard	25.6	15.3	24.7	14.4	27.9	2.4
Logan	21.4	12.6	22.4	11.8	25.9	2.2
Loup	22.2	11.4	24.2	11.1	24.8	2.1

County	Corn bu.	Wheat bu.	Barley bu.	Rye bu.	Oats bu.	Alfalfa tons
Nance	28.3	17.5	26.4	16.4	29.0	2.4
Sherman	23.2	14.3	24.7	13.5	27.4	2.1
Thomas	18.9	11.6	23.2	10.7	24.2	2.0
Valley	25.3	14.4	25.4	13.5	28.6	2.2
Wheeler	22.4	9.2	22.7	10.0	23.0	2.1
REPUBLICAN RIVER BASIN						
Chase	21.3	13.6	25.6	24.8	11.2	2.4
Dundy	20.7	13.4	26.0	24.1	10.5	2.6
Franklin	18.9	12.1	25.6	22.6	13.4	2.1
Frontier	19.5	11.4	23.6	21.9	12.8	2.5
Furnas	21.4	11.6	26.9	24.1	14.7	2.3
Gosper	19.6	11.9	25.2	23.8	11.3	2.1
Harlan	19.4	11.2	24.8	23.1	13.9	2.5
Hayes	20.5	13.3	24.7	25.5	12.5	2.3
Hitchcock	24.3	13.3	27.2	24.3	12.0	2.8
Perkins	19.9	16.0	26.2	26.6	12.7	2.0
Red Willow	20.8	12.1	25.5	24.9	22.4	2.9
Webster	21.3	13.3	27.2	25.3	14.1	2.0
ELKHORN RIVER BASIN						
Antelope	27.8	12.2	25.6	11.5	24.8	2.6
Colfax	36.1	19.0	31.8	17.7	30.8	3.0
Cuming	39.1	17.0	35.5	17.0	33.1	3.0
Dodge	37.4	19.6	34.6	18.4	33.7	3.2
Holt	22.1	11.1	24.1	11.7	23.6	2.0
Madison	31.9	16.9	28.3	13.0	28.2	2.6
Pierce	30.7	6.8	28.5	13.2	26.2	2.4
Rock	19.6	10.6	22.2	10.7	22.8	1.8
Stanton	36.2	18.7	33.0	14.9	30.9	2.8
Wayne	34.5	12.5	34.2	17.2	30.2	2.6
BLUE RIVER BASIN						
Adams	22.5	14.0	26.2	13.6	28.3	2.2
Clay	23.7	14.4	24.9	16.3	31.4	2.2
Fillmore	25.4	16.6	26.9	17.0	30.6	2.5
Gage	25.8	16.3	27.0	16.7	29.6	2.3
Hamilton	28.0	16.4	29.2	17.6	33.2	2.5
Jefferson	24.3	16.4	27.3	17.1	28.7	2.2
Kearney	18.4	12.8	22.8	13.4	25.0	1.8
Nuckolls	21.4	14.8	26.8	15.2	28.7	2.0
Polk	28.7	18.3	30.3	17.3	33.1	2.8
Saline	28.8	18.6	27.4	18.7	30.8	2.6
Seward	31.0	18.6	29.7	17.7	32.7	2.7
Thayer	22.5	19.4	25.4	15.0	29.6	2.1
York	28.9	16.7	27.2	16.5	31.4	2.6
NIOBRARA RIVER BASIN						
Cherry	20.2	12.6	24.6		26.9	2.1
Keya Paha	19.5	9.8	24.5	11.2	22.6	2.0
Sheridan	20.8	16.2	30.4	13.5	30.8	1.9
MISSOURI RIVER BASIN ABOVE PLATTE RIVER						
Boyd	23.8	10.8	25.4	14.2	28.0	2.0
Burt	40.8	19.2	33.7	20.1	34.1	3.0
Cedar	32.4	13.7	29.9	17.6	29.4	2.4
Dakota	36.7	12.6	31.0	17.7	29.6	2.8
Dixon	33.2	13.1	31.2	17.6	28.8	2.5
Douglas	36.0	19.1	29.5	20.0	30.0	2.9
Knox	28.6	11.5	26.8	15.0	26.6	2.2
Thurston	32.0	16.0	30.7	18.1	29.7	2.7
Washington	38.8	20.3	31.5	19.3	32.6	3.1

County	Corn bu.	Wheat bu.	Barley bu.	Rye bu.	Oats bu.	Alfalfa tons
MISSOURI RIVER BASIN BELOW PLATTE RIVER						
Cass	32.4	18.5	25.7	18.5	28.8	2.7
Johnson	28.8	16.3	24.3	16.3	28.0	2.4
Nemaha	34.0	19.2	27.5	18.8	31.3	2.8
Otoe	31.7	18.6	28.0	18.7	29.5	2.8
Pawnee	28.8	15.6	14.6	15.6	27.9	2.3
Richardson	34.2	19.9	29.0	18.5	33.0	2.8
WHITE RIVER - HAT CREEK BASINS						
White Dawes County	20.9	16.4	28.9	13.1	30.5	1.9
Hat Sioux County	21.3	16.1	29.0	14.7	31.9	2.4

LEADING MANUFACTURING COUNTIES OF NEBRASKA
1929

Counties	Number of Establishments	Number of Wage Earners	Wages	Cost of Materials and Containers	Value of Products	Value Added by Manufacture
Adams	45	618	$ 735,481	$ 3,754,602	$ 6,350,692	$ 2,459,878
Box Butte	9	294	479,626	1,329,129	2,205,335	809,128
Buffalo	22	121	161,167	1,105,231	1,725,735	571,359
Cass	13	407	599,287	622,737	2,422,113	1,461,852
Dawes	13	185	299,390	333,499	809,390	435,325
Dawson	19	66	78,555	726,528	1,036,840	291,450
Dodge	49	447	486,058	3,795,160	5,557,430	1,677,761
Douglas	445	16,339	21,636,998	276,882,987	355,635,684	75,593,417
Gage	33	738	906,342	4,706,798	7,399,890	2,574,269
Hall	43	589	720,112	4,016,528	6,527,900	2,302,766
Jefferson	17	256	303,499	1,456,702	2,230,853	702,467
Lancaster	164	3,093	4,185,236	16,427,161	28,829,736	11,850,959
Lincoln	18	469	713,080	842,666	2,093,059	1,158,017
Madison	34	391	488,532	2,304,990	3,848,356	1,454,335
Nuckolls	15	199	260,483	2,156,620	3,428,512	958,692
Platte	24	165	194,108	1,242,688	1,836,290	554,519
Red Willow	17	265	414,074	395,941	1,074,914	642,187
Richardson	19	179	281,797	1,327,877	2,043,594	674,419
Thayer	13	234	134,381	570,250	944,215	361,560
York	15	86	98,090	199,529	480,748	251,533

Only counties with the required number of establishments are listed.

Sources: Nebraska Blue Book, 1938 and United States Census, 1930.

LEADING MANUFACTURING CITIES OF NEBRASKA
1929

Cities	Number of Establishments	Number of Wage Earners	Wages	Cost of Materials and Containers	Value of Products	Value Added by Manufacture
Beatrice	24	498	$ 577,986	$ 3,958,521	$ 5,976,092	$ 1,933,515
Fremont	33	385	438,266	3,606,290	5,173,022	1,488,216
Grand Island	37	522	637,884	3,483,224	5,645,029	1,999,066
Hastings	38	554	656,386	3,695,115	6,048,241	2,238,694
Lincoln	150	1,889	2,301,195	12,778,043	22,912,816	9,639,010
Norfolk	20	170	216,359	1,616,783	2,666,491	1,001,567
North Platte	15	379	576,551	807,096	1,759,914	878,380
Omaha	431	16,108	21,356,639	275,792,637	352,835,338	73,915,103

Only cities with the required number of establishments are listed.

Sources: Nebraska Blue Book, 1938; and United States Census, 1930.

STREAM DISCHARGES

SUMMARY OF MEAN ANNUAL RUN-OFF

Station	State	Period of Record	Complete Years	Mean Run-off A.F.
PLATTE RIVER BASIN				
Horse Creek at:				
Lyman	Nebraska	1921-1938	18	52,787
Pumpkin Creek at:				
Bridgeport	do	1922-1938	17	28,044
Blue Creek at:				
Lewellen	do	1921-1938	18	58,918
Birdwood Creek at:				
Hershey	do	1922-1938	17	129,416
North Platte River at:				
Northgate	Colorado	1915-1938	24	370,524
Saratoga	Wyoming	1904-1938	35	948,486
Pathfinder (inflow)	do	1904-1938	35	1,364,330
Pathfinder (outflow)	do	1909-1938	30	1,304,129
Whalen (above)	do	1901-1938	38	1,577,770
Whalen (below)	do	1909-1938	30	957,701
Wyo-Nebr., line	Nebraska	1928-1938	11	803,512
Mitchell	do	1902-1910; 1921-1938	27	1,233.114
Bridgeport	do	1915-1938	24	1,420,[illegible]32
North Platte	do	1909-1938	30	1,809,228
Lodgepole Creek at:				
Bushnell	do	1924-1938	15	10,925
South Platte River at:				
Julesburg	Colorado	1902-1938	37	399,282
North Platte	Nebraska	1918-1938	21	299,275
Platte River at:				
North Platte	Nebraska	1918-1938	21	2,098,829
Overton	do	1915-1938	24	2,152,294
Duncan	do	1929-1938	10	1,235,840
Ashland	do	1896-1915; 1929-1938	30	4,911,856
LOUP RIVER BASIN				
North Loup River at:				
St. Paul	Nebraska	1895-1915; 1929-1938	31	756,905
Middle Loup River at:				
St. Paul	do	1895-1915; 1929-1938	31	984,616
Loup River at:				
Columbus	do	1895-1915; 1929-1938	31	2,113,489
REPUBLICAN RIVER BASIN				
No. Fork Rep. Riv. at:				
Colo.-Nebr., line	do	1924-1938	15	36,470
Arikaree River at:				
Haigler	Nebraska	1924-1938	15	16,048

Station	State	Period of Record	Complete Years	Mean Run-off A.F.
REPUBLICAN RIVER BASIN				
So. Fork Rep. Riv. at:				
Benkelman	do	1895;1903-1906;1924-1933;1938	16	41,564
Frenchman River at:				
Culbertson	do	1895-1896; 1922-1938	19	92,169
Republican River at:				
Culbertson	do	1922-1929; 1931-1938	16	122,020
Medicine Creek at:				
Cambridge	do	1923-1931; 1937-1938	11	46,467
Bloomington	do	1929-1938	10	423,539
Nebraska Kansas line	do	1897-1915; 1930-1938	28	512,578
ELKHORN RIVER BASIN				
Elkhorn River at:				
Neligh	do	1931-1938	8	119,327
Waterloo	do	1912-1913; 1929-1938	12	561,789
BLUE RIVER BASIN				
Little Blue River at:				
Endicott	do	1909-1915; 1929-1938	17	207,619
Big Blue River at:				
Barnston	do	1920-1925; 1929-1938	16	269,817
NIOBRARA RIVER BASIN				
Niobrara River at:				
Dunlap	do	1924-1938	15	36,389
Spencer	do	1928-1936	9	878,763
MISSOURI RIVER BASIN				
Missouri River at:				
Omaha	do	1929-1938	10	16,953,990
WHITE & HAT CREEK BASIN				
White River at:				
Chadron	do	1925-1929; 1931-1938	13	20,909
Hat Creek at:				
Nebr.-So. Dak. line	do	1905-1906	2	38,456

PLATTE RIVER BASIN

MONTHLY AND YEARLY DISCHARGES
HORSE CREEK NEAR LYMAN, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1921	*400	*300	*200	153	119	155	172	305	426	597	561	537	3,925	7
1922	399	236	154	184	222	266	208	266	528	296	256	298	3,313	6
1923	307	298	307	430	333	501	696	430	1,923	4,603	9,270	8,271	27,369	52
1924	10,607	7,864	3,392	4,780	6,829	5,284	4,395	8,166	11,040	6,724	5,414	4,620	79,115	150
1925	3,431	3,193	1,262	3,652	6,034	1,310	2,624	7,527	3,632	2,681	7,450	4,110	46,906	89
1926	3,813	3,689	3,111	3,689	3,721	1,725	952	6,569	15,749	15,098	14,438	16,899	89,453	169
1927	5,339	2,975	3,074	3,066	4,599	2,663	5,416	13,172	12,498	29,427	26,015	17,851	126,095	239
1928	8,731	10,086	3,197	4,427	978	1,353	863	12,942	10,949	8,961	5,226	12,050	79,763	151
1929	5,350	4,681	3,074	2,150	1,555	3,804	7,438	18,125	19,904	7,757	6,472	6,188	86,498	164
1930	6,456	5,256	6,129	5,534	9,108	6,052	1,468	5,231	3,689	6,270	14,727	19,141	89,061	169
1931	10,900	5,750	7,070	5,110	3,250	4,020	3,920	6,580	7,860	6,080	5,280	3,740	69,560	132
1932	2,530	*2,560	*2,400	1.680	3,850	1,910	1,510	3,280	10,200	6,640	7,750	8,150	52,820	99
1933	5,210	2,160	1,320	1,540	989	1,860	2,090	10,400	7,740	5,950	8,240	14,300	61,799	117
1934	5,480	1,830	1,550	*1,410	1,080	1,200	1,090	516	1,110	1.000	1,030	768	18,064	34
1935	781	631	732	581	563	458	1,440	2,190	10,080	2,680	2,070	2,480	24,686	47
1936	1,790	1,360	930	670	450	793	845	949	5,950	1,680	2,380	1,880	19,677	37
1937	1,860	1,120	841	498	507	860	624	1,100	4,020	5,850	3,540	5,910	26,730	51
1938	4,960	2,190	1,780	1,230	926	1,220	1,420	7,190	4,720	5,650	4,430	9,990	45,706	87
Mean	4,352	3,121	2,251	2,266	2,506	1,969	2.065	5.830	7,334	6.553	6,919	7,621	52,787	
% Annual Mean	8.3	5.9	4.3	4.3	4.7	3.7	3.9	11.1	13.9	12.4	13.1	14.1		100
Maximum	10,900	10,086	7,070	5,534	9,108	6,052	7,438	18,125	19,904	29,427	26,015	19,141	126,095	
Minimum	307	236	154	153	119	155	172	266	426	296	256	298	3,313	

Mean discharge May to September: 34,257 acre-feet or 64.9 per cent of annual mean
Mean annual discharge 1931-1938: 39,835 acre-feet or 75.5 per cent of annual mean

* Estimated

Location; Sec. 25, T. 23 N., R. 58 W.
Drainage Area; 1,860 Square Miles

MONTHLY AND YEARLY DISCHARGES
PUMPKIN CREEK NEAR BRIDGEPORT, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1922	*2,000	*2,500	*3,000	3,201	3,348	3,662	2,933	3,858	817	1,301	1,085	1,539	29,244	104
1923	1,329	2,203	2,677	2,989	2,449	2,312	2,334	3,066	2,989	1,297	2,531	2,108	28,284	101
1924	2,572	2,499	2,582	3,136	2,971	3,565	3,205	2,438	1,948	1,706	1,190	1,985	29,797	106
1925	1,848	2,548	3,505	2,951	3,372	3,258	1,785	860	1,646	1,606	1,874	1,309	26,562	95
1926	1,876	1,954	2,019	2,509	2,729	3,566	2,916	2,372	2,150	2,118	2,767	3,064	30,040	107
1927	2,213	1,964	1,844	3,234	2,566	3,773	4,669	2,969	3,657	1,327	3,673	2,975	34,864	124
1928	2,648	3,154	3,135	4,181	3,796	3,953	4,522	2,346	2,380	2,313	2,872	1,845	37,145	132
1929	2,459	2,836	3,340	3,477	2,352	3,461	5,077	5,074	2,430	1,422	1,570	1,805	35,303	126
1930	2,091	1,964	3,812	3,973	4,518	3,622	3,094	4,268	3,015	2,126	3,104	4,165	39,752	142
1931	4,420	2,980	3,380	3,900	3,750	3,330	3,150	2,430	464	1,040	1,720	2,150	32,714	117
1932	1,930	2,260	2,460	2,090	1,840	3,490	2,430	1,900	2,270	1,660	1,190	774	24,294	87
1933	1,220	1,740	1,890	2,500	2,230	2,760	1,960	2,590	1,050	1,030	1,250	2,350	22,570	80
1934	1,800	1,910	2,590	2,670	2,290	2,650	2,140	1,760	1,450	789	430	900	21,379	76
1935	740	470	1,320	1,950	1,500	1,980	2,580	4,440	5,470	2,550	1,860	1,230	26,090	93
1936	2,700	1,960	1,990	3,090	2,200	3,030	2,330	793	1,320	1,420	752	690	22,275	79
1937	625	1,070	1,190	1,710	1,920	2,220	886	833	1,470	359	688	1,320	14,291	51
1938	754	865	1,890	2,340	2,050	1,910	1,410	2,260	2,340	1,940	1,630	2,750	22,139	79
Mean	1,954	2,052	2.507	2,935	2,699	3,091	2,789	2,603	2,169	1,530	1,776	1,939	28,044	
% Annual Mean	7.0	7.3	8.9	10.5	9.6	11.0	10.0	9.3	7.7	5.5	6.3	6.9		100
Maximum	4,420	3,154	3,812	4,181	4,518	3,953	5,077	5,074	5,470	2,550	3,673	4,165	39,752	
Minimum	625	470	1,190	1,710	1,500	1,910	886	793	464	359	430	690	14,291	

Mean discharge May to September: 10,017 acre-feet or 35.7 per cent of annual mean
Mean annual discharge 1931-1938: 23,219 acre-feet or 82.8 per cent of annual mean

* Estimated

Location; Sec. 12, T. 19 N., R. 50 W.
Drainage Area; 1,080 Square Miles

MONTHLY AND YEARLY DISCHARGES
BLUE CREEK NEAR LEWELLEN, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1919									*500	208	1,908	791		
1920								*5,500	4,716	1,622	1,206	3,098		
1921	4,000	5,000	6,000	6,512	6,054	6,222	5,209	4,439	4,249	351	984	1,890	50,910	86
1922	3,703	4,859	*5,000	5,534	4,998	5,784	6,359	4,532	3,231	1,745	1,948	3,052	50,745	86
1923	3,642	5,355	5,533	6,563	5,225	5,516	4,945	3,777	5,000	1,154	3,541	2,089	52,340	89
1924	5,389	5,151	6,149	7,256	6,883	6,724	6,287	3,141	2,419	1,035	1,225	595	52,254	89
1925	5,557	6,267	6,886	6,952	6,498	6,948	5,435	2,063	3,035	1,509	2,336	3,094	56,580	96
1926	5,657	6,426	5,579	6,886	7,053	6,394	6,506	4,066	7,547	111	426	2,499	59,150	100
1927	4,829	6,843	7,378	7,624	8,108	7,686	8,311	5,135	4,780	1,154	5,853	4,403	72,104	122
1928	5,839	6,168	7,686	8,368	8,122	8,612	4,730	1,722	3,965	7,462	2,878	1,369	66,921	114
1929	6,149	7,557	7,884	7,966	6,998	7,500	7,825	7,254	2,201	5,992	1,497	5,177	74,000	126
1930	6,843	7,597	7,103	5,383	6,863	7,787	7,438	8,549	3,536	2,294	2,327	4,659	70,379	119
1931	6,998	7,676	7,563	6,518	6,775	8,688	7,595	3,856	1,053	2,360	1,251	1,819	62,152	105
1932	4,640	6,430	8,300	7,260	6,790	6,950	7,500	4,770	4,050	621	2,020	1,590	60,921	103
1933	5,010	6,250	6,520	7,870	6,660	8,550	6,900	7,690	964	255	4,430	5,430	66,529	113
1934	5,360	6,160	6,360	6,580	5,810	6,160	4,060	4,010	3,840	2,730	991	2,540	54,601	93
1935	3,640	3,500	7,260	7,200	6,600	5,450	3,120	6,230	7,150	2,230	2,940	343	55,663	94
1936	1,500	4,890	5,910	6,350	5,820	5,720	6,100	3,090	2,220	3,810	2,130	2,850	50,390	86
1937	859	4,810	5,540	5,490	5,220	6,990	4,270	588	2,870	826	2,300	4,470	44,233	75
1938	2,710	5,500	6,460	7,070	5,550	5,730	5,600	5,420	3,660	3,730	3,480	5,740	60,650	103
Mean	4,574	5,913	6,617	6,855	6,446	6,856	6,011	4,463	3,654	2,187	2,364	2,978	58,918	
% Annual Mean	7.8	10.0	11.2	11.6	11.0	11.6	10.2	7.6	6.2	3.7	4.0	5.1		100
Maximum	6,998	7,676	8,300	8,368	8,122	8,688	8,311	8,549	7,547	7,462	5,853	5,740	74,000	
Minimum	859	3,500	5,000	5,383	4,998	5,450	3,120	588	500	111	426	343	44,233	

Mean discharge May to September: 15,646 acre-feet or 26.6 per cent of annual mean
Mean annual discharge 1931-1938: 56,892 acre-feet or 96.6 per cent of annual mean

* Estimated

Location: Sec. 30, T. 16 N., R. 42 W.
Drainage Area: 267 Square Miles

MONTHLY AND YEARLY DISCHARGES
BIRDWOOD CREEK NEAR HERSHEY, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1922	*11,000	*11,500	*12,000	12,434	11,482	12,974	11,391	13,680	11,440	12,162	12,684	10,441	143,188	111
1923	11,056	11,579	13,029	13,277	10,492	10,695	9,782	10,227	11,355	10,330	13,489	9,652	134,963	104
1924	12,238	12,139	12,543	11,436	10,863	11,070	10,591	11,296	10,431	8,749	9,312	10,367	131,035	101
1925	11,067	11,424	12,051	12,051	13,051	11,436	13,031	11,815	10,433	10,088	10,820	11,187	138,454	107
1926	11,682	11,722	12,113	12,912	11,940	14,142	12,476	11,067	10,611	10,264	10,181	10,552	139,662	108
1927	11,603	13,249	12,912	12,912	11,662	14,142	12,000	11,542	11,683	10,834	11,268	12,139	145,946	113
1928	11,695	12,515	11,278	13,097	12,446	13,260	12,793	11,067	11,960	12,585	9,907	9,193	141,796	110
1929	10,268	11,514	11,744	12,615	11,623	13,569	13,408	11,891	9,253	9,382	10,504	11,534	137,305	106
1930	10,245	10.562	11,653	10,858	11,554	11,314	10,830	10,503	12,754	9,818	10,526	10,056	130,673	101
1931	13,520	11,540	11,680	11,310	10,910	12,300	11,270	9,866	10,233	8,402	8,360	8,210	127,601	99
1932	9,470	10,400	11,800	10,000	9,780	11,600	11,100	9,280	8,690	7,750	8,850	9,940	118,660	92
1933	10,900	11,200	11,100	11,600	9,830	12,400	11,700	12,400	8,210	9,720	11,300	10,400	130,760	101
1934	11,300	12,190	11,770	12,980	*10,000	10,430	9,850	7,910	7,500	7,550	8,800	10,670	120,950	93
1935	11,260	12,790	11,230	9,900	11,220	12,590	13,110	12,760	9,710	7,840	8,430	8,210	129,050	100
1936	10,800	12,500	10,570	10,240	8,100	10,250	10,340	8,780	8,450	6,790	7,060	7,410	111,290	86
1937	9,590	9,780	8,820	6,630	8,310	12,310	10,980	9,730	9,200	8,770	7,940	9,080	111,140	86
1938	9,820	9,040	9,810	10,860	6,760	9,970	9,690	9,140	8,500	7,620	7,060	9,330	107,600	83
Mean	11,030	11.508	11,535	11,477	10,590	12,027	11,432	10,762	10,024	9,333	9,794	9,904	129,416	
% Annual Mean	8.5	8.9	8.9	8.9	8.2	9.3	8.9	8.3	7.7	7.2	7.6	7.6		100
Maximum	13,520	13,249	13,029	13,277	13,051	14,142	13,408	13,680	12,754	12,585	13,489	12,139	145,946	
Minimum	9,470	9,040	8,820	6,630	6,760	9,970	9,690	7,910	7,500	6,790	7,060	7,410	111,140	

Mean discharge May to September: 49,817 acre-feet or 38.5 per cent of annual mean
Mean annual discharge 1931-1938: 119,631 acre-feet or 92.4 per cent of annual mean

* Estimated

Location: Sec. 2, T. 14 N., R. 33 W.
Drainage Area: 286 Square Miles

MONTHLY AND YEARLY DISCHARGES
NORTH PLATTE RIVER NEAR NORTHGATE, COLORADO
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1915	*17,000	*11,000	*10,000	*8,000	*7,500	*13,000	*46,400	*68,000	54,000	22,600	11,300	9,880	278,680	75
1916	12,600	12,500	11.500	8,730	10,400	28,300	37,500	73,800	86,300	40,700	34,600	18,300	375,230	101
1917	20,600	12,700	11,300	10,600	9,330	12,800	51,900	147,000	190,000	120,000	28,200	12,100	626,530	169
1918	14,200	14,800	12,900	11,300	9,830	23,700	47,600	86,700	169,000	43,200	10,700	10,700	454,630	123
1919	18,800	14.900	11,200	9,590	8,550	16,200	39,200	49,400	29,900	8,480	9,220	5,590	221,030	60
1920	9,470	10,200	10,500	9,840	9,840	11,700	21,400	135,000	164,000	60,400	27,000	14,600	483,950	131
1921	14,100	14,000	10,300	11,300	10,900	25,900	26,200	101,000	193,000	55,600	31,500	15,100	508.900	137
1922	10,700	*11,000	*10,000	*9,000	*8,000	*14,000	*45,000	65,200	71,400	15,700	8,790	7,140	275,930	74
1923	4,720	4,760	4.610	4,920	4,160	5,530	26,800	125,000	191,000	87,300	29,400	20,100	508,300	137
1924	17,700	*14,000	*10,000	*8,500	*7,000	*9,000	73,800	91,000	121,000	31,900	8,300	4,700	396,900	107
1925	15,200	*14,000	*10,000	*9,000	*9,000	*26,000	41,100	42,400	72,000	33,400	25,300	22,000	319,400	86
1926	25,900	*23,000	*16,000	*12,000	*13,000	*20.000	102,000	121,000	115,000	59,300	17,900	6,960	532,060	144
1927	9,350	*9,000	*7,500	*8,000	*8,000	*13,000	*53,000	124,000	108,000	41,100	21,500	13,200	415,650	112
1928	15,900	*20,000	*18,000	*15,000	*12.500	*22,000	*55,000	148,000	127,000	45,200	20,000	8,210	506,810	137
1929	10,000	*14,000	*10,000	*9,000	*8,500	*12,000	*65,000	123,000	151,000	62,100	29,000	29,900	523,500	141
1930	21.300	14,900	12,300	8,000	12,200	14,400	107,000	38,200	58,900	16,000	29,000	13,000	345,200	93
1931	17,500	7,740	5.530	6,150	6,660	8,610	48,100	26,700	36,200	7,560	6,700	4,920	182,370	49
1932	10,200	8.450	6,760	7,460	6,330	9,840	91,600	128,000	101,000	46,500	20,100	6,900	441,140	119
1933	8,360	10,000	5,280	2,970	1,980	7,560	21,300	45,100	121,000	16,500	11,200	7,500	258,750	70
1934	7,480	7,150	6,190	4,410	5,040	11,700	18,900	17,500	5,320	1,640	2,370	1.410	89,110	24
1935	1,950	3,230	3,270	3,060	2,850	7,510	16,040	22,210	92,050	31,840	11,940	4,880	200.830	54
1936	5,560	8,490	4,360	2,930	3,810	7,920	89,110	86,280	73,950	25,830	18,420	5,470	332,130	90
1937	8,240	9,230	3,840	2,410	3,250	9,640	30,430	51,810	54,080	27,750	9,860	4,720	215,260	58
1938	7,930	7,300	5,640	5,040	5,050	7,740	84,490	90,040	128,800	29,010	12,600	16,660	400,300	108
Mean	12,698	11,515	9,041	7.800	7,653	14,085	51,620	83,514	104,746	38,734	18,121	10,997	370,524	
% Annual Mean	3.4	3.1	2.4	2.1	2.1	3.8	13.9	22.5	28.3	10.5	4.9	3.0		100
Maximum	25,900	23,000	18,000	15,000	13,000	28,300	107,000	148,000	193,000	120,000	34,600	29.900	626,530	
Minimum	1,950	3,230	3,270	2,410	1,980	5,530	16,040	17,500	5,320	1,640	2,370	1,410	89,110	

Mean discharge May to September: 256,112 acre-feet or 69.1 per cent of annual mean
Mean annual discharge 1931-1938: 264,986 acre-feet or 71.5 per cent of annual mean

* Estimated

Location: Sec. 11, T. 11 N., R. 80 W.
Elevation: 7,850 Feet
Drainage Area: 1,440 Square Miles
Distance above Pathfinder Reservoir: 190 Miles

MONTHLY AND YEARLY DISCHARGES
NORTH PLATTE RIVER AT SARATOGA, WYOMING
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1904	40,600	33,700	32,200	19,800	17,300	36,200	88,100	276,000	321,000	82,400	30,700	19,800	997,800	105
1905	23,100	15,400	13,500	12,300	13.900	26,100	56,600	205,000	418,000	86,100	26.400	13,500	909,900	96
1906	18,400	19,900	16,900	15,400	13,900	24,600	99,400	291,000	337,000	123,000	33,300	29,700	1,022,600	108
1907	*30,000	*32,000	*26,000	*22,000	*20,000	*41,000	*131,000	*348,000	*453,000	*123,000	*43,000	*29,000	1,298,000	137
1908	*20,000	*16,000	*13,000	*11,000	*13,000	*21,000	*66,000	*176,000	*229,000	*62,000	*22,000	*15,000	664,000	70
1909	*25,000	*15,000	*12.000	*11,000	*15,000	*20,000	78,000	360,000	768,000	319,000	87,300	60.100	1,770,400	187
1910	*30,000	*25,000	*20,000	*15,000	*13,000	*60,000	*80,000	*170,000	*140,000	*20,000	*18,000	*18,000	609,000	64
1911	30,700	26,800	18,400	15,400	16,700	24,600	89,300	234,000	320,000	78,100	18,600	12,400	885,000	93
1912	31,200	18,200	15,400	13,800	14,400	22,800	69,000	250,000	497,000	196,000	54,200	36,100	1,218,100	128
1913	42,100	26,800	24,600	21,500	19,400	30,700	160,000	255 000	218,000	40,200	17,300	15,500	871,100	92
1914	27,000	23,800	21,500	18,400	16,700	27,700	132,000	384,000	422,000	86.100	29,800	17,900	1,206,900	127
1915	34.300	20.100	18,400	15,400	13,900	24,600	89,300	124,000	193,000	48,000	19,000	18.900	618,900	65
1916	28,400	22,700	20,200	14,800	18,200	61,500	89,300	220,000	263,000	73,800	44,800	30,600	887.300	94
1917	42.000	23.100	20,200	18,600	16,400	23,200	130,000	311,000	625,000	304,000	58.400	28,200	1,600,100	169
1918	25,800	27.300	23,100	19,900	17,300	47,500	76,800	257,000	455,000	95,900	26,000	21,600	1.093,100	115
1919	36,800	28,100	19.600	16,300	14.500	30,500	93,400	219,000	114,000	16,700	13,700	9,700	612,300	65
1920	16,700	17,300	17,700	16,700	16,700	21,000	42,800	421,000	497,000	116,000	39.200	23,400	1,245,500	131
1921	25 600	25,500	17,400	19,800	19,200	54,000	56,900	302,000	607,000	138,000	59,600	28,000	1,353,000	143
1922	20,500	20,400	17,300	13,400	14 200	27,200	83,300	218,000	278,000	42,800	15,100	10,100	760,300	80
1923	11,900	16,400	14,700	15,900	13,300	16,600	57,800	264,000	445,000	149,000	39,200	25,000	1,068,800	113
1924	32,000	26,200	18,400	15,700	12,100	15,600	117,000	235,000	293,000	47,100	11,500	10,100	833.700	88
1925	29,000	25,100	17,600	16.400	16,700	50,100	86,300	194,000	221,000	100,000	40,100	41,500	837,500	88
1926	62,700	40,700	28,000	22.800	24,000	38,600	200,000	364,000	342,000	90,400	32,700	15,600	1,261,400	133
1927	17,700	15,600	13,100	15,000	15,000	25,500	100,000	341,000	334,000	87.900	39,800	25,000	1,029,600	109
1928	37,100	42,100	33,000	28,000	22,800	44,800	95,800	464,000	343,000	91,000	30,300	17,000	1.248,900	132
1929	24,400	25,100	16,800	16,700	14,900	23,400	124,000	271,000	456,000	144,000	51,400	51,400	1,219,100	129
1930	39,700	27,700	23,400	14,900	22,800	27,400	155,000	123,000	155,000	27,800	49,600	24,600	690,900	73
1931	38,100	17.400	11.900	13,500	14,400	18,700	80,900	116,000	128.000	16,100	12,900	12,300	480,200	51
1932	23,200	18,100	14.600	13,900	13,500	20,900	151,000	316,000	304,000	101,000	32,300	14,900	1,023,400	108
1933	23,900	22,000	11,700	9.280	7,780	26,400	51,000	138,000	361,000	44,300	20,000	16,300	731,660	77
1934	16,600	15,400	15,500	11,600	12,400	20,700	46,400	70,600	16,600	3,620	5,070	4,010	238.500	25
1935	7,950	9,540	11,250	12,670	11,160	16,110	29,310	74,580	267,500	59,880	19,570	8,800	528,120	56
1936	11,760	10,590	16,390	13,610	14,470	23,010	140,200	282,600	195,400	47,040	28,240	9,940	802,050	85
1937	17,750	19,010	12,800	11,160	10,100	20,470	62,310	189,800	204,600	68,210	17,770	11,700	645,680	68
1938	17,520	17,460	14,830	13,930	15,000	24,980	127,600	257,700	329,000	59,710	23,890	32,390	934,010	98
Mean	27.414	22,689	18.325	15.873	15,546	29,642	95.309	249,208	330,003	91,090	31,735	21,652	948,486	
% Annual Mean	2.9	2.4	1.9	1.7	1.6	3.1	10.1	26.3	34.8	9.6	3.3	2.3		100
Maximum	62,700	42,100	33,000	28,000	24,000	61,500	200,000	464,000	768,000	319,000	87,300	60,100	1,770,400	
Minimum	7,950	9,340	11,250	9,280	7.780	15,600	29,310	70.600	16,600	3,620	5,070	4,010	238,500	

Mean discharge May to September: 723,688 acre-feet or 76.3 per cent of annual mean
Mean annual discharge 1931-1938: 672,953 acre-feet or 71.0 per cent of annual mean

Estimated

Location: Sec. 14, T. 17 N., R. 84 W.
Elevation: 6,750 Feet
Drainage Area: 2,880 Square Miles
Distance above Pathfinder Reservoir: 124 Miles

MONTHLY AND YEARLY DISCHARGES
NORTH PLATTE RIVER INTO PATHFINDER RESERVOIR
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1904	*53,000	*40,000	*35,000	*24,000	*21,000	*49,000	103,000	363,000	402,000	111,000	35,800	23,200	1,262,000	93
1905	29,600	*18,000	*15,000	*14,000	*16,000	*34,000	83,300	263,000	524.000	111,000	36,700	14,800	1.159,400	86
1906	21,500	24.000	*20,000	*18,000	*16,000	*32,000	180,000	380,000	440,000	139,000	41,000	39,500	1,351,000	100
1907	35,400	*60,000	*35,000	*25,000	*30,000	116,000	145,000	312,000	613.000	370,000	84,800	34,900	1,851,100	137
1908	41,100	26.200	19,400	18.000	20,000	46,700	96,400	146,000	273,000	125,000	74,400	32,400	918,600	68
1909	39,700	31,900	24,600	24,600	25.700	59,500	124,000	451,000	1,024,000	406,000	104.000	70,800	2,385,800	176
1910	42.100	44.700	33,700	26,100	20,400	107,000	127,000	253,000	195,000	26,500	16,500	22,300	920.200	68
1911	29,300	25,600	24,500	26,700	34,800	84,300	93,500	266,000	407,000	82,900	29 200	19,800	1,123,500	83
1912	52,200	30,200	20,700	17,800	24,900	34,100	174,000	374,000	630,000	274,000	115,000	73,100	1,820,000	134
1913	76,400	51,600	30,000	20,500	24,700	47,200	317,000	321,000	255,000	63.400	33,100	23,500	1,263,400	93
1914	39,100	39.700	19,900	20,400	20,700	59,300	195,000	443,000	525,000	110,000	61,600	29,900	1,563,600	115
1915	49,400	30,200	17,400	15.500	17,100	31,000	136,000	164,000	244,000	79.400	50,100	54,400	888,500	66
1916	47.300	30,700	27,600	23,400	29.800	133,000	137,000	291,000	328.000	111,000	59,400	38.100	1,256,300	93
1917	69,400	32,600	29,300	23,600	20.600	35,700	265,000	447.000	823,000	430.000	80,000	43.300	2,289,700	169
1918	29,000	37,400	35.200	28,800	23.300	72.000	127,000	324,000	604,000	130.000	40 400	32,200	1,463,300	110
1919	49,200	34,600	30.700	16,300	23.100	45,400	138,000	260,000	185,000	31,800	22,400	11.500	850,000	63
1920	27.500	26.300	23.800	22,500	33,700	71,000	155,000	563,000	662,000	175,000	72.600	37,100	1.869,800	135
1921	37,400	38,600	21,500	29,200	33,300	105,000	93,000	386,000	753,000	168,000	85,400	28.300	1.778,700	131
1922	27,400	30.000	30,100	27.100	21,400	66,900	119,000	334.000	383,000	67,500	27,400	10.100	1,143.900	84
1923	15,900	25,800	23,500	28.600	25.700	34,300	126,000	362,000	542,000	206.000	59,800	47,900	1,504,500	111
1924	60,600	51,700	24,400	23.300	34,500	37,100	360.000	351,000	398,000	89,300	29.200	10,400	1,489,500	110
1925	52.200	44,300	30.400	26,600	31.500	97.300	143.000	253,000	307.000	136.000	63,700	55,500	1,242,500	92
1926	61,500	50,900	46,500	33,300	36.700	85,700	321,000	435,000	400.000	191,000	68,200	26,700	1,776,500	131
1927	39,700	31.100	33,600	25,700	23.500	50,500	147,000	423,000	410,000	140,000	80,100	46,000	1,455,200	107
1928	56,900	61.300	32.700	33,200	36,000	115,000	141,000	560,000	442,000	152,000	64,900	29.200	1,724,200	127
1929	35,900	41.300	27.600	21,900	26,300	55,600	282,000	460,000	596,000	211,000	76,300	68.800	1,902,700	140
1930	60,300	38.600	40,000	24,300	30,200	62,800	228,000	180,000	219.000	58,000	95,500	28,500	1,065,200	79
1931	34,400	31.400	28.600	15.600	23,300	40,300	119,000	147,000	171,000	25,800	20.100	16,800	706,300	52
1932	31,200	25,300	19,400	20,100	20,100	44,300	235.000	456,000	435,000	163,000	42,000	15 200	1,506,600	111
1933	32,400	36,300	22,600	22,000	18,800	50,200	98,900	222,000	513,000	77,300	25,000	31,000	1,149,500	85
1934	24,000	28,100	25,300	24.000	29.200	44.500	74,500	83,800	26,500	9,560	6,910	5,830	382,200	28
1935	122,801	15,290	15.840	17,460	19,920	30,380	41,870	89.080	347,980	70,320	23,240	12,500	806,681	60
1936	16,910	26,640	17,810	18,400	13,840	42,700	189,570	349,110	257 150	54.560	42,620	13,340	1,045,650	77
1937	28.750	30,400	20,720	14.560	13,640	55,430	191,600	280,010	311,610	131,860	29,850	22,190	1.130,600	83
1938	29,860	32,830	30.920	25,410	25,400	86,610	177,730	322.140	408,170	102,230	29,940	63,660	1,334,920	99
Mean	44.332	34,785	26.663	22,941	24,951	61,766	162.982	323.261	430,126	137,955	52,205	32,363	1,354,330	
% Annual Mean	3.3	2.6	2.0	1.7	1.8	4.6	12.0	23.9	31.7	10.2	3.8	2.4		100
Maximum	122,801	61,300	46,500	33,500	36,700	133,000	380.000	563,000	1,024.000	430,000	115,000	73,100	2,385,800	
Minimum	16,910	15,290	15.000	14,000	13,640	30,380	41,870	83,800	26,500	9.560	6,910	5.830	382,200	

Mean discharge May to September: 975,860 acre-feet or 72.1 per cent of annual mean
Mean annual discharge 1931-1938: 1,007,806 acre-feet or 74.4 per cent of annual mean

* Estimated

Location: Sec. 27, T. 26 N., R. 84 W.
Elevation: 5,852 Feet
Drainage Area: 7,410 Square Miles
Distance above Pathfinder Reservoir: 2.05 Miles

MONTHLY AND YEARLY DISCHARGES
NORTH PLATTE RIVER BELOW PATHFINDER RESERVOIR, WYOMING
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1909	39,700	31,900	24,600	24,600	25,700	57,700	88,100	364,000	477,000	521,000	393,000	184,000	2,231,300	171
1910	164,000	41,500	32,100	26,000	20,400	108,000	67,200	54,400	143.000	125,000	119,000	104,000	1,008.600	77
1911	29,300	25,500	24,500	26,400	34,800	66,800	105,000	91,100	188,000	205,000	170,000	132,000	1,098.400	84
1912	49,700	31,800	20,800	18,500	5,120	246	595	27,200	221,000	357,000	398.000	340,000	1,469,961	113
1913	326,000	100,000	29,100	20,800	4,490	184	5,910	126,000	202,000	187,000	174,000	136,000	1,310,484	100
1914	18.600	286	307	307	278	307	298	168,000	261,000	283,000	300,000	280,000	1,312,383	101
1915	116,000	8,020	307	307	555	615	41,500	62.700	168,000	259,000	188,000	100.000	945,074	72
1916	474	298	307	615	575	892	9,820	208,000	274,000	307,000	238.000	116,000	1,155,981	89
1917	21,500	298	307	307	278	307	13,700	82,400	803.000	556,000	277,000	239,000	1,994,097	153
1918	46,600	298	307	307	278	1,970	65,500	277,000	402,000	313,000	236,000	155,000	1,498,260	115
1919	33,300	1,490	1,200	922	833	922	4,920	184,000	311,000	243,000	212,000	123,000	1,116,587	86
1920	87,500	893	922	922	863	922	893	42,100	533,000	328,000	244.000	134,000	1,373,815	105
1921	59,300	893	922	5,130	6,660	6,950	86,900	137,000	702,000	342,000	267,000	177,000	1,791,755	137
1922	68,900	1,190	5,440	6,460	5.830	5,160	2,450	261,000	300,000	292,000	245,000	163.000	1,356,430	104
1923	70.700	1,610	4,860	4,610	4,170	3,570	33,400	9,410	216,000	326,000	233,000	180.000	1,087,330	83
1924	5,960	5,950	6,150	6,150	5,750	6,150	213,000	360,000	312,000	394,000	356,000	205,000	1,876,110	144
1925	23,400	2,800	3,260	3,440	3,610	4,610	9,400	156,000	238,000	352,000	291,000	198,000	1,285,520	99
1926	3,070	3,000	12,900	14,600	2,800	2.390	7,680	164,000	315,000	372,000	335,000	214,000	1,446,440	111
1927	3,070	9,700	25,600	29,800	12,000	8.120	3,150	27,400	314,000	362,000	282.000	202,000	1,276,840	98
1928	6,150	5,910	14,300	23,200	5,750	6,150	15,300	287,000	483,000	294,000	329,000	280,000	1,749,760	134
1929	62,700	3,560	4,920	4,610	4,940	5,160	4,990	120.000	591,000	345,000	352,000	223,000	1,719,880	132
1930	75.000	5,380	5,530	5,530	5,000	5,530	5,360	46,200	278,000	365,000	258,000	152,000	1.206,510	93
1931	12,000	12,300	7,190	6,270	2,740	3,070	2,560	121,000	317,000	296,000	197,000	26,800	1,003,930	77
1932	31,200	4,610	2,180	2,150	2,010	941	0	65,200	336,000	376,000	280,000	211,000	1,311,291	101
1933	18,700	4,600	3.690	3,070	3,350	1,080	790	0	314,000	344,000	303,000	152,000	1,148,280	88
1934	34,100	0	0	0	0	0	4,090	159,000	93,900	111,000	78,500	4,930	485,520	37
1935	7,390	4,470	4,620	3,070	1,540	1,230	720	0	58,700	312,540	248,910	34,360	677,150	52
1936	4,570	4,400	4,550	3,610	2,880	220	50,860	243,390	192,470	256,320	208 290	43,660	1,017,220	78
1937	5,260	2,670	3 010	10,360	3,540	880	0	148,030	170,790	254,140	297,160	153,550	1,049,390	80
1938	11,150	2,730	0	0	15,050	37.910	50,360	91,800	236,390	276,880	307,180	85,740	1,117,130	86
Mean	47,836	10,603	8.129	8,401	6,060	11,266	29,815	136,178	315,042	311,965	260,568	158,268	1,304,129	
% Annual Mean	3.7	0.8	0.6	0.6	0.5	0.9	2.3	10.4	24.2	23.9	20.0	12.1		100
Maximum	326,000	100,000	32,100	29,800	34,800	108,000	213,000	364,000	803.000	556,000	398,000	340,000	2,231,300	
Minimum	474	0	0	0	0	0	0	0	58,700	111,000	78.500	4,930	485,520	

Mean discharge May to September: 1,182,019 acre-feet or 90.6 per cent of annual mean
Mean annual discharge 1931-1938: 976,296 acre-feet or 74.9 per cent of annual mean

Location: Sec. 24, T. 29 N., R. 84 W.
Elevation: 5,650 Feet
Drainage Area: 10,700 Square Miles
Distance Below Pathfinder Reservoir: 0.25 Mile

MONTHLY AND YEARLY DISCHARGES
NORTH PLATTE RIVER ABOVE WHALEN, WYOMING
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1901	*40,000	*35,000	*30,000	*25,000	*35,000	*75,000	123,000	528,000	545,000	117,000	43,400	18,800	1,615,200	102
1902	25,000	22,000	20,000	19,000	20,000	55,000	112,000	341,000	365,000	79,900	24,600	11,700	1,095,200	69
1903	26,800	30,700	*30,000	*28,000	49,900	89,800	161,000	287,000	505,000	162,000	30,000	39,600	1,448,800	92
1904	60,400	*45,000	*34,000	*27,000	*25,000	73,200	102,000	374,000	555,000	172,000	44,000	29,000	1,540,600	98
1905	40,100	29,900	*20,000	*18,000	*20,000	*40,000	151,000	414,000	631,000	202,000	64,000	22,700	1,652,700	105
1906	26,700	33,300	*24,000	*22,000	*21,000	*37,000	246,000	405,000	535,000	216,000	83,000	40,000	1,689,000	107
1907	30,700	75,600	*45,000	*28,000	*40,000	*150,000	217,000	395,000	791,000	462,000	114,000	59,100	2,415,400	153
1908	60,300	*40,000	*23,000	*22,000	*25,000	67,000	117,000	288,000	625,000	138,000	70,700	34,800	1,510,800	96
1909	37,800	*40,000	*35,000	*36,000	*39,000	*100,000	*180,000	407,000	640,000	473,000	386,000	179,000	2,561,800	162
1910	212,000	59,500	46,900	40,200	34,200	133,000	132,000	74,400	120,000	124,000	108,000	101,000	1,185,200	75
1911	51,400	30,600	25,200	37,900	46,600	76,900	101,000	117,000	192,000	200,000	169,000	134,000	1,190,600	75
1912	65,200	38,500	29,000	23,600	23,600	25,200	90,400	184,000	219,000	323,000	381,000	342,000	1,744,500	111
1913	346,000	155,000	41,500	38,900	24,800	33,200	90,400	137,000	198,000	181,000	164,000	140,000	1,546,800	98
1914	41,600	15,200	12,800	13,200	11,300	25,600	68,400	228,000	246,000	268,000	286,000	275,000	1,491,100	95
1915	153,000	40,700	7,130	6,090	7,110	15,900	76,200	132,000	217,000	256,000	205,000	178,000	1,294,130	82
1916	48,700	24,500	16,500	8,670	17,500	27,900	70,200	226,000	257,000	225,000	245,000	124,000	1,360,970	86
1917	61,500	13,400	12,000	10,500	12,100	41,800	81,500	283,000	916,000	609,000	280,000	254,000	2,574,800	163
1918	103,000	27,000	14,800	10,200	7,780	18,600	106,000	398,000	445,000	384,000	295,000	212,000	2,024,380	128
1919	66,400	24,000	15,600	13,700	16,200	11,800	28,100	164,000	305,000	246,000	220,000	121,000	1,231,800	78
1920	92,200	13,700	6,120	7,870	8,340	37,600	54,400	334,000	521,000	357,000	260,000	172,000	1,864,230	118
1921	105,000	16,300	11,400	14,700	27,000	24,000	88,100	210,000	666,000	351,000	268,000	174,000	1,955,500	124
1922	89,800	15,400	9,770	9,960	13,800	19,900	16,100	341,000	308,000	284,000	246,000	174,000	1,526,730	97
1923	86,100	14,300	8,670	13,300	9,550	17,600	53,000	168,000	248,000	350,000	256,000	252,000	1,476,520	94
1924	74,400	31,800	18,200	15,000	29,600	32,000	329,000	489,000	330,000	366,000	319,000	224,000	2,228,000	141
1925	85,500	29,900	18,400	15,600	32,600	28,300	66,000	194,000	248,000	330,000	280,000	223,000	1,551,300	98
1926	25,800	17,000	16,700	25,400	21,000	25,000	116,000	219,000	325,000	371,000	310,000	219,000	1,688,900	107
1927	32,800	23,600	29,000	40,800	28,700	21,300	64,300	204,000	311,000	345,000	289,000	222,000	1,611,500	102
1928	30,700	27,800	19,400	14,400	17,000	25,600	53,400	349,000	559,000	319,000	324,000	264,000	2,012,300	128
1929	64,000	28,400	23,600	23,100	18,200	65,800	66,600	242,000	660,000	366,000	339,000	245,000	2,143,700	136
1930	58,100	24,700	27,100	25,200	34,900	36,000	66,600	104,000	261,000	347,000	284,000	190,000	1,458,600	92
1931	47,700	27,300	22,900	17,200	15,900	20,200	32,600	152,000	324,000	294,000	251,000	53,600	1,258,400	80
1932	31,600	26,000	14,700	15,200	11,800	14,400	42,000	140,000	306,000	364,000	275,000	230,000	1,472,700	93
1933	55,900	17,800	16,500	12,700	11,200	14,400	30,100	197,000	324,000	344,000	310,000	204,000	1,537,600	97
1934	41,800	17,200	20,900	13,700	14,400	17,000	25,200	118,000	106,000	102,000	112,000	14,900	603,100	38
1935	12,100	5,350	5,160	7,060	8,160	11,310	11,030	41,120	110,340	293,300	241,640	85,170	831,640	53
1936	15,970	13,260	13,500	12,950	11,810	12,660	43,310	239,470	200,360	246,730	206,530	70,790	1,087,340	69
1937	19,320	18,800	16,480	16,630	9,870	15,620	28,340	161,980	207,580	312,810	291,290	180,090	1,278,810	81
1938	18,350	14,610	16,900	16,210	15,290	15,130	57,580	123,350	209,180	272,850	293,910	141,260	1,194,620	76
Mean	65,868	30,898	20,996	19,604	21,453	40,808	92,023	246,824	382,512	287,515	220,446	148,803	1,577,770	
% Annual Mean	4.2	2.0	1.3	1.2	1.4	2.6	5.8	15.6	24.3	18.2	14.0	9.4		100
Maximum	346,000	155,000	46,900	40,800	49,900	150,000	329,000	528,000	916,000	609,000	386,000	342,000	2,574,800	
Minimum	12,100	5,350	5,160	6,090	7,110	11,310	11,030	41,120	106,000	79,900	24,600	11,700	603,100	

Mean discharge May to September: 1,286,100 acre-feet or 81.5 per cent of annual mean
Mean annual discharge 1931-1938: 1,158,026 acre-feet or 73.4 per cent of annual mean

* Estimated

Location: Sec. 11. T. 25 N., R. 65 W.
Elevation: 4,430 Feet
Drainage Area: 16,300 Square Miles
Distance below Pathfinder Reservoir: 192 Miles

MONTHLY AND YEARLY DISCHARGES
NORTH PLATTE RIVER BELOW WHALEN, WYOMING
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1909	37,800	*40,000	*35,000	*36,000	*39,000	*100,000	*180,000	387,000	631,000	414,000	315,000	121,000	2,335,800	246
1910	204,400	59,500	46,900	40,200	34,200	133,000	120,000	38,000	60,700	62,700	34,400	30,300	864,300	90
1911	45,700	39,600	25,300	37,900	46,600	75,000	47,600	73,800	121,000	145,000	93,500	73,200	824,200	86
1912	62,100	38,500	29,000	23,600	23,600	25,200	90,400	154,000	145,000	255,000	352,000	305,000	1,503,400	157
1913	346,000	155,000	41,500	38,900	24,800	33,200	90,400	101,000	127,000	119,000	94,700	86,300	1,257,800	131
1914	41,600	15,200	12,800	13,200	11,300	25,600	68,400	180,000	164,000	181,000	199,000	206,000	1,118,100	117
1915	153,000	40,700	7,130	6,090	7,110	15,900	67,200	99,000	162,000	176,000	134,000	132,000	1,000,130	104
1916	48,700	24,500	16,500	8,670	16,900	27,900	64,900	159,000	181,000	218,000	155,000	56,500	977,570	102
1917	54,400	13,400	12,000	10,500	12,100	41,800	72,600	231,000	857,000	512,000	181,000	171,000	2,168,800	226
1918	85,500	27,000	14,800	10,200	7,780	18,600	76,200	351,000	349,000	264,000	184,000	137,000	1,505,080	157
1919	39,400	24,000	15,600	13,700	16,200	11,800	25,000	97,800	191,000	124,000	104,000	41,500	704,000	74
1920	37,100	12,200	4,890	6,640	7,190	36,400	53,300	316,000	436,000	240,000	149,000	92,200	1,390,920	145
1921	58,500	14,600	9,590	12,900	25,400	22,200	64,900	143,000	625,000	227,000	155,000	82,100	1,440,190	150
1922	46,200	13,000	8,610	8,730	12,700	18,800	10,400	279,000	198,000	151,000	119,000	64,900	930,340	97
1923	23,500	10,200	6,460	11,600	8,160	16,000	32,000	117,000	189,000	208,000	135,000	154,000	915,920	96
1924	62,700	30,300	16,700	13,800	28,400	30,400	312,000	352,000	189,000	170,000	124,000	75,600	1,374,900	144
1925	55,500	29,900	18,400	15,600	32,600	25,500	14,800	85,500	107,000	145,000	109,000	86,900	725,700	76
1926	16,300	7,970	7,500	14,000	11,400	14,000	58,800	117,000	177,000	196,000	124,000	80,900	824,870	86
1927	22,200	18,300	19,600	30,400	18,300	21,200	42,100	133,000	171,000	145,000	132,000	77,400	830,500	87
1928	38,900	27,800	13,300	8,670	16,600	25,600	24,100	215,000	444,000	134,000	122,000	88,100	1,158,070	121
1929	27,400	28,400	23,700	21,800	13,800	64,600	54,500	159,000	509,000	148,000	117,000	121,000	1,288,200	135
1930	38,700	20,400	24,900	21,400	33,500	36,000	31,300	16,800	92,200	124,000	101,000	61,300	601,500	63
1931	26,000	22,900	13,000	10,500	10,900	16,300	10,900	37,500	117,000	97,200	68,900	8,690	439,790	46
1932	2,550	2,990	4,150	5,800	3,840	6,760	3,370	43,800	127,000	144,000	98,300	53,000	492,560	51
1933	2,880	10,600	6,730	3,010	2,960	8,940	5,650	126,000	141,000	125,000	93,200	48,700	574,670	60
1934	8,860	6,990	8,740	5,740	8,760	11,600	4,390	46,900	45,400	34,400	5,330	2,620	189,730	20
1935	2,820	600	620	620	560	980	1,770	16,850	46,350	103,570	63,640	23,230	261,610	27
1936	3,560	1,530	1,000	710	690	2,690	2,370	86,740	79,610	90,690	49,960	12,670	332,220	35
1937	3,920	4,980	3,100	4,120	1,910	3,170	4,980	61,790	69,520	121,740	79,510	20,280	379,020	40
1938	3,190	3,420	7,380	4,340	4,010	3,540	26,110	27,350	68,770	80,020	82,140	10,890	321,160	34
Mean	53,479	24,816	15,163	14,645	16,042	29,089	56,348	141,061	226,352	171,844	125,719	84,143	957,701	
% Annual Mean	5.6	2.6	1.6	1.5	1.7	3.0	5.8	14.7	23.6	18.0	13.1	8.8		100
Maximum	346,000	155,000	46,900	40,200	46,600	133,000	312,000	387,000	857,000	512,000	352,000	305,000	2,335,800	
Minimum	2,550	600	620	620	560	980	1,770	16,800	45,400	34,400	5,330	2,620	189,730	

Mean discharge May to September: 749,119 acre-feet or 78.2 per cent of annual mean
Mean annual discharge 1931-1938: 373,845 acre-feet or 39.0 per cent of annual mean

* Estimated

Location: Sec. 11, T. 26 N., R. 65 W.
Elevation: 4,279 Feet
Drainage Area: 16,300 Square Miles
Distance below Pathfinder Reservoir: 200 Miles

MONTHLY AND YEARLY DISCHARGES
NORTH PLATTE RIVER AT WYOMING-NEBRASKA STATE LINE
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1912								160,000	147,000	264,000	402,000	185,000		
1913									120,000	127,000	100,000	106,000		
1914								202,000		163,000	183,000	181,000		
1915								105,000	164,000	172,000	156,000	143,000		
1916							77,100	152,000	194,000	200,000	163,000			
1917											148,000	190,000		
1918									389,000	252,000	160,000	116,000		
1928	*72,600	*58,500	*47,800	*45,100	*51,000	*70,400	*71,600	*273,000	*542,000	*180,000	*141,000	*121,000	1,654,000	206
1929	*57,800	*44,900	*34,700	*41,000	*34,600	*88,400	*125,000	256,000	619,000	215,000	131,000	145,000	1,794,400	223
1930	89,200	57,200	55,000	46,200	56,100	54,600	57,000	67,000	92,800	113,000	125,000	97,600	910,700	113
1931	88,500	60,700	48,100	35,800	34,200	36,800	35,200	41,000	105,000	84,200	74,700	37,800	681,700	85
1932	29,500	22,600	26,300	27,100	25,100	25,100	24,600	51,300	111,000	132,000	95,300	64,300	634,200	79
1933	30,500	37,000	30,900	29,800	24,300	31,200	25,800	163,000	127,000	121,000	94,100	69,600	784,200	98
1934	40,000	34,900	35,400	30,300	25,500	33,100	18,100	30,500	51,600	37,600	9,480	13,700	360,380	45
1935	15,160	10,360	19,390	17,420	16,530	17,810	12,700	28,010	96,160	85,230	65,120	41,920	425,610	53
1936	28,180	18,430	23,860	23,530	21,100	25,300	25,350	65,640	82,580	85,550	59,260	39,520	496,300	32
1937	28,260	32,600	26,390	19,430	18,330	24,460	21,480	55,650	83,910	125,000	75,270	41,460	552,240	69
1938	33,750	28,590	31,120	30,200	28,140	29,370	41,010	49,770	68,250	75,840	79,260	49,120	544,400	68
Mean	46,675	36,889	34,451	31.444	30,445	39,686	41,440	98,443	179,955	112,220	86,317	65,547	803,512	
% Annual Mean	5.8	4.6	4.3	3.9	3.8	4.9	5.2	12.2	22.4	14.0	10.7	8.2		100
Maximum	89,200	60,700	55,000	46,200	56,100	88,400	125,000	273,000	619,000	264,000	402,000	190,000	1,794,400	
Minimum	15,160	10,360	19,390	17,420	16,530	17,810	12,700	28,010	51,600	37,600	9,480	13,700	360,700	

Mean discharge May to September: 542,482 acre-feet or 67.5 per cent of annual mean
Mean annual discharge 1931-1938: 559,941 acre-feet or 69.7 per cent of annual mean

* Estimated

Location: Sec. 10, T. 23 N., R. 60 W.
Elevation: 4,035 Feet
Drainage Area: 22,100 Square Miles
Distance Below Pathfinder Reservoir: 240 Miles

MONTHLY AND YEARLY DISCHARGES
NORTH PLATTE RIVER AT MITCHELL, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1902	'23,600	'18,800	'18,400	'52,800	'73,800	'78,600	'95,500	'267,700	'292,400	'80,500	'12,700	'4,120	1,018,420	83
1903	'18,400	'35,500	'32,800	'53,200	'27,000	'46,600	'170,300	'274,900	'456,800	'161,800	'29,000	'45,500	1,309,800	106
1904	'89,100	'105,000	'103,000	'104,000	'87,400	'100,000	'89,900	'423,000	'611,000	'177,000	'36,500	'22,700	1,948,600	158
1905	'18,900	'23,700	'23,200	'23,400	'32,700	'76,200	'213,000	'616,000	'759,000	'221,000	'79,700	'25,000	2,111,800	171
1906	'28,300	'27,600	'28,900	'34,100	'32,700	'83,500	'266,000	"421,000	"551,000	"196,000	"67,000	"44,200	1,780,300	144
1907	"43,500	"75,600	'73,700	'87,200	'82,600	'131,000	"236,000	"381,000	"758,000	"437,000	"118,000	"57,100	2,460,700	200
1908	"48,100	"44,600	'43,100	'43,600	'36,900	"57,200	"72,000	"183,000	"473,000	"125,000	"50,100	"13,600	1,190,200	97
1909	"7,440	"53,400	"52,800	'63,200	'62,100	'81,600	"109,000	"439,000	"904,000	"769,000	"427,000	"118,000	3,086,540	250
1910	"196,000	"72,000	"99,000	'117,000	'109,000	'146,000	'156,000	'49,400	'32,800	'29,600	'7,930	'9,460	1,024,190	83
1911								'47,300	'86,300	'75,600	'46,600	'35,200		
1912	'62.100	'58,200	'67,000											
1916								94,250	13,200	129,456	112,300	33,600		
1917								'309,000	904,971	562,225	117,423	121,658		
1918								320,000	330,649	218,363	89,207	67,736		
1919	47,405													
1920								380,336	475,445	187,659	77,654	54,287		
1921	65,742	'64,100	'67,000	'78,500	'62,100	'65,700	71,703	128,729	724,770	167,804	121,589	57,224	1,674,961	136
1922	85,390	57,720	'56,500	'57,100	'46,500	'49,500	53,061	280,778	147,381	79,766	53,168	18,129	984,993	80
1923	45,620	46,612	52,364	51,174	70,910	51,868	64,959	148,167	171,176	145,191	132,150	80,728	1,060,919	86
1924	146,144	90,207	72,100	73,786	69,125	67,141	440,337	447,676	196,465	138,646	108,448	108,001	1,958,076	159
1925	120,001	86,381	79,935	79,935	71,604	69,125	72,006	91,141	66,050	76,166	93,274	67,141	972,759	79
1926	82,414	70,417	67,637	*79,935	53,554	59,207	23,869	130,514	273,526	209,457	116,134	79,439	1,245,903	101
1927	92,688	71,703	78,050	86,084	80,927	83,108	141,820	245,557	191,804	145,291	215,705	91,538	1,524,275	124
1928	125,952	98,480	98,381	75,174	63,868	82,811	75,273	217,391	542,985	120,000	79,389	57,620	1,637,322	133
1929	55,934	75,472	64,364	43,042	55,538	88,415	125,754	253,293	600,257	149,258	58,961	129,523	1,699,811	138
1930	131,704	93,770	84,992	89,555	73,786	79,935	83,803	75,224	44,785	53,733	90,497	83,208	984,992	80
1931	121,000	93,400	86,100	67,000	56,600	53,000	60,100	36,000	35,800	21,800	26,900	13,200	670,900	54
1932	40,400	41,000	47,300	40,600	44,900	45,100	39,800	34,800	53,200	60,300	36,000	24,700	510,100	41
1933	54,100	55,100	47,600	46,400	37,500	43,300	38,700	153,000	61,900	50,000	35,200	48,800	671,600	54
1934	68,370	50,170	51,170	46,220	38,240	45,080	25,500	5,760	11,160	6,160	4,890	4,680	357,400	29
1935	9,620	8,040	27,470	32,100	25,540	23,630	14,150	29,490	88,120	14,480	14,730	8,960	296,320	24
1936	18,890	25,940	35,660	29,940	27,180	31,410	24,240	12,430	31,680	20,750	9,250	7,770	275,140	22
1937	31,500	43,750	37,040	24,790	27,050	33,690	24,560	15,320	43,380	61,140	15,760	14,030	372,010	30
1938	48,620	43,350	46,820	40,870	36,690	40,530	51,920	50,540	25,330	26,610	22,720	32,070	466,070	38
Mean	67,312	58,141	58,348	59,285	55,030	67,157	105,158	200,382	300,280	138,645	76,470	46,906	1,233,114	
% Annual Mean	5.5	4.7	4.7	4.8	4.5	5.4	8.5	16.3	24.4	11.2	6.2	3.8		100
Maximum	196,000	105,000	103,000	117,000	109,000	146,000	440,337	616,000	904,000	769,000	427,000	129,523	3,086,540	
Minimum	7,440	8,040	18,400	23,400	25,540	23,630	14,150	5,760	11,160	6,160	4,890	4,120	275,140	

Mean discharge May to September: 762,683 acre-feet or 61.9 per cent of annual mean
Mean annual discharge 1931-1938: 452,443 acre-feet or 36.7 per cent of annual mean

* Estimated
" U.S.G.S.
' Army Engineers' Report

Location: Sec. 27, T. 23 N., R. 56 W.
Elevation: 3,945 Feet
Drainage Area: 24,300 Square Miles
Distance below Pathfinder Reservoir: 253 Miles

MONTHLY AND YEARLY DISCHARGES
NORTH PLATTE RIVER AT BRIDGEPORT, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1904	29,900	21,000						386,200	573,000	180,800	9,600	6,400		
1905	26,600	48,700					286,900	720,000	858,600	278,900	80,900	22,000		
1906	42,100						399,300	602,000	714,000	253,000	69.500	45,200		
1907	44,700													
1915	*190,000	*75,000	*60,000	*55,000	*60,000	*90,000	*160,000	*200,000	180,000	136,000	212,000	*150,000	1,568,000	110
1916	*100,000	*60,000	*50,000	*50,000	*50,000	*70,000	*86,000	130,000	153,000	107,000	130,000	64,000	1,050,000	74
1917	*100,000	*55,000	*50,000	*50,000	*70,000	*140,000	*80,000	329,000	878,000	567,000	164,000	163,000	2,646,000	186
1918	144,000	93,000	*65,000	*55,000	*50,000	*90,000	*100,000	337,000	332,000	214,000	115,000	115,000	1,710,000	120
1919	121,000	*100,000	*85,000	*75,000	*65,000	*70,000	77,700	86,300	104,000	51,100	55,800	103,000	993,900	70
1920	114,000	*85,000	*60,000	*65,000	*55,000	*90,000	115,000	393,000	454,000	219,000	111,000	107,000	1,858,000	131
1921	100,000	*95,000	*80,000	*85,000	*90,000	*90,000	95,000	143,000	766,000	186,000	134,000	102,000	1,966,000	138
1922	141,000	99,600	*60,000	*70,000	*70,000	*100,000	77,400	254,000	167,000	117,000	85,100	49,000	1,290,100	91
1923	75,100	90,200	64,900	86,900	73,100	69.600	80,500	189;000	224,000	178,000	176,000	95,900	1,403,200	99
1924	187.000	120,000	106,000	121,000	117,000	109,000	348,000	431,000	233,000	146,000	124,000	163,000	2,205,000	155
1925	167,000	126,000	123,000	121,000	102,000	102,000	78,300	88,100	90,600	77,600	115,000	111,000	1,301,600	92
1926	125,000	105,000	98,400	*123,000	*127,000	*105,000	104,000	144,000	278,000	217,000	143,000	152,000	1,721,400	121
1927	156,000	116,000	*135,000	111,000	132,000	117,000	171,000	287,000	225,000	148,000	265,000	128,000	1,991,000	140
1928	173,000	124,000	130,000	*123,000	*92,000	121,000	103,000	262,000	615,900	191,000	117,000	104,000	2,155,900	152
1929	125,000	136,000	116,000	104,000	91,900	158,000	155,000	239,000	696,000	164,000	112,000	225,000	2,321,900	163
1930	220,000	143,000	122,000	*111,000	*98,100	*169,000	127,000	151,000	92,900	75,500	151,000	148,000	1,608,500	113
1931	211,000	140,000	117,000	121,000	91,600	84,800	95,800	66,400	52,100	33,700	44,500	45,600	1,103,500	78
1932	88,500	78,000	80,600	66,400	67,900	71,300	68,400	60,700	65,500	68,900	64,000	63,700	843,900	59
1933	111,000	101,000	86,100	93,500	62,200	82,400	70,800	194,000	68,400	68,900	68,200	124,000	1,130,500	80
1934	124,000	96,400	99,000	75,600	69,400	78,100	54,600	10,800	21,500	7,640	5,680	13,700	656,420	46
1935	30,740	27,120	68,810	65,990	47,700	47,090	44,660	62,200	130,600	19,290	21,350	22,960	587,610	41
1936	49,710	59,620	62,900	59,740	51,240	68,550	50,710	17,840	43,910	26,420	17,640	17,940	526,420	37
1937	61,500	80,630	63,830	44,410	50,930	63,730	47,070	21,980	60,450	64,030	24,390	37,750	620,700	44
1938	88,710	82,530	83,660	70,270	61,860	69,280	77,050	86,200	43.640	50,700	38.600	88,820	841,320	59
Mean	125,136	95,337	86,133	83,034	76,914	93,994	102,791	174,313	248,942	130,574	103,936	99,728	1,420,832	
% Annual Mean	8.8	6.7	6.1	5.8	5.4	6.6	7.2	12.3	17.6	9.2	7.3	7.0		100
Maximum	220,000	143,000	135,000	123,000	132,000	169,000	399,300	720,000	878,000	567,000	265,000	225,000	2,646,000	
Minimum	26,600	21,000	50,000	44,410	47 700	47,090	44,660	10,800	21,500	7,640	5,680	6,400	526,420	

Mean discharge May to September: 757,493 acre-feet or 53.3 per cent of annual mean
Mean annual discharge 1931-1938: 788,796 acre-feet or 55.5 per cent of annual mean

* Estimated

Location: Sec. 28, T. 20 N., R. 50 W.
Elevation: 3,656 Feet
Drainage Area: 25,300 Square Miles
Distance below Pathfinder Reservoir: 293 Miles

MONTHLY AND YEARLY DISCHARGES
NORTH PLATTE RIVER AT NORTH PLATTE, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1909	49,400	110,000	*70,000	*70,000	*75,000	*145,000	140,000	408,000	803,000	358,000	221,000	70,800	2,520,200	139
1910	169,000	87,500	*90,000	*75,000	*70,000	*180,000	*150,000	*50,000	*10,000	*3,000	*1,000	*1,000	886,500	49
1911	47,000	50,000	*60,000	*70,000	*90,000	103,000	22,000	60,400	37,400	37,800	50,100	19,000	646,700	36
1912	95,900	100,000	*90,000	*75,000	*80,000	*250,000	443,000	158,000	34,000	227,000	563,000	348,000	2,463,900	136
1913	*400,000	*210,000	*90,000	*85,000	*95,000	*150,000	*220,000	168,000	78,600	66,400	51,200	79,700	1,693,900	94
1914	119,000	91,600	*80,000	*80,000	*75,000	*90,000	119,000	295,000	94,400	56,200	109,000	189,000	1,398,200	77
1915	*230,000	*110,000	*90,000	*85,000	*100,000	*200,000	264,000	245,000	236,000	141,000	245,000	184,000	2,130,000	118
1916	*150,000	*100,000	*85,000	*80,000	*85,000	*100,000	*120,000	133,000	162,000	62,200	134,000	67,000	1,278,200	71
1917	*130,000	*90,000	*85,000	*80,000	*120,000	*200,000	*260,000	409,000	1,034,000	696,000	142,000	192,000	3,438,000	190
1918	199,000	*130,000	*100,000	*90,000	*85,000	*130,000	171,000	374,000	273,000	251,000	182,000	113,000	2,098,000	116
1919	205,000	165,000	*130,000	*110,000	*100,000	*110,000	*120,000	126,000	145,000	70,300	53,400	102,000	1,436,700	79
1920	146,000	*140,000	*100,000	*90,000	*85,000	*130,000	*230,000	420,000	532,000	212,000	128,000	155,000	2,368,000	131
1921	163,000	173,000	170,000	*150,000	*120,000	*130,000	135,000	206,000	918,000	203,000	173,000	122,000	2,663,000	147
1922	164,000	*130,000	*120,000	*110,000	*120,000	*200,000	159,000	349,000	201,000	118,000	93,100	51,300	1,815,400	100
1923	88,000	107,000	111,000	140,000	110,000	122,000	128,000	230,000	225,000	150,000	236,000	107,000	1,754,000	97
1924	318,000	192,000	174,000	92,200	156,000	205,000	509,000	577,000	344,000	133,000	122,000	202,000	3,024,200	167
1925	249,000	185,000	166,000	160,000	234,000	156,000	128,000	106,000	132,000	59,500	202,000	126,000	1,903,500	105
1926	198,000	179,000	174,000	254,000	235,000	150,000	197,000	180,000	365,000	269,000	178,000	194,000	2,573,000	142
1927	217,000	195,000	185,000	126,000	122,000	194,000	268,000	308,000	239,000	153,000	321,000	133,000	2,461,000	136
1928	262,000	211,000	172,000	154,000	150,000	170,000	155,000	232,000	647,000	244,000	135,000	103,000	2,635,000	146
1929	157,000	169,000	152,000	90,100	140,000	215,000	259,000	309,000	666,000	155,000	84,000	211,000	2,607,100	144
1930	238,000	176,000	192,000	135,000	186,000	187,000	145,000	210,000	108,000	33,300	160,000	159,000	1,919,300	106
1931	242,000	187,000	187,000	156,000	156,000	145,000	144,000	86,900	40,300	14,900	19,200	36,200	1,414,500	78
1932	96,500	103,000	117,000	113,000	130,000	146,000	107,000	71,300	79,700	51,800	57,800	70,200	1,143,300	63
1933	153,000	153,000	126,000	164,000	109,000	142,000	140,000	274,000	70,200	49,400	78,100	165,000	1,623,700	90
1934	163,000	150,000	143,000	152,000	118,000	129,000	86,500	32,100	22,000	6,750	6,600	17,300	1,026,250	57
1935	29,240	45,940	85,500	106,100	98,680	93,980	79,010	146,700	208,500	17,630	7,730	14,770	933,780	52
1936	49,620	84,180	61,220	92,430	87,630	82,110	46,710	28,040	16,580	3,510	7,290	8,730	568,050	31
1937	62,670	67,140	37,210	18,490	99,520	134,600	92,150	26,090	63,600	30,950	10,300	40,990	683,710	38
1938	106,400	120,400	126,700	117,100	125,100	113,000	81,140	89,980	60,750	67,620	39,570	122,000	1,169,760	65
Mean	163,224	133,725	118,988	110,681	118,564	150,090	170,617	210,284	261,534	131,375	126,680	113,466	1,809,228	
% Annual Mean	9.0	7.4	6.6	6.1	6.6	8.3	9.4	11.6	14.4	7.3	7.0	6.3		100
Maximum	400,000	211,000	192,000	254,000	235,000	250,000	509,000	577,000	1,034,000	696,000	563,000	348,000	3,438,000	
Minimum	29,240	45,940	37,210	18,490	70,000	82,110	22,000	26,090	10,000	3,000	1,000	1,000	568,050	

Mean discharge May to September: 843,339 acre-feet or 46.6 per cent of annual mean
Mean annual discharge 1931-1938: 1,070,381 acre-feet or 59.2 per cent of annual mean

* Estimated

Location: Sec. 28, T. 14 N., R. 30 W.
Elevation: 2,795 Feet
Drainage Area: 32,000 Square Miles
Distance below Pathfinder Reservoir: 422 Miles

MONTHLY AND YEARLY DISCHARGES
LODGEPOLE CREEK NEAR BUSHNELL, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1924	*888	*975	*1,012	1,229	1,150	1,168	1,130	1,168	1,130	729	619	873	12,071	110
1925	1,107	1,071	1,106	1,150	1,027	1,041	625	702	645	510	589	595	10,168	93
1926	676	773	922	867	1,019	1,081	873	694	595	635	694	635	9,464	87
1927	774	833	984	787	1,027	983	1,106	527	892	527	751	809	10,000	92
1928	972	833	922	1,107	1,119	922	952	922	833	553	1,045	615	10,795	99
1929	875	892	492	799	777	1,660	1,488	1,408	1,130	553	799	833	11,706	107
1930	922	1,011	984	706	1,111	1,414	1,011	1,105	853	399	1,204	1,131	11,851	108
1931	1,745	1,428	1,224	1,045	1,063	1,474	1,190	1,234	920	543	575	714	13,155	120
1932	732	952	922	861	1,040	1,400	1,230	1,090	1,010	719	615	666	11,237	103
1933	836	815	855	1,660	978	1,270	1,130	1,140	559	504	2,110	1,090	12,947	119
1934	1,080	1,140	*1,230	*1,050	883	946	807	601	466	397	557	543	9,700	89
1935	653	799	853	811	744	831	1,060	1,240	3,120	756	528	659	12,054	110
1936	918	1,100	827	994	976	1,110	1,030	835	599	261	365	383	9,398	86
1937	583	789	815	515	617	973	857	671	706	1,220	677	481	8,904	82
1938	539	604	640	679	590	873	829	823	799	995	799	2,260	10,430	95
Mean	887	934	919	951	941	1,143	1,021	944	951	620	795	819	10,925	
% Annual Mean	8.1	8.5	8.4	8.7	8.6	10.5	9.3	8.7	8.7	5.7	7.3	7.5		100
Maximum	1,745	1,428	1,230	1,660	1,150	1,660	1,488	1,408	3,120	1,220	2,110	2,260	13,155	
Minimum	539	604	492	515	590	831	625	527	466	261	365	383	8,904	

Mean discharge May to September: 4,129 acre-feet or 37.8 per cent of annual mean
Mean annual discharge 1931-1938: 10,978 acre-feet or 100.5 per cent of annual mean

* Estimated

Location: Sec. 33, T. 15 N., R. 57 W.
Drainage Area: 1,090 Square Miles

MONTHLY AND YEARLY DISCHARGES
SOUTH PLATTE RIVER AT JULESBURG, COLORADO
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1902	*19,300	*23,900	*26,400	*28,900	*29,100	*31,900	'2,740	'2,280	'1,670	'1,170	'184	'9,100	176,644	52
1903	'7,930	'2,200	'46,700	'30,700	'16,600	'24,600	'26,500	'2,340	'833	'184	'7,990	'893	167,470	49
1904	'984	'1,600	'1,840	'1,230	'1,150	'3,500	'1,030	'5,880	'99,000	'11,200	'3,040	'1,410	131,564	39
1905	'4,720	'6,490	'15,300	'110,000	'27,790	'35,700	'113,000	'364,000	'286,000	'12,200	'42,700	'2,490	1,020,300	301
1906	'4,230	'18,400	'34,700	'30,700	'57,100	'97,000	"37,800	"18,600	"2,530	"2,390	"1,300	"1,810	306,560	90
1907	'41,800	'49,200	*26,400	*28,900	*29,100	*31,900	*30,800	*50,800	*91,900	*10,900	*9,400	*11,800	412,600	122
1908	*19,300	*23,900	*26,400	*28,900	*29,100	*31,900	*30,800	*50,800	'3,430	'3,790	'3,240	'2,360	253,920	75
1909	'3,680	'9,160	'9,210	'9,210	'8,320	'49,100	"63,700	"25,900	"168,000	'75,800	'46,100	'142,000	609,880	180
1910	'71,900	'79,700	'67,800	'73,700	'44,300	'70,600	'17,100	'2,790	'500	'353	'1,180	'1,030	430,853	127
1911	'1,410	'1,370	'9,280	'37,200	'25,700	'9,430	'1,540	'1,480	'996	'668	'3,360	'694	93,128	27
1912	'1,250	'1,580	'1,120	'921	'861	'5,220	'17,100	'7,010	'1,880	'3,710	'38,000	'35,000	113,652	33
1913	'25,300	'20,800	'24,600	'20,000	'16,600	'21,800	'23,200	'7,980	'2,080	'1,720	'1,840	'1,490	166,810	49
1914	'2,460	'4,160	'12,300	'9,210	'22,200	'49,100	'98,000	'363,000	'266,000	'11,700	'14,400	'26,800	879,030	259
1915	'20,700	'46,600	'46,100	'36,800	'33,300	'46,100	'73,800	'189,000	'141,000	'7,070	'15,200	'8,810	664,480	196
1916	'46,000	'58,400	'60,200	'55,200	'51,700	'24,800	'3,630	'4,580	'2,980	'1,610	'1,780	'2,140	315,020	93
1917	'6,820	'11,800	'15,400	'18,300	'36,700	'31,700	'25,700	'109,000	'281,000	'32,000	'2,080	'4,490	574,990	169
1918	'33,300	'23,400	'29,900	'18,400	'15,200	'18,400	'8,510	'6,890	'7,740	'21,700	'17,600	'12,500	213,540	63
1919	'29,600	'26,400	'31,100	'27,600	'22,200	'32,100	'30,700	'18,900	'2,840	'1,370	'1,240	'8,810	232,860	69
1920	'31,900	'21,400	'18,400	'16,800	'14,300	'21,000	'42,000	'89,200	'19,100	'5,560	'4,170	'21,600	305,430	90
1921	'21,300	'17,100	'18,000	'13,400	'10,100	'12,200	'15,200	'17,400	'631,000	'21,600	'3,270	'7,020	787,590	232
1922	'32,000	'31,400	'29,900	'30,900	'39,800	'42,300	'13,900	'13,100	'1,590	'1,240	'726	'726	237,282	70
1923	'1,120	'6,900	'9,720	18,328	19,597	16,562	9,719	37,151	160,227	33,541	2,458	17,911	333,214	98
1924	82,930	126,289	102,349	94,692	93,541	104,213	118,811	100,841	312,758	3,757	2,179	9,640	1,152,000	340
1925	'17,200	'22,600	'20,200	20,900	32,200	27,555	6,780	2,120	2,700	2,025	1,664	1,950	157,894	47
1926	8,719	24,270	26,686	30,700	26,800	16,600	24,900	76,900	114,000	41,100	6,820	6,250	403,447	119
1927	24,800	23,400	22,400	'25,900	'25,300	'42,600	'78,000	'21,800	'9,880	'1,890	'13,400	'4,450	293,520	87
1928	'22,000	'21,700	'21,100	23,700	24,400	25,500	3,890	14,900	90,400	50,400	16,600	1,670	316,260	93
1929	13,600	25,700	24,200	*35,700	*47,200	*53,590	53,100	46,300	1,990	2,020	1,210	16,500	321,020	95
1930	7,750	27,200	34,600	20,800	103,000	39,800	10,600	24,100	3,970	2,700	25,900	6,070	306,190	90
1931	24,600	24,000	33,300	23,700	24,600	34,900	39,300	4,280	2,620	2,230	1,520	1,640	216,690	64
1932	3,790	6,130	16,700	28,800	25,900	15,200	6,310	5,710	2,210	1,570	2,120	1,270	115,410	34
1933	2,340	6,190	7,620	15,200	20,000	16,100	3,170	18,900	3,020	3,460	6,010	14,800	116,810	34
1934	9,470	11,100	18,600	19,200	11,600	14,900	4,530	5,650	16,800	2,210	1,250	1,770	117,060	35
1935	2,810	2,790	7,980	9,810	4,380	6,940	3,450	47,300	192,600	3,680	1,550	2,750	286,040	84
1936	5,010	5,760	14,710	16,290	18,570	8,020	4,160	2,980	3,340	1,230	4,380	2,100	86,550	26
1937	3,910	4,900	6,930	8,880	19,170	12,740	5,420	2,350	3,380	1,640	1,660	1,680	72,660	21
1938	2,780	5,140	8,070	10,070	16,420	5,030	5,140	13,530	11,220	3,960	2,740	81,150	165,250	49
Mean	17,857	22,236	25,017	27,812	28,195	30,546	28,487	47,985	79,545	10,407	8,385	12,810	339,282	
% Annual Mean	5.3	6.5	7.4	8.2	8.3	9.0	8.4	14.1	23.4	3.1	2.5	3.8		100
Maximum	82,930	126,289	102,349	110,000	103,000	104,213	118,811	364,000	631,000	75,800	46,100	142,000	1,152,000	
Minimum	984	1,370	1,120	921	861	3,500	1,030	1,480	500	184	184	694	72,660	

Mean discharge May to September: 159,132 acre-feet or 46.9 per cent of annual mean
Mean annual discharge 1931-1938: 147,061 acre-feet or 43.3 per cent of annual mean

* Estimated
' Army Engineers Report
" U.S.G.S.

Location: Sec. 33, T. 12 N., R. 44 W.
Drainage Area: 20,600 Square Miles

MONTHLY AND YEARLY DISCHARGES
SOUTH PLATTE RIVER AT NORTH PLATTE, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1918	'33,400	'8,910	'7,980	'11,600	'16,600	'32,500	'22,300	11,107	'4,040	'6,260	'11,900	'6,900	173,497	58
1919	'15,900	'14,800	'13,500	'20,200	'27,700	'55,200	'37,400	25,121	16,989	'4,160	'1,690	'2,380	235,040	79
1920	'5,820	'14,800	'14,100	'20,900	'29,200	56,281	55,240	68,332	18,823	'3,640	'921	'12,100	300,157	100
1921	12,198	'8,610	'8,290	'12,300	'17,200	'33,100	20,678	22,076	555,836	103,975	7,934	3,510	805,707	269
1922	27,967	'28,600	'33,100	'49,700	'44,300	'55,000	15,672	23,804	2,982	677	310	0	282,112	94
1923	0	140	90	18,159	24,397	20,291	11,801	26,846	217,986	56,936	36,100	13,428	426,174	142
1924	58,216	119,208	99,274	75,860	64,860	84,695	100,167	73,270	266,590	5,345	0	2,677	950,162	317
1925	'14,600	'19,200	'22,100	28,959	56,291	56,292	7,265	1,400	2,360	0	0	0	208,467	70
1926	139	15,511	20,747	20,598	27,769	24,000	10,661	88,265	110,084	34,800	3,728	1,368	357,670	120
1927	18,327	24,079	22,750	49,190	55,538	77,058	100,563	41,346	9,164	69	8,072	0	406,156	136
1928	11,881	17,256	15,372	26,132	26,281	34,711	5,682	13,606	104,232	62,182	26,083	168	343,586	115
1929	6,071	29,851	27,769	15,372	19,835	95,800	54,050	49,230	2,033	0	410	10,920	311,341	104
1930	4,195	31,736	21,520	36,893	81,125	76,860	6,317	47,683	12,992	228	14,648	6,585	340,782	114
1931	47,951	38,083	67,241	41,009	32,559	28,404	38,702	4,020	1,283	0	0	24	299,276	100
1932	137	179	13,670	28,800	24,659	20,392	13,093	5,131	1,557	139	20	198	107,975	36
1933	0	0	0	7,560	13,000	22,800	2,710	20,100	1,810	0	1,240	13,900	83,120	28
1934	5,030	8,560	16,860	24,620	8,530	13,880	1,710	1,540	8,270	170	0	79	89,249	30
1935	0	0	4,440	11,410	6,790	6,490	3,260	39,610	216,600	8,090	14	10	296,714	99
1936	44	2,410	4,810	11,750	11,500	14,370	5,360	3,440	2,680	0	0	0	56,364	19
1937	0	623	5,240	2,800	15,120	20,530	9,680	4,390	4,570	603	280	988	64,824	22
1938	1,740	2,640	7,900	10,170	12,540	9,690	7,030	14,010	18,430	6,680	1,560	53,990	146,380	49
Mean	12,553	18,343	20,322	24,952	29,323	39,921	25,207	27,825	75,205	13,998	5,472	6,154	299,275	
% Annual Mean	4.2	6.1	6.8	8.3	9.8	13.4	8.4	9.3	25.1	4.7	1.8	2.1		100
Maximum	58,216	119,208	99,274	75,860	81,125	95,800	100,563	88,265	555,836	103,975	36,100	13,900	950,162	
Minimum	0	0	0	2,800	6,790	6,490	1,710	1,400	1,283	0	0	0	56,364	

Mean discharge May to September: 128,654 acre-feet or 43.0 per cent of annual mean
Mean annual discharge 1931-1938: 142,988 acre-feet or 47.8 per cent of annual mean

' Army Engineers' Report

Location: Sec. 9, T. 13 N., R. 30 W.
Drainage Area: 24,300 Square Miles

MONTHLY AND YEARLY DISCHARGES
PLATTE RIVER AT NORTH PLATTE, NEBRASKA
Combined Records of the North Platte and South Platte Rivers
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1918	232,400	158,910	107,980	101,600	161,600	162,800	193,300	385,107	277,040	257,260	193,900	119,900	2,331,497	111
1919	220,900	179,800	144,108	130,200	127,700	165,200	187,400	151,121	161,989	74,460	55,090	104,380	1,672,340	80
1920	151,820	154,800	114,100	110,900	114,200	186,281	255,240	488,332	550,823	215,640	128,921	167,100	2,668,157	127
1921	175,198	181,630	178,290	162,300	137,200	163,100	155,678	228,076	1,473,836	306,975	180,934	125,510	3,468,707	165
1922	191,967	158,600	153,100	159,700	164,300	255,000	174,672	372,604	205,982	118,677	93,410	51,300	2,097,512	100
1923	68,060	167,140	111,090	158,159	134,397	142,291	139,801	256,846	442,986	206,936	272,100	139,428	2,180,174	104
1924	376,216	311,208	273,274	168,060	220,860	289,695	609,167	650,270	610,890	138,345	122,000	204,677	3,974,362	189
1925	263,600	204,200	186,100	188,959	190,291	212,292	135,265	107,400	134,360	59,800	202,000	126,900	2,011,967	96
1926	198,139	194,511	194,747	274,598	262,769	174,000	207,661	268,265	475,084	305,800	181,728	195,368	2,930,670	140
1927	235,327	219,079	207,750	175,190	177,538	271,058	268,863	349,346	248,164	163,069	329,072	133,090	2,767,156	132
1928	273,861	226,256	187,372	180,132	176,281	304,711	160,682	245,606	737,232	306,182	161,083	103,168	3,014,586	144
1929	163,071	190,851	179,769	105,472	159,835	310,800	313,050	358,230	638,035	185,000	84,410	221,920	2,918,441	139
1930	242,195	207,756	213,520	171,895	267,125	265,860	181,317	257,683	139,992	33,528	164,646	165,585	2,260,082	108
1931	260,951	225,066	254,241	197,009	188,889	173,404	182,702	90,920	41,583	14,900	19,300	38,224	1,713,776	82
1932	96,837	165,179	130,670	141,800	154,680	166,392	130,093	76,451	31,257	51,959	57,620	70,398	1,251,276	60
1933	153,000	155,600	126,000	171,560	122,000	164,800	142,710	294,100	72,010	49,400	79,340	178,900	1,706,820	81
1934	168,030	158,580	159,860	176,620	125,530	142,860	88,210	33,640	30,270	6,920	6,600	17,379	1,115,499	53
1935	29,240	45,940	89,940	117,610	105,470	100,470	82,270	186,310	425,100	98,550	7,744	14,790	1,303,304	62
1936	40,664	86,[illegible]	66,030	104,180	99,130	96,480	52,070	51,480	19,260	3,510	7,290	8,730	624,414	30
1937	62,670	67,765	42,450	21,290	114,640	155,130	101,880	30,480	36,170	31,663	10,580	41,976	748,534	36
1938	186,140	183,040	134,600	127,270	137,640	122,690	88,170	103,990	79,180	74,500	41,130	175,990	1,316,140	63
Mean	179,526	164,184	155,094	149,735	159,177	186,811	181,422	236,497	351,997	126,687	114,238	113,463	2,098,829	
% Annual Mean	8.6	7.8	7.4	7.1	7.6	8.9	8.7	11.3	16.8	6.0	5.4	5.4		100
Maximum	376,216	311,208	273,274	274,598	267,125	310,800	609,167	650,270	1,473,836	306,975	329,072	221,920	3,974,362	
Minimum	29,240	45,940	42,450	21,290	99,130	96,480	52,070	30,480	19,260	3,510	6,600	8,730	624,414	

Mean discharge May to September: 922,882 acre-feet or 44.0 per cent of annual mean
Mean annual discharge 1931-1938: 1,222,470 acre-feet or 58.2 per cent of annual mean

Drainage Area: 56,300 Square Miles
Distance below Pathfinder Reservoir: 422 Miles

MONTHLY AND YEARLY DISCHARGES
PLATTE RIVER AT OVERTON, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1915	*270,000	*140,000	*120,000	*100,000	*125,000	*230,000	*20[illegible],000	488,000	536,000	268,000	395,000	174,000	3,046,000	142
1916	*180,000	*140,000	*120,000	*100,000	*90,000	*100,000	*110,000	*93,000	166,000	19,000	105,000	51,000	1,274,000	59
1917	*100,000	*110,000	*100,000	*90,000	*130,000	*250,000	*310,000	830,000	1,434,000	728,000	89,000	247,000	4,418,000	205
1918	298,000	*190,000	*150,000	*130,000	*120,000	*180,000	*220,000	*315,000	*130,000	201,000	121,000	94,000	2,149,000	100
1919	233,000	168,000	*150,000	*130,000	*120,000	*140,000	°186,000	*84,000	165,000	49,000	10,000	58,000	1,493,000	69
1920	143,000	*110,000	*120,000	*110,000	*125,000	*230,000	*310,000	722,000	640,000	324,000	113,000	146,000	3,093,000	144
1921	°130,000	°156,000	*160,000	*170,000	*120,000	*140,000	142,000	199,000	1,105,000	104,000	167,000	146,000	2,739,000	127
1922	202,000	208,000	*160,000	*150,000	*170,000	*260,000	*180,000	332,000	189,000	74,000	66,000	10,000	2,001,000	93
1923	86,000	*155,000	*154,000	195,000	231,000	162,000	138,000	280,000	549,000	179,000	313,000	134,000	2,576,000	120
1924	372,000	345,000	296,000	160,000	317,000	343,000	542,000	672,000	681,000	126,000	74,000	146,000	4,074,000	189
1925	278,000	212,000	185,000	211,000	311,000	186,000	168,000	108,000	97,000	1,000	129,000	88,000	1,974,000	92
1926	179,000	210,000	189,000	344,000	236,000	174,000	214,000	259,000	427,000	272,000	168,000	164,000	2,836,000	132
1927	257,000	219,000	*203,000	*215,000	*194,000	320,000	392,000	389,000	250,000	105,000	310,000	102,000	2,956,000	137
1928	270,000	220,000	*184,000	*307,000	*288,000	258,000	188,000	213,000	699,000	277,000	122,000	49,000	3,075,000	143
1929	152,000	262,000	172,000	*99,000	175,000	300,000	363,000	410,000	640,000	134,000	0	192,000	2,899,000	135
1930	222,000	227,000	234,000	184,000	167,000	218,000	243,000	373,000	219,000	4,000	104,000	162,000	2,357,000	110
1931	294,000	196,000	236,000	214,000	235,000	262,000	214,000	108,000	19,000	0	0	0	1,778,000	83
1932	44,000	99,000	140,000	121,000	135,000	160,000	112,000	71,000	68,000	9,000	6,000	8,000	973,000	45
1933	122,000	142,000	139,000	167,000	114,000	176,000	156,000	265,000	67,000	0	4,000	146,000	1,518,000	71
1934	126,000	138,000	146,000	166,000	115,000	128,000	77,000	3,000	0	0	0	0	899,000	42
1935	0	0	68,230	94,080	123,700	95,230	47,960	235,500	541,300	20,970	323	5,170	1,232,463	57
1936	13,630	79,810	69,500	81,900	88,320	150,100	46,060	45,880	17,510	0	0	0	592,710	28
1937	0	28,050	54,750	20,420	125,500	196,800	70,970	6,470	59,030	0	0	3,140	565,130	26
1938	35,690	87,710	119,200	140,500	143,900	140,900	60,250	127,200	58,890	31,330	14,480	176,700	1,136,750	53
Mean	166,972	160,107	152,903	154,163	166,643	200,001	195,427	277,044	364,905	121,929	96,283	95,917	2,152,294	
% Annual Mean	7.7	7.4	7.1	7.2	7.7	9.3	9.1	12.9	16.9	5.7	4.5	4.5		100
Maximum	372,000	345,000	296,000	344,000	317,000	343,000	542,000	830,000	1,434,000	728,000	395,000	247,000	4,418,000	
Minimum	0	0	54,750	20,420	88,320	95,230	46,060	3,000	0	0	0	0	565,130	

Mean discharge May to September: 956,078 acre-feet or 44.4 per cent of annual mean
Mean annual discharge 1931-1938: 1,086,882 acre-feet or 50.5 per cent of annual mean

Location: Sec. 12, T. 8 N., R. 20 W.
Elevation: 2,320 Feet
Drainage Area: 58,400 Square Miles
Distance below Pathfinder Reservoir: 490 Miles

* Estimated
° Lexington Record

MONTHLY AND YEARLY DISCHARGES
PLATTE RIVER AT DUNCAN, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1929	*119,000	*217,000	*123,000	*92,200	*69,400	*311,000	299,000	333,000	643,000	119,000	916	95,200	2,421,716	196
1930	220,000	194,000	38,900	*61,500	*277,000	213,000	189,000	436,000	304,000	7,070	48,500	136,000	2,124,970	172
1931	269,000	198,000	216,000	192,000	237,000	200,000	235,000	114,000	13,700	449	92	452	1,675,693	136
1932	1,260	45,800	92,800	62,700	301,000	247,000	105,000	75,600	132,000	18,300	6,460	2,010	1,089,930	88
1933	42,800	80,300	*49,200	131,000	126,000	225,000	132,000	238,000	64,900	855	314	43,200	1,133,569	92
1934	68,290	113,800	*129,100	*123,000	*127,700	188,400	81,660	3,500	462	0	0	0	836,912	68
1935	0	53	1,430	39,660	87,890	67,660	12,200	195,100	703,300	40,440	68	7,619	1,175,420	95
1936	123	55,670	74,660	35,970	61,340	246,800	33,290	48,500	11,590	61	0	0	568,004	46
1937	11	116	325	6	34,200	196,300	68,900	23,240	40,520	7,040	378	2	371,038	30
1938	14	24,530	92,130	154,100	120,000	206,700	53,940	128,100	65,290	18,370	163	98,800	962,137	78
Mean	72,060	92,927	81,755	89,214	144,153	212,186	120,999	159,504	197,876	21,159	5,689	38,328	1,235,840	
% Annual Mean	5.8	7.5	6.6	7.2	11.7	17.2	9.8	12.9	16.0	1.7	0.5	3.1		100
Maximum	269,000	217,000	216,000	192,000	301,000	311,000	299,000	436,000	703,300	119,000	48,500	136,000	2,421,716	
Minimum	0	53	325	6	34,200	67,660	12,200	3,500	462	0	0	0	371,038	

Mean discharge May to September: 422,556 acre-feet or 34.2 per cent of annual mean
Mean annual discharge 1931-1938: 976,463 acre-feet or 79.0 per cent of annual mean

Location: Sec. 10, T. 23 N., R. 60 W.
Elevation: 4,035 Feet
Drainage Area: 22,100 Square Miles
Distance below Pathfinder Reservoir: 240 Miles

* Estimated

MONTHLY AND YEARLY DISCHARGES
PLATTE RIVER AT ASHLAND
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1896	°220,000	°251,500	°228,000	°337,500	°473,000	°600,000	°541,000	°399,000	°726,000	°309,000	°214,500	°230,000	4,531,500	92
1897	°264,000	°340,000	°272,000	°542,000	°426,000	°407,000	°465,000	°1,018,000	°1,368,000	°384,000	°193,500	°1,032,000	6,711,500	137
1898	°369,000	°286,000	°267,500	°370,000	°370,000	°327,000	°294,000	°667,000	°1,058,000	°354,000	°219,000	°151,800	4,733,300	96
1899	°204,500	°201,500	°211,000	°667,000	°765,000	°875,000	°820,000	°960,000	°1,220,000	°1,189,000	°214,000	°180,500	7,507,500	153
1900	°166,500	°219,000	°197,000	°391,000	°401,000	°665,000	°616,000	°162,000	°1,253,000	°450,000	°356,000	°343,000	5,219,500	106
1901	°305,000	°207,000	°208,000	°237,000	°247,000	°330,000	°634,000	°545,000	°887,000	°257,500	°151,000	°301,000	4,509,500	92
1902	°435,000	°211,500	°204,000	°371,000	°407,000	°439,000	°339,000	°617,000	°668,000	°780,000	°369,000	°245,000	5,085,500	104
1903	°343,000	°227,000	°218,000	°538,000	°770,000	°1,080,000	°577,000	°680,000	°630,000	°657,000	°633,000	°271,500	7,024,500	143
1904	°242,500	°385,000	°299,000	°269,000	°297,000	°317,000	°372,500	°506,000	°1,190,000	°796,000	°200,000	°190,000	5,064,000	103
1905	°272,000	°205,000	°181,500	°383,000	°451,000	°708,000	°915,000	°2,015,000	°2,715,000	°1,418,000	°724,000	°593,000	10,580,500	215
1906	°334,000	°551,000	°594,000	°301,000	°368,000	°553,000	°838,000	°910,000	°635,000	°446,000	°323,000	°238,000	6,071,000	124
1907	°351,000	°495,000	°421,000	°260,000	°297,000	°318,000	°459,000	°615,000	°1,239,000	°987,000	°377,000	°243,000	6,062,000	123
1908	°331,000	°318,500	°376,000	°255,000	°255,000	°356,000	°247,000	°412,000	°1,285,000	°515,000	°305,000	°221,000	4,876,500	99
1909	°321,500	°323,000	°341,500	*347,700	*366,800	*454,800	*357,800	*793,000	*1,695,500	*939,600	*492,000	*243,300	6,696,500	136
1910	*327,000	*272,700	*322,000	*269,000	*321,000	*494,600	*338,400	*291,400	*203,300	*183,200	*218,400	*187,300	3,448,300	70
1911	*212,400	*220,500	*367,600	°377,000	°371,000	°345,000	°196,000	°260,000	°185,000	°160,500	°227,500	°209,000	3,131,500	64
1912	°298,000	°311,500	°369,000	°453,000	°506,000	°705,000	°924,000	°568,000	°340,000	°203,500	°673,000	°523,000	5,774,000	118
1913	°637,000	°643,000	°444,000	°338,000	°398,000	°505,000	°617,000	°563,000	°229,000	°191,000	°181,500	°169,000	4,815,500	98
1914	°179,500	°222,000	°223,000	°108,000	°164,500	°175,000	°165,500	°681,000	°722,000	°101,000	°22,000	°148,500	2,912,000	59
1915	°50,500	°75,400	°90,800	°340,000	°469,000	°525,000	°715,000	°800,000	°1,288,000	°736,000	°834,000	°547,000	6,470,700	132
1929	"257,000	"444,000	"261,000	*215,000	*189,000	762,000	637,000	652,000	952,000	408,000	132,000	254,000	5,163,000	105
1930	415,300	337,000	123,000	*191,000	600,000	419,000	512,000	990,000	637,000	143,000	272,000	336,000	4,975,300	101
1931	501,000	434,000	403,000	400,000	479,000	435,000	466,000	348,000	236,000	117,000	107,000	139,000	4,065,000	83
1932	148,000	217,000	347,000	196,000	513,000	713,000	323,000	345,000	744,000	144,000	349,000	170,000	4,209,000	86
1933	222,000	213,000	148,000	277,000	240,000	539,000	367,000	542,000	218,000	298,000	159,000	210,000	3,453,000	70
1934	200,200	264,000	278,600	221,800	299,400	357,700	235,600	126,100	169,400	90,550	94,200	129,900	2,467,450	50
1935	165,500	170,400	109,900	143,400	299,700	322,600	321,800	587,100	1,217,000	229,000	151,500	187,400	3,905,300	80
1936	140,100	218,500	220,400	128,300	114,600	790,100	223,100	259,500	160,400	53,780	66,020	118,800	2,493,600	51
1937	116,500	135,400	117,400	50,990	165,700	624,900	236,300	221,000	294,100	150,600	118,900	126,500	2,358,290	48
1938	137,100	158,400	180,500	240,600	143,300	492,600	257,200	400,800	280,900	363,600	99,370	286,100	3,040,470	62
Mean	272,203	281,260	260,790	307,943	372,900	521,177	474,340	604,463	828,253	435,161	279,213	274,153	4,911,856	
% Annual Mean	5.5	5.7	5.3	6.3	7.6	10.6	9.6	12.3	16.9	8.9	5.7	5.6		100
Maximum	637,000	643,000	444,000	667,000	770,000	1,080,000	924,000	2,015,000	2,715,000	1,418,000	834,000	1,032,000	10,580,500	
Minimum	50,500	75,400	90,800	50,990	114,600	175,000	165,500	126,100	160,400	53,780	22,000	118,800	2,358,290	

Mean discharge May to September: 2,421,243 acre-feet or 49.3 per cent of annual mean
Mean annual discharge 1931-1938: 3,249,012 acre-feet or 66.1 per cent of annual mean

* Estimated
" U.S.G.S.
° Plattsmouth Record

Location: Sec. 30, T. 13 N., R. 10 E.
Elevation: 1,020 Feet
Drainage Area: 85,800 Square Miles
Distance below Pathfinder Reservoir: 719 Miles

LOUP RIVER BASIN

MONTHLY AND YEARLY DISCHARGES
NORTH LOUP RIVER NEAR ST. PAUL, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1895	*53,600	*56,700	*50,500	'30,000	'35,000	'40,000	'62,400	'23,100	91,100	53,100	60,600	65,100	621,100	82
1896	70,500	'60,400	'75,700	'63,300	'72,500	'84,000	77,600	63,900	86,900	67,800	55,600	54,300	832,500	110
1897	56,900	'64,200	'57,200	'70,000	'66,500	'81,600	79,100	66,400	81,400	50,700	41,500	41,900	739,400	98
1898	60,200	*70,900	*65,500	*68,000	*57,300	*62,000	*59,200	*76,800	*85,200	*42,600	*58,100	*42,400	748,200	99
1899	'57,700	'53,800	'47,500	'58,300	'55,500	'73,000	'74,200	70,200	91,200	63,600	64,600	52,800	762,300	101
1900	'56,800	*42,400	*37,700	*46,300	*45,900	*68,000	*71,000	*81,300	*74,000	*71,500	75,800	*71,200	731,900	97
1901	*49,100	*49,500	*47,300	*57,700	*55,100	*66,600	*68,900	*61,300	*73,400	*34,200	*30,200	*60,400	643,700	85
1902	*65,900	*49,500	*50,200	*61,200	*59,700	*75,600	*61,000	*70,600	*68,800	*124,100	*104,300	*68,200	845,500	112
1903	*70,000	'56,500	'50,200	'61,400	'66,500	'99,500	'91,000	75,900	64,800	72,000	100,000	49,700	857,500	113
1904	*64,400	*77,600	*67,600	*77,300	*74,800	*74,400	*70,800	*65,100	*92,500	*93,400	*51,400	*50,300	859,800	114
1905	*89,400	*93,000	*56,700	*45,200	*69,100	*109,700	*163,300	*186,100	*172,000	*198,500	*152,100	*119,400	1,434,500	190
1906	*71,900	*92,900	*82,600	*100,700	*96,800	*114,600	*118,200	*100,400	*61,200	*60,900	*66,400	*55,200	1,023,800	135
1907	*71,600	*65,500	*58,000	*51,300	*45,200	*66,600	*58,000	*72,000	*99,300	*81,900	*51,200	*52,000	772,600	102
1908	*49,500	*53,800	*54,500	*51,300	*49,100	*74,400	*66,900	*109,300	*136,300	*54,500	*59,500	*55,900	815,000	108
1909	*54,100	*52,700	*51,300	*66,600	*59,100	*66,600	*61,200	*69,800	*106,100	*113,600	*67,300	*53,400	821,800	109
1910	*53,800	*51,600	*54,500	*49,100	*46,300	*64,400	*51,600	*61,200	*43,400	*45,900	*64,400	*60,100	646,300	85
1911	*57,200	*49,100	*50,600	*52,300	*48,400	*59,500	*56,300	*57,700	*44,900	*36,700	*50,600	*56,600	619,900	82
1912	*53,800	*57,300	*50,500	*53,300	*58,100	*71,800	*200,800	*113,600	*60,500	*44,100	*48,800	*58,700	891,300	118
1913	*47,500	*55,500	*51,300	*62,300	*59,500	*76,500	*92,200	*95,100	*59,500	*48,400	*43,100	*43,100	734,000	97
1914	*47,500	*55,500	*49,100	*58,000	*49,500	*52,300	*53,800	*68,400	*49,100	*43,800	*52,700	*47,700	627,400	83
1915	*48,400	*45,900	*40,600	*49,500	*47,300	*61,200	*120,300	*75,500	*133,100	*120,300	*103,600	*95,100	940,800	124
1929	57,400	65,500	43,000	43,000	41,600	104,000	75,000	79,300	70,200	57,900	42,600	46,700	726,200	96
1930	55,700	40,600	26,600	40,600	85,500	60,800	88,700	84,200	80,300	43,000	67,000	52,400	725,400	96
1931	66,400	61,900	57,400	67,000	80,000	70,700	61,900	56,000	45,500	43,200	43,200	43,300	696,500	92
1932	51,800	52,400	74,400	41,700	81,700	58,800	57,900	68,900	119,000	48,700	46,500	43,900	745,400	98
1933	54,500	46,400	39,500	52,700	38,400	64,600	61,300	75,600	39,400	53,800	51,400	47,700	625,300	83
1934	45,700	53,040	50,640	46,120	42,760	48,410	47,210	43,240	36,080	30,260	38,660	48,350	530,470	70
1935	48,880	47,940	33,910	39,230	69,980	55,040	93,720	89,690	95,390	50,750	40,650	41,760	706,940	93
1936	47,600	49,770	49,470	37,400	42,310	159,200	52,700	59,160	39,160	28,810	33,240	36,330	635,150	84
1937	42,500	44,920	42,390	32,630	41,870	78,830	48,680	52,110	43,540	40,960	36,290	41,170	545,790	72
1938	43,100	38,480	35,150	45,170	45,810	71,800	51,290	63,320	46,650	49,980	27,590	39,260	557,600	74
Mean	56,938	56,621	50,960	54,150	57,617	74,254	76,971	75,007	77,159	63,515	59,056	54,657	756,905	
% Annual Mean	7.5	7.5	6.7	7.2	7.6	9.8	10.2	9.9	10.2	8.4	7.8	7.2		100
Maximum	89,400	93,000	82,600	100,700	96,800	159,200	200,800	186,100	172,000	198,500	152,100	119,400	1,434,500	
Minimum	42,500	38,480	26,600	30,000	35,000	40,000	47,210	23,100	36,080	28,810	27,590	36,330	530,470	

Mean discharge May to September: 329,394 acre-feet or 43.5 per cent of annual mean
Mean annual discharge 1931-1938: 630,394 acre-feet or 83.3 per cent of annual mean

*** Estimated**
' U.S.G.S.

Location: Sec. 22, T. 15 N., R. 10 W.
Drainage Area: 4,040 Square Miles

MONTHLY AND YEARLY DISCHARGES
MIDDLE LOUP RIVER NEAR ST. PAUL, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1895	*71,600	*65,900	*58,700	*25,000	*35,000	*40,000	'69,500	72,200	83,100	52,900	59,800	52,200	685,700	70
1896	51,600	'73,000	'79,200	'68,200	'78,100	'90,800	81,200	71,000	88,700	78,100	59,900	59,100	878,900	89
1897	64,000	'69,400	'61,500	'75,500	'72,000	'88,500	119,000	78,300	61,700	53,200	41,400	40,200	824,700	84
1898	71,900	*94,900	*87,800	*91,100	*76,800	*83,000	*79,300	*102,900	*114,100	*57,100	*77,900	*56,900	993,700	101
1899	'62,000	'57,900	'51,200	'62,600	'59,800	'78,500	'79,600	63,700	85,900	61,900	74,200	60,600	797,900	81
1900	68,200	*56,800	*50,600	*62,000	*61,500	*77,800	*95,200	*109,000	*99,100	*95,800	*101,600	*95,400	973,000	99
1901	*65,800	*66,300	*63,400	*77,300	*74,000	*89,200	*92,300	*68,800	*98,400	*45,800	*40,400	*81,000	862,700	88
1902	*88,300	*66,400	*67,300	*82,000	*78,700	*97,800	*68,400	*94,800	*92,200	*166,200	*139,800	*91,300	1,133,000	115
1903	'76,000	'60,500	'54,100	'66,400	'71,500	*107,000	'98,000	197,300	115,300	124,700	206,900	79,100	1,256,800	128
1904	'77,900	*104,000	*92,100	*103,500	*100,100	*99,700	*94,900	*87,300	*123,900	*125,100	*68,800	*67,400	1,144,700	116
1905	*119,700	*124,600	*49,100	*60,600	*92,500	*146,900	*155,900	*249,400	*230,400	*266,000	*203,900	*160,000	1,859,000	189
1906	*96,400	*124,500	*110,700	*135,000	*129,800	*153,600	*158,400	*134,500	*82,000	*81,600	*9,200	*74,000	1,289,700	131
1907	*95,900	*87,800	*77,800	*68,700	*60,600	*89,200	*77,800	*96,400	*133,100	*109,700	*68,700	*69,600	1,035,300	105
1908	*66,300	*72,000	*73,000	*68,700	*65,800	*99,700	*89,700	*146,400	*182,700	*73,000	*79,700	*74,900	1,091,900	111
1909	*72,500	*70,600	*68,700	*89,200	*79,200	*89,200	*82,000	*93,500	*142,100	*152,200	*90,200	*71,500	1,100,900	112
1910	*72,000	*69,200	*73,000	*65,800	*62,000	*86,300	*69,200	*82,000	*58,200	*61,500	*86,300	*80,600	866,100	88
1911	*76,700	*65,800	*67,700	*70,100	*64,900	*79,700	*75,400	*77,300	*60,100	*49,100	*67,700	*75,800	830,300	84
1912	*72,000	*76,000	*67,700	*71,500	*77,900	*96,200	*269,000	*152,200	*107,800	*59,100	*65,300	*78,700	1,193,400	121
1913	*63,900	*74,400	*68,700	*83,500	*79,700	*102,600	*123,500	*127,400	*79,700	*64,900	*57,700	*87,700	983,700	100
1914	*63,900	*74,400	*65,800	*77,800	*66,300	*70,100	*72,000	*91,600	*65,800	*58,700	*70,600	*64,000	'841,000	85
1915	*64,900	*61,500	*54,400	*66,300	*15,700	*82,000	*161,200	*101,100	*178,400	*161,200	*13,800	*127,400	1,087,900	110
1929	70,100	80,900	29,900	33,800	41,300	128,000	91,000	127,000	102,000	76,900	53,900	60,700	895,500	91
1930	61,500	44,400	29,900	43,900	134,000	83,000	107,000	124,000	155,000	45,100	66,100	77,400	991,300	101
1931	103,000	78,000	75,000	90,400	89,400	89,200	72,600	70,100	53,400	47,100	47,200	46,300	861,700	88
1932	71,300	60,700	97,800	58,000	82,800	94,700	66,000	90,400	179,000	78,700	81,200	60,100	1,020,700	104
1933	68,900	50,600	45,400	66,200	50,600	100,000	75,000	89,200	48,000	69,500	78,700	63,100	807,200	82
1934	62,800	68,970	78,700	64,560	61,090	66,410	69,130	57,470	52,370	44,540	52,890	59,290	738,220	75
1935	78,030	80,730	43,530	46,600	84,580	72,550	94,530	131,000	163,000	89,400	92,030	82,080	1,058,060	107
1936	84,670	83,370	62,180	42,370	48,800	182,700	69,050	64,650	54,580	35,770	41,150	48,480	817,770	83
1937	50,880	48,460	49,580	18,140	57,230	144,600	66,400	71,880	61,960	52,310	45,640	71,950	759,010	77
1938	68,560	41,660	47,110	54,190	58,770	90,390	65,550	134,400	84,620	109,800	38,110	50,480	843,340	86
Mean	73,588	72,700	64,567	67,450	71,305	96,753	96,373	105,065	106,053	85,375	74,217	72,170	984,616	
% Annual Mean	7.5	7.4	6.6	6.8	7.2	9.8	9.8	10.7	10.7	8.7	7.5	7.3		100
Maximum	119,700	124,600	110,700	135,000	134,000	182,700	269,000	249,400	230,400	266,000	206,900	160,000	1,859,000	
Minimum	50,880	41,660	29,900	18,140	15,700	40,000	65,550	57,470	48,000	35,770	9,200	40,200	685,700	

Mean discharge May to September: 441,880 acre-feet or 44.9 per cent of annual mean
Mean annual discharge 1931-1938: 863,250 acre-feet or 87.7 per cent of annual mean

* Estimated
' U.S.G.S.

Location: Sec. 10, T. 14 N., R. 10 W.
Drainage Area: 7,320 Square Miles

MONTHLY AND YEARLY DISCHARGES
LOUP RIVER NEAR COLUMBUS, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1895	160,600	*159,300	*141,920	*170,000	*180,000	*200,000	168,900	182,400	213,700	130,500	140,700	144,400	1,982,420	94
1896	168,000	179,000	194,000	167,000	191,000	221,000	242,800	183,500	'179,000	166,700	161,600	146,400	2,200,000	104
1897	210,400	169,000	180,000	184,000	175,000	218,000	'220,000	153,500	172,000	155,700	111,400	84,900	2,000,900	95
1898	152,300	'199,000	'184,000	'191,000	'161,000	'174,000	166,300	215,800	259,300	119,700	163,300	119,200	2,084,900	99
1899	117,700	'141,000	'125,000	'164,000	'146,000	'192,000	195,400	'187,000	'232,000	'126,000	144,900	127,500	1,888,500	89
1900	198,100	'119,000	'106,000	'130,000	'129,000	'163,000	199,500	228,500	207,800	200,800	212,900	200,100	2,094,700	99
1901	137,900	138,900	'133,000	'162,000	'155,000	'167,000	193,600	144,200	206,300	96,100	84,800	169,800	1,808,600	86
1902	165,100	'139,000	'141,000	'172,000	'165,000	'205,000	143,400	198,300	193,300	348,500	293,100	191,500	2,375,200	112
1903	171,900	'149,000	'132,000	'162,000	'174,000	'261,000	239,600	251,200	189,700	211,200	330,400	164,400	2,436,400	115
1904	180,800	'218,000	'193,000	'217,000	'210,000	'209,000	198,900	183,000	259,700	262,300	144,300	141,300	2,417,300	114
1905	251,000	261,200	'103,000	'127,000	'194,000	'303,000	329,800	522,800	485,000	557,500	427,300	335,400	3,897,000	184
1906	202,000	'261,000	'232,000	'263,000	'272,000	'322,000	332,000	282,000	172,000	171,000	192,000	155,000	2,876,000	136
1907	'201,000	'184,000	'163,000	'144,000	'127,000	'167,000	'163,000	'202,000	'279,000	'230,000	'144,000	'146,000	2,170,000	103
1908	'139,000	'151,000	'153,000	'144,000	'138,000	'209,000	'168,000	'307,000	'383,000	'153,000	'167,000	'157,000	2,289,000	108
1909	'152,000	'148,000	'144,000	'187,000	'166,000	'187,000	'172,000	'196,000	'298,000	'319,000	'189,000	'180,000	2,308,000	109
1910	'151,000	'145,000	'153,000	'138,000	'130,000	'181,000	'145,000	'172,000	'122,000	'129,000	'181,000	'169,000	1,816,000	86
1911	'160,800	'138,000	'142,000	'147,000	'136,000	'167,000	'158,000	'162,000	'126,000	'103,000	'142,000	'159,000	1,740,800	82
1912	161,000	161,000	*141,900	*149,800	*163,300	*201,600	564,000	319,000	226,000	124,000	137,000	165,000	2,503,600	118
1913	134,000	156,000	'144,000	'175,000	'167,000	'215,000	259,000	267,000	167,000	136,000	121,000	121,000	2,062,000	98
1914	134,000	156,000	'138,000	'163,000	'139,000	'147,000	151,000	192,000	'138,000	'123,000	'148,000	'134,000	1',763,000	83
1915	'136,000	'129,000	'114,000	'139,000	'133,000	'172,000	338,000	212,000	374,000	338,000	291,000	267,000	2,643,000	125
1929	140,000	171,000	86,100	89,200	97,200	303,000	261,000	240,000	200,000	162,000	106,000	139,000	1,994,500	94
1930	148,000	92,200	57,800	92,200	244,000	173,000	227,000	269,000	252,000	105,000	165,000	152,000	1,977,200	94
1931	*203,000	*168,000	*159,000	*189,000	*203,000	170,000	162,000	154,000	132,000	111,000	95,300	94,000	1,840,300	87
1932	121,000	111,000	185,000	95,900	200,000	181,000	142,000	175,000	349,000	*153,000	*153,800	*125,000	1,991,400	94
1933	*149,500	*117,000	*102,000	*145,000	*107,000	*197,500	*164,500	*198,000	*105,000	*148,000	*156,000	*133,000	1,722,500	82
1934	138,300	160,800	176,800	116,800	122,800	148,100	163,400	111,800	112,100	76,000	97,680	139,000	1,553,280	73
1935	154,300	143,200	93,120	91,670	180,700	150,600	266,100	292,100	480,500	172,900	146,100	153,200	2,294,490	109
1936	123,200	151,100	131,200	83,220	87,810	419,700	143,900	184,300	114,900	66,290	85,170	99,650	1,690,440	80
1937	121,100	125,200	131,100	38,360	127,700	317,700	132,300	160,300	195,300	129,500	80,650	141,800	1,701,010	80
1938	107,188	85,489	70,137	89,563	71,947	219,474	122,382	193,808	146,441	139,218	43,151	106,958	1,395,756	66
Mean	157,748	155,367	139,357	146,346	157,844	212,860	211,380	217,403	223,227	176,255	163,073	152,629	2,113,489	
% Annual Mean	7.5	7.3	6.6	6.9	7.5	10.1	10.0	10.3	10.6	8.3	7.7	7.2		100
Maximum	251,000	261,200	232,000	263,000	272,000	419,700	564,000	522,800	485,000	557,500	427,300	335,400	3,897,000	
Minimum	107,188	85,489	57,800	38,360	71,947	147,000	122,382	111,800	105,000	66,290	43,151	84,900	1,395,756	

Mean discharge May to September: 932,587 acre-feet or 44.1 per cent of annual mean
Mean annual discharge 1931-1938: 1,773,647 acre-feet or 83.9 per cent of annual mean

* Estimated
' U.S.G.S.

Location: Sec. 30, T. 17 N., R. 1 E.
Drainage area: 14,200 Square Miles

REPUBLICAN RIVER BASIN

MONTHLY AND YEARLY DISCHARGES
NORTH FORK OF THE REPUBLICAN RIVER AT THE COLORADO-NEBRASKA LINE
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1924	*2,662	*3,200	*3,800	°4,673	°4,372	°4,145	°3,570	°3,074	°1,388	°615	°1,142	°893	33,534	92
1925	°1,190	°2,082	°3,689	°738	°4,887	°5,423	°4,403	°2,828	°952	*2,978	°1,335	°2,083	32,588	89
1926	°4,243	°5,058	°5,226	*3,823	*3,749	4,314	3,411	1,277	892	1,967	2,864	*1,758	38,582	106
1927	°3,197	°4,046	*4,056	3,094	3,332	4,488	4,700	2,169	773	936	1,291	1,368	33,450	92
1928	3,689	4,700	4,238	4,611	3,049	3,955	2,797	2,828	4,463	2,204	430	2,172	39,136	107
1929	3,013	4,403	5,395	3,812	3,221	5,095	4,314	4,243	2,519	984	827	1,844	39,670	109
1930	2,479	3,719	4,120	*5,226	*3,396	*4,568	*3,511	*3,340	*4,245	*3,124	*2,422	*1,963	42,113	115
1931	984	555	1,720	2,676	4,221	4,683	5,030	1,760	1,290	498	670	1,090	25,177	69
1932	7,030	3,080	4,610	4,920	4,890	6,520	3,820	1,940	1,480	2,190	3,690	2,180	46,350	127
1933	2,640	4,290	4,930	4,670	3,070	4,000	2,730	4,050	541	17,000	2,130	3,230	53,881	148
1934	2,570	3,170	4,610	4,490	4,400	4,430	2,570	732	3,060	327	593	1,060	32,012	88
1935	1,990	2,120	4,040	3,870	3,100	4,650	2,490	3,430	5,160	428	1,760	2,550	35,588	98
1936	1,250	3,080	4,210	3,630	3,490	4,750	4,060	2,670	2,720	387	1,570	1,380	33,197	91
1937	2,600	3,310	3,340	3,120	2,990	3,540	3,050	812	1,390	670	418	1,220	26,460	73
1938	1,920	2,760	3,700	3,470	2,860	3,520	5,080	3,970	2,860	2,190	778	2,210	35,318	97
Mean	2,764	3,305	4,112	3,788	3,708	4,538	3,702	2,608	2,249	2,433	1,461	1,800	36,470	
% Annual Mean	7.6	9.1	11.3	10.4	10.2	12.4	10.1	7.1	6.2	6.7	4.0	4.9		100
Maximum	7,030	5,058	5,395	5,226	4,890	6,520	5,080	4,243	5,160	17,000	3,690	3,230	53,881	
Minimum	984	555	1,720	738	2,860	3,520	2,490	732	541	327	418	893	25,177	

Mean discharge May to September: 10,551 acre-feet or 28.9 per cent of annual mean
Mean annual discharge 1931-1938: 35,990 acre-feet or 98.6 per cent of annual mean

* Estimated
° Sanborn, Nebraska Record

Location: Sec. 10, T. 1 N., R 42 W.
Drainage Area: 395 Square Miles

MONTHLY AND YEARLY DISCHARGES
ARIKAREE RIVER AT HAIGLER, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1924	'491	'475	'983	'860	'2,010	'2,520	'1,600	'1,960	'1,720	'614	'61	'59	13,353	83
1925	'307	'475	'552	119	205	2,670	1,297	603	1,035	0	156	471	7,890	49
1926	1,384	785	307	123	222	1,045	873	543	694	1,230	30	297	7,533	47
1927	236	525	307	'736	'1,160	'2,460	2,201	753	357	1,174	307	416	10,632	66
1928	553	1,041	543	553	2,396	1,607	714	9,574	3,035	1,004	676	1,100	22,796	142
1929	686	1,368	984	1,523	1,610	2,130	1,190	1,835	1,765	291	945	734	15,061	94
1930	823	1,170	1,557	1,783	2,721	678	724	2,620	4,592	1,269	1,630	1,101	20,668	129
1931	984	555	1,722	1,362	1,125	1,785	2,412	1,341	1,160	141	125	244	12,956	81
1932	667	851	941	*932	*1,519	1,750	1,340	1,480	1,550	910	5,360	506	17,806	111
1933	824	869	762	1,040	1,670	1,700	1,370	2,420	363	7,260	3,660	2,290	24,228	151
1934	891	1,100	*1,410	*1,480	*1,170	1,320	1,280	526	2,430	86	3,040	317	15,050	94
1935	369	1,130	*1,350	*1,050	1,140	1,060	1,580	43,610	35,640	1,850	2,450	470	91,699	571
1936	450	722	817	873	1,150	1,320	1,550	5,480	2,280	50	571	722	15,985	100
1937	891	904	550	617	3,720	1,550	476	670	1,240	292	46	1,340	12,296	77
1938	518	545	398	735	431	780	809	5,110	1,150	2,430	6,810	8,300	28,016	175
Mean	672	834	879	919	1,483	1,625	1,294	2,481	1,672	1,240	1,725	1,224	16,048	
% Annual Mean	4.2	5.2	5.5	5.7	9.2	10.1	8.1	15.5	10.4	7.7	10.8	7.6		100
Maximum	1,384	1,368	1,722	1,783	3,720	2,670	2,412	43,610	35,640	7,260	6,810	8,300	91,699	
Minimum	236	475	307	119	205	678	476	526	357	0	30	59	7,533	

Mean discharge May to September: 8,342 acre-feet or 52.0 per cent of annual mean
Mean annual discharge 1931-1938: 17,849 acre-feet or 111.2 per cent of annual mean

* Estimated
' Army Engineers' Report
Note:- Flood flows of May and June, 1935 not included in monthly mean, but shown in annual total

Location: Sec. 28, T. 1 N., R. 41 W.
Drainage Area: 3,243 Square Miles

MONTHLY AND YEARLY DISCHARGES
SOUTH FORK OF THE REPUBLICAN RIVER AT BENKELMAN, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1895	'2,020	'1,190	'2,510	'1,840	'2,160	'3,680	'2,080	'306	'8,300	'5,760	'610	'1,190	31,646	76
1903	'5,830	'2,730	'2,580	'3,070	'3,930	'8,600	'5,640	'2,460	'2,200	'922	'1,540	'890	40,392	97
1904	'2,400	'3,380	'2,640	'4,170	'4,870	'4,910	'2,370	'1,840	'4,750	'1,230	'737	'475	33,772	81
1905	'1,840	'2,080	'1,780	'3,440	'5,260	'9,750	'8,390	'6,150	'4,080	'2,180	'2,940	'3,090	50,980	123
1906	'3,980	'3,860	'3,380	'4,900	'6,650	'8,100	'7,680	'6,110	'5,370	'670	'0	'0	50,700	122
1924	'3,380	'2,970	'2,400	5,349	5,004	4,602	3,412	3,261	1,369	893	2,340	297	35,277	85
1925	'675	'950	'1,100	'614	6,553	10,637	4,344	2,459	1,844	0	718	1,206	31,100	75
1926	3,104	2,559	'1,350	'1,230	'1,660	2,525	2,261	587	1,490	2,705	3,094	2,384	24,949	60
1927	1,107	1,904	'2,210	4,919	4,189	4,488	6,664	1,517	3,927	1,761	1,352	1,428	35,486	85
1928	983	1,963	2,257	3,505	2,070	3,326	2,320	4,735	5,234	5,645	4,489	2,559	39,086	94
1929	2,836	5,088	2,644	3,259	2,499	4,840	'6,950	3,997	3,054	865	746	1,547	38,325	92
1930	'2,150	1,686	2,408	'1,100	'2,830	'2,760	'2,380	'5,460	'6,530	'2,950	'5,280	'3,500	39,034	94
1931	8,390	6,070	3,874	4,453	7,438	6,143	3,710	3,560	2,840	74	3,020	129	49,701	120
1932	615	*2,980	*4,610	*5,530	*4,310	3,590	3,640	4,510	11,400	*823	*4,700	*5,950	52,658	127
1933	1,120	2,350	3,505	5,534	5,054	4,388	2,380	2,575	992	655	12,135	10,185	50,873	122
1938	2,220	1,990	2,440	3,000	2,780	3,490	4,300	12,700	6,390	8,390	3,280	10,070	61,050	147
Mean	2,666	2,734	2,606	3,495	4,204	5,364	4,282	3,889	4,361	2,221	2,936	2,806	41,564	
% Annual Mean	6.4	6.6	6.3	8.4	10.1	12.9	10.3	9.3	10.5	5.3	7.1	6.8		100
Maximum	8,390	6,070	4,610	5,534	7,438	10,637	8,390	6,150	11,400	8,390	12,135	10,185	61,050	
Minimum	615	950	1,100	614	1,660	2,525	2,080	306	992	0	0	0	24,949	

Mean discharge May to September: 16,213 acre-feet or 39.0 per cent of annual mean

* Estimated
' Army Engineers' Report

Location: Sec. 31, T. 1 N., R. 37 W.
Drainage Area: 2,640 Square Miles

MONTHLY AND YEARLY DISCHARGES
FRENCHMAN RIVER AT CULBERTSON, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1895	*6,440	*6,250	*5,960	*4,300	*4,430	*6,460	*8,150	*7,930	*7,850	*9,720	*5,900	*4,640	78,030	85
1896	*6,820	*5,940	*4,900	*5,820	*5,450	*5,520	*5,940	*7,010	*6,190	*5,780	*4,670	*4,880	68,920	75
1922	*5,828	*7,437	*8,947	7,993	8,462	8,777	5,032	2,898	1,571	1,347	4,358	4,901	67,551	73
1923	2,866	6,252	11,613	11,365	9,332	9,749	5,643	24,406	25,081	11,153	6,407	4,213	128,080	139
1924	9,188	11,682	4,355	13,527	12,424	12,059	9,520	7,787	6,426	6,458	4,562	2,499	100,487	109
1925	6,148	9,520	12,297	12,298	11,914	16,249	12,034	11,129	4,070	1,384	2,233	2,569	101,845	110
1926	4,552	7,563	11,129	11,621	8,942	8,484	3,907	3,076	5,197	5,903	3,778	4,165	78,317	85
1927	4,058	4,939	*8,947	12,297	10,996	16,048	15,272	9,427	10,651	2,185	2,667	1,785	99,272	108
1928	4,046	4,365	6,148	10,268	10,124	9,285	8,569	26,870	30,050	13,222	8,362	4,046	135,355	147
1929	6,024	11,008	9,898	8,301	9,251	12,131	11,157	10,770	7,650	2,648	853	2,321	92,012	100
1930	4,403	8,914	10,431	10,699	9,433	9,967	8,787	9,836	7,369	6,276	6,645	4,800	97,560	106
1931	9,156	10,274	9,461	8,785	8,588	8,951	8,630	6,640	2,930	2,870	7,070	2,330	85,685	93
1932	4,330	*8,630	*9,220	*9,530	*9,780	12,700	8,750	5,290	8,150	2,830	3,810	1,140	84,160	91
1933	2,990	6,130	8,240	*11,100	*11,100	12,200	8,150	6,060	1,460	1,460	8,240	12,400	89,530	97
1934	7,000	5,570	*11,990	*11,680	10,760	10,940	7,590	1,880	9,830	2,370	1,700	4,220	85,530	93
1935	3,110	4,000	10,080	10,840	9,160	11.080	6,890	32,080	22,860	7,230	2,250	5,290	124,870	135
1936	4,290	7,780	9,710	10,090	10,340	11,670	8,020	9,620	6,620	1,620	1,310	1,670	82,740	90
1937	1,390	5,890	9,340	7,130	9,010	9,650	6,580	2,620	9,870	2,710	1,510	1,860	67,560	73
1938	2,300	5,360	9,130	9,780	9,110	9,110	8,290	8,840	9,950	4,270	2,340	5,250	83,730	91
Mean	4,997	7,237	9,042	9,864	9,400	10,581	8,258	10,220	9,672	4,812	4,140	3,946	92,169	
% Annual Mean	5.4	7.9	9.8	10.7	10.2	11.5	8.9	11.1	10.5	5.2	4.5	4.3		100
Maximum	9,188	11,682	12,297	13,527	12,424	16,249	15,272	32,080	30,050	13,222	8,362	12,400	135,355	
Minimum	1,390	4,000	4,355	4,300	4,430	5,520	3,907	1,880	1,460	1,347	853	1,140	67,551	

Mean discharge May to September: 32,790 acre-feet or 35.6 per cent of annual mean
Mean annual discharge 1931-1938: 87,976 acre-feet or 95.4 per cent of annual mean

* Estimated
Note:- Flood Flows of May and June, 1935 not included in monthly mean, but shown in annual total

Location, Sec. 17, T. 3 N., R. 31 W.
Drainage Area: 2,800 Square Miles

MONTHLY AND YEARLY DISCHARGES
REPUBLICAN RIVER AT CULBERTSON, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1922	*4,950	*7,751	*8,560	6,444	12,984	17,367	10,389	7,991	6,210	4,116	8,632	6,278	101,672	83
1923	2,422	1,642	3,522	*12,545	*12,735	*11,701	*10,525	*8,737	*7,707	*11,355	*12,039	*6,540	104,470	86
1924	*4,950	*7,751	*8,560	17,094	17,256	19,676	15,947	9,188	3,788	1,168	3,533	357	109,268	90
1925	952	3,570	3,689	24,595	27,214	22,997	10,949	7,993	5,831	4,443	3,007	5,504	120,744	99
1926	6,764	9,878	*8,560	*12,545	9,997	10,028	8,390	2,569	139	7,194	807	*6,540	83,411	68
1927	3,935	7,140	*8,560	13,896	12,353	16,724	17,250	5,539	9,520	2,050	4,466	297	101,730	83
1928	4,427	7,021	4,482	8,547	9,318	9,864	6,426	15,727	20,327	84,172	13,047	5,117	188,475	154
1929	8,384	15,144	5,595	9,285	7,009	21,364	*15,450	16,342	9,035	430	3,074	5,295	116,407	95
1931	10,005	9,243	15,640	10,748	14,697	12,685	12,600	6,950	6,900	283	1,910	786	102,447	84
1932	*3,690	*9,820	*10,500	*11,700	*9,200	9,590	8,930	7,500	11,500	6,030	9,840	1,120	99,420	81
1933	4,430	7,560	9,530	*1,140	*9,720	11,200	8,090	14,800	2,760	2,570	80,600	38,000	190,400	156
1934	8,240	8,960	*12,910	*11,990	12,230	11,330	8,660	1,510	8,770	171	623	20	85,414	70
1935	1,200	5,280	11,170	12,300	10,840	13,590	8,140	243,100	208,400	23,630	14,930	9,170	561,750	110
1936	3,640	5,900	11,040	8,290	9,960	14,210	14,310	46,850	20,210	305	3,970	38	138,723	114
1937	3,730	5,800	7,420	4,350	9,710	15,410	10,820	19,480	22,200	2,670	2,070	9,690	113,350	93
1938	5,530	6,260	6,120	8,730	10,190	10,460	10,900	31,520	20,340	17,610	12,860	21,770	162,290	133
Mean	4,828	7,420	8,491	10,887	12,213	14,450	11,111	13,513	10,349	10,512	10,963	7,283	122,020	
% Annual Mean	4.0	6.1	6.9	8.9	10.0	11.8	9.1	11.1	8.5	8.6	9.0	6.0		100
Maximum	10,005	15,144	15,640	24,595	27,214	22,997	17,250	243,100	208,400	84,172	80,600	38,000	561,750	
Minimum	952	1,642	3,522	1,140	7,009	9,590	6,426	1,510	139	171	623	20	83,411	

Mean discharge May to September: 52,620 acre-feet or 43.1 per cent of annual mean
Mean annual discharge 1931-1938: 128,271 acre-feet or 105.1 per cent of annual mean

* Estimated
Note:- Flood Flows of May and June, 1935 not included in monthly mean, but shown in annual total

Location: Sec. 17, T. 3 N., R. 31 W.
Drainage Area: 8,790 Square Miles

MONTHLY AND YEARLY DISCHARGES
MEDICINE CREEK NEAR CAMBRIDGE, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1923	'1,720	'2,080	'2,020	'3,680	'1,110	'2,760	'4,570	'6,640	'18,100	'11,100	'9,040	'4,630	67,450	145
1924	'4,300	'3,560	'3,070	'2,460	'2,010	'3,380	'3,560	'3,070	'2,080	'2,640	'3,680	'2,080	35,890	77
1925	'1,660	'1,370	'1,230	1,721	1,611	3,344	3,729	3,126	2,499	2,586	2,285	1,537	26,698	57
1926	1,599	1,547	1,590	1,840	3,665	3,088	3,729	2,713	3,411	2,705	10,123	2,677	38,687	83
1927	2,261	1,844	4,710	4,611	4,165	4,120	6,297	3,272	17,200	2,697	3,821	1,904	56,902	122
1928	2,152	4,462	2,897	3,812	1,898	2,892	4,106	5,657	10,314	7,422	3,441	3,868	52,921	114
1929	1,658	2,797	2,828	2,582	2,660	4,030	4,998	5,542	4,810	2,644	1,140	3,094	38,783	83
1930	3,368	4,582	4,306	3,751	3,524	4,046	5,038	4,550	9,993	8,231	6,428	1,785	59,602	128
1931	5,020	3,987	4,673	4,949	4,772	5,603	4,697	4,694	2,142	1,902	1,845	992	45,276	97
1937	*2,700	*2,750	2,635	2,430	2,850	3,910	3,000	2,790	6,430	4,490	5,540	2,790	42,315	91
1938	2,480	3,000	3,050	2,820	2,860	3,840	3,920	7,300	4,060	8,020	2,660	2,600	46,610	100
Mean	2,629	2,907	3,001	3,150	2,830	3,728	4,331	4.487	7,367	4,949	4,546	2,542	46,467	
% Annual Mean	5.7	6.3	6.5	6.8	6.1	8.0	9.3	9.6	15.8	10.6	9.8	5.5		100
Maximum	5,020	4,582	4,710	4,940	4,772	5,603	6,297	7,300	18,100	11,100	10,123	4,630	67,450	
Minimum	1,599	1,370	1,230	1,721	1,110	2,760	3,000	2,713	2,080	1,902	1,140	992	26,698	

Mean discharge May to September: 23,891 acre-feet or 51.4 per cent of annual mean

* Estimated
' Army Engineers' Report

Location: Sec. 18, T. 4 N., R. 25 W.
Drainage Area: 884 Square Miles

MONTHLY AND YEARLY DISCHARGES
REPUBLICAN RIVER AT BLOOMINGTON, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1929	'26,900	'25,900	'27,500	'21,800	'16,100	'70,100	'54,400	"56,700	"109,000	"70,100	"12,000	"8,570	499,070	118
1930	"16,600	"23,900	"24,500	"21,400	"25,800	"30,400	"48,700	"84,800	"136,000	"26,600	"31,800	"46,300	516,800	122
1931	99,000	53,900	38,300	34,100	40,800	45,900	55,300	41,800	41,200	9,550	25,000	4,560	489,390	116
1932	3,970	12,400	11,900	14,800	55,300	42,900	29,800	27,100	98,200	18,000	26,900	19,900	361,170	85
1933	5,320	8,750	*21,500	*26,100	20,900	32,600	66,600	72,600	13,500	8,420	49,600	93,400	419,290	99
1934	19,630	20,910	*35,360	*31,360	25,480	34,400	26,340	8,910	67,410	5,310	2,680	24,230	302,020	71
1935	5,220	11,830	15,110	26,430	22,640	29,800	27,500	121,300	555,900	49,390	65,900	71,330	1,002,350	237
1936	18,520	25,820	25,100	19,920	14,280	45,730	25,580	140,500	51,660	3,640	1,650	7,900	380,300	90
1937	2,490	12,090	17,850	8,960	34,730	34,840	20,940	24,330	100,900	32,990	48,130	25,670	363,920	86
1938	7,010	12,070	14,100	25,770	23,800	31,510	36,650	72,410	83,140	58,640	38,120	40,740	443,960	105
Mean	20,466	20,757	23,122	23,064	27,983	39,818	39,181	58,624	77,824	28,262	30,178	34,260	423,539	
% Annual Mean	4.8	4.9	5.5	5.4	6.6	9.4	9.3	13.8	18.4	6.7	7.1	8.1		100
Maximum	99,000	53,900	38,300	34,100	55,300	70,100	66,600	140,500	555,900	70,100	65,900	93,400	1,002,350	
Minimum	2,490	8,750	11,900	8,960	14,280	29,800	20,940	8,910	13,500	3,640	1,650	4,560	302,020	

Mean discharge May to September: 229,148 acre-feet or 54.1 per cent of annual mean
Mean annual discharge 1931-1938: 402,441 acre-feet or 95.0 per cent of annual mean

* Estimated
" U.S.G.S.
' Army Engineers' Report
Note:- Flood flows of May and June, 1935 not included in monthly mean, but shown in annual total

Location: Sec. 8, T. 1 N., R. 15 W.
Drainage Area: 19,000 Square Miles

MONTHLY AND YEARLY DISCHARGES
REPUBLICAN RIVER NEAR THE NEBRASKA-KANSAS LINE
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1897	14,100	26,800	*27,300	*24,500	*39,800	31,300	56,300	25,800	*47,600	56,700	15,900	8,900	375,000	73
1898	*15,900	*20,200	*22,100	*24,200	*30,900	*21,700	*25,800	64,800	73,500	29,400	12,000	17,200	357,700	70
1899	16,200	*22,700	*13,600	*23,300	*23,000	*36,800	34,400	31,400	31,600	28,200	18,600	3,000	282,800	55
1900	3,300	*5,640	*16,200	*18,500	*22,100	*43,800	54,100	45,200	23,300	9,800	9,200	9,300	260,440	51
1901	4,200	*5,340	*8,600	*16,900	*19,900	*34,600	57,200	22,400	13,000	2,620	4,300	7,710	196,770	38
1902	27,200	24,900	*19,600	*23,500	*24,100	*41,400	33,000	78,000	81,600	*264,000	41,400	69,900	728,600	142
1903	67,600	37,000	*33,100	*36,800	*36,500	*178,000	54,600	276,000	114,000	119,000	75,600	23,100	1,041,300	203
1904	20,000	24,800	*25,000	*32,800	*40,000	*35,800	*60,500	*58,200	99,200	102,000	22,800	10,700	531,800	104
1905	31,500	31,100	*24,800	*34,900	*46,500	*58,200	63,100	118,000	175,000	353,000	190,000	43,100	1,169,200	228
1906	29,400	*37,100	*37,400	*43,000	*52,100	*46,000	*36,900	99,000	27,700	*41,100	34,000	15,100	498,800	97
1907	22,100	36,300	*24,500	*26,400	*32,100	*36,200	30,800	36,300	41,600	26,700	7,560	4,610	325,170	63
1908	7,500	14,300	*21,100	*23,900	*25,800	28,300	17,100	20,700	96,400	49,900	54,000	12,100	371,100	72
1909	37,400	32,500	41,800	*47,800	*42,100	*46,300	23,800	34,100	100,000	76,900	14,600	41,100	538,400	105
1910	12,400	21,300	*20,900	*24,500	*29,900	*34,400	21,400	23,900	15,700	7,130	68,900	29,800	309,930	60
1911	12,400	14,200	*14,400	18,400	25,500	28,500	16,200	17,500	8,930	66,400	360,000	42,100	624,530	122
1912	26,100	17,800	15,400	*17,800	*84,300	316,000	96,400	57,800	25,100	16,700	76,900	19,000	769,300	150
1913	21,900	25,300	25,100	*28,800	*35,400	*54,600	41,500	65,800	19,200	8,850	670	904	328,024	64
1914	2,000	2,680	*20,900	*29,400	*40,400	35,500	22,900	49,100	115,000	71,300	14,900	10,300	414,380	81
1915	4,600	10,500	*9,820	*11,400	*14,400	*44,500	*38,000	*56,800	*323,000	*150,000	*219,000	*67,000	949,110	185
1930	*20,000	*25,300	*25,000	*19,900	*29,400	*32,500	*53,100	*81,400	*152,300	*36,700	*35,300	*56,500	567,400	111
1931	*119,700	*57,100	*39,100	*31,700	*46,500	*49,100	°60,300	°59,000	°57,500	°13,600	°34,800	°6,070	574,470	112
1932	*4,800	*13,100	*12,100	*13,800	°171,000	°50,200	°35,200	°30,100	121,000	21,700	27,100	23,200	523,300	102
1933	4,660	8,750	*18,400	*26,100	22,500	37,400	66,000	83,000	15,600	14,500	55,300	107,000	459,210	90
1934	24,570	21,400	34,030	*32,590	26,920	38,290	29,390	12,750	66,630	6,780	1,100	19,020	313,470	61
1935	5,800	14,170	15,230	19,150	30,420	32,210	30,840	111,100	618,200	63,210	74,610	104,100	1,119,040	218
1936	23,580	27,010	31,540	18,890	15,020	45,040	33,360	124,200	72,660	7,270	2,150	9,870	410,590	80
1937	3,740	10,870	17,580	9,950	39,000	42,820	23,410	25,640	103,500	54,510	47,050	27,670	405,640	79
1938	8,530	9,000	12,970	26,250	24,650	35,730	32,160	89,660	100,200	56,810	51,000	49,940	496,900	97
Mean	20,760	21,327	22,413	25,183	38,222	54,114	40,991	62,424	78,519	62,671	56,026	29,928	512,578	
% Annual Mean	4.1	4.2	4.4	4.9	7.5	10.5	8.0	12.2	15.3	12.2	10.9	5.8		100
Maximum	119,700	57,100	41,800	47,800	171,000	316,000	96,400	276,000	618,200	353,000	360,000	107,000	1,169,200	
Minimum	2,000	2,680	8,600	9,950	14,400	21,700	16,200	12,750	8,930	2,620	670	904	196,770	

Mean discharge May to September: 289,568 acre-feet or 56.5 per cent of annual mean
Mean annual discharge 1931-1938: 537,828 acre-feet or 104.9 per cent of annual mean

* Estimated
° Republican River at Bostwick

Location: Sec. 6, T. 1 N., R. 6 W.
Drainage Area: 22,500 Square Miles

Note:- Flood flows of May and June, 1935 not included in monthly mean, but shown in annual.
1897-1903 inclusive: Republican River at Superior.
1904-1915 inclusive: Republican River at Bostwick.

ELKHORN RIVER BASIN

MONTHLY AND YEARLY DISCHARGES
ELKHORN RIVER NEAR NELIGH, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1931	*10,000	*13,500	*13,100	*11,200	*12,400	18,000	19,200	13,200	5,550	3,390	2,510	3,030	125,080	105
1932	6,270	9,520	9,840	8,300	10,400	16,800	15,800	12,800	19,200	8,360	10,900	5,650	133,840	112
1933	7,690	9,580	8,480	*10,100	*8,050	15,300	11,800	20,000	6,250	5,850	8,610	5,680	117,390	98
1934	6,420	7,300	*8,610	*8,300	*8,330	11,380	10,800	7,720	5,110	2,960	1,710	3,710	82,350	69
1935	5,580	7,360	10,150	9,620	10,140	11,240	17,920	31,140	39,260	8,570	3,690	5,320	159,990	134
1936	6,500	8,470	10,010	7,470	7,590	20,930	17,030	22,360	11,170	2,760	2,160	3,800	120,250	101
1937	4,900	6,940	6,750	4,150	5,940	14,000	10,480	10,610	7,200	9,460	5,820	3,280	89,530	75
1938	5,670	6,370	5,930	5,600	7,110	12,560	13,180	36,370	14,240	9,500	4,950	4,700	126,180	106
Mean	6,629	8,630	9,109	8,093	8,745	15,026	14,526	19,275	13,497	6,356	5,044	4,396	119,327	
% Annual Mean	5.6	7.2	7.6	6.8	7.3	12.6	12.2	16.2	11.3	5.3	4.2	3.7		100
Maximum	10,000	13,500	13,100	11,200	12,400	20,930	19,200	31,140	39,260	9,460	10,900	5,680	159,990	
Minimum	4,900	6,370	5,930	4,150	5,940	11,240	10,480	7,720	5,110	2,760	1,710	3,030	82,350	

Mean discharge May to September: 48,568 acre-feet or 40.7 per cent of annual mean

* Estimated

Location: Sec. 20, T. 25 N., R. 6 W.
Drainage Area: 1,740 Square Miles

MONTHLY AND YEARLY DISCHARGES
ELKHORN RIVER NEAR WATERLOO, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1912	'57,500	'69,600	'61,500	'70,600	'37,000	'103,000	'196,000	'87,900	'72,000	'42,900	'57,200	'35,000	890,200	158
1913	'44,900	'40,200	'27,700	'32,000	'33,800	'98,300	'135,000	'176,000	'79,100	'40,500	'31,300	'20,200	759,000	135
1929	"35,900	"45,400	'40,000	'27,100	'16,700	"83,000	"78,600	"86,100	"147,000	"98,400	"37,900	"30,200	726,300	129
1930	"34,000	"35,200	"9,220	"15,400	"61,100	"49,900	"64,900	"235,000	"72,600	"25,000	"58,300	"30,800	691,420	123
1931	33,600	42,100	36,800	34,300	43,300	46,900	48,700	44,500	41,700	18,400	12,800	22,900	426,000	76
1932	23,300	34,800	42,300	44,700	57,400	154,000	60,100	109,000	129,000	29,100	76,900	35,600	796,200	142
1933	30,300	28,700	23,300	29,800	23,700	69,500	59,100	67,000	24,100	57,500	26,400	24,700	464,100	83
1934	20,010	23,560	*27,670	*24,600	32,010	38,840	37,870	20,110	56,140	29,800	8,040	16,000	334,650	60
1935	18,400	23,140	16,190	18,290	25,050	37,480	49,470	80,980	104,800	29,160	25,150	17,490	445,600	79
1936	17,130	21,720	22,610	16,370	16,430	99,230	42,710	44,590	33,530	10,660	12,890	37,780	375,650	67
1937	14,470	16,710	18,130	13,530	21,500	63,340	37,770	48,940	61,440	35,110	36,280	21,980	389,200	69
1938	21,990	19,650	18,460	17,170	19,730	49,380	43,970	66,630	38,960	71,510	21,790	53,910	443,150	79
Mean	29,292	33,398	28,657	28,655	32,310	74,406	71,182	88,896	71,697	40,670	33,746	28,880	561,789	
% Annual Mean	5.2	5.9	5.1	5.1	5.8	13.3	12.7	15.8	12.8	7.2	6.0	5.1		100
Maximum	57,500	69,600	61,500	70,600	61,100	154,000	196,000	235,000	147,000	98,400	76,900	37,780	890,200	
Minimum	14,470	16,710	9,220	13,530	16,430	37,480	37,770	20,110	24,100	10,660	8,040	16,000	334,650	

Mean discharge May to September: 263,889 acre-feet or 47.0 per cent of annual mean
Mean annual discharge 1931-1938: 459,319 acre-feet or 81.7 per cent of annual mean

* Estimated
" U.S.G.S.
' Army Engineers' Report

Location: Sec. 10, T. 15 N., R. 10 E.
Drainage Area: 6,390 Square Miles

BLUE RIVER BASIN

MONTHLY AND YEARLY DISCHARGES
LITTLE BLUE RIVER NEAR ENDICOTT, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1909	11,000	10,600	11,300	11,300	11,800	12,100	10,700	21,800	70,200	83,000	12,500	39,000	305,300	147
1910	12,900	29,600	29,300	19,200	20,000	16,400	11,100	25,300	42,200	13,800	23,200	15,700	258,700	125
1911	10,700	10,100	10,600	10,300	8,330	8,850	9,280	9,040	6,660	16,700	39,500	15,600	155,660	75
1912	21,300	11,100	11,900	11,600	39,600	119,000	42,300	30,300	24,800	9,780	30,300	13,200	365,180	176
1913	20,400	10,400	13,500	12,300	10,500	18,700	12,300	40,000	18,000	7,260	5,530	4,350	173,240	83
1914	6,520	8,390	17,300	15,400	11,100	11,800	10,900	12,200	48,100	18,100	11,600	11,100	182,510	88
1915	8,300	9,460	10,700	11,000	14,400	16,700	17,700	16,600	171,000	121,000	110,000	30,400	537,260	259
1929	'22,100	'18,700	'15,700	'6,450	'15,600	'26,100	'24,100	"10,400	"15,200	"9,220	"7,130	"6,430	177,130	85
1930	"8,360	"6,900	"5,230	"4,610	"6,830	"8,480	"14,600	"71,900	"32,000	"8,920	"14,800	"11,700	194,330	94
1931	7,190	10,400	8,180	7,870	7,280	8,240	9,040	25,000	23,600	9,410	14,100	8,870	139,180	67
1932	11,000	17,400	10,600	9,220	32,000	18,800	9,700	10,300	32,000	10,600	12,000	7,320	180,940	87
1933	7,810	7,560	7,130	9,100	7,110	8,120	9,100	15,100	6,190	7,070	17,300	10,100	111,690	54
1934	7,240	7,110	8,720	9,000	7,300	8,860	7,460	6,840	4,650	3,410	3,120	7,370	81,080	39
1935	5,720	6,520	7,100	6,460	6,460	7,480	15,000	76,880	104,800	17,280	6,090	17,080	276,870	133
1936	7,650	8,310	8,140	8,230	23,150	10,870	8,220	11,380	6,030	5,640	2,970	5,330	105,920	51
1937	5,580	5,970	7,240	5,440	9,670	9,620	7,650	10,150	9,600	21,820	8,590	7,620	108,950	52
1938	6,840	6,300	5,960	7,900	6,820	8,760	8,860	40,520	27,470	19,190	19,020	17,960	175,600	85
Mean	10,624	10,872	11,094	9,728	13,997	18,758	13,412	25,512	37,794	22,482	19,868	13,478	207,619	
% Annual Mean	5.1	5.2	5.3	4.7	6.8	9.0	6.5	12.3	18.2	10.8	9.6	6.5		100
Maximum	22,100	29,600	29,300	19,200	39,600	119,000	42,300	76,880	171,000	121,000	110,000	39,000	537,260	
Minimum	5,580	5,970	5,230	4,610	6,460	7,480	7,460	6,840	4,650	3,410	2,970	4,350	81,080	

Mean discharge May to September: 119,134 acre-feet or 57.4 per cent of annual mean
Mean annual discharge 1931-1938: 147,529 acre-feet or 75.9 per cent of annual mean

" U.S.G.S.
' Army Engineers' Report
Note:- 1909-1915 inclusive - Fairbury, Nebraska Record

Location: Sec. 5, T. 1 N., R. 3 E.
Drainage Area: 2,590 Square Miles

MONTHLY AND YEARLY DISCHARGES
BIG BLUE RIVER NEAR BARNSTON, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1920	*37,346	*25,773	*13,206	*17,537	*31,666	*14,200	*41,890	*34,861	*29,749	*25,134	*26,696	*13,632	311,690	116
1921	*9,940	*13,277	*11,289	*10,792	*11,573	*11,857	*12,070	*17,040	*45,653	*45,440	*16,543	*25,702	231,176	86
1922	*10,437	*10,972	*11,076	*7,171	*11,573	*20,945	*13,064	*11,289	*9,869	*45,866	*10,224	*3,294	165,780	61
1923	*3,983	*9,727	*7,071	*7,384	*4,728	*6,155	*22,507	*29,749	*76,680	*6,198	*11,502	*26,767	212,451	79
1924	*117,150	*7,455	*5,410	*5,722	*11,502	*9,940	*13,419	*11,502	*66,740	*85,910	*24,992	*15,620	375,362	139
1925	*5,239	*5,616	*8,094	*6,113	*21,087	*6,986	*10,082	*11,715	*83,070	*14,626	*52,256	*10,579	235,463	87
1929	*38,979	*35,003	*11,786	*10,011	*30,317	*61,983	*49,416	*21,371	*81,650	*21,158	*10,863	*5,871	378,408	140
1930	*7,029	*6,503	*5,765	*5,587	*17,182	*6,503	*11,289	*125,670	*36,991	*9,159	*7,313	*30,672	269,663	100
1931	*4,132	*20,874	*13,703	*7,739	*6,879	*6,212	*9,940	*29,323	*29,039	*15,265	*11,999	*31,240	186,345	69
1932	*32,305	*43,310	*15,265	*21,300	*61,273	*37,275	*10,934	*13,135	"130,000	"38,700	"73,800	"26,800	504,097	187
1933	8,610	8,510	10,100	9,720	8,000	13,300	10,900	27,600	8,630	17,000	38,100	14,800	175,270	65
1934	4,860	5,790	8,320	7,060	6,570	9,000	7,830	5,900	4,120	1,890	1,300	20,600	83,240	31
1935	13,990	9,190	8,110	12,060	10,950	11,010	22,350	114,100	200,000	39,030	5,480	18,090	464,360	172
1936	7,690	12,640	9,010	8,130	61,160	66,030	12,220	26,750	12,330	2,390	1,970	4,110	224,430	83
1937	4,620	4,610	5,510	4,160	17,090	19,360	8,050	11,490	29,280	27,880	20,890	6,960	159,900	59
1938	5,670	6,170	7,090	7,510	6,980	14,320	13,290	90,270	80,860	50,890	20,390	36,000	339,440	126
Mean	19,499	14,089	9,425	9,250	19,908	19,692	16,828	36,360	57,791	27,909	20,895	18,171	269,817	
% Annual Mean	7.2	5.2	3.5	3.4	7.4	7.3	6.2	13.5	21.4	10.4	7.7	6.8		100
Maximum	117,150	43,310	15,265	21,300	61,273	66,030	49,416	125,670	200,000	85,910	73,800	31,240	504,097	
Minimum	3,983	4,610	5,410	4,160	4,728	6.155	7,830	5,900	4,120	1,890	1,300	3,294	83,240	

Mean discharge May to September: 161,126 acre-feet or 59.7 per cent of annual mean
Mean annual discharge 1931-1938: 267,135 acre-feet or 99.0 per cent of annual mean

* Estimated
" U.S.G.S.

Location: Sec. 13, T. 1 N., R. 7 E.
Drainage Area: 4,350 Square Miles

NIOBRARA RIVER BASIN

MONTHLY AND YEARLY DISCHARGES
NIOBRARA RIVER AT DUNLAP, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1924	*2,224	*2,675	*3,431	2,440	5,510	5,831	10,572	5,455	3,174	2,329	2,626	2,618	48,885	134
1925	2,991	3,530	4,919	3,259	4,610	4,919	2,618	2,559	1,428	4,120	2,380	892	38,225	105
1926	3,013	3,332	3,497	*3,513	*3,831	4,818	4,344	2,644	2,499	2,890	5,903	1,666	41,950	115
1927	2,975	*2,675	*3,431	4,242	3,832	5,042	5,732	5,656	2,618	3,197	4,673	3,332	47,405	130
1928	3,689	4,086	3,689	4,550	3,293	4,550	3,796	3,259	2,380	3,628	1,870	2,142	40,932	112
1929	2,705	*2,890	*3,340	4,058	*2,054	6,825	7,735	4,120	1,567	*1,460	*2,060	2,737	41,551	114
1930	*2,031	2,559	*2,942	*3,060	*4,220	*4,240	*6,730	*6,240	*2,230	*1,120	*2,460	*2,060	39,892	110
1931	*2,224	*2,675	*3,431	*3,513	*3,831	4,830	5,000	3,520	518	258	2,860	869	33,529	92
1932	1,190	*1,490	*1,540	*1,230	*2,300	4,880	3,880	3,990	1,400	1,180	1,240	774	25,094	69
1933	1,140	2,800	3,230	*4,730	*3,610	5,470	5,040	5,020	2,610	664	3,620	3,920	41,854	115
1934	2,200	2,110	*3,690	*4,000	3,710	4,430	2,660	424	246	732	2,580	879	27,661	76
1935	593	1,380	3,450	3,650	3,780	4,190	5,430	5,120	5,310	617	1,130	1,540	36,190	99
1936	953	2,550	3,150	3,060	3,150	5,520	4,200	1,410	1,050	294	209	786	26,332	72
1937	1,230	2,890	3,480	2,760	2,690	4,630	3,000	650	1,110	760	597	5,390	29,187	80
1938	1,260	1,770	3,100	2,880	3,050	4,320	3,990	2,870	982	973	704	1,250	27,149	75
Mean	2,028	2,628	3,355	3,396	3,565	4,966	4,982	3,529	1,941	1,615	2,327	2,057	36,389	
% Annual Mean	5.6	7.2	9.2	9.3	9.8	13.7	13.7	9.7	5.3	4.4	6.4	5.7		100
Maximum	3,689	4,086	4,919	4,730	5,510	6,825	10,572	6,240	5,310	4,120	5,903	5,390	48,885	
Minimum	593	1,380	1,540	1,230	2,054	4,190	2,618	424	246	258	209	774	25,094	

Mean discharge May to September: 11,469 acre-feet or 31.5 per cent of annual mean
Mean annual discharge 1931-1938: 30,875 acre-feet or 84.8 per cent of annual mean

* Estimated

Location: Sec. 27, T. 29 N., R. 48 W.
Drainage Area: 1,550 Square Miles

MONTHLY AND YEARLY DISCHARGES
NIOBRARA RIVER NEAR SPENCER, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1928	71,300	54,600	37,000	71.900	82,200	126,000	92,200	76,900	77,400	73,800	55,300	61,300	879,900	100
1929	76,200	80,300	72,600	*39,700	*48,900	*129,000	*80,300	*83,000	*104,000	*66,400	*50,200	*70,800	901,400	103
1930	*78,100	*85,100	*55,500	54.700	114,000	101,000	120,000	145,000	89,300	50,100	60,100	60,100	1,013,000	115
1931	81,800	73,800	78,700	80,600	101,000	92,200	94,000	76,900	58,700	47,600	52,100	50,200	887,600	101
1932	*62,700	*56.800	*76,200	*58,600	*98,400	*97,800	*83,300	*105,000	*107,000	*52,800	*51,700	*51,200	901,500	103
1933	67,600	65,500	47,400	75,600	61,600	110,000	76,800	96,500	49.400	53,800	67,600	54,500	826,300	94
1934	64,970	71,420	59,030	79,660	71,710	90,960	70,140	62,340	59,270	39,610	49,280	74,940	793,330	90
1935	69,050	70,200	56,440	51,230	96,940	91,440	107,000	88,030	97,750	55,770	46,900	51,670	882,400	100
1936	61,400	70,970	57,460	58,270	57,820	155,600	88,940	94,410	55,180	33,740	42,260	47,360	823,410	94
Mean	70,347	69,854	60,037	63,362	81,397	110,444	90,298	92,009	77,556	52,624	52,827	58,008	878,763	
% Annual Mean	8.0	7.9	6.8	7.2	9.3	12.6	10.3	10.5	8.8	6.0	6.0	6.6		100
Maximum	81,800	85,100	78,700	80,600	114,000	155,600	120,000	145,000	107,000	73,800	67,600	74,940	1,013,000	
Minimum	61,400	54,600	37,000	39,700	48,900	90,960	70,140	62,340	49,400	33,740	42,260	47,360	793,330	

Mean discharge May to September: 333,024 acre-feet or 37.9 per cent of annual mean
Mean annual discharge 1931-1936: 852,427 acre-feet or 97.0 per cent of annual mean

* Estimated

Location: Sec. 30, T. 33 N., R. 11 W.
Drainage Area: 10,800 Square Miles

MINOR MISSOURI BASIN ABOVE PLATTE RIVER

MONTHLY AND YEARLY DISCHARGES
MISSOURI RIVER AT OMAHA, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1929	1,210,000	1,210,000	658,000	571,000	655,000	3,440,000	3,970,000	2,430,000	6,780,000	3,380,000	1,380,000	851,000	26,535,000	157
1930	1,010,000	916,000	487,000	621,000	994,000	3,170,000	2,620,000	2,610,000	2,490,000	1,700,000	1,190,000	1,230,000	19,038,000	112
1931	1,030,000	922,000	499,000	550,000	911,000	1,050,000	1,190,000	885,000	1,900,000	1,410,000	689,000	578,000	11,614,000	69
1932	640,000	672,000	384,000	464,000	548,000	1,680,000	2,060,000	2,690,000	4,740,000	3,460,000	1,430,000	982,000	19,750,000	116
1933	750,000	660,000	342,000	590,000	529,000	1,790,000	2,040,000	2,360,000	3,950,000	2,580,000	990,000	1,220,000	17,801,000	105
1934	751,700	733,100	558,200	461,900	731,400	1,497,000	1,253,000	1,387,000	1,903,000	1,408,000	613,700	437,300	11,735,300	69
1935	610,000	626,800	376,400	358,000	583,700	965,600	1,421,000	1,514,000	3,305,000	3,129,000	1,235,000	640,100	14,664,600	86
1936	544,100	456,500	436,100	419,100	398,700	2,853,000	1,914,000	1,792,000	2,286,000	1,428,000	752,100	750,600	14,030,200	83
1937	574,600	569,600	524,600	407,400	352,500	1,267,000	1,800,000	1,226,000	3,374,000	3,234,000	1,406,000	541,100	15,296,800	90
1938	647,200	626,900	319,200	430,600	487,100	2,476,000	1,435,000	1,334,000	2,537,000	4,829,000	1,864,000	2,086,000	19,075,000	113
Mean	766,760	741,590	458,450	487,300	619,040	2,018,860	1,970,300	1,822,800	3,326,500	2,655,800	1,154,980	931,610	16,953,990	
% Annual Mean	4.5	4.4	2.7	2.9	3.7	11.9	11.6	10.7	19.6	15.7	6.8	5.5		100
Maximum	1,210,000	1,210,000	658,000	621,000	994,000	3,440,000	3,970,000	2,690,000	6,780,000	4,829,000	1,864,000	2,086,000	26,535,000	
Minimum	510,000	456,500	319,200	358,000	352,500	965,600	1,190,000	885,000	1,900,000	1,408,000	613,700	437,300	11,614,000	

Mean discharge May to September: 9,891,690 acre-feet or 58.3 per cent of annual mean
Mean annual discharge 1931-1938: 15,495,863 acre-feet or 91.4 per cent of annual mean

Source: United States Geological Survey

Location: Sec. 23, T. 15 N., R. 14 E.
[illegible] 955 Feet

WHITE RIVER AND HAT CREEK BASINS

MONTHLY AND YEARLY DISCHARGES
WHITE RIVER NEAR CHADRON, NEBRASKA
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1925	185	377	553	117	678	762	631	524	863	1,840	412	381	7,323	35
1926	1,733	863	892	*939	*1,953	4,560	2,986	615	*2,477	2,336	6,026	416	25,795	123
1927	2,227	*1,169	*1,196	*939	3,052	3,669	6,605	6,271	5,414	4,304	2,275	3,153	40,294	192
1928	3,996	3,947	3,012	1,107	4,938	4,837	2,975	2,029	4,939	1,045	1,476	297	34,598	165
1929	1,722	1,190	676	676	*1,953	6,087	*3,354	4,558	1,904	*1,624	*2,260	2,142	28,146	135
1931	*1,599	*1,169	*1,107	*939	*1,953	*3,304	*800	1,050	898	103	*2,260	246	15,428	74
1932	800	893	1,540	1,540	2,010	2,060	2,800	2,030	827	357	806	238	15,601	75
1933	516	464	338	*738	*500	3,340	4,930	8,480	1,460	861	4,490	1,080	27,197	130
1934	805	1,310	*1,840	*1,720	1,280	1,560	1,140	270	300	443	2,390	154	13,212	63
1935	411	305	716	676	1,210	2,840	7,690	6,940	5,690	3,330	206	395	30,409	145
1936	151	926	*258	*221	*460	1,160	1,400	377	871	131	145	3,940	10,040	48
1937	194	1,470	1,420	610	1,020	1,230	1,060	1,500	2,910	520	371	441	12,746	61
1938	421	299	297	425	473	1,750	1,790	2,770	952	1,120	433	299	11,029	53
Mean	1,112	1,106	1,065	819	1,652	2,860	2,935	2,878	2,270	1,386	1,812	1,014	20,909	
% Annual Mean	5.3	5.3	5.1	3.9	7.9	13.7	14.0	13.8	10.9	6.6	8.7	4.8		100
Maximum	3,996	3,947	3,012	1,720	4,938	6,087	7,690	8,480	5,690	4,304	6,026	3,940	40,294	
Minimum	151	299	258	117	460	762	631	270	300	103	145	154	7,323	

Mean discharge May to September: 9,360 acre-feet or 44.8 per cent of annual mean
Mean annual discharge 1931-1938: 16,958 acre-feet or 81.1 per cent of annual mean

* Estimated

Location: Sec. 18, T. 33 N., R. 49 W.
Drainage Area: 750 Square Miles

MONTHLY AND YEARLY DISCHARGES
HAT CREEK NEAR THE NEBRASKA-SOUTH DAKOTA LINE
Values in Acre-Feet

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Totals	% of Annual Mean
1905	46	409	1,150	1,150	690	2,714	681	3,790	12,282	14,674	19,734	173	57,493	150
1906	102	55	46	46	46	1,610	2,070	3,873	3,119	352	4,646	3,450	19,415	50
Mean	74	232	598	598	368	2,162	1,376	3,832	7,701	7,513	12,190	1,812	38,456	
% Annual Mean	0.2	0.6	1.6	1.6	0.9	5.6	3.6	10.0	20.0	19.5	31.7	4.7		100

Mean discharge May to September: 33,048 acre-feet or 85.9 per cent of annual mean

Note:- All quantities estimated

MAXIMUM, MINIMUM AND MEAN DISCHARGES

PLATTE RIVERS

HORSE CREEK NEAR LYMAN

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 1,000 S.F. or more Discharge	Number of Days 500 S.F. or more Discharge
1921	12	8/ 8-10	2	1/ 1-16; 2/15-28	6	0	0
1922	16	6/13	2	12/ 1-15	5	0	0
1923	187	8/25	5	10/ 1-31;11/ 1-30 12/ 1-31	38	0	0
1924	232	6/ 8	7	12/30-31	109	0	0
1925	395	5/22	11.6	4/ 1-20	65	0	0
1926	298	8/ 1-20	16	4/ 1-30	123	0	0
1927	680	8/ 1-10	32	3/21-31	174	0	10
1928	267	9/16-30	13	4/16-30	110	0	0
1929	431	6/11-15	28	2/ 1-28	119	0	0
1930	1,300	8/15	20	4/21-30; 5/ 1-16	123	2	7
1931	284	6/ 8	30	3/26-28	96	0	0
1932	508	6/20-21	13	1/ 6	73	0	2
1933	676	5/23	12	4/16-18,19	85	0	3
1934	353	10/1	6	5/18-21,23,25	25	0	0
1935	742	6/13	4	1/19-21	34	0	1
1936	379	6/ 6	4	2/ 8-17	27	0	0
1937	372	9/30	3	1/22	37	0	0
1938	411	5/20	7	4/ 7	65	0	0

SHEEP CREEK NEAR MORRILL

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 200 S. F. or more Discharge	Number of Days 100 S.F. or more Discharge
1919	150	9/12	0	4/ 1- 5; 7/12-14	37	0	2
1920	195	6/18	1	5/18-31; 6/ 1-12	53	0	25
1921	88	11/30	48	3/ 7- 9; 7/ 1- 8	65	0	0
1922	101	9/18	37	6/12	72	0	2
1923	130	12/28-31	0	6/21-30; 7/ 1-20 8/12 da.; 8/21 da.	52	0	36
1924	122	9/17-25	0	5/21-31; 6/ 1-29 7/10 da.	59	0	61
1925	138	10/30-31	0.4	6/ 1-10	57	0	90
1926	110	10/ 1-10	7	6/ 1-20	58	0	31
1927	184	3/31	7	6/ 1-30	64	0	35
1928	111	11/ 1-15	6	7/16-31	62	0	17
1929	114	9/14-30	4	6/24-30; 7/ 1-31	61	0	27
1930	124	11/ 1-15	0	6/11-15	66	0	61
1931	135	10/16-31	1	5/26-28; 9/ 3 da.	61	0	76
1932	200	8/ 2	1	6/18-20	54	1	29
1933	148	4/20-31	1	6/ 2 da.	67	0	83
1934	123	10/ 1- 2	1	7/12 da.	55	0	71
1935	97	7/13	0.9	3/26	29	0	0
1936	86	4/13	1	7/ 7	32	0	0
1937	68	10/ 7;11/ 9	1	5/ 9,11,13-17,19	51	0	0
1938	132	7/20	1.6	6/ 4- 5	47	0	5

WINTERS CREEK NEAR SCOTTSBLUFF

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 200 S.F. or more Discharge	Number of Days 100 S.F. or more Discharge
1919	94	9/22-24	40	4/20-22,27-28 5/20-27	62	0	0
1920	90	10/17-23	12	7/28-29; 8/21-22,27 9/ 1- 3	46	0	0
1921	94	9/27	38	3/23-24	57	0	0
1922	125	9/30	31	1/1- 6	53	0	20
1923	126	10/ 2- 4	15	9/30	66	0	31
1924	128	9/16-20	12	10/ 2	60	0	21
1925	150	9/26-30	19	6/ 1-10	60	0	25
1926	94	10/ 1-31	17	5/11-31	66	0	0
1927	161	8/ 2-14	32	7/ 1-10	72	0	34
1928	96	11/23-30	11	7/ 1-31	58	0	0
1929	102	7/16-31	15	6/ 1-30	58	0	16
1930	121	9/ 1-30	5	6/16-30; 7/ 1- 8	59	0	35
1931	151	9/24	14	12/29-31	60	0	27
1932	135	9/21	5	5/20	57	0	14
1933	176	9/14	4	6/ 4,11-12,17	68	0	52
1934	97	10/ 5	1	7/24	44	0	0
1935	138	6/11	1	8/16-17	41	0	15
1936	211	6/ 9	7	5/18-21	48	2	10
1937	248	8/18	4	5/21-23,25; 6/16; 8/14	50	1	16
1938	186	9/ 2	6	6/10	62	0	36

NINE MILE DRAIN AT McGREW

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 300 S.F. or more Discharge	Number of Days 200 S.F. or more Discharge
1920	306	9/7	44	10/ 3	140	1	40
1921	199	8/29	87	4/25-28	131	0	0
1922	274	8/29	64	4/ 5-10	118	0	16
1923	146	10/ 1	55	3/ 7-10	-	0	0
1924	256	9/19	85	5/ 6;12/ 3- 4	132	0	50
1925	267	8/21-31	74	4/ 1-30	147	0	61
1926	224	9/ 1-30	83	3/ 1-31	161	0	102
1927	267	8/11-20	112	5/21-31; 6/ 1-30	150	0	61
1928	222	11/ 1-15	89	5/ 1-15	151	0	99
1929	195	8/ 6-31/ 9/ 1-30	91	1/ 1-31	147	0	0
1930	270	9/16-30	86	1/ 6-30; 5/ 1-30	151	0	51
1931	270	10/ 1-20	86	5/ 1-20	154	0	54
1932	385	8/13	81	5/13-14	141	2	59
1933	344	9/14	83	4/12,17,19	148	5	64
1934	220	10/ 1	50	5/23	107	0	7
1935	204	6/11	60	4/14,16-17, 19-21	92	0	1
1936	898	6/ 9	55	5/15	100	2	3
1937	296	8/18	64	4/15	106	0	1
1938	301	9/ 2	75	4/30	116	1	16

RED WILLOW CREEK NEAR BAYARD

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 500 S.F. or More Discharge	Number of Days 300 S.F. or More Discharge
1919	250	7/12	0	4/ 1- 2	86	0	0
1920	175	7/15	5	5/23	56	0	0
1921	307	6/20	15	7/ 5	78	0	1
1922	137	5/22-25	35	5/ 6	63	0	0
1923	245	7/29	20	8/ 8	64	0	0
1924	124	9/25	6	7/11	41	0	0
1925	270	5/10-11	8	6/ 9-10	64	0	0
1926	1,316	6/15	25	5/ 1-15	81	2	3
1927	260	8/ 9	30	7/21-29	73	0	0
1928	217	8/ 1-15	11	8/16-31	77	0	0
1929	500	7/ 3	5	6/21-30	59	1	1
1930	300	8/16-20	4	7/ 1-31; 8/ 1-10	73	0	5
1931	214	5/22	1	5/ 2 da.; 6/ 1 da. 7/ 6 da.	48	0	0
1932	450	5/21	37	6/10	86	0	1
1933	575	8/26	33	6/13	98	1	7
1934	150	10/ 1	18	7/ 8-19	61	0	0
1935	327	6/12	15	4/23	55	0	1
1936	385	6/ 9	17	5/ 5- 6	59	0	1
1937	180	5/13	21	4/20	60	0	0
1938	588	5/19	33	5/15	82	2	3

PUMPKIN CREEK NEAR BRIDGEPORT

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 200 S.F. or More Discharge	Number of Days 100 S.F. or More Discharge
1922	85	8/13	9	6/20-25	40	0	0
1923	83	6/12	15	6/27-28	39	0	0
1924	62	3/24-25	14	8/19-21	41	0	0
1925	255	7/28	14	5/ 1-31	37	1	1
1926	81	9/ 6-10	23	11/16-30;12/ 1-15	41	0	0
1927	120	4/21-30	25	7/ 1-31	48	0	10
1928	89	4/16-30	18	7/ 1-15	51	0	0
1929	122	4/21-30	17	6/16-20	49	0	20
1930	108	5/11-20	26	7/ 1-10	55	0	10
1931	85	10/ 1-10	1	5/30-31; 6/ 9 da.	22	0	0
1932	200	6/16	8	8/11-12, 14	34	1	1
1933	76	8/28	6	8/ 2, 24	31	0	0
1934	121	5/ 3	1	6/ 8- 9	30	0	1
1935	188	6/17	6	11/18-22	36	0	10
1936	63	3/ 6	0.4	8/ 6	31	0	0
1937	46	9/ 8	3.4	7/17	20	0	0
1938	89	6/23	5.4	7/12	31	0	0

BLUE CREEK NEAR LEWELLEN

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 300 S.F. or More Discharge	Number of Days 200 S.F. or More Discharge
1919	87	8/20-21	1	6/5 da.; 7/19 da.	14	0	0
1920	119	6/1	2	8/12	45	0	0
1921	110	2/19-28	0	7/3-4	66	0	0
1922	280	8/4	1	8/21-31	69	0	2
1923	124	5/28	2	7/20-21	72	0	0
1924	124	3/3	10	7/15; 9/1-30	72	0	0
1925	123	4/1-10	1	7/16-31	78	0	0
1926	127	2/1-28	1	7/26-31	83	0	0
1927	164	4/11-20	2	7/21-31	100	0	0
1928	181	1/1-15	6	8/26-31	92	0	0
1929	140	11/1-5;12/16-31	1	6/11-25	102	0	0
1930	300	5/11	1	6/18-30	97	1	3
1931	200	10/4	1	5/27-30; 6/ 3 da. 8/ 8 da.	86	0	1
1932	295	4/24	1	6/9; 7/ 6 da. 8/ 9 da.	84	0	3
1933	285	4/21; 8/26	1	6/ 9 da.; 7/22 da.	92	0	4
1934	212	5/3	0	8/ 5- 8	76	0	1
1935	377	6/12	0.2	9/18-21	77	1	2
1936	156	1/10	0.3	6/17-20	70	0	0
1937	298	8/25	0.2	7/11	61	0	1
1938	267	5/20	1.2	8/20	94	0	2

OTTER CREEK NEAR LEMOYNE

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 100 S.F. or More Discharge	Number of Days 50 S.F. or More Discharge
1920	26	5/14	11	7/19	24	0	0
1922	36	3/11-17	12	6/11-18	24	0	0
1923	28	3/1-5	17	7/6-15	23	0	0
1924	27	3/26-31; 4/1-3	1	8/1-4; 7/29-31	19	0	0
1925	30	2/1-28; 9/11-30	2	6/1-10	24	0	0
1926	29	10/1-31	0	7/1-31; 8/1-15	20	0	0
1927	32	4/11-30; 6/1-20	0.7	7/1-31	17	0	0
1928	35	3/1-15	9	9/16-30	26	0	0
1929	33	4/1-15	7	1/16-31; 6/1-15	24	0	0
1930	31	5/1-31	2	7/21-24	24	0	0
1931	37	4/5-6	3	8/6	26	0	0
1932	30	3/18-20; 4/24-30; 6/29-30 10/20-21	2	6/8-9	23	0	0
1933	45	3/1	5	6/22	25	0	0
1934	29	1/9; 3/4	2	8/5	20	0	0
1935	44	7/21	11	4/20	24	0	0
1936	30	3/6-10	14	8/1-31	21	0	0
1937	35	9/4	1	5/30-31; 6/1-23	21	0	0
1938	28	4/26	10	5/16-19	22	0	0

BIRDWOOD CREEK NEAR HERSHEY

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 500 S.F. or more Discharge	Number of Days 300 S.F. or more Discharge
1920	208	5/ 7; 8/20	128	9/29	154	0	0
1922	269	5/25	138	6/21	200	0	0
1923	417	8/11	126	8/27	186	0	7
1924	204	10/13-31;11 1-30 12/ 1-31	134	7/17	181	0	0
1925	235	2/ 1-28	142	6/21-30	192	0	0
1926	230	3/ 1-31	150	7/11-25	193	0	0
1927	230	3/ 1-31	162	7/21-31	201	0	0
1928	227	3/ 1-15	150	8/26-31; 9/ 1-15	195	0	0
1929	277	4/21-30	144	6/26-30	189	0	0
1930	500	6/19	117	11/ 1-15	180	1	2
1931	850	10/12	112	7/22,24	176	2	3
1932	280	8/13	91	8/24	164	0	0
1933	335	4/21	102	6/25	181	0	2
1934	482	8/17	71	6/29-30; 7/ 1	167	0	1
1935	514	5/24	61	1/19	178	1	5
1936	300	4/30	81	2/ 8	154	0	1
1937	411	7/21	85	1/ 8	154	0	1
1938	364	4/ 8	61	4/ 7	149	0	1

NORTH PLATTE AT WYOMING-NEBRASKA LINE

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 10,000 S. F. or More Discharge	Number of Days 5,000 S.F. or More Discharge
1930	5,340	10/1	395	1/11	1,256	0	1
1931	2,250	10/6	354	3/27	940	0	0
1932	2,680	7/5	238	1/13	875	0	0
1933	6,730	5/25	262	4/24	1,082	0	3
1934	1,760	6/4	21	5/16	497	0	0
1935	9,200	6/1	100	4/23	587	0	1
1936	2,060	6/5	135	5/6	685	0	0
1937	3,970	7/14	98	5/5	762	0	0
1938	1,640	7/3	346	5/12	751	0	0

NORTH PLATTE AT BRIDGEPORT

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 10,000 S. F. or More Discharge	Number of Days 5,000 S.F. or More Discharge
1923	7,300	5/25	600	12/10	1,935	0	20
1924	13,200	4/18	1,200	2/20	3,041	8	47
1925	8,500	5/19	400	6/5-6,25-26,7/3-4	1,795	0	4
1926	7,050	6/17	1,050	5/27	2,374	0	17
1927	7,500	6/23	1,500	3/17-19,28-29;7/13-17	2,746	0	35
1928	14,400	6/6,10	1,000	4/27-30	2,972	19	45
1929	20,220	6/3	275	1/19-	3,203	22	32
1930	9,200	10/1	400	7/1-2	2,219	0	4
1931	4,600	10/7-8	396	7/19	1,522	0	0
1932	1,980	8/4	520	6/10-11	1,164	0	0
1933	6,570	5/26	547	7/30	1,559	0	2
1934	2,410	10/2,5-6	55	5/28	905	0	0
1935	8,550	6/2	196	7/28-29	810	0	2
1936	1,980	6/9	61	5/25	728	0	0
1937	3,020	7/17	118	5/24	856	0	0
1938	2,990	5/21	192	6/18	1,160	0	0

NORTH PLATTE RIVER AT NORTH PLATTE

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 15,000 S. F. or More Discharge	Number of Days 10,000 S. F. or More Discharge
1923	10,500	5/29	900	7/11	2.419	0	1
1924	18,400	10/3	1,250	9/ 1-10	4,171	4	34
1925	5,700	6/12-13	175	7/ 2-3	2,626	0	0
1926	10,800	6/19	1,000	5/27	3,549	0	2
1927	8,700	6/26	1,250	7/20;9/1	3,394	0	0
1928	15,500	6/12	700	8/21-22	3,634	3	18
1929	18,400	6/ 6-8	600	1/ 1	3,596	4	20
1930	10,000	10/ 3-4	150	7/12	2,647	0	2
1931	6,150	4/ 3	75	7/29	1,951	0	0
1932	5,370	3/19	416	5/25	1,577	0	0
1933	9,980	5/29	329	7/31	2,240	0	0
1934	3,800	3/ 5	41	7/25;8/ 1,5-6	1,416	0	0
1935	8,740	6/18	52	8/17-18	1,288	0	0
1936	4,500	3/ 5	36	8/18	784	0	0
1937	3,560	2/24	79	8/16,22-24	943	0	0
1938	4,250	2/27	278	7/16	1,613	0	0

LODGEPOLE CREEK NEAR BUSHNELL

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 300 S.F. or more Discharge	Number of Days 200 S.F. or more Discharge
1925	20	3/ 1-10	3	7/ 1-31	13	0	0
1926	21	3/21-28	10	5/21-31; 6/ 1-30 7/11-31; 8/21-31 9/ 1-30	13	0	0
1927	24	4/21-30	4	5/ 1-20	14	0	0
1928	117	8/ 3	9	7/31 da.; 8/25 da.	15	0	0
1929	27	3/ 1-31	8	12/31 da.	16	0	0
1930	148	8/22	6	7/16-31	15	0	0
1931	32	10/ 1-15	5	7/21	18	0	0
1932	69	6/27	9	10/ 1; 8/11,20,23	15	0	0
1933	460	8/27	4	3/ 9	18	1	1
1934	40	8/ 8	5	7/30-31	13	0	0
1935	287	6/12	2	4/11	17	0	1
1936	43	8/ 1	1	12/14	13	0	0
1937	135	7/13	3	1/21	12	0	0
1938	300	9/ 3	6	2/19	14	1	1

SOUTH PLATTE RIVER AT NORTH PLATTE

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 5,000 S.F. or More Discharge	Number of Days 2,000 S.F. or More Discharge
1926	5,600	6/21-22	0	10/1 -24;8/ 4-8;9/10-19	493	2	20
1927	2,400	4/20-21,23	0	7/6 - 8/1, 7-8,31-9/30	560	0	12
1928	3,850	6/10	0	10/1 -4	474	0	16
1929	3,000	3/ 1-10	0	6/28;8/16-17-19	429	0	11
1930	3,900	3/ 4	0	10/21-28;7/8-20,25-8/17; 9/24-25	470	0	5
1931	1,900	12/ 2	0	5/19-6/4;6,19-9/13,17-30	413	0	0
1932	851	3/17	0	10/15;11/17,25-30;5/27;6/4-10; 7/1-2,11-22,28;8/4-29	149	0	0
1933	658	5/16-17	0	10/1-1/17;6/25-30;7/1-8/5	115	0	0
1934	1,060	6/22	0	5/22-6/20;7/8-9/8,23-24,26-30	123	0	0
1935	21,900	6/ 4	0	10/1-12/16;3/23;4/22-23;7/30-8/21, 24,30-9/1,5-7,9-30	409	4	17
1936	942	3/ 4	0	10/14-31;11/4-16;6/28-9/30	78	0	0
1937	530	3/ 6	0	10/1-11/14;3/22-25	89	0	0
1938	3,650	9/14	13	8/14	202	0	5

PLATTE RIVER AT OVERTON

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 20,000 S. F. or More Discharge	Number of Days 10,000 S. F. or More Discharge
1926	13,500	6/22	500	5/31	3,912	0	10
1927	12,000	4/18-19	0	7/29-31	4,077	0	4
1928	21,000	6/12-13	0	8/24; 9/5	4,241	2	18
1929	18,800	6/ 7	1	8/16; 9/3	3,999	0	21
1930	9,800	5/13	0	7/15-20,26-8/15	3,251	0	0
1931	9,700	10/12	0	6/26; 9/30	2,452	0	0
1932	5,750	3/18	0	10/1-12; 7/12-22;8/23;9/9	1,342	0	0
1933	8,190	5/31	0	9/ 1; 8/30	2,094	0	0
1934	3,910	12/ 2-3	0	5/20; 9/31	1,240	0	0
1935	29,400	6/ 5	0	10/ 1-12/6;7/20-8/27	1,700	2	12
1936	5,500	3/ 5	0	6/ 27-9/30	818	0	0
1937	5,000	2/22	0	10/1-11/4;5/20-21,25,29-31,6/1;7/1 9/4; 6-9,8-10, 22-30	779	0	0
1938	7,520	2/28	0	10/1-9	1,568	0	0

PLATTE RIVER AT ASHLAND

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 40,000 S. F. or more Discharge	Number of Days 20,000 S. F. or more Discharge
1928	2,620	8/27	1,810	9/ 1	1,479	0	0
1929	36,000	3/13	1,750	8/12	7,722	0	13
1930	39,800	2/19	1,730	8/ 3	6,091	0	12
1931	16,300	10/14	1,270	7/31	2,819	0	0
1932	42,500	5/29	1,000	6/10	5,807	1	10
1933	15,900	7/19	1,150	12/11-15	4,759	0	0
1934	12,000	6/10	386	2/26	3,403	0	0
1935	39,400	6/ 3	747	12/ 7	5,387	0	17
1936	41,000	3/ 5	600	7/31	3,445	1	7
1937	16,300	6/29	416	1/ 3	3,257	0	0
1938	27,100	7/ 8	750	12/ 9	4,199	0	3

NORTH LOUP RIVER NEAR ST. PAUL

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 8,000 S.F. or more Discharge	Number of Days 5,000 S.F. or more Discharge
1929	6,540	3/11	530	6/22-25	1,002	0	2
1930	3,880	6/14	225	12/ 1- 3	1,001	0	0
1931	2,520	10/12	126	1/15	961	0	0
1932	9,500	6/ 2	180	3/10	1,028	3	6
1933	3,870	7/ 8	450	2/ 1-10;12/ 6-15	862	0	0
1934	1,260	9/ 3	373	7/22-23	732	0	0
1935	7,360	4/25	350	2/26	975	0	1
1936	9,020	3/ 6	280	12/27	875	2	6
1937	2,500	3/ 8	433	6/24	754	0	0
1938	2,750	3/ 2	180	1/31	770	0	0

MIDDLE LOUP RIVER NEAR ST. PAUL

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 10,000 S.F. or more Discharge	Number of Days 6,000 S.F. or more Discharge
1929	9,400	3/11	302	12/ 6	1,235	0	4
1930	7,870	6/ 4	230	11/23	1,369	0	4
1931	6,940	10/13	535	6/30; 8/15	1,189	0	1
1932	14,200	5/31	550	3/10	1,408	3	8
1933	4,530	7/15	550	12/ 6-15	1,113	0	0
1934	2,620	6/17	361	7/22	1,018	0	0
1935	14,300	6/ 1	500	2/26	1,459	1	4
1936	10,500	3/ 3	300	1/ 1	1,126	1	4
1937	6,090	6/26	102	1/ 8	1,048	0	1
1938	9,700	7/ 7	160	12/ 8	1,165	0	2

LOUP RIVER NEAR COLUMBUS

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 20,000 S.F. or more Discharge	Number of Days 15,000 S.F. or more Discharge
1929*	20,000	3/12	1,350	8/18	2,751	1	3
1930*	10,600	3/16; 6/ 4	550	12/ 1-5	2,727	0	0
1931	8,920	10/13	610	3/30	2,538	0	0
1932*	26,400	5/31	490	3/10	2,746	3	6
1933	6,488	8/ 3	1,200	12/ 6-15	2,376	0	0
1934	5,590	12/ 3	502	12/28	2,142	0	0
1935	27.600	4/25	34	2/28	3,165	2	7
1936	24,500	3/ 6	530	12/28	2,329	3	5
1937	13,700	6/27	200	1/ 7	2,350	0	0
1938	12,300	5/13	306	1/30	1,928	0	0

* Genoa Records

REPUBLICAN RIVER

NORTH FORK OF THE REPUBLICAN RIVER AT THE COLORADO-NEBRASKA LINE

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of days 500 S.F. or More Discharge	Number of Days 300 S.F. or More Discharge
1924	76	1/ 1-31; 2/ 1-29	10	6/21-30; 7/ 1-31	44	0	0
1925	88	3/ 1-31	12	1/ 1-31	45	0	0
1926	73	3/ 1-20	9	5/ 1-10; 6/21-30	41	0	0
1927	83	4/21-30	12	7/21-31	41	0	0
1928	81	12/ 1-20	7	8/ 1-31	54	0	0
1929	87	3/ 1-15	11	8/ 1-10	55	0	0
1930	106	3/13	22	9/11-20	58	0	0
1932	348	7/30	0	8/25-26	57	0	1
1933	152	8/22	6	6/18-19	53	0	0
1934	301	6/15	4	7/ 7; 8/10	44	0	1
1935	275	6/ 1	3	7/17-18/21	49	0	0
1936	269	3/ 1	4	7/11	46	0	0
1937	75	7/24	2.6	6/22-24	37	0	0
1938	531	5/30	1.7	7/11	49	1	3

ARIKAREE RIVER AT HAIGLER

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of days 2,000 S.F. or more Discharge	Number of days 500 S.F. or More Discharge
1925	51	3/ 1-20	0	7/ 1-31	15	0	
1926	22	10/ 1-31	1	8/ 1-31	24	0	[illegible]
1927	47	4/21-30	0	5/21-31; 6/ 1-20	12	0	0
1928	3,200	5/17	4	12/16-31	31	1	1
1929	62	6/ 1- 5	1	7/11-20	21	0	0
1930	120	6/ 5-15	7	8/26-31	29	0	0
1931	125	4/ 2	0	7/29-31; 9/11-15	18	0	0
1932	1,200	8/27	0	7/21	31	0	2
1933	3,300	7/ 9	1	6/20/23-30; 7/ 1- 8	33	1	2
1934	1,080	8/14	0	7/20-31; 8/ 1-13	21	0	2
1935	17,000	5/31	3	7/17	126	5	7
1936	2,020	5/29	0	7/16; 8/ 6	22	1	1
1937	199	9/ 8	0	1/26-28; 8/21-26,29-31 9/ 1- 3	17	0	0
1938	1,770	9/ 1	0.5	2/17-18	39	0	5

SOUTH FORK OF THE REPUBLICAN RIVER AT BENKELMAN

Year	Maximum Discharge in Second-Feet	Date	Minimum Dischare in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 500 S.F. or More Discharge	Number of Days 300 S.F. or More Discharge
1903	79	8/ 2	7	6/28-30; 7/ 1- 3	48	0	0
1904	397	6/19	5	7/27-31; 9/18-24	58	0	2
1905	300	4/25	5	7/15-20	61	0	1
1906	317	4/27-28	0	6/21-31; 7/ 1-25	58	0	2
1924	87	1/ 1-31; 2/ 1/29	5	3/ 1-30	49	0	0
1925	173	3/ 1-31	0	7/ 1-31	58	0	0
1926	155	6/16	6	5/21-31; 6/ 1-11,21-30	38	0	0
1927	112	4/ 1-30	5	5/21-31	49	0	0
1928	339	6/18	16	10/ 1-31	54	0	1
1929	102	11/ 1-15	1	7/11-31; 8/16-31	47	0	0
1932	690	6/13	6	10/ 1-12	73	5	6
1933	800	8/23-24,28-29	6	6/21-30; 7/ 1- 5	70	9	15
1938	1,640	5/31	0	7/ 3- 6,11-13 8/ 1-17,22-25	84	9	19

REPUBLICAN RIVER AT CULBERTSON

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of days 2,000 S.F. or More Discharge	Number of days 500 S.F. or More Discharge
1922	410	2/26	52	7/10	148	0	0
1924	352	3/ 1-10	6	8/25-31; 9/ 1-30	162	0	0
1925	490	4/ 1-28	3	9/ 1-15	155	0	0
1926	199	3/ 1-10	0	8/ 1-20	103	0	0
1927	530	4/16-20	3	5/21-31	140	0	5
1928	10,000	7/29	72	10/ 1-31	260	6	33
1929	396	3/21-31	0	4/ 1-30	152	0	0
1931	500	2/22	0	7- 8- 9/29 da.	141	0	1
1932	2,670	7/31	0	7/11-30	137	1	5
1933	15,000	8/28	0	6/26-30; 7/10; 8/ 1	277	6	25
1934	1,260	6/16	0	5- 6- 7- 8- 9/77 da.	118	0	3
1935	90,000	5/31	2	10/ 1- 3	775	18	49
1936	13,600	5/30	0	7/21; 8/18; 9/28	192	1	21
1938	3,960	5/31	0	8/13-14	224	4	27

FRENCHMAN RIVER AT CULBERTSON

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean-Discharge in Second-Feet	Number of days 1,000 S.F. or More Discharge	Number of days 500 S.F. or More Discharge
1922	188	2/22	20	7/ 9-13	83	0	0
1923	610	6/ 4- 7	41	10/20-25	177	0	19
1924	220	1/ 1-31	16	9/ 1-10	139	0	0
1925	289	3/ 1-18; 2/11-28	0	7/13-17	140	0	0
1926	490	6/17	30	6/ 1-15	108	0	0
1927	522	4/16-20	30	9/ 1-30	166	0	5
1928	505	6/ 1-30	58	9/16-30	187	0	30
1929	457	6/10	0	8/19-25	127	0	0
1930	242	2/21-28	42	9/21-30	135	0	0
1931	420	8/10	22	6/29-30; 7/ 1- 3	118	0	0
1932	393	6/19	9	9/ 9-10	116	0	0
1933	1,200	8/28	12	7/25	123	1	2
1934	1,000	6/15	15	8/17	118	1	1
1935	5,500	5/31	8	8/16-17	172	5	7
1936	424	5/29	7	8/13-14,26	114	0	0
1937	605	6/22	12	7/16-17; 8/26	107	0	1
1938	422	6/ 1	14	8/24	116	0	0

MEDICINE CREEK NEAR CAMBRIDGE

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 500 S.F. or More Discharge	Number of Days 300 S.F. or More Discharge
1925	82	4/ 1-10	26	9/ 1-30	41	0	0
1926	1,500	8/11	11	6/21-30	53	4	4
1927	305	4/16-20	31	11/ 1-30	58	0	5
1928	336	6/21-30	33	2/ 1-29; 3/16-31	73	0	10
1929	102	6/ 1-15	10	8/11-20	50	0	0
1930	626	6/ 4	30	8/21-31; 9/ 1-30	82	1	2
1931	178	4/ 1	13	9/11-20	62	0	0
1937	968	8/ 4	21	7/27	51	4	5
1938	957	5/30	6	1/30	64	4	6

REPUBLICAN RIVER AT BLOOMINGTON

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 6,000 S.F. or more Discharge	Number of Days 4,000 S.F. or more Discharge
1930	10,800	6/ 5	126	10/ 1	714	2	5
1931	9,540	10/13	17	9/16	676	2	2
1932	6,940	2/24	32	10/11	499	1	1
1933	7,670	4/22	14	8/ 2	579	2	8
1934	5,300	6/17	10	8/ 7- 8	417	0	2
1935	116,000	6/ 1	49	10/13	1,384	11	20
1936	10,700	5/ 9	7	7/29	525	4	5
1938	7,700	6/ 1	39	10/12	613	1	3

REPUBLICAN RIVER NEAR HARDY

1896	4,850	7/ 3	197	9/ 8		0	0
1897	4,310	7/ 6	60	9/14	460	0	1
1898	2,300	6/11	60	10/ 3	615	0	0
1899	4,036	6/27	6	9/17	386	0	1
1900	2,945	5/ 8	8	9/ 4; 9/ 9	362	0	0
1901	4,941	9/12	5	7/16-30; 8/ 4-10 8/21-24	375	0	2
1902	12,490	7/8	155	9/17	2,415	5	9
1903	14,100	5/29	270	9/28	1,706	15	22
1904	7,480	7/ 6	60	9/19	785	2	4
1905	24,500	7/ 4	275	10/ 3, 8,10	1,973	19	32
1906	5,130	5/ 2	150	9/ 8	689	0	1
1907	2,120	6/ 8	40	9/23-26	428	0	0
1908	6,160	6/18	60	10/ 6- 7	452	1	2
1909	5,480	9/20	65	8/25-26; 9/ 1	754	0	4
1910	5,430	8/20	50	8/ 2- 3	440	0	4
1911	17,600	8/ 6	25	7/ 8	984	9	11
1912	8,700	3/28	35	6/16	1,221	10	24
1913	2,960	5/10	6	8/24,27-31; 9/1-17	435	0	0
1914	7,540	6/17	20	10/ 5- 6	574	3	6
1931	5,470	5/ 5	34	9/21	619	0	1
1932	3,830	6/ 5	34	9/ 7- 8	669	0	0
1933	6,060	4/22	20	10/11	633	1	8
1934	5,340	6/18	0	8/ 9-19	432	0	2
1935	117,000	6/ 2	58	10/15,17	1,416	15	26
1936	8,810	5/10	15	9/ 3	567	2	5
1937	7,140	6/ 6	24	9/ 4	560	2	5
1938	6,650	6/ 2	60	11/21	686	1	3

ELKHORN RIVER

ELKHORN RIVER NEAR NELIGH

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 1,000 S.F. or More Discharge	Number of Days 500 S.F. or More Discharge
1931	550	3/14; 4/ 4	16	7/20-21; 8/ 7; 9/ 9-14	90	0	10
1932	665	6/11	12	7/ 1	185	0	7
1933	567	5/12	58	4/ 5; 7/ 1	161	0	6
1934	415	4/ 3	19	8/ 4- 6	114	0	0
1935	2,110	6/ 3	43	8/16-17	221	11	26
1936	629	5/13	25	8/19	166	0	10
1937	757	6/30	39	6/12	124	0	3
1938	948	5/19	45	1/31	174	0	25

ELKHORN RIVER NEAR WATERLOO

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 10,000 S.F. or More Discharge	Number of Days 6,000 S.F. or More Discharge
1930	12,400	5/12	138	9/25	953	2	6
1931	2,110	11/21	124	9/12	588	0	0
1932	10,600	5/ 7	214	7/28	1,098	1	4
1933	6,600	7/13	250	2/ 6-10	640	0	1
1934	7,040	6/ 9	121	8/10,14	462	0	1
1935	3,250	6/ 6	130	2/28	615	0	0
1936	5,740	3/10	78	8/19	519	0	0
1937	2,350	6/21	131	9/22	538	0	0
1938	4,630	7/ 8	145	1/31	612	0	0

BLUE RIVER

LITTLE BLUE RIVER NEAR ENDICOTT

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 2,000 S.F. or more Discharge	Number of Days 1,000 S.F. or more Discharge
1931	1,730	5/29	16	1/14	192	0	6
1932	2,980	6/ 3	103	9/25,28	250	2	11
1933	2,110	8/23	72	7/ 7	154	1	3
1934	366	9/27	38	7/26; 8/ 5	112	0	0
1935	7,060	6/ 2	56	1/23	382	17	28
1936	2,240	2/24	36	7/28; 8/30	146	2	4
1937	1,520	7/27	70	7/11	151	0	3
1938	1,880	5/31	50	11/18	243	0	15

BIG BLUE RIVER NEAR BARNSTON

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 5,000 S.F. or more Discharge	Number of Days 2,000 S.F. or more Discharge
1933	4,190	8/24	44	7/ 2	242	0	5
1934	1,320	9/ 4	8	8/ 5	115	0	0
1935	9,630	6/ 2	8	10/17	641	8	37
1936	7,880	2/15	24	7/26	310	2	14
1937	2,140	7/26; 8/ 1	19	9/22	221	0	3
1938	5,530	9/13	23	10/ 6	469	2	15

NIOBRARA RIVER

NIOBRARA RIVER AT DUNLAP

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 1,000 S.F. or More Discharge	Number of Days 500 S.F. or More Discharge
1924	266	4/11-15	50	1/11-31	64	0	0
1925	83	2/ 1-28	15	9/ 1-30	53	0	0
1926	96	8/ 1-31	28	9/ 1-30	56	0	0
1927	119	4/22-30	44	6/ 1-30	69	0	0
1928	83	2/ 1-29	28	8/16-30	59	0	0
1929	130	4/ 1-30	0	2/ 1-28	61	0	0
1931	627	8/ 6	2	7/ 4- 5	42	0	1
1932	449	5/ 6	1	9/22	35	0	0
1933	400	9/26	3	10/ 1, 4- 6, 8,11	58	0	0
1934	374	8/17	1	6/24,28-30; 7/ 3	38	0	0
1935	245	6/ 1	3	7/13	58	0	0
1936	123	3/ 6	0.6	8/ 2- 4	36	0	0
1937	1,060	9/ 4	6.3	5/20-22	40	1	1
1938	166	5/29	2.8	8/25 .	38	0	0

NIOBRARA RIVER NEAR SPENCER

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 5,000 S.F. or More Discharge	Number of Days 3,000 S.F. or More Discharge
1929	5,470	6/ 6	266	1/10	1,245	3	11
1930	5,240	5/13	360	1/11	1,399	1	17
1931	3,560	3/31	220	3/28	1,226	0	1
1933	4,240	8/28	134	12/11	1,141	0	3
1934	6,140	9/24	176	12/29	1,096	1	3
1935	3,600	3/ 2	188	12/28	1,217	0	2
1936	5,890	3/10	146	12/27	1,134	2	11

WHITE RIVER

WHITE RIVER NEAR CHADRON

Year	Maximum Discharge in Second-Feet	Date	Minimum Discharge in Second-Feet	Date	Mean Discharge in Second-Feet	Number of Days 1,000 S.F. or more Discharge	Number of Days 500 S.F. or more Discharge
1924	73	4/ 1-30	0	9/21-31;10/ 1-20	18	0	0
1925	268	7/28	1.9	1/ 1-31	19	0	0
1926	106	3/ 1-10	7	9/ 1-30	38	0	0
1927	183	4/21-30	33	10/ 1-31	68	0	0
1928	83	2/ 1-31; 6/ 1-31	5	9/ 1-30	48	0	0
1929	103	5/29	11	1/ 1-31;12/ 1-31	34	0	0
1931	44	6/16	0	7/29-30; 9/10-19	9	0	0
1932	390	4/24	0	8/ 6- 8	22	0	0
1933	1,090	4/21	3	9/ 5,10;10/ 1	37	1	5
1934	615	9/17	0	7/ 6- 7; 8/ 1,20-30 9/14-16	18	0	1
1935	1,520	4/26	1	8/23,25; 9/25-26	42	2	5
1936	1,160	9/ 4	0.4	7/12	14	1	1
1937	336	6/12	0	1/ 8-10; 7/ 9; 8/21-26 12- 1- 7	18	0	0
1938	350	5/19	0.9	9/ 7	15	0	0

FREQUENCY OF FLOW

MINIMUM DISCHARGE, IN SECOND FEET, FOR EACH DECILE GROUP

PLATTE RIVER BASIN

Horse Creek near Lyman

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	431	1,300	284	508	676	363	742	379	373	411	546
10	302	205	151	150	215	37	77	41	79	152	141
20	161	164	112	111	123	27	40	32	58	79	88
30	112	133	102	76	83	24	30	27	40	66	69
40	105	105	100	52	72	22	19	24	29	54	58
50	101	101	90	43	47	20	14	21	18	38	49
60	87	91	82	40	33	17	12	17	15	33	43
70	56	75	75	35	26	15	11	13	13	24	34
80	38	59	65	28	23	12	10	11	10	20	28
90	35	27	48	22	16	10	7	10	8	17	20
Min.	28	20	30	13	12	6	4	4	3	7	13
Mean	126	131	96	73	85	25	34	27	37	63	70

Sheep Creek near Morrill

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	114	124	135	200	148	123	97	86	68	132	123
10	87	117	122	92	115	113	55	62	64	80	91
20	84	94	108	85	101	99	52	56	54	71	80
30	82	89	91	80	93	86	51	53	51	65	74
40	81	81	85	75	89	83	49	51	46	60	70
50	80	79	81	73	83	75	43	49	43	58	66
60	77	74	71	68	76	13	5	5	4	55	45
70	20	24	6	6	51	7	3	3	3	20	14
80	12	20	4	5	6	4	3	2	2	4	6
90	6	4	3	3	3	3	2	1	1	3	3
Min.	4	0	1	1	1	1	1	1	1	2	1
Mean	73	68	61	54	67	55	29	32	31	47	52

Winters Creek near Scottsbluff

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	102	121	151	135	176	97	138	211	248	186	157
10	99	98	95	89	111	82	65	65	76	98	88
20	76	88	84	70	84	69	51	57	63	76	72
30	70	80	74	62	72	60	46	54	54	63	64
40	64	73	66	59	69	56	45	50	50	59	60
50	57	61	60	56	65	53	43	47	47	57	55
60	56	55	51	53	61	44	41	45	45	53	50
70	47	50	49	52	58	23	37	43	41	50	45
80	35	36	42	47	56	10	24	37	39	48	37
90	29	8	40	25	35	5	6	20	23	44	24
Min.	15	5	14	5	4	1	1	7	4	8	6
Mean	59	61	80	57	68	44	41	48	50	62	57

(Continued)

Nine Mile Drain at McGrew

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.			270	385	344	220	204	398	296	301	365
10			216	214	225	165	123	136	157	163	175
20			194	191	197	135	115	126	145	142	156
30			185	164	178	114	107	118	132	128	141
40			174	148	152	108	98	106	112	117	127
50			153	135	125	95	86	92	94	104	111
60			136	112	115	89	76	82	85	95	99
70			123	99	107	85	74	72	77	90	91
80			106	94	100	80	71	68	73	86	85
90			91	89	94	73	68	65	69	82	79
Min.			86	81	83	50	60	55	64	75	69
Mean			154	141	148	107	92	100	106	116	121

Red Willow Creek near Bayard

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	500	300	214	450	575	150	327	385	180	588	367
10	120	141	80	130	160	103	75	76	92	122	200
20	70	92	71	106	122	86	66	70	78	87	85
30	52	90	66	95	100	76	58	66	69	79	75
40	49	76	58	86	86	66	52	61	60	74	67
50	47	70	48	76	81	60	49	55	53	68	61
60	44	53	36	71	74	53	45	51	49	63	54
70	41	48	30	66	67	42	42	48	47	59	49
80	38	31	21	59	63	31	36	43	45	55	42
90	15	6	7	54	59	25	31	39	40	49	33
Min.	5	4	1	37	33	18	15	17	21	33	18
Mean	65	70	48	87	98	61	56	59	60	82	69

Pumpkin Creek near Bridgeport

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	122	108	85	200	76	121	188	63	46	89	110
10	67	78	70	53	44	44	76	51	36	50	57
20	64	68	63	43	42	43	55	47	31	40	50
30	56	64	56	41	41	42	38	42	27	38	45
40	55	63	55	36	39	40	34	36	21	36	42
50	49	60	52	34	35	34	31	32	19	34	38
60	42	48	50	31	27	25	26	28	15	24	32
70	37	40	38	26	24	22	22	22	12	20	26
80	27	35	19	19	19	13	16	16	10	15	19
90	23	33	14	14	14	8	10	9	7	13	15
Min.	17	26	1	8	6	1	6	0	3	5	7
Mean	30	62	22	34	31	30	36	31	20	31	33

(Continued)

Blue Creek near Lewellen

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	140	300	200	295	285	212	377	152	298	267	253
10	135	136	133	132	139	111	126	108	111	118	125
20	129	127	124	123	132	107	118	98	100	108	117
30	127	122	122	120	123	102	107	93	93	102	111
40	125	118	120	114	113	98	100	86	86	95	106
50	121	115	109	104	106	92	81	80	74	89	97
60	105	103	101	79	95	86	64	72	52	82	84
70	97	93	51	64	82	66	55	56	21	71	66
80	88	65	20	27	37	28	32	28	9	56	39
90	24	19	5	6	6	4	9	10	4	35	12
Min.	1	1	1	1	1	0	0	0	0	1	1
Mean	102	98	86	84	92	75	77	70	61	84	83

Otter Creek near Lemoyne

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	33	31	37	30	45	29	44	30	35	28	34
10	31	31	34	29	31	25	29	27	25	26	29
20	31	29	32	28	30	25	26	26	24	25	28
30	30	28	31	27	29	24	25	25	24	25	27
40	29	26	30	26	27	24	25	24	23	24	26
50	26	26	29	25	26	23	24	21	23	23	25
60	25	25	27	23	25	22	23	20	22	22	23
70	22	24	26	22	24	20	23	18	21	21	22
80	19	24	23	18	22	19	22	16	20	20	20
90	14	12	18	13	20	7	21	15	18	17	16
Min.	7	2	3	2	5	2	11	14	1	10	6
Mean	24	26	26	23	25	20	24	21	21	22	23

Birdwood Creek near Hershey

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	277	500	850	280	335	482	514	300	411	364	431
10	231	204	203	195	213	205	223	207	198	188	207
20	213	196	195	185	198	200	213	184	183	171	194
30	200	190	192	180	190	191	203	174	169	162	185
40	194	181	185	174	187	183	189	166	158	155	177
50	190	177	181	169	183	174	179	154	152	150	171
60	179	174	171	160	177	166	168	143	144	144	163
70	171	171	161	152	171	150	153	130	134	138	153
80	166	163	147	141	163	131	141	117	123	131	142
90	151	150	132	125	146	114	123	103	112	107	126
Min	144	177	112	91	102	71	61	81	85	61	99
Mean	188	186	176	164	181	167	178	154	153	149	170

(Continued)

North Platte River at North Platte

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	18,400	5,800	6,150	5,370	9,980	3,800	8,740	4,500	3,560	4,250	7,055
10	5,464	3,781	3,741	2,216	3,210	2,704	2,850	1,668	2,150	2,775	3,056
20	4,500	3,563	3,162	1,959	2,820	2,522	1,829	1,299	1,590	2,257	2,550
30	3,725	3,283	2,713	1,863	2,673	2,371	1,606	1,112	1,181	2,052	2,258
40	3,240	3,070	2,373	1,753	2,550	2,069	1,387	807	900	1,867	2,002
50	2,963	2,804	2,144	1,597	2,415	1,670	1,058	554	676	1,588	1,747
60	2,700	2,573	1,729	1,393	2,100	814	771	345	493	1,313	1,423
70	2,308	2,261	741	1,156	1,579	303	472	233	370	1,033	1,046
80	1,900	2,000	436	988	1,050	162	300	151	258	850	810
90	1,450	888	261	804	719	89	148	76	165	577	518
Min.	875	150	75	416	329	41	52	36	79	278	233
Mean	3,777	2,667	1,955	1,438	2,238	1,416	1,290	785	1,082	1,616	1,826

South Platte River at North Platte

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	3,000	3,900	1,900	851	823	1,060	21,900	942	530	3,650	3,856
10	921	1,265	1,002	452	429	369	888	213	295	345	618
20	700	700	769	315	243	218	225	170	150	250	374
30	516	611	658	230	156	144	130	92	92	184	281
40	408	374	507	120	58	96	78	65	71	147	192
50	273	355	403	25	27	63	24	36	47	123	138
60	253	170	117	20	20	31	19	21	27	100	78
70	25	69	21	15	15	20	14	16	19	71	29
80	17	21	14	10	10	13	10	11	13	45	16
90	8	10	7	5	5	7	5	5	6	23	8
Min.	0	0	0	0	0	0	0	0	0	13	0
Mean	421	603	413	149	115	123	410	78	90	202	260

Platte River at Ashland

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.		39,800	10,300	42,500	15,900	12,000	39,400	41,000	16,300	27,100	2,690
10		13,717	9,063	11,540	9,775	6,225	11,750	5,085	6,283	7,250	8,069
20		9,200	8,150	7,993	7,229	5,067	7,400	4,263	4,167	5,367	5,884
30		7,463	7,464	6,053	5,250	4,470	5,150	3,573	3,421	4,532	4,738
40		6,400	6,720	4,680	4,540	3,644	3,975	2,897	2,760	4,067	3,968
50		5,913	5,838	3,971	3,710	2,863	3,050	2,425	2,355	3,650	3,378
60		5,140	4,243	3,148	3,256	2,400	2,500	2,095	2,007	3,138	2,793
70		3,183	3,038	2,683	2,761	1,756	2,095	1,799	1,762	2,531	2,159
80		2,833	2,200	2,392	2,259	1,488	1,806	1,424	1,470	2,115	1,799
90		2,051	1,847	2,162	1,788	1,071	1,594	951	993	1,492	1,395
Min.		1,730	1,270	1,000	1,150	386	474	600	416	750	778
Mean		6,746	2,823	5,815	4,765	3,408	5,394	3,445	3,257	4,199	4,428

(Continued)

LOUP RIVER BASIN

North Loup River near St. Paul

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	6,540	3,880	2,520	9,500	3,870	1,260	7,360	9,020	2,500	2,750	4,920
10	1,405	1,719	1,378	1,362	1,185	921	1,606	1,185	1,034	1,119	1,291
20	1,225	1,196	1,169	1,168	1,030	845	1,183	949	862	938	1,057
30	1,141	1,018	1,049	993	930	795	1,063	866	799	831	949
40	1,052	921	986	920	881	776	943	803	747	783	881
50	1,004	864	915	845	831	757	827	735	710	739	823
60	933	808	854	800	773	721	713	660	668	686	762
70	819	740	785	751	712	671	655	610	609	622	697
80	739	671	711	702	664	613	585	524	554	548	631
90	638	601	630	640	561	532	465	462	512	433	547
Min.	530	225	126	180	450	373	350	280	433	180	313
Mean	1,003	1,002	961	1,029	863	732	976	877	754	770	897

Middle Loup River near St. Paul

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	9,400	7,870	6,940	14,200	4,530	2,620	14,300	10,500	6,090	9,700	8,615
10	1,808	2,505	1,723	1,934	1,594	1,278	2,303	6,740	1,638	1,725	2,325
20	1,497	1,730	1,463	1,526	1,367	1,180	1,679	1,374	1,233	1,361	1,441
30	1,292	1,403	1,319	1,309	1,207	1,121	1,455	1,231	1,074	1,216	1,263
40	1,163	1,185	1,215	1,204	1,118	1,091	1,289	1,103	988	1,096	1,445
50	1,031	1,023	1,142	1,116	1,016	1,070	1,175	933	880	980	1,037
60	932	919	1,055	1,036	943	1,042	1,094	834	800	900	956
70	812	819	951	952	858	894	1,032	759	723	811	861
80	664	720	797	879	774	786	888	658	648	717	753
90	571	591	666	794	711	716	716	523	555	533	638
Min.	302	230	535	550	550	361	500	300	102	150	358
Mean	1,237	1,369	1,191	1,409	1,115	1,020	1,461	1,130	1,048	1,165	1,215

Loup River near Columbus

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	20,000	10,600	4,360	26,400	6,488	5,590	27,600	24,500	13,700	12,300	15,154
10	4,505	4,725	3,350	3,977	3,488	3,089	5,517	3,168	3,613	3,188	3,862
20	3,343	3,450	3,038	2,973	2,910	2,683	3,850	2,713	2,936	2,540	2,944
30	2,893	2,917	2,679	2,653	2,617	2,424	2,906	2,423	2,473	2,050	2,601
40	2,526	2,636	2,515	2,345	2,373	2,282	2,553	2,112	2,250	1,836	2,343
50	2,206	2,365	2,387	2,150	2,240	2,158	2,264	1,900	2,046	1,631	2,135
60	1,876	1,990	2,270	1,976	2,082	1,970	2,117	1,697	1,807	1,423	1,921
70	1,744	1,783	1,990	1,843	1,903	1,821	1,877	1,504	1,602	1,222	1,729
80	1,499	1,633	1,711	1,709	1,700	1,414	1,625	1,331	1,360	969	1,495
90	1,447	1,325	1,509	1,386	1,510	1,096	1,277	1,051	1,031	694	1,233
Min.	1,350	550	610	490	1,200	502	341	530	200	306	608
Mean	2,755	2,731	2,542	2,751	2,379	2,145	3,169	2,334	2,350	1,928	2,508

(Continued)

REPUBLICAN RIVER BASIN

North Fork of the Republican River at the Colorado-Nebraska Line

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	87	106	300	348	192	301	275	269	75	531	248
10	76	85	78	93	82	76	79	77	60	69	78
20	74	67	76	84	77	74	71	70	56	62	71
30	69	65	45	80	75	72	66	64	53	59	65
40	68	63	30	75	66	65	59	60	50	54	59
50	63	59	28	60	61	42	50	55	45	48	51
60	59	55	17	39	51	24	43	27	36	41	39
70	35	51	11	29	40	14	33	19	20	36	29
80	31	44	10	18	22	10	17	12	9	27	20
90	17	32	8	11	9	7	7	6	6	7	11
Min.	11	22	0	0	6	4	3	4	3	2	6
Mean	51	63	35	57	53	44	49	46	37	49	48

Arikaree River at Haigler

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	62	120	125	1,200	3,300	1,080	17,000	2,020	199	1,770	2,688
10	35	52	29	42	41	24	79	31	28	36	40
20	30	34	28	30	30	23	35	21	21	21	27
30	25	30	24	26	22	22	25	17	17	16	22
40	20	26	22	22	19	21	23	15	14	14	20
50	17	21	18	18	16	18	20	14	11	13	17
60	16	19	16	16	15	15	18	13	9	10	15
70	16	17	10	14	13	9	15	10	6	9	12
80	13	15	4	8	11	6	8	6	4	6	8
90	7	11	2	4	6	2	6	2	1	4	5
Min.	1	7	0	0	1	0	3	0	0	1	1
Mean	22	28	18	18	33	21	127	22	17	39	35

South Fork of the Republican River at Benkelman

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	102		486	690	800					1,640	744
10	71		150	91	92					155	112
20	66		109	77	91					85	85
30	65		89	76	63					53	71
40	54		73	75	57					51	62
50	47		66	53	49					42	51
60	45		51	50	37					36	44
70	27		39	42	29					29	33
80	26		9	14	21					17	17
90	2		1	10	10					2	5
Min.	1		0	6	6					0	3
Mean	62		71	73	70					84	69

(Continued)

Medicine Creek near Cambridge

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	102	626	178						968	957	566
10	87	150	96						70	76	96
20	83	113	87						61	66	82
30	75	81	85						55	61	71
40	48	75	80						51	59	61
50	47	74	76						46	54	59
60	46	65	53						43	50	51
70	43	61	37						40	45	45
80	42	50	35						36	37	40
90	25	31	22						31	29	28
Min.	10	30	13						21	6	16
Mean	60	84	63						51	64	64

Frenchman River at Culbertson

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	457	242	420	393	1,200	1,000	5,500	424	605	422	1,066
10	199	186	183	184	207	199	209	189	166	175	190
20	191	175	164	170	189	194	183	176	152	163	176
30	179	168	156	156	179	175	173	167	140	154	165
40	166	158	146	151	145	146	164	157	119	141	149
50	139	144	135	143	131	111	139	136	103	126	131
60	132	127	121	116	98	84	99	80	56	103	102
70	69	118	76	61	55	54	71	60	34	75	67
80	51	92	52	41	37	36	55	29	30	49	47
90	25	74	41	27	23	27	43	23	21	31	34
Min.	0	42	22	9	12	15	8	7	12	14	14
Mean	123	143	118	116	124	118	172	114	107	116	125

Republican River at Culbertson

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	396		500	2,670	15,000	1,260	90,000	13,600	2,590	3,960	13,442
10	323		257	198	308	218	885	357	284	356	354
20	223		246	178	193	198	285	220	207	235	221
30	189		208	169	180	184	206	194	173	188	188
40	155		180	164	171	156	186	159	137	158	163
50	113		156	141	150	135	170	102	113	133	135
60	90		121	129	130	94	150	84	89	111	111
70	76		85	76	88	12	120	52	66	89	74
80	52		18	60	58	7	69	10	47	62	43
90	6		8	14	20	3	42	5	25	21	16
Min.	0		0	0	0	0	2	0	0	0	0
Mean	161		142	137	278	118	776	192	157	224	243

(Continued)

Republican River at Bloomington

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.		10,800	9,540	6,940	7,670	5,300	116,000	10,700	8,220	7,700	21,519
10		1,438	965	1,110	1,238	594	2,219	953	1,004	1,188	1,190
20		819	815	707	675	522	983	530	610	757	713
30		573	745	486	485	495	546	468	490	615	545
40		472	683	399	433	457	444	383	396	531	466
50		440	598	280	365	371	404	332	314	476	398
60		410	560	204	293	300	359	301	250	373	339
70		377	488	168	166	209	297	223	223	252	267
80		318	221	120	121	93	165	101	156	185	164
90		238	77	69	67	38	98	33	101	119	93
Min.		126	17	32	14	10	49	7	7	39	33
Mean		714	675	499	579	417	1,384	525	503	613	657

Republican River near Hardy

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.				3,830	6,060	5,340	117,000	8,810	7,140	6,650	22,119
10				2,258	1,263	614	3,225	1,035	1,096	1,481	1,567
20				1,500	746	547	1,300	627	717	1,036	925
30				725	552	522	666	538	574	748	618
40				525	445	490	558	477	448	598	506
50				366	404	416	449	408	365	489	414
60				283	335	368	389	351	279	358	338
70				178	218	271	327	278	228	261	252
80				124	160	117	238	133	175	190	168
90				73	89	37	125	46	112	147	90
Min.				34	20	0	58	15	24	60	30
Mean				279	634	432	1,546	566	560	686	672

ELKHORN RIVER BASIN

Elkhorn River near Neligh

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.			550	665	587	415	2,110	629	757	948	870
10			373	322	252	175	364	346	208	348	299
20			294	247	189	152	243	250	172	220	221
30			250	194	168	144	192	200	138	177	183
40			109	170	161	136	177	154	123	140	146
50			97	164	148	123	161	129	106	113	130
60			87	139	141	106	142	109	92	101	115
70			59	126	123	85	109	100	78	94	97
80			44	100	107	64	89	63	68	84	77
90			27	88	90	35	72	39	58	72	60
Min.			16	12	58	19	43	25	39	45	32
Mean			90	185	162	114	221	166	124	174	155

(Continued)

Elkhorn River near Waterloo

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	5,580	12,400	2,110	10,600	6,600	7,040	3,250	5,740	2,350	4,630	6,030
10	2,233	2,013	945	2,012	1,119	681	1,225	914	1,121	1,158	1,342
20	1,463	1,225	776	1,463	828	571	814	741	823	794	950
30	1,167	878	708	1,105	619	476	624	580	677	648	748
40	1,063	715	636	857	537	436	500	412	532	538	623
50	904	622	564	722	504	405	399	353	348	435	526
60	764	513	511	638	462	365	346	303	292	356	455
70	653	396	451	550	412	311	303	267	249	323	392
80	526	296	347	459	[illegible]9	256	268	229	228	291	327
90	437	251	199	346	327	173	231	153	208	255	258
Min.	277	138	124	214	250	121	130	78	131	145	161
Mean	887	954	588	1,099	641	463	615	519	538	612	692

BLUE RIVER BASIN

Little Blue River near Endicott

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.		3,240	1,730	2,980	2,110	366	7,060	2,240	1,520	1,880	2,570
10		482	313	414	183	157	698	179	209	468	345
20		257	181	257	156	141	288	155	156	288	209
30		167	157	200	144	131	154	146	138	215	161
40		147	145	175	137	124	134	141	127	188	146
50		134	137	162	131	118	126	132	119	177	137
60		123	133	153	126	112	120	121	109	169	130
70		107	128	144	118	95	111	101	101	159	118
80		89	120	132	106	76	103	72	93	147	104
90		80	110	118	90	54	86	55	85	135	90
Min.		14	16	103	72	38	56	36	70	50	51
Mean		268	192	250	154	112	382	146	151	243	211

Big Blue River near Barnston

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.					4,190	1,320	9,630	7,880	2,140	5,530	5,115
10					412	174	2,005	384	508	1,285	795
20					254	141	650	232	310	620	368
30					198	123	278	181	189	355	221
40					178	107	211	159	141	240	173
50					163	93	180	135	112	162	141
60					150	81	153	116	93	134	121
70					128	68	120	87	79	117	100
80					111	53	92	46	67	103	79
90					81	25	65	31	52	88	57
Min.					44	8	8	24	19	23	21
Mean					242	115	641	310	221	469	333

(Continued)

NIOBRARA RIVER BASIN

Niobrara River at Dunlap

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	130		627	449	400	394	245	123	1,060	166	399
10	130		83	74	88	71	88	76	67	67	83
20	112		77	45	78	67	74	59	58	57	70
30	69		66	40	75	62	65	53	52	51	59
40	67		51	29	69	44	62	49	46	45	51
50	65		26	27	64	36	57	36	37	34	42
60	46		18	24	53	25	38	19	26	28	31
70	42		11	22	45	15	22	10	17	21	23
80	28		7	19	32	7	15	7	11	15	16
90	4		3	15	12	3	10	4	8	9	8
Min.	0		2	1	3	o 1	3	1	6	3	2
Mean	57		46	35	58	38	50	36	40	37	44

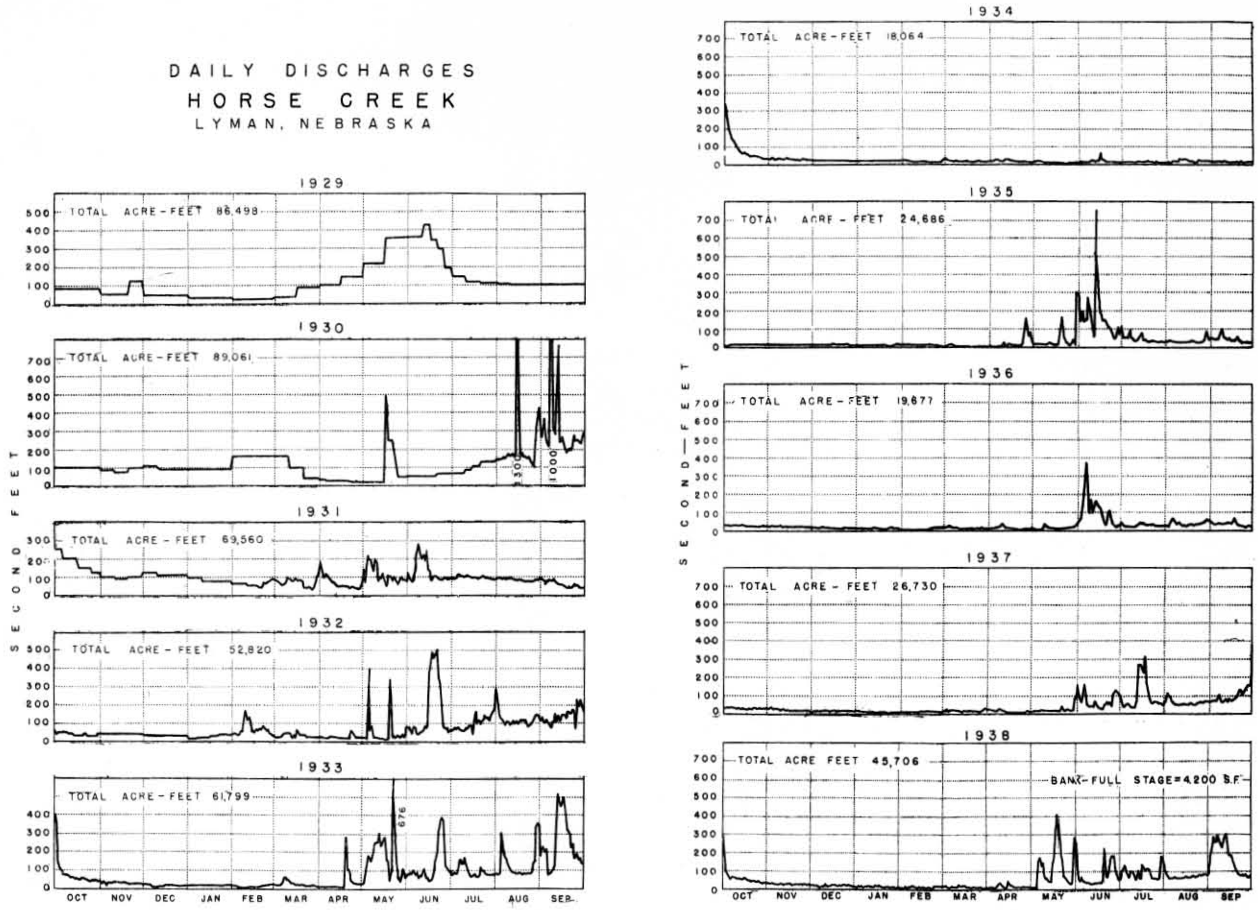
Niobrara River near Spencer

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	5,470	5,240	3,560	5,680	4,240	6,140	3,600	5,890			4,978
10	1,725	2,313	1,758	1,910	1,742	1,558	1,884	1,710			1,825
20	1,522	1,850	1,560	1,480	1,442	1,347	1,583	1,410			1,524
30	1,377	1,577	1,358	1,293	1,286	1,230	1,375	1,229			1,341
40	1,225	1,450	1,261	1,159	1,185	1,152	1,245	1,090			1,221
50	1,116	1,258	1,204	1,085	1,115	1,076	1,178	985			1,127
60	1,006	1,100	1,118	989	1,037	973	1,079	896			1,036
70	930	975	968	898	907	867	908	774			903
80	850	867	839	810	758	741	810	672			793
90	725	708	678	690	623	640	664	564			662
Min.	266	360	220	115	134	176	188	146			201
Mean	1,245	1,421	1,227	1,246	1,191	1,096	1,219	1,137			1,223

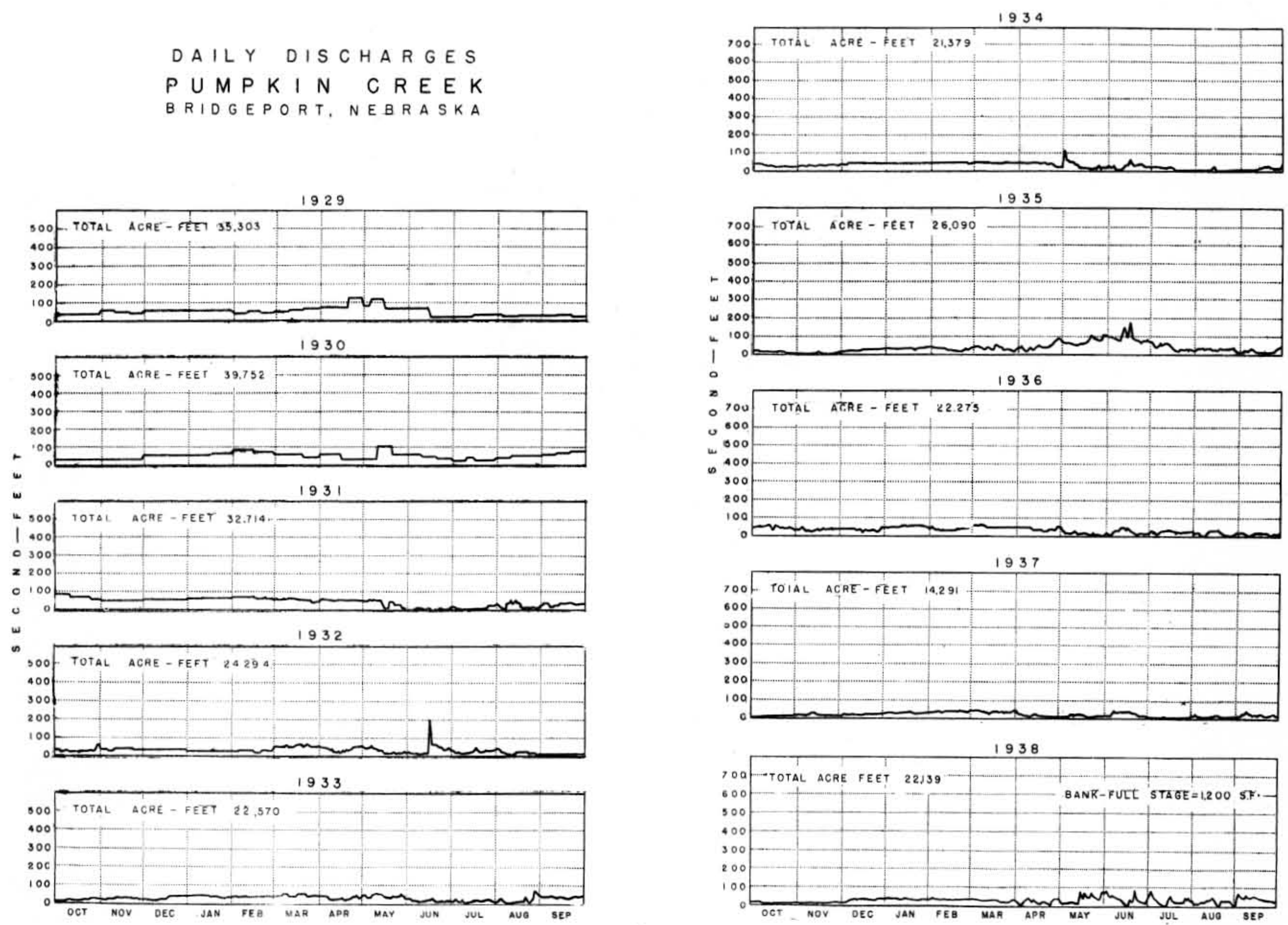
White River near Chadron

% of Time	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	Mean
Max.	103		44	300	1,090	615	1,520	1,160	336	350	613
10	99		24	36	67	31	98	23	37	29	54
20	72		18	32	30	29	46	14	25	18	32
30	37		14	26	18	25	20	8	17	12	21
40	36		10	25	13	18	15	6	12	10	16
50	28		6	16	12	9	11	5	9	8	12
60	23		4	13	10	6	9	4	6	7	9
70	20		2	8	9	5	7	4	5	6	7
80	12		1	5	7	4	5	3	3	5	5
90	11		0	2	6	2	3	2	1	3	3
Min.	11		0	0	3	0	1	1	0	0	2
Mean	39		21	22	38	18	42	14	18	15	25

Maximum discharges are included in the upper decile group. Average daily discharges are arrayed by magnitude and the decile points determined.

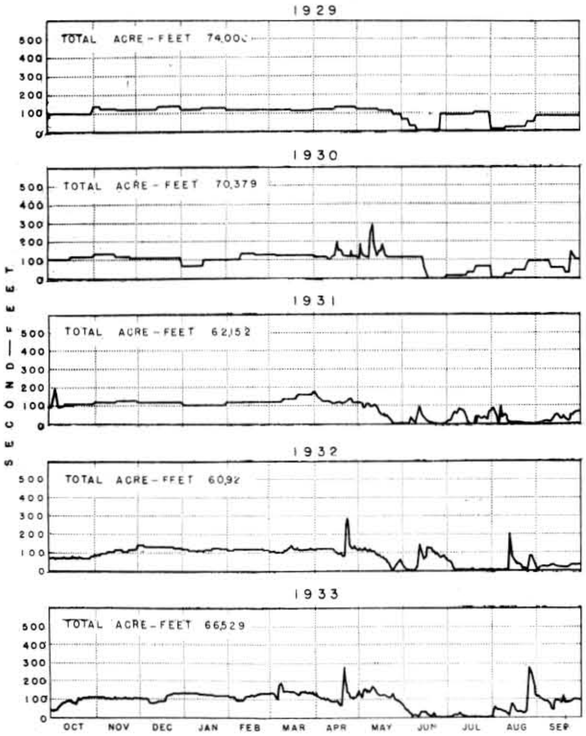

DAILY DISCHARGES
HORSE CREEK
LYMAN, NEBRASKA
1929
TOTAL ACRE-FEET 86,498
1930
TOTAL ACRE-FEET 89,061
1931
TOTAL ACRE-FEET 69,560
1932
TOTAL ACRE-FEET 52,820
1933
TOTAL ACRE-FEET 61,799
676
1934
TOTAL ACRE-FEET 18,064
1935
TOTAL ACRE-FEET 24,686
1936
TOTAL ACRE-FEET 19,677
1937
TOTAL ACRE-FEET 26,730
1938
TOTAL ACRE FEET 45,706
BANK-FULL STAGE=4,200 S.F.
SECOND—FEET
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP

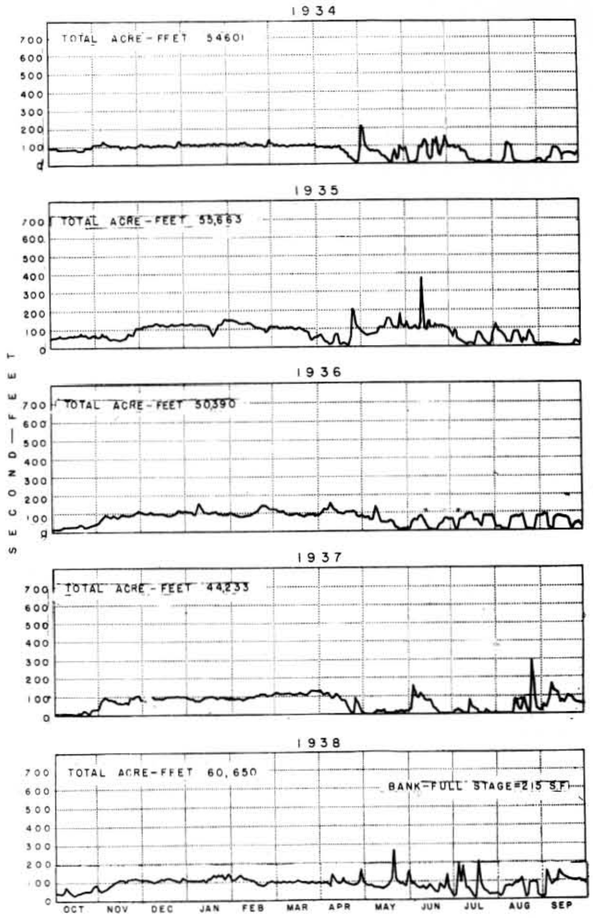
CVI


DAILY DISCHARGES
PUMPKIN CREEK
BRIDGEPORT, NEBRASKA
1929
TOTAL ACRE-FEET 35,303
1930
TOTAL ACRE-FEET 39,752
1931
TOTAL ACRE-FEET 32,714
1932
TOTAL ACRE-FEET 24,294
1933
TOTAL ACRE-FEET 22,570
1934
TOTAL ACRE-FEET 21,379
1935
TOTAL ACRE-FEET 26,090
1936
TOTAL ACRE-FEET 22,275
1937
TOTAL ACRE-FEET 14,291
1938
TOTAL ACRE FEET 22,139
BANK-FULL STAGE=1,200 S.F.
SECOND—FEET
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP

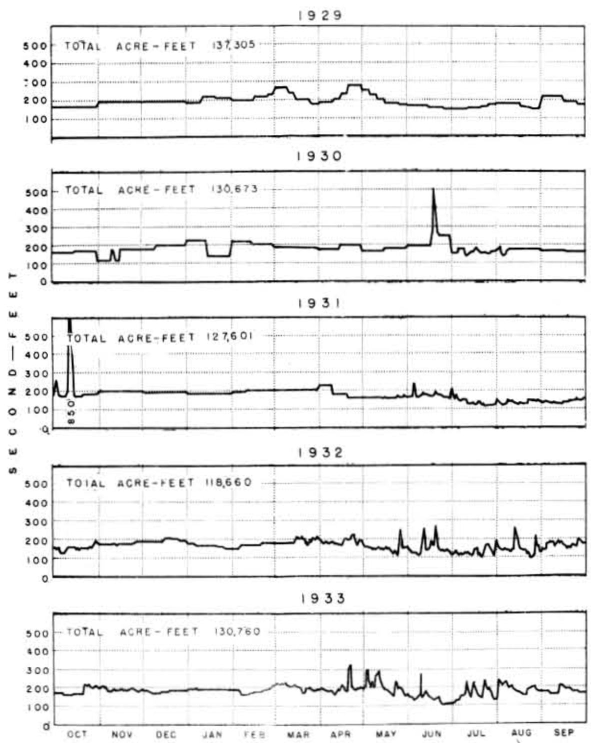
CVII

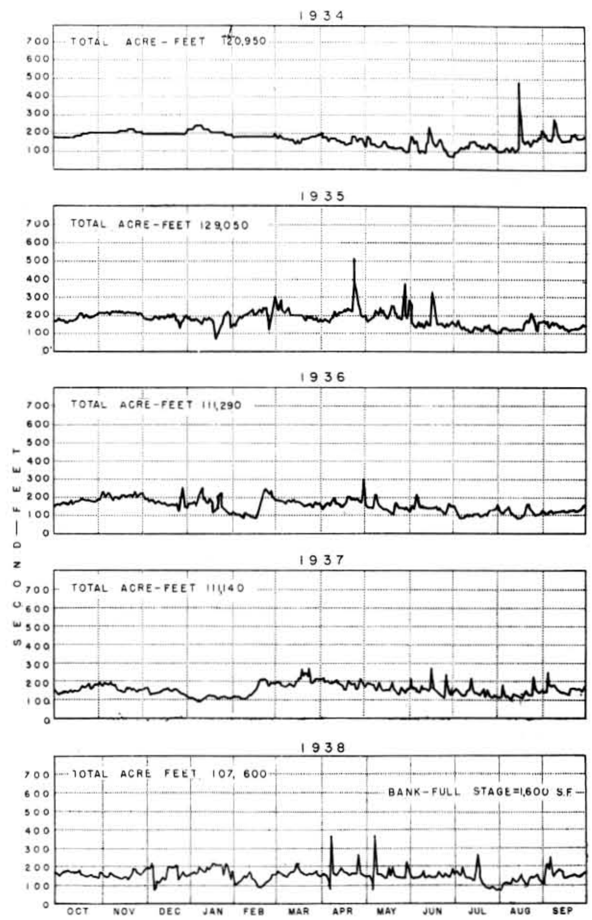
DAILY DISCHARGES
BLUE CREEK
LEWELLEN, NEBRASKA



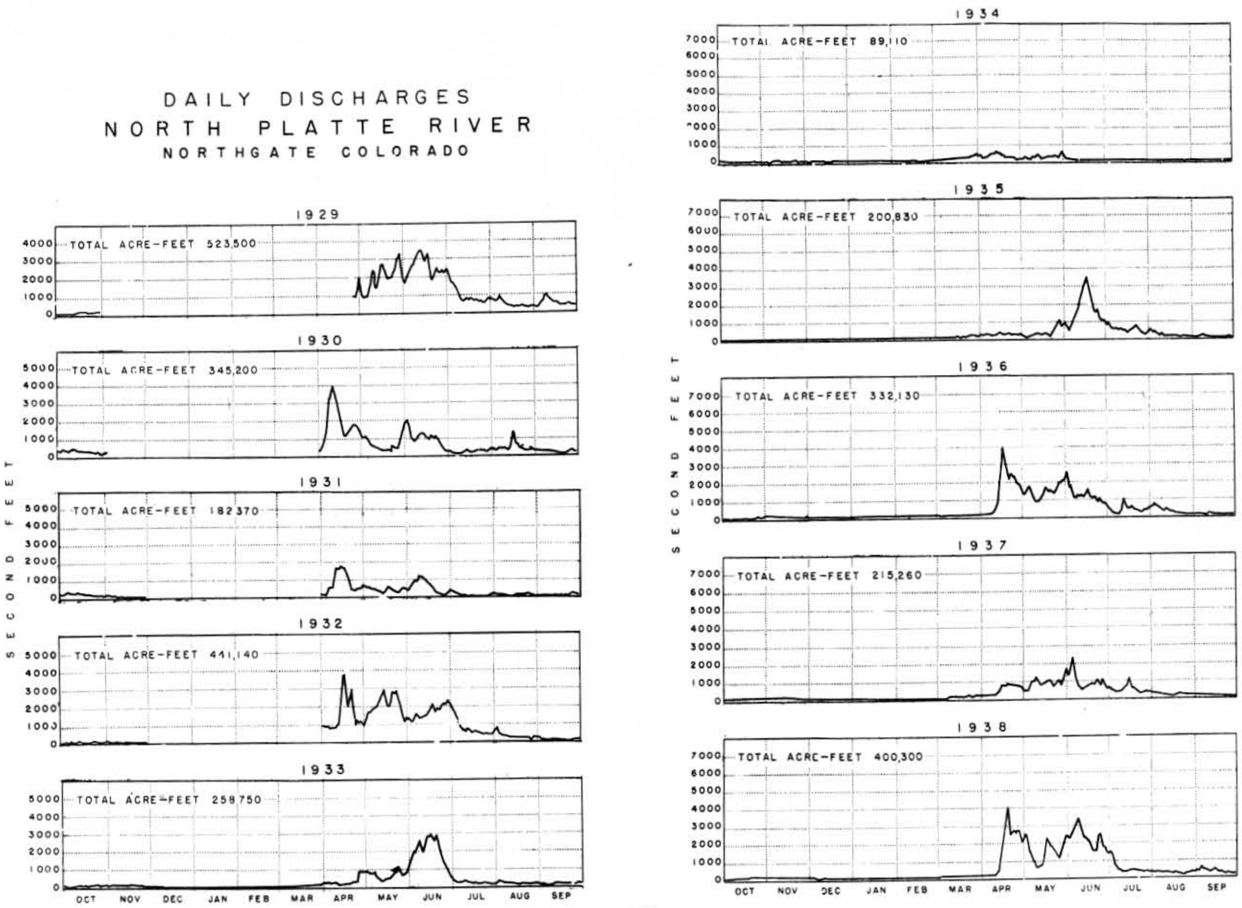


DAILY DISCHARGES
BIRDWOOD CREEK
HERSHEY, NEBRASKA



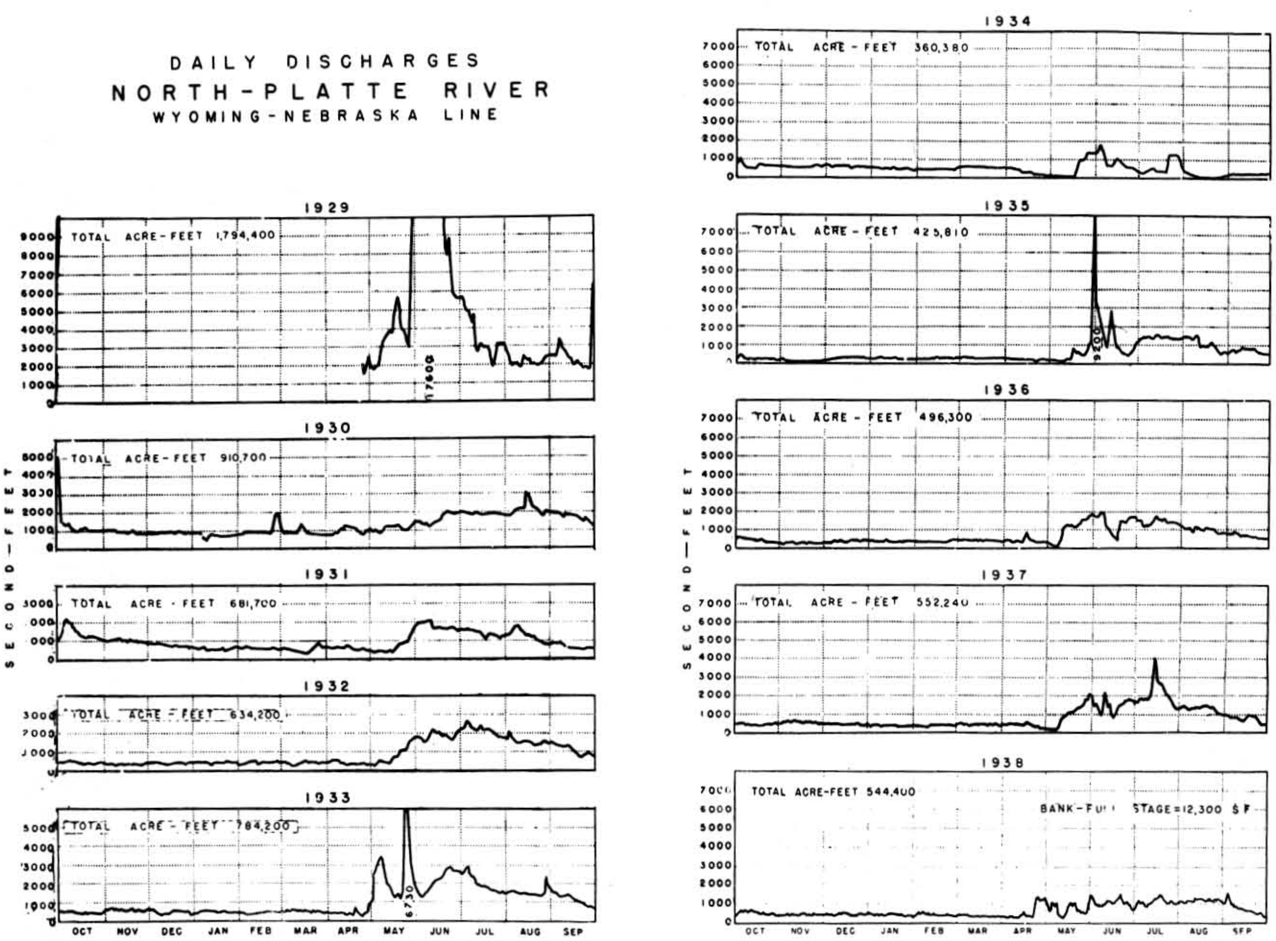


DAILY DISCHARGES NORTH PLATTE RIVER
NORTHGATE COLORADO



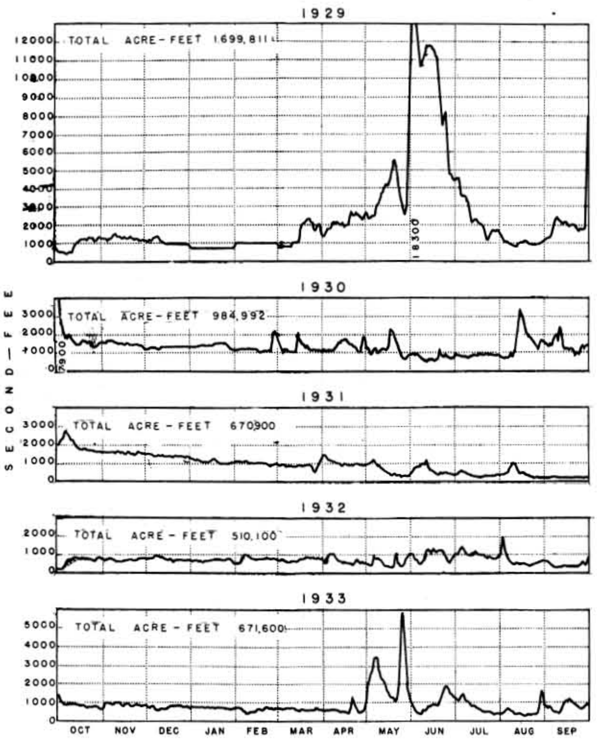
CX

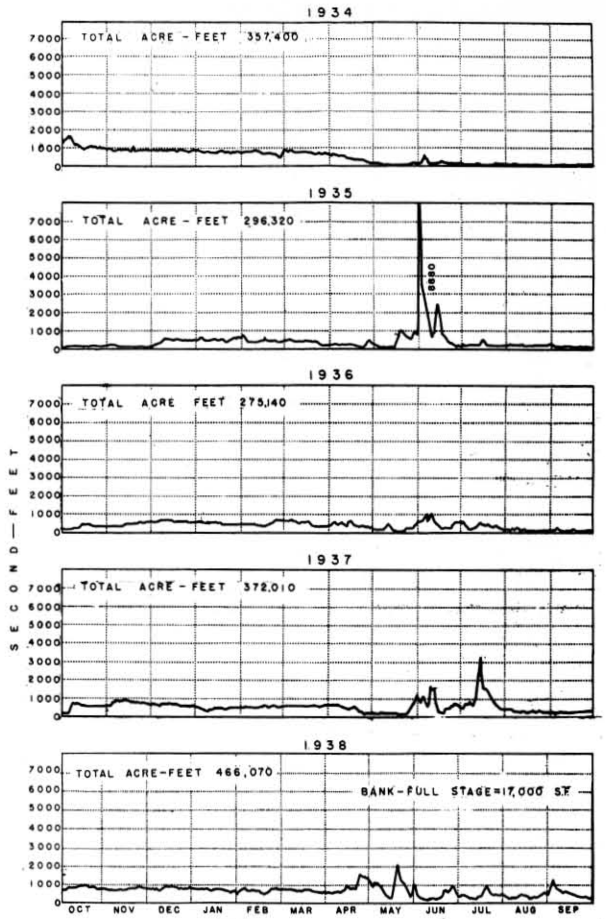
DAILY DISCHARGES NORTH-PLATTE RIVER
WYOMING-NEBRASKA LINE



CXI

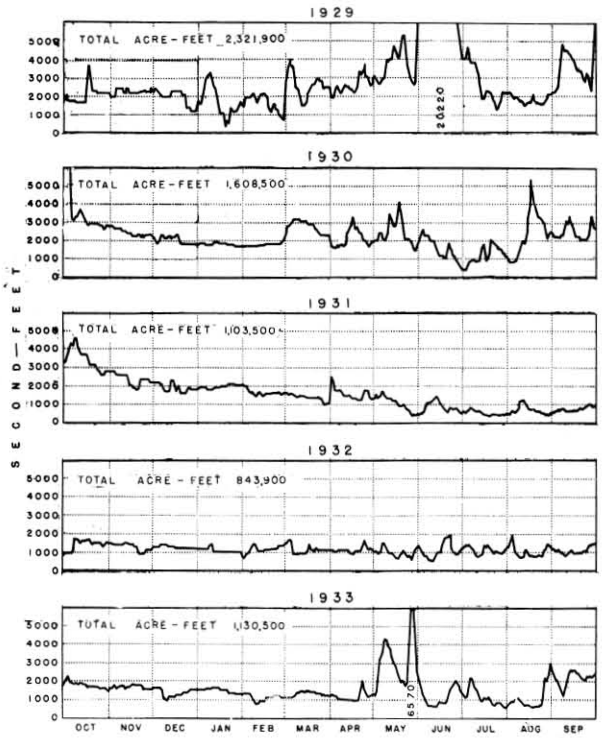
DAILY DISCHARGES
NORTH-PLATTE RIVER
MITCHELL, NEBRASKA

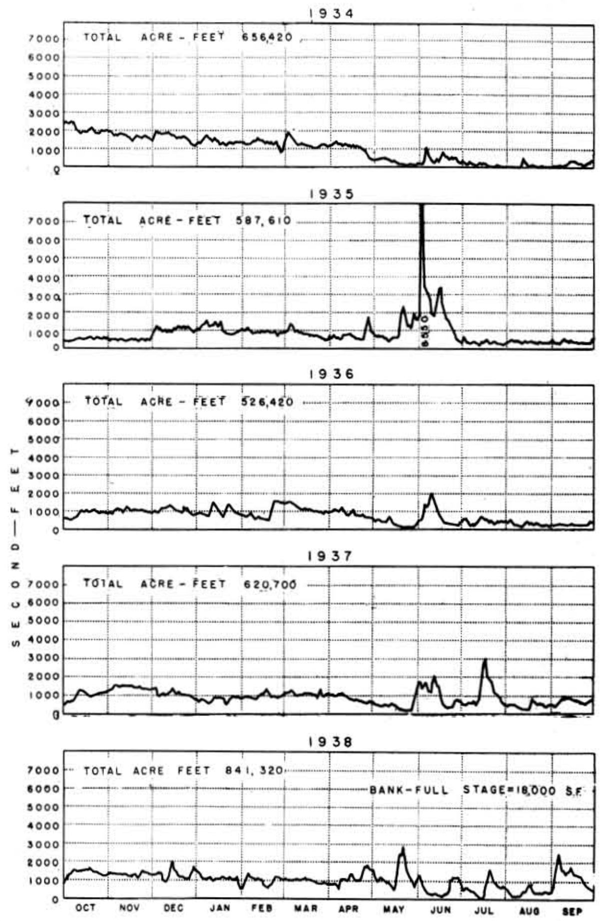




CXII

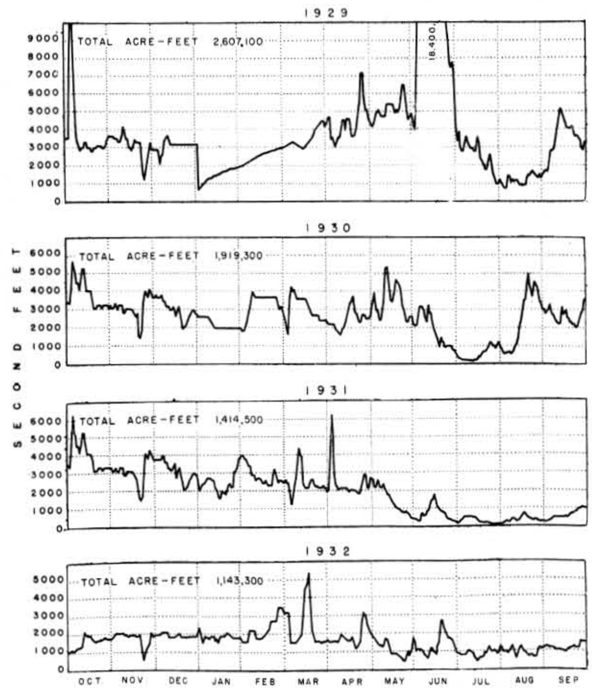
DAILY DISCHARGES
NORTH PLATTE RIVER
BRIDGEPORT NEBRASKA

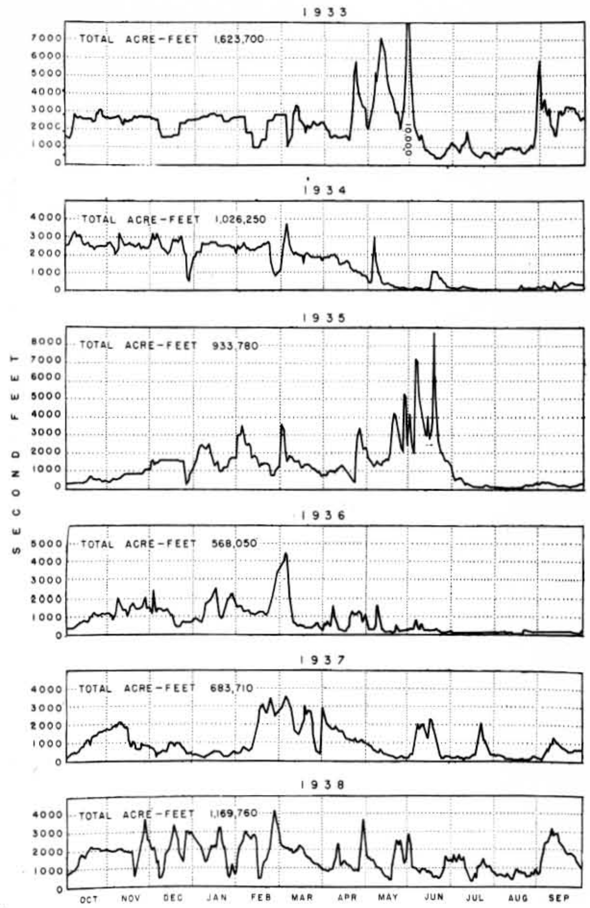




CXIII

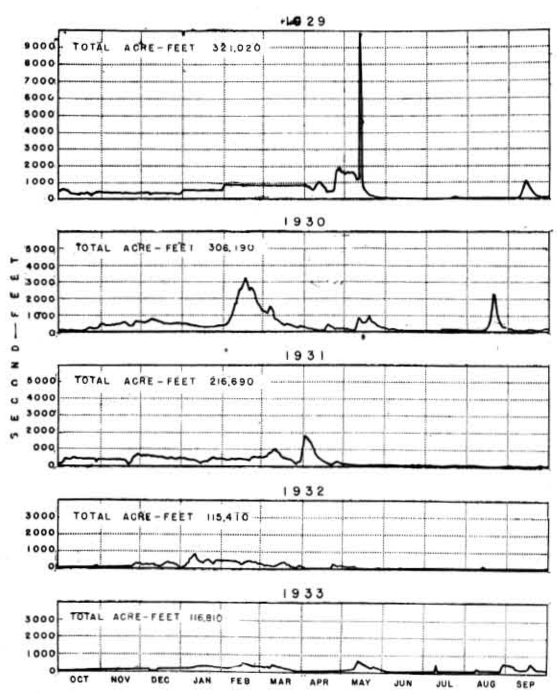
DAILY DISCHARGES
NORTH PLATTE RIVER
NORTH PLATTE NEBRASKA

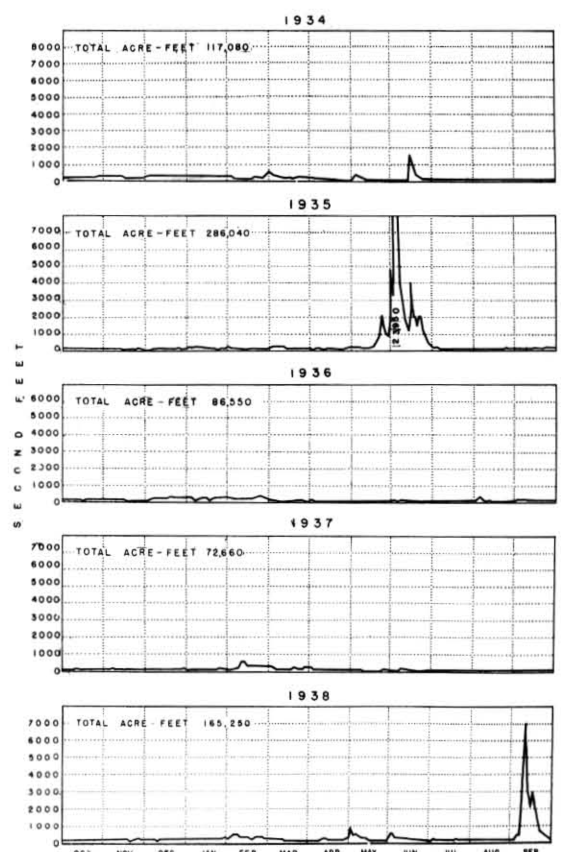




CXIV

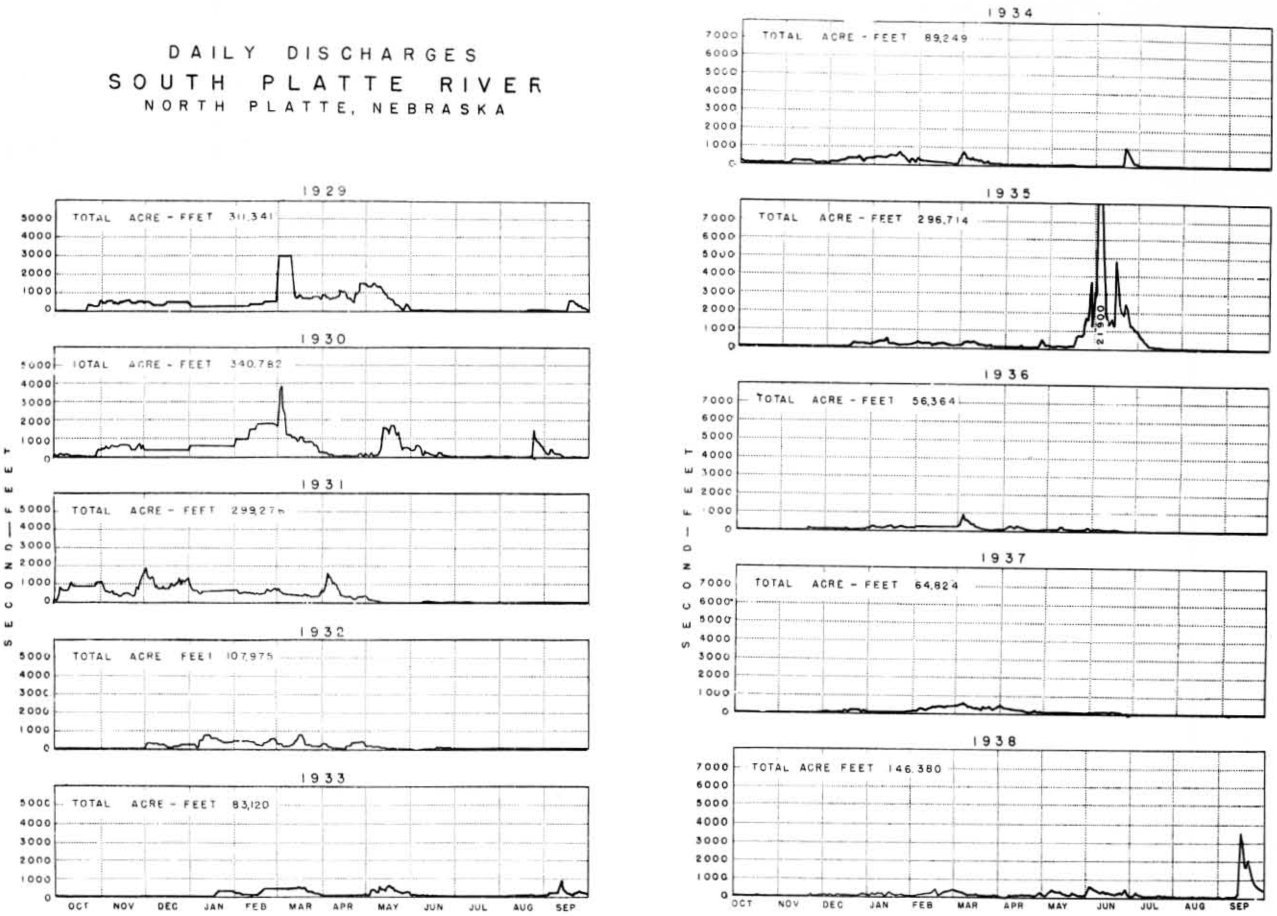
DAILY DISCHARGES
SOUTH PLATTE RIVER
JULESBURG, COLORADO



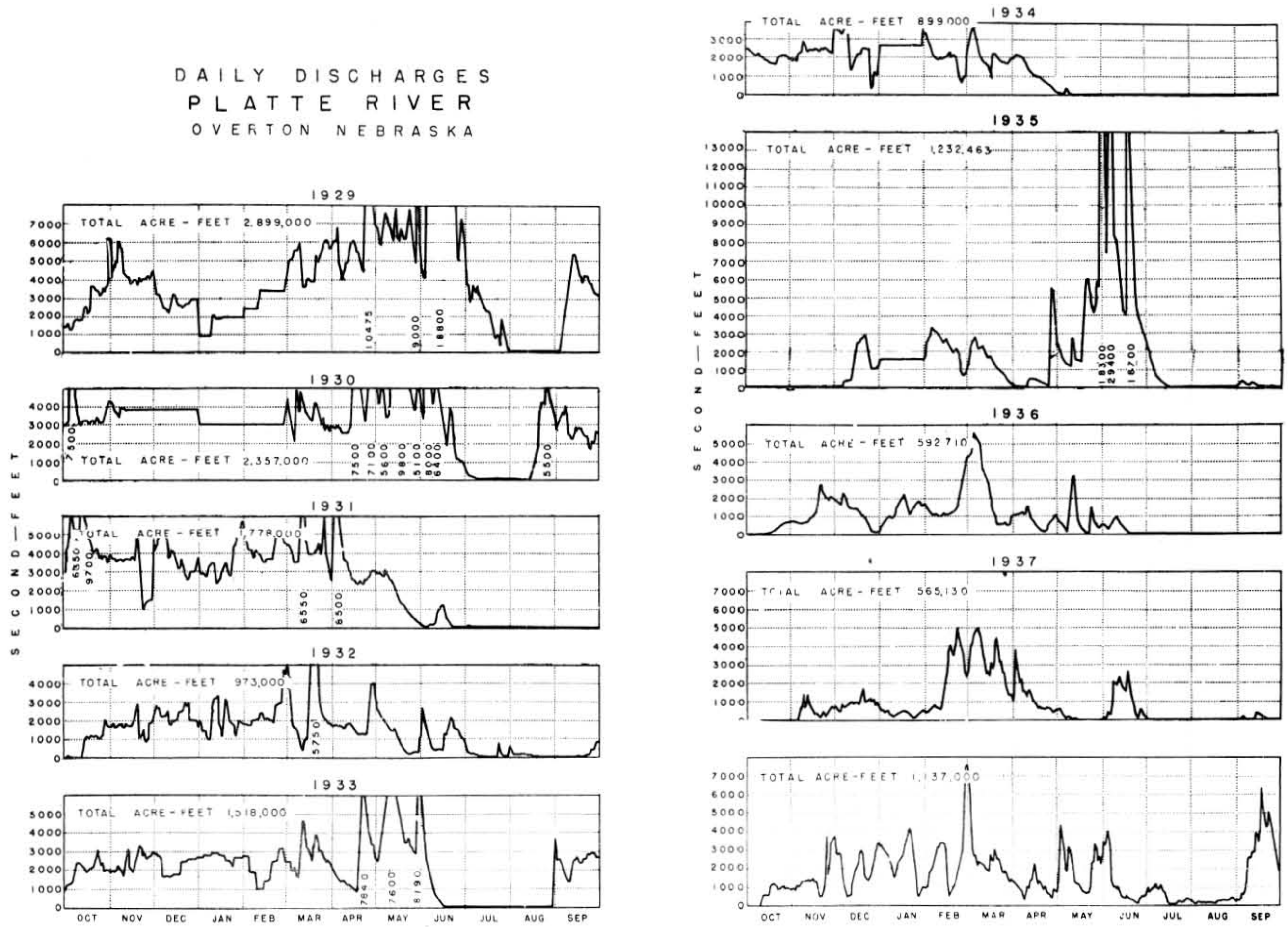


CXV

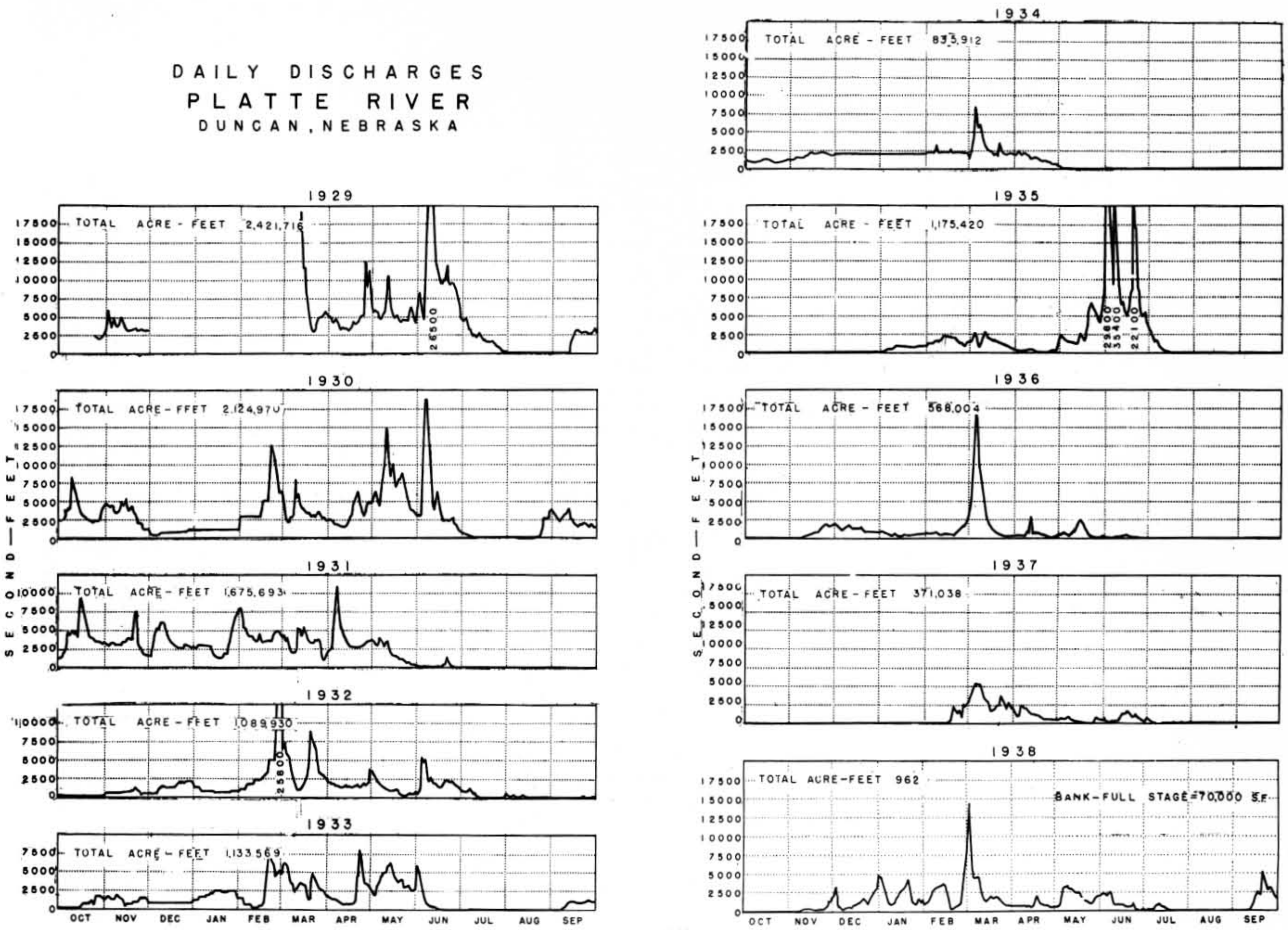
DAILY DISCHARGES
SOUTH PLATTE RIVER
NORTH PLATTE, NEBRASKA



DAILY DISCHARGES
PLATTE RIVER
OVERTON NEBRASKA

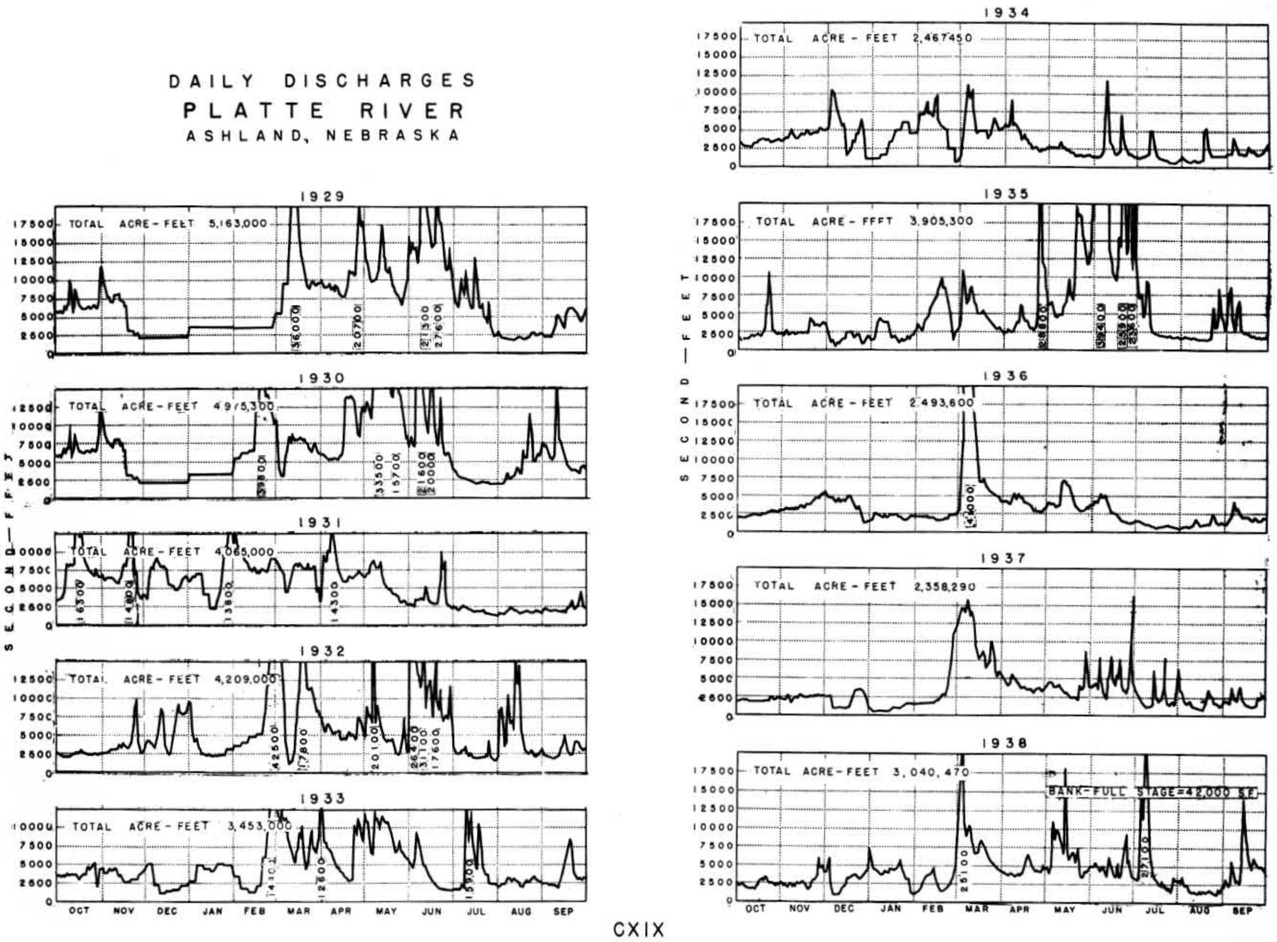


DAILY DISCHARGES
PLATTE RIVER
DUNCAN, NEBRASKA



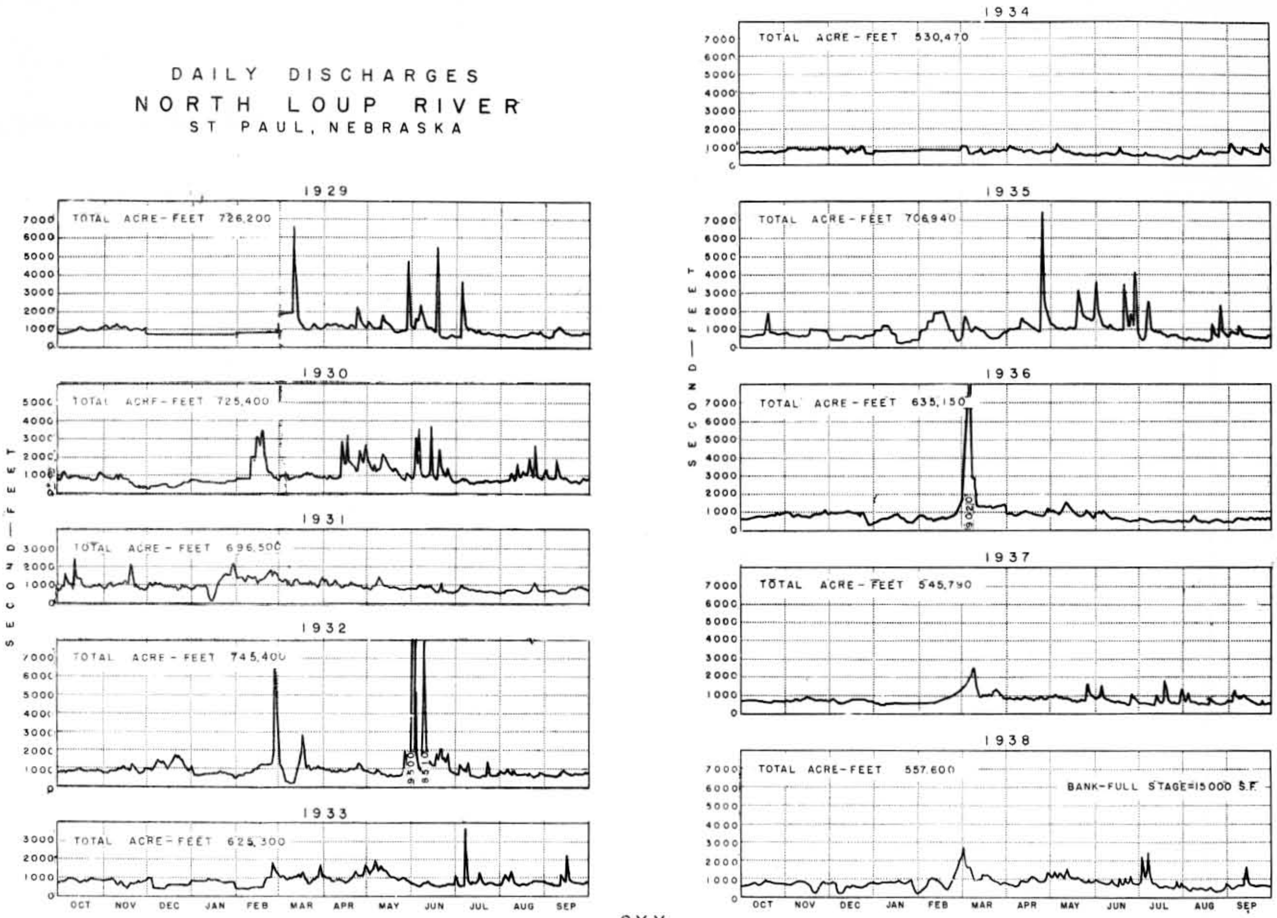
CXVIII

DAILY DISCHARGES
PLATTE RIVER
ASHLAND, NEBRASKA



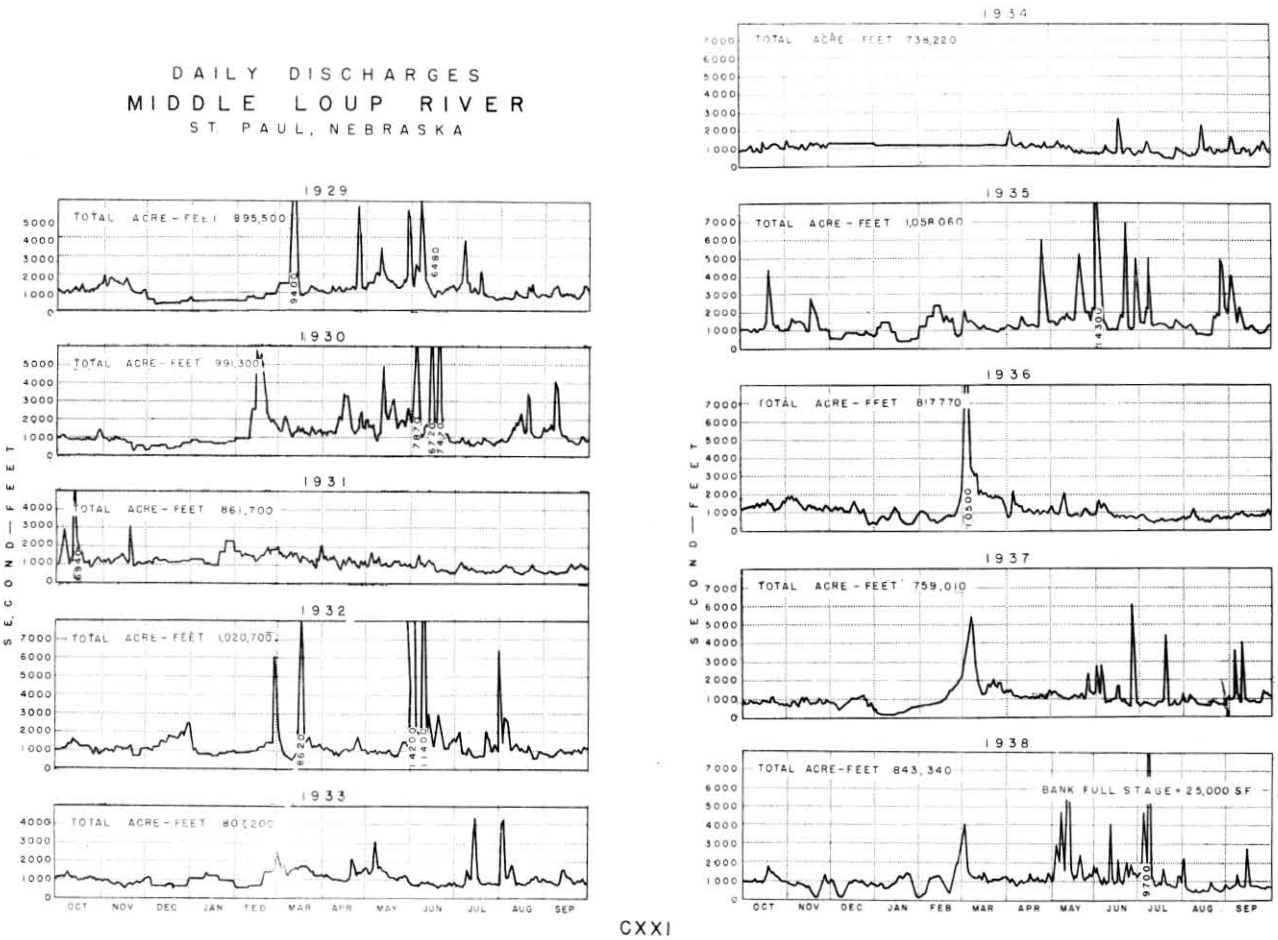
CXIX

DAILY DISCHARGES
NORTH LOUP RIVER
ST PAUL, NEBRASKA

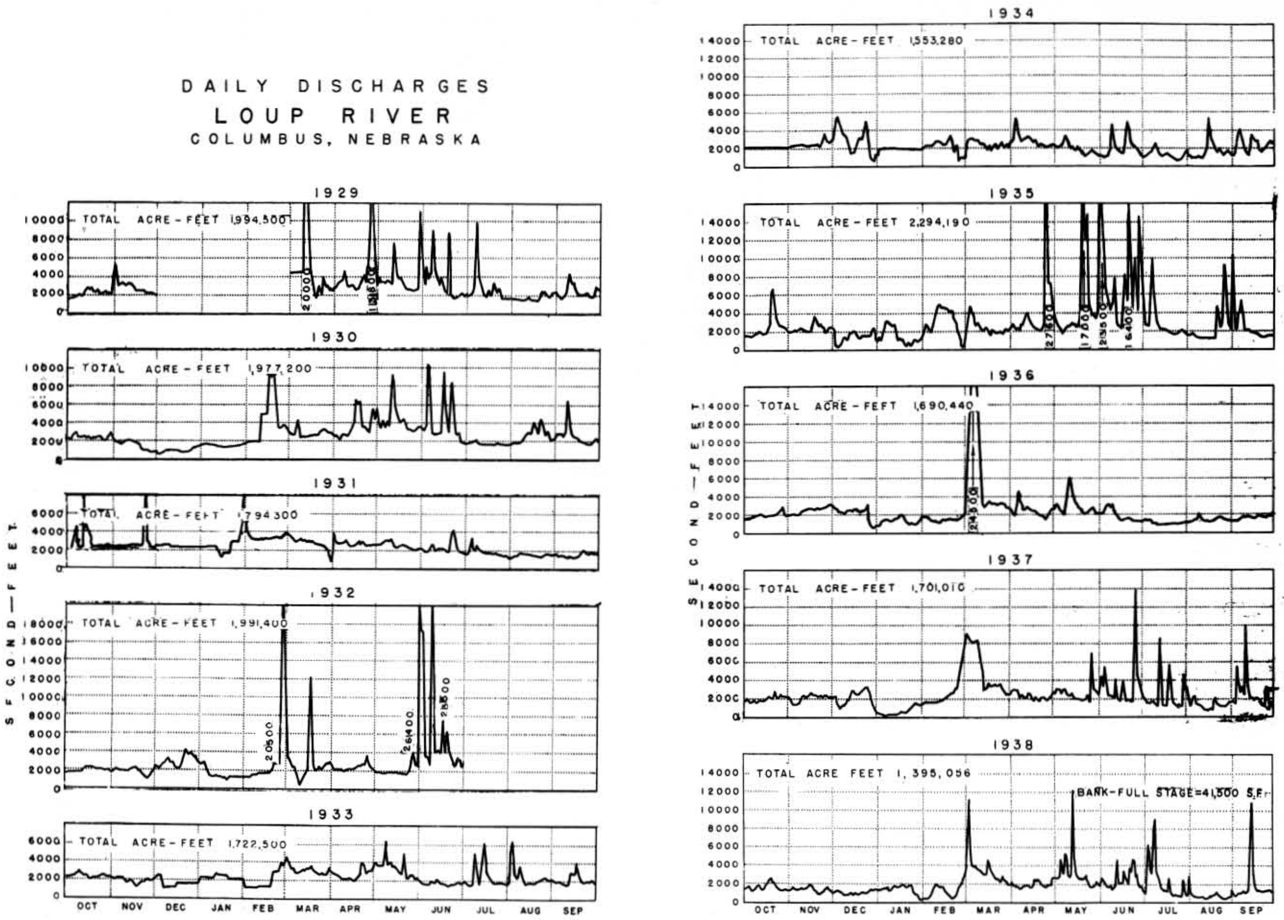


CXX

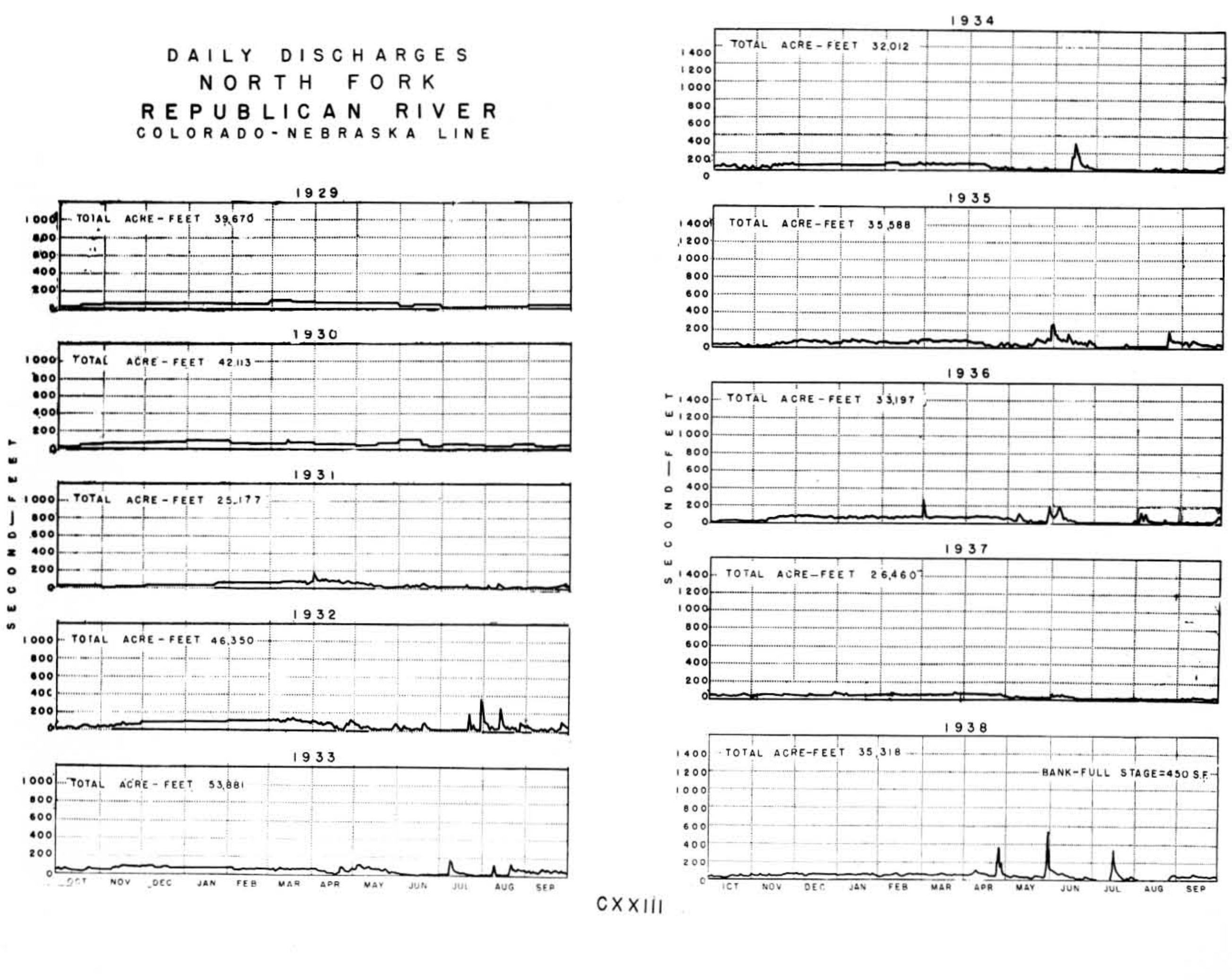
DAILY DISCHARGES
MIDDLE LOUP RIVER
ST. PAUL, NEBRASKA



CXXI

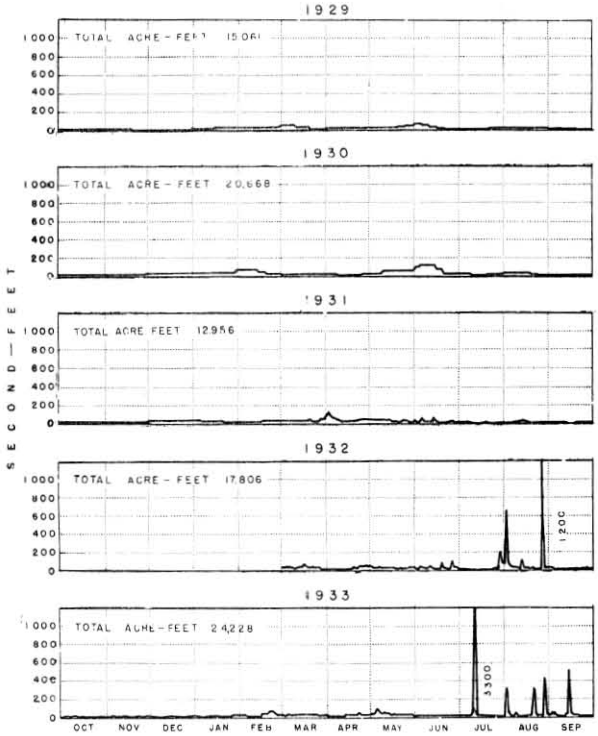


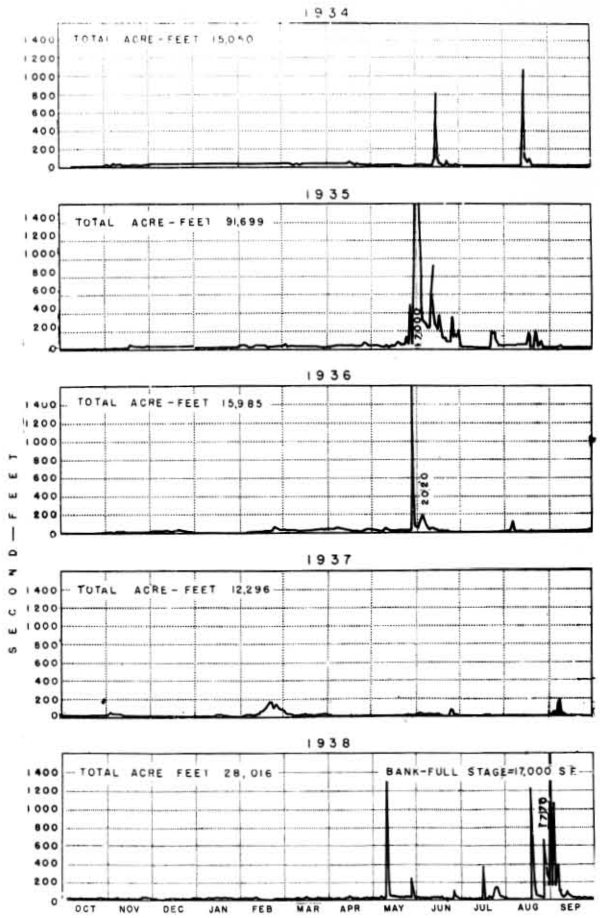
CXXII



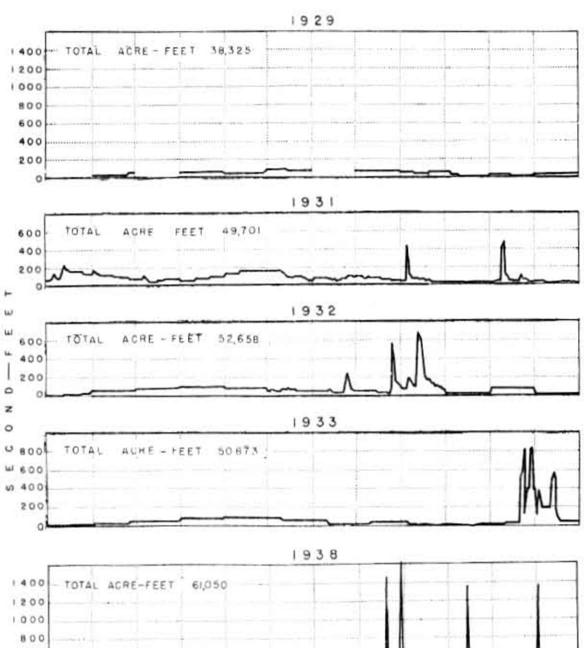
CXXIII

DAILY DISCHARGES
ARIKAREE RIVER
HAIGLER, NEBRASKA

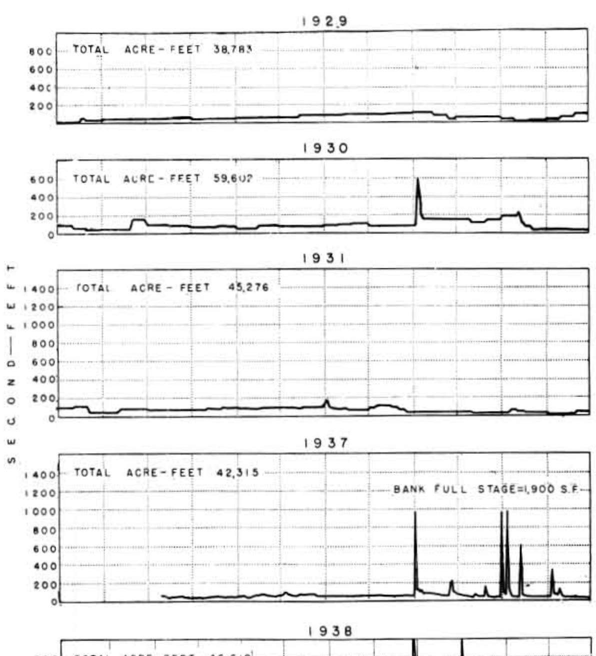


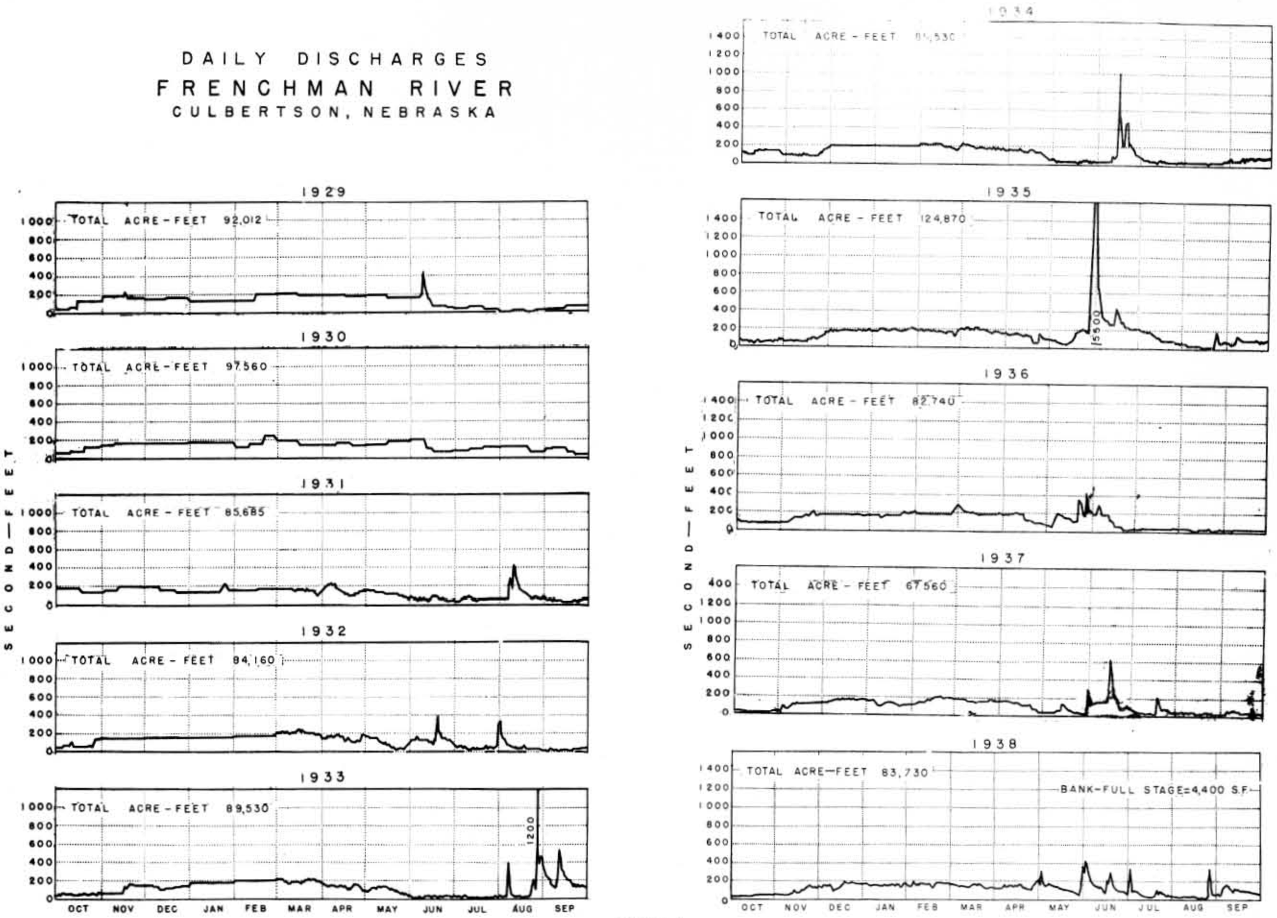


DAILY DISCHARGES
SOUTH FORK REPUBLICAN
BENKELMAN, NEBRASKA

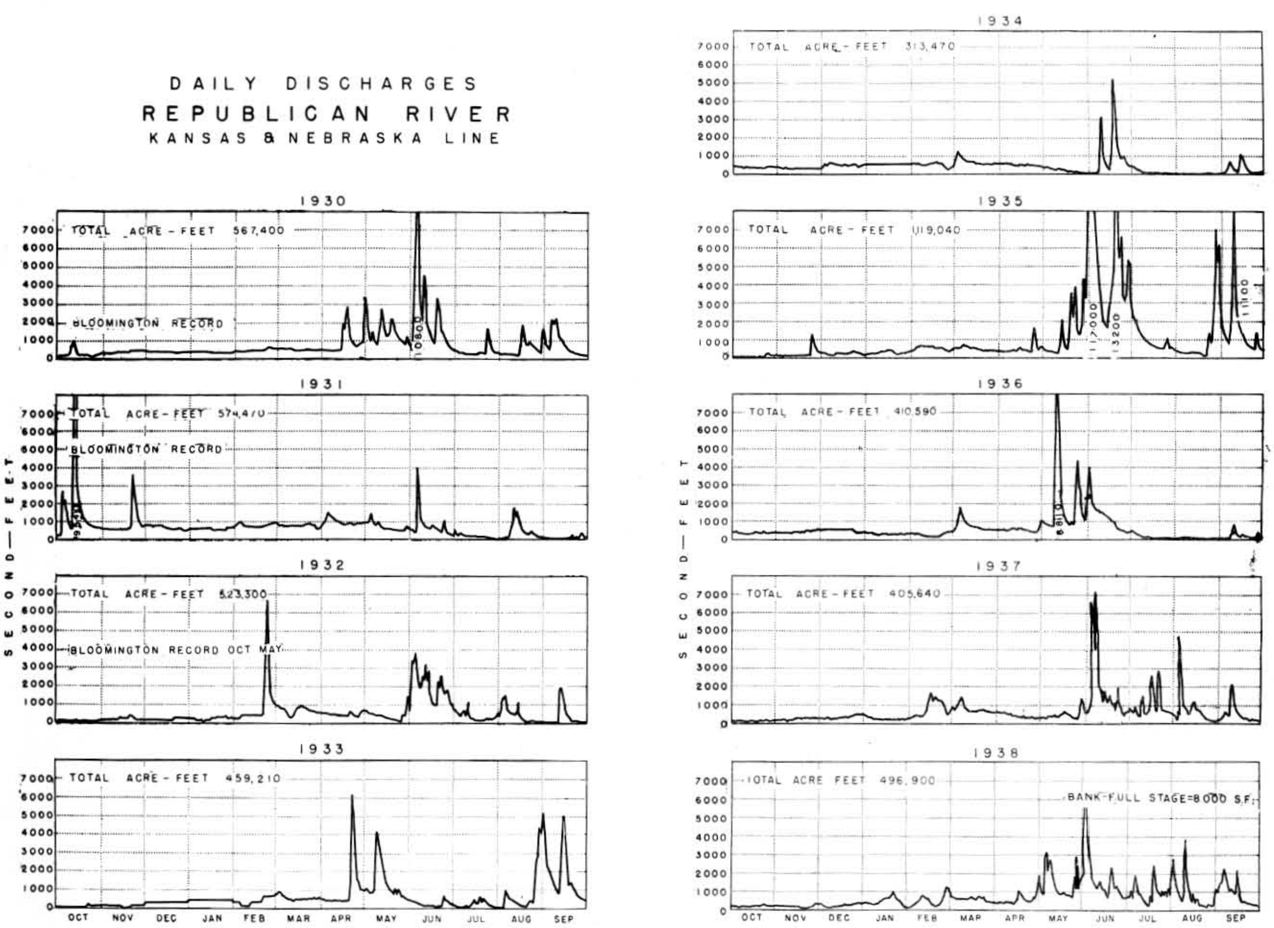


DAILY DISCHARGES
MEDICINE CREEK
CAMBRIDGE, NEBRASKA



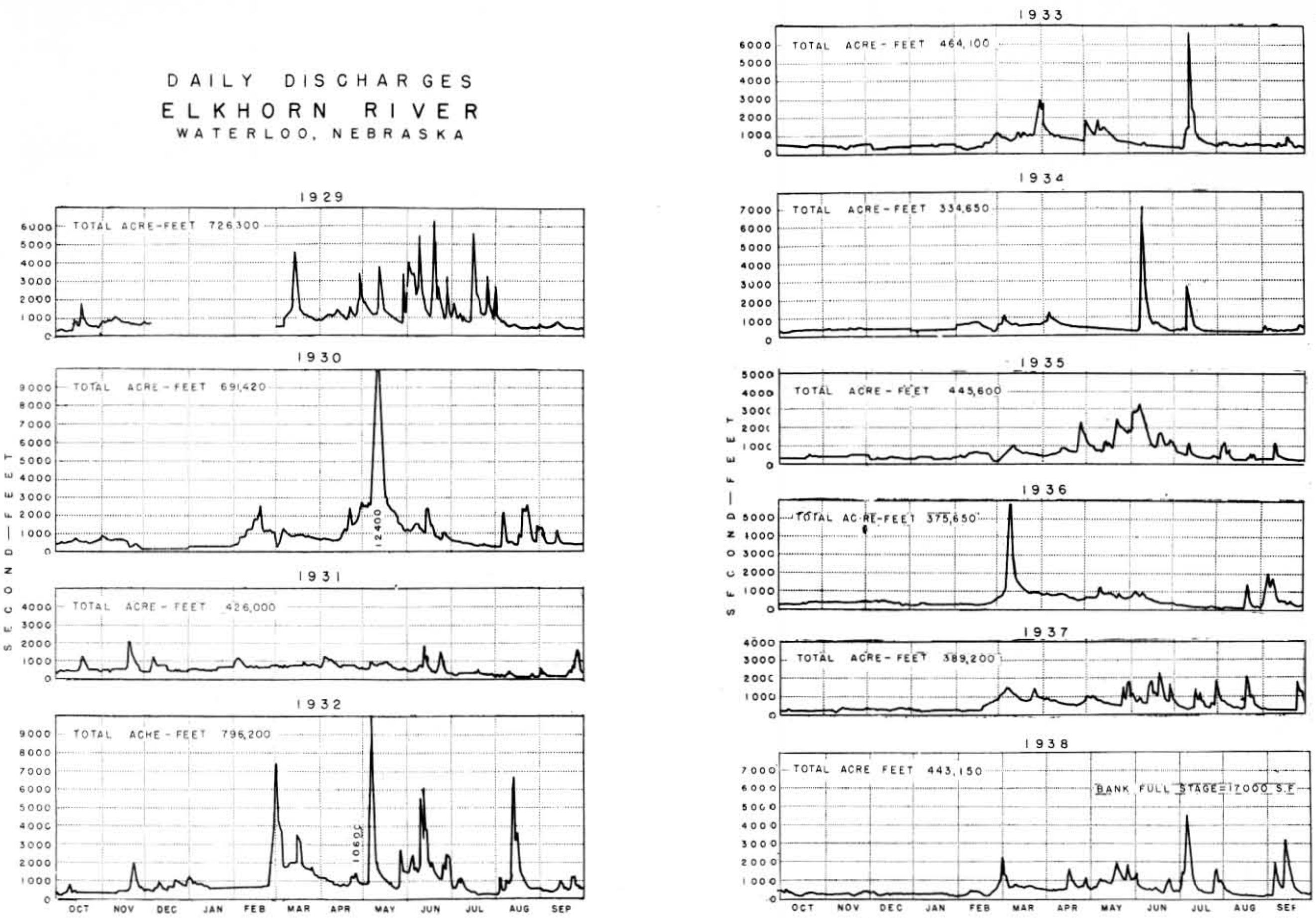


CXXVI



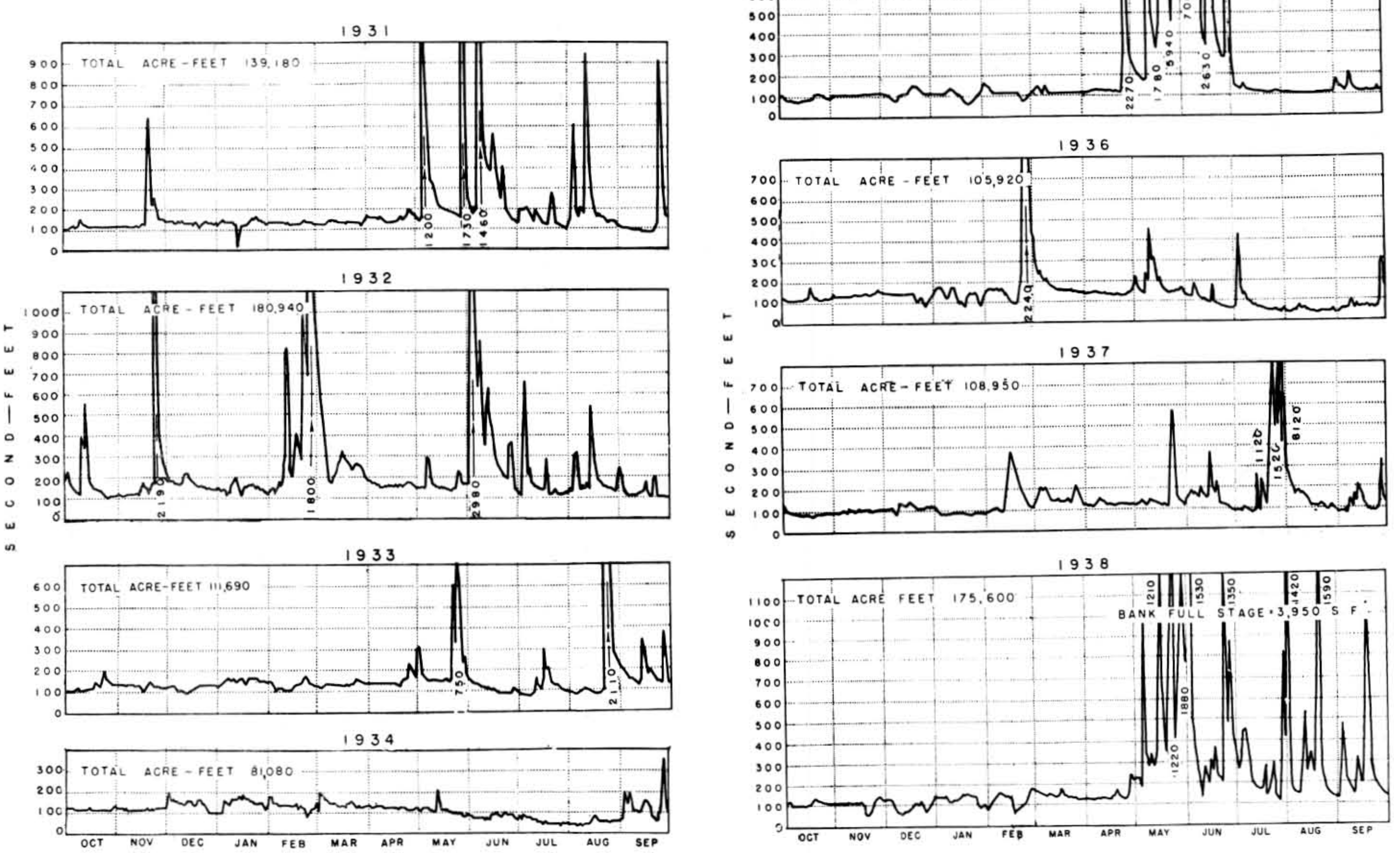
CXXVII

DAILY DISCHARGES
ELKHORN RIVER
WATERLOO, NEBRASKA



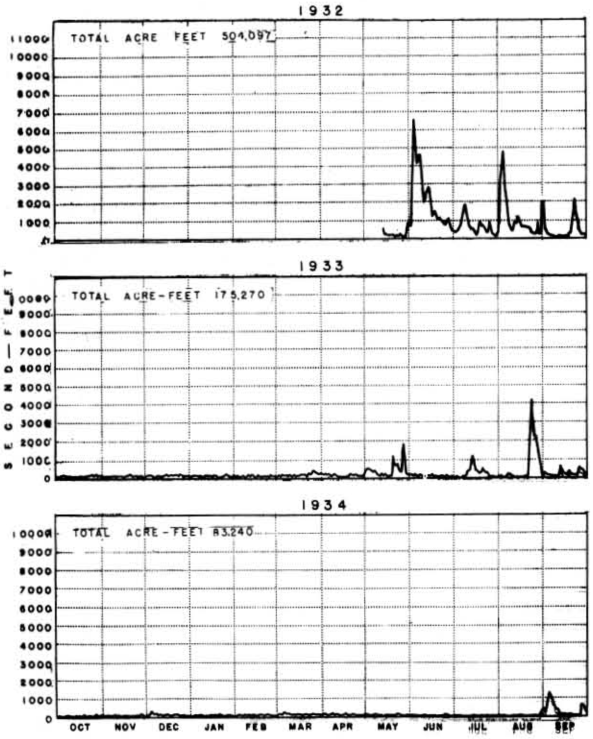
CXXVIII

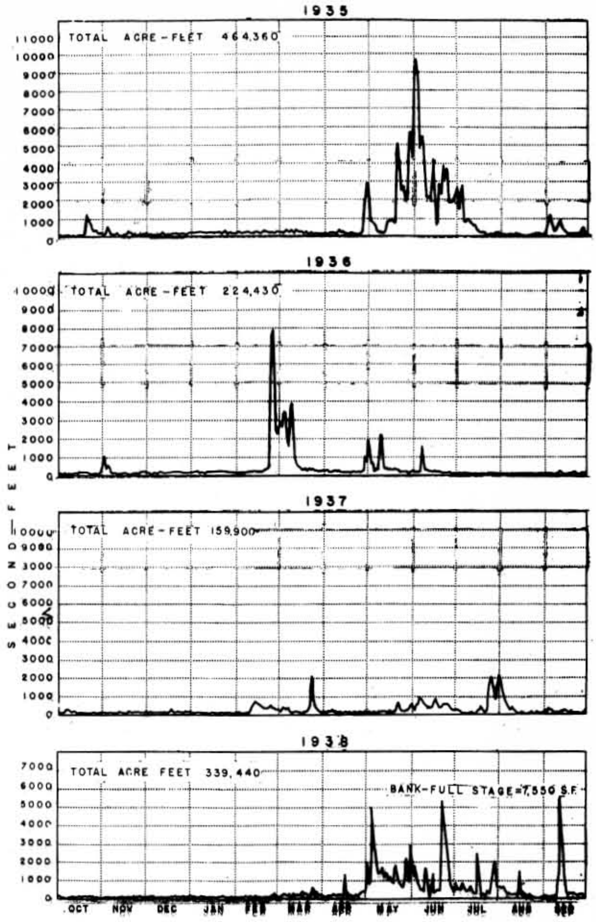
DAILY DISCHARGES
LITTLE BLUE RIVER
ENDICOTT, NEBRASKA



CXXIX

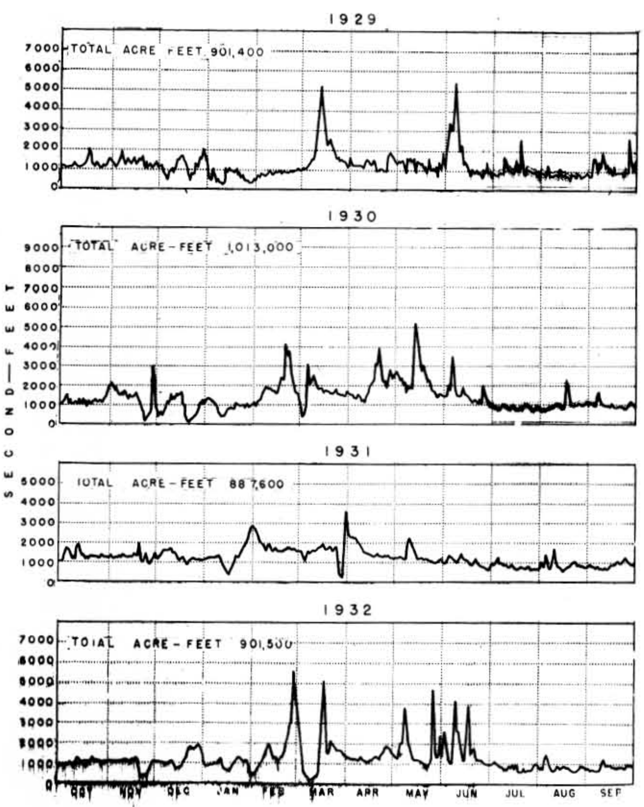
DAILY DISCHARGES
BIG BLUE RIVER
BARNSTON, NEBRASKA

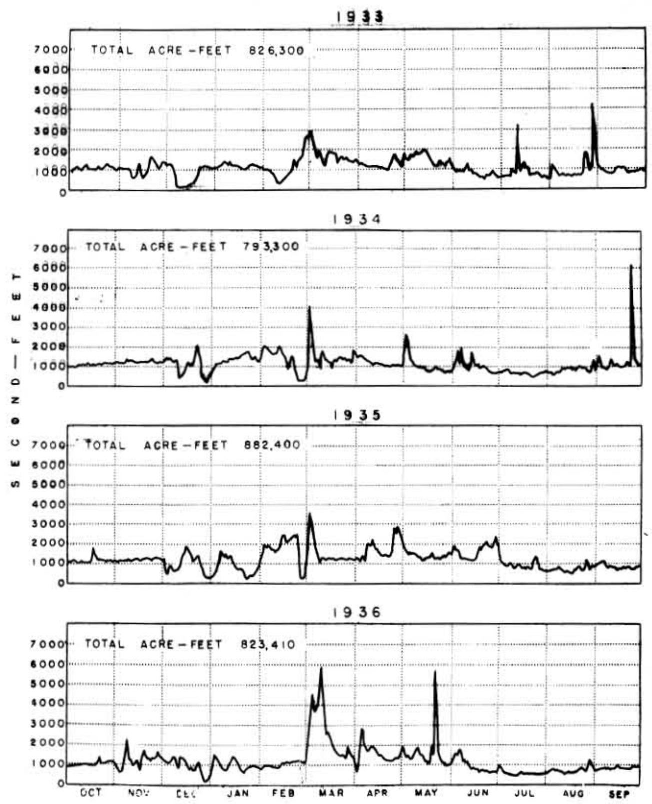




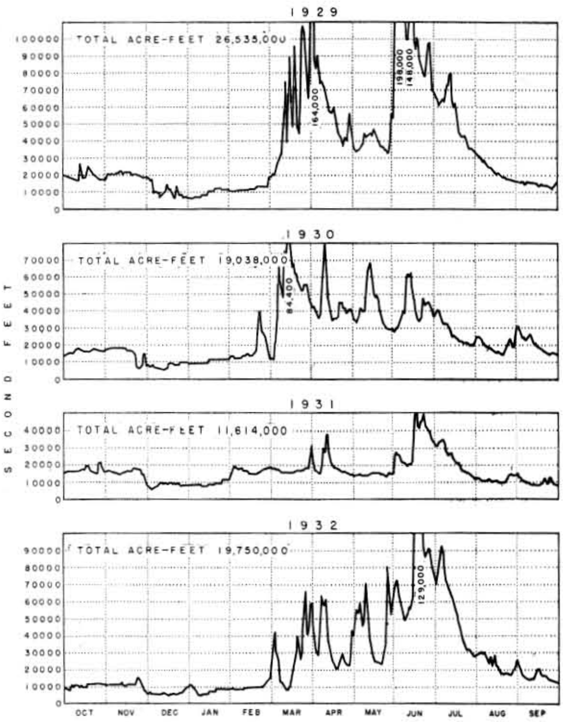
CXXX

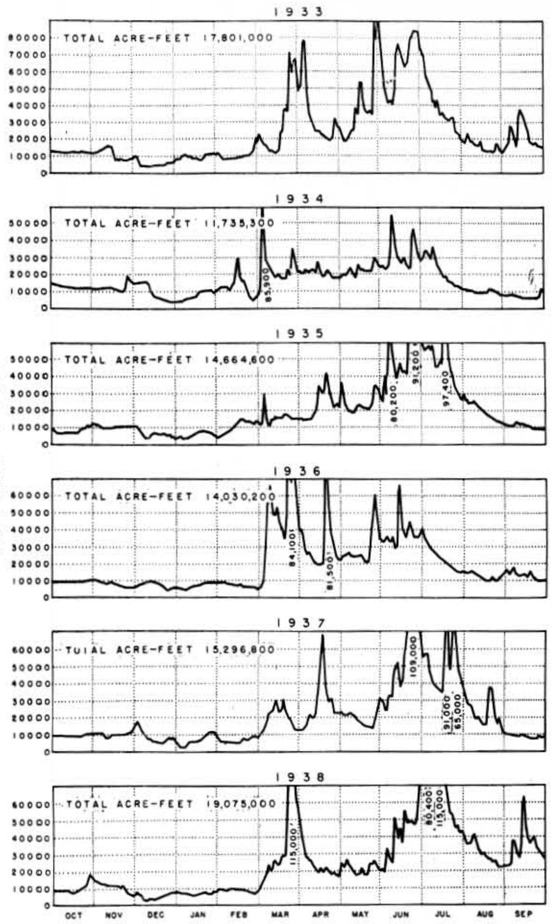
DAILY DISCHARGES
NIOBRARA RIVER
SPENCER, NEBRASKA



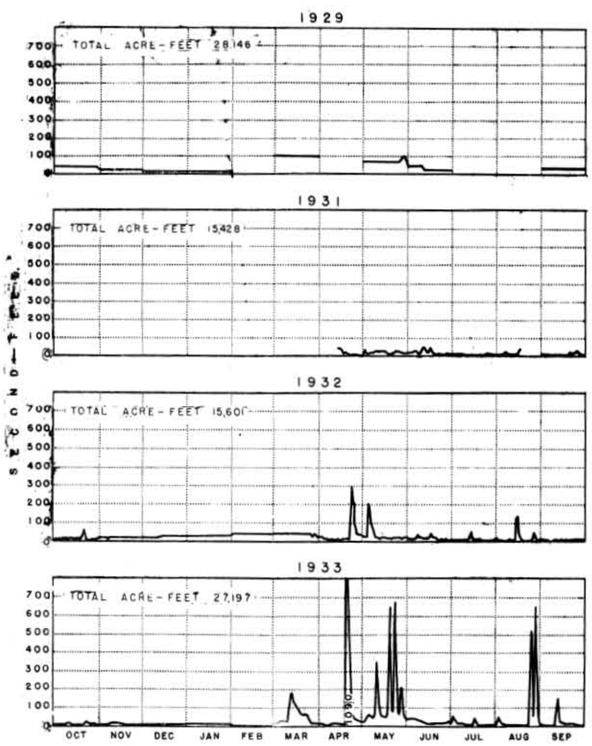


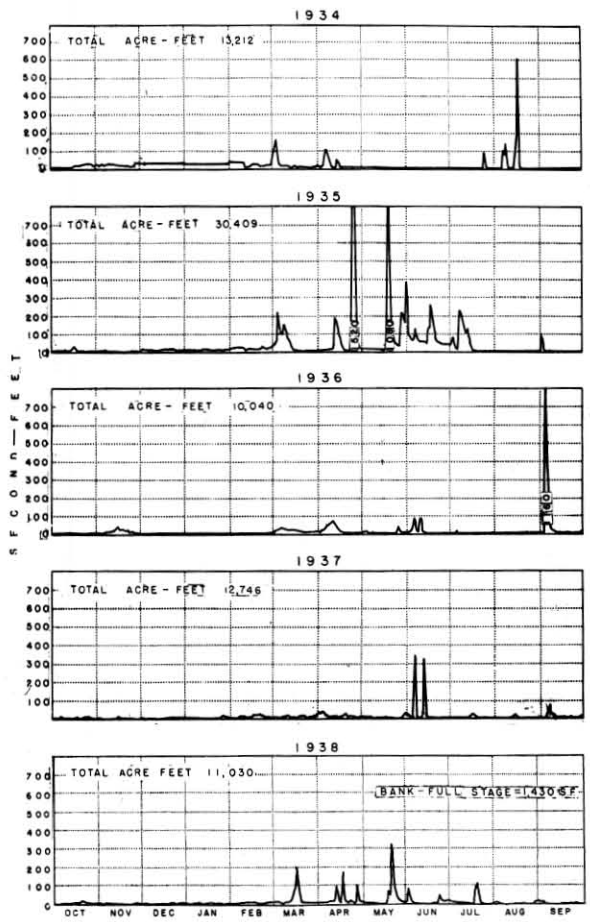
DAILY DISCHARGES
MISSOURI RIVER
OMAHA NEBRASKA

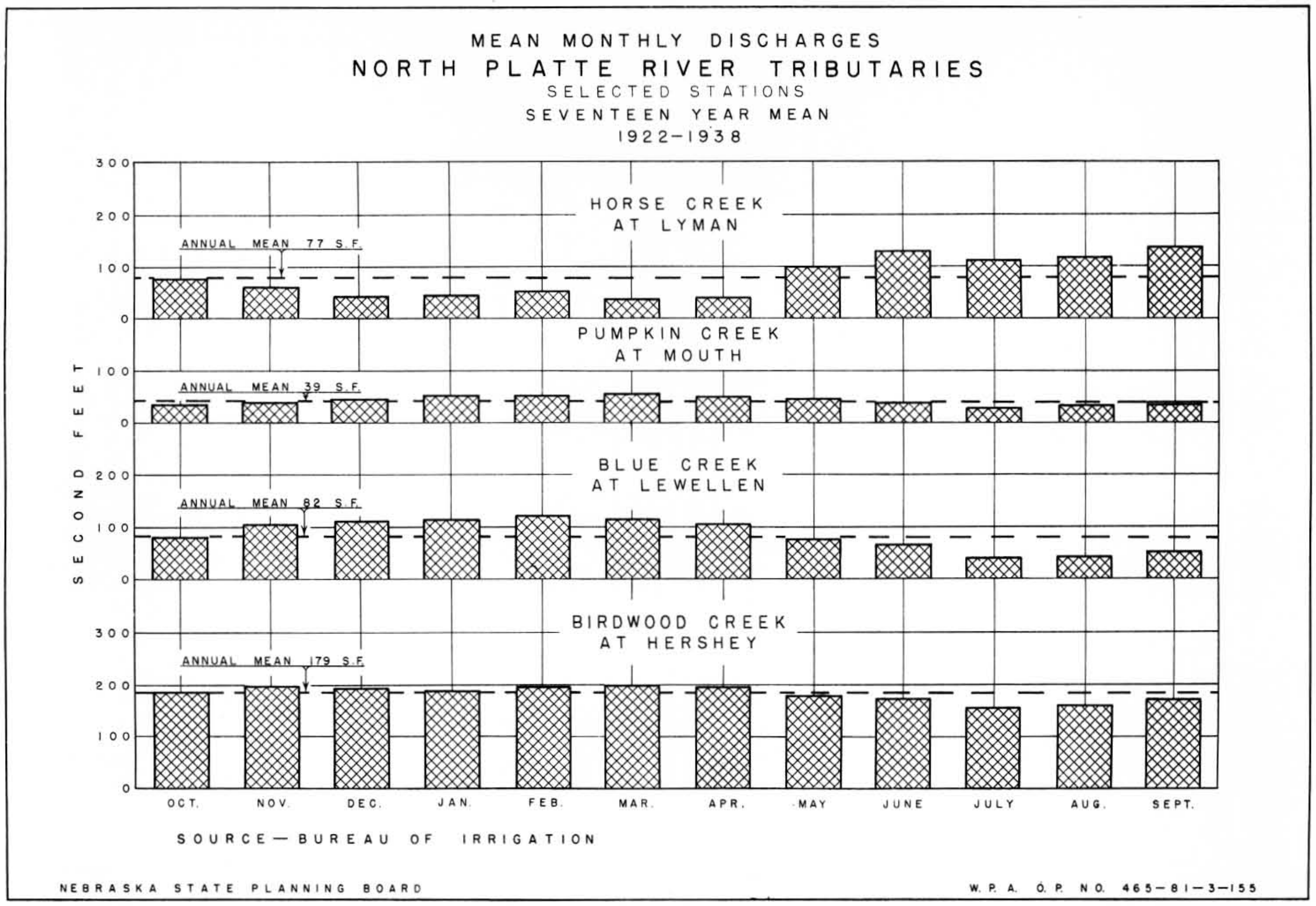




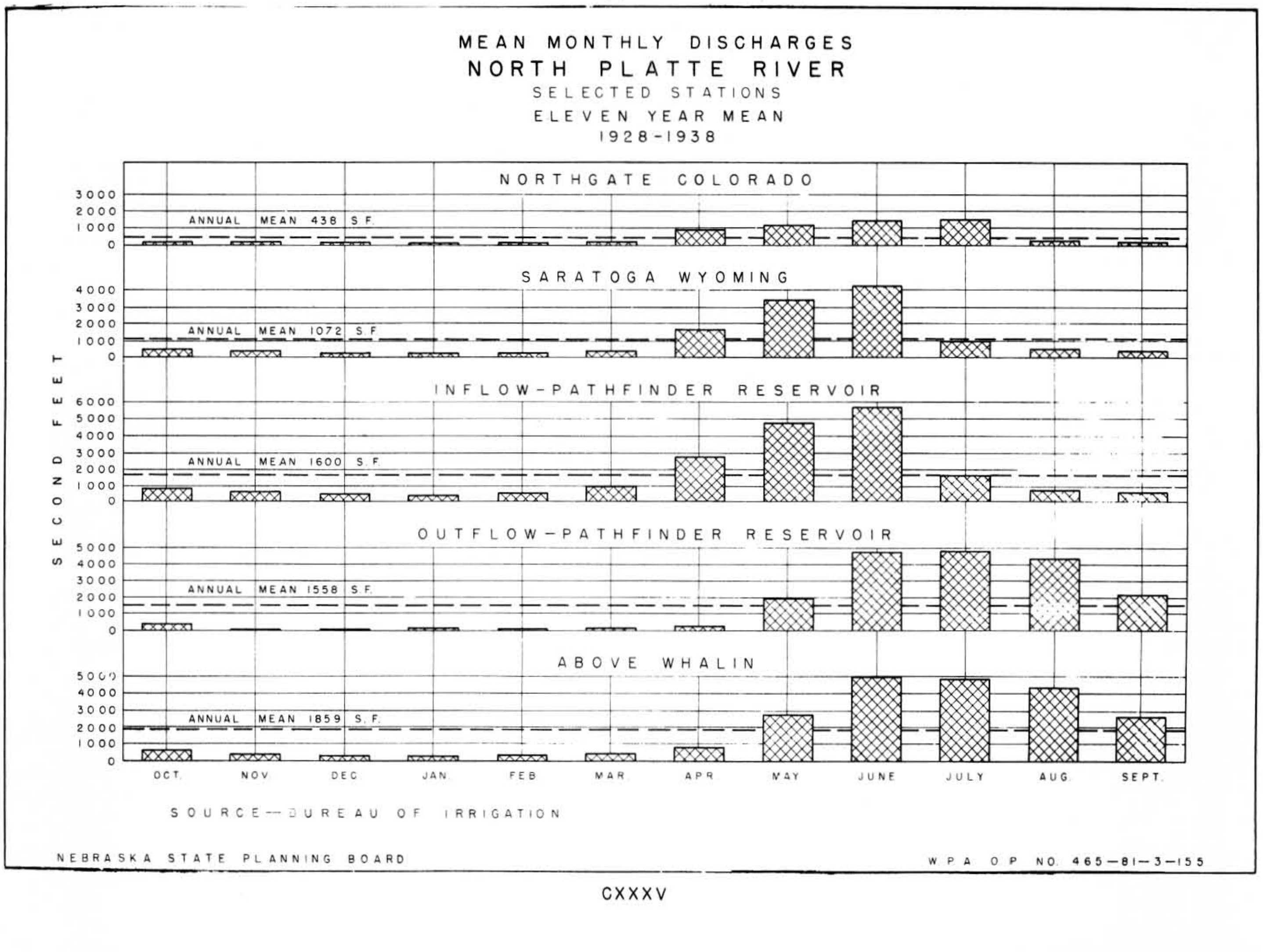
DAILY DISCHARGES
WHITE RIVER
CHADRON, NEBRASKA

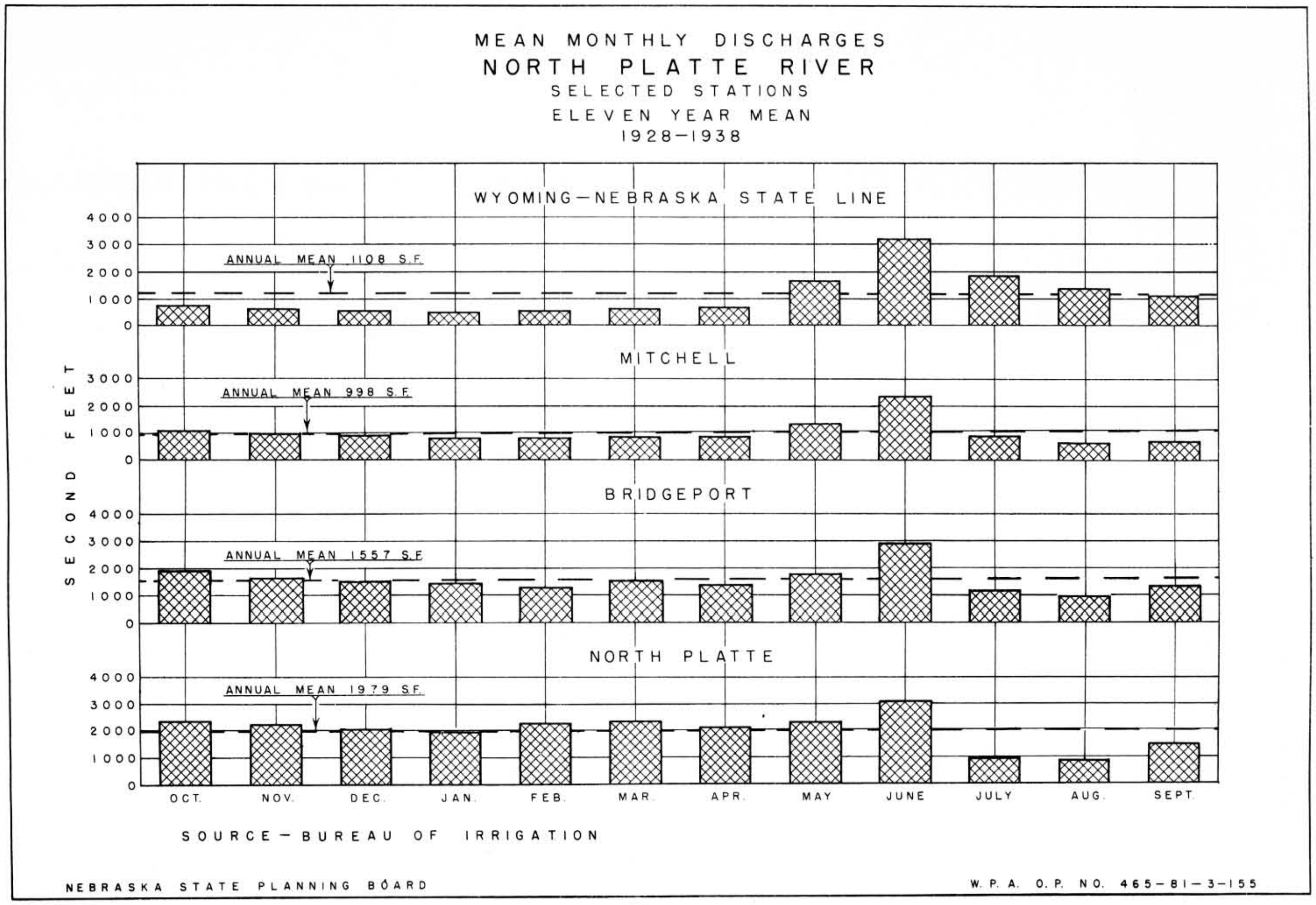





MEAN MONTHLY DISCHARGES
NORTH PLATTE RIVER TRIBUTARIES
SELECTED STATIONS
SEVENTEEN YEAR MEAN
1922–1938
HORSE CREEK AT LYMAN
ANNUAL MEAN 77 S.F.
PUMPKIN CREEK AT MOUTH
ANNUAL MEAN 39 S.F.
BLUE CREEK AT LEWELLEN
ANNUAL MEAN 82 S.F.
BIRDWOOD CREEK AT HERSHEY
ANNUAL MEAN 179 S.F.
SECOND FEET
OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT.
SOURCE — BUREAU OF IRRIGATION
NEBRASKA STATE PLANNING BOARD
W. P. A. O. P. NO. 465-81-3-155

CXXXIV


MEAN MONTHLY DISCHARGES
NORTH PLATTE RIVER
SELECTED STATIONS
ELEVEN YEAR MEAN
1928-1938
NORTHGATE COLORADO
ANNUAL MEAN 438 S.F.
SARATOGA WYOMING
ANNUAL MEAN 1072 S.F.
INFLOW-PATHFINDER RESERVOIR
ANNUAL MEAN 1600 S.F.
OUTFLOW-PATHFINDER RESERVOIR
ANNUAL MEAN 1558 S.F.
ABOVE WHALIN
ANNUAL MEAN 1859 S.F.
SECOND FEET
OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT.
SOURCE — BUREAU OF IRRIGATION
NEBRASKA STATE PLANNING BOARD
W. P. A. O. P. NO. 465-81-3-155



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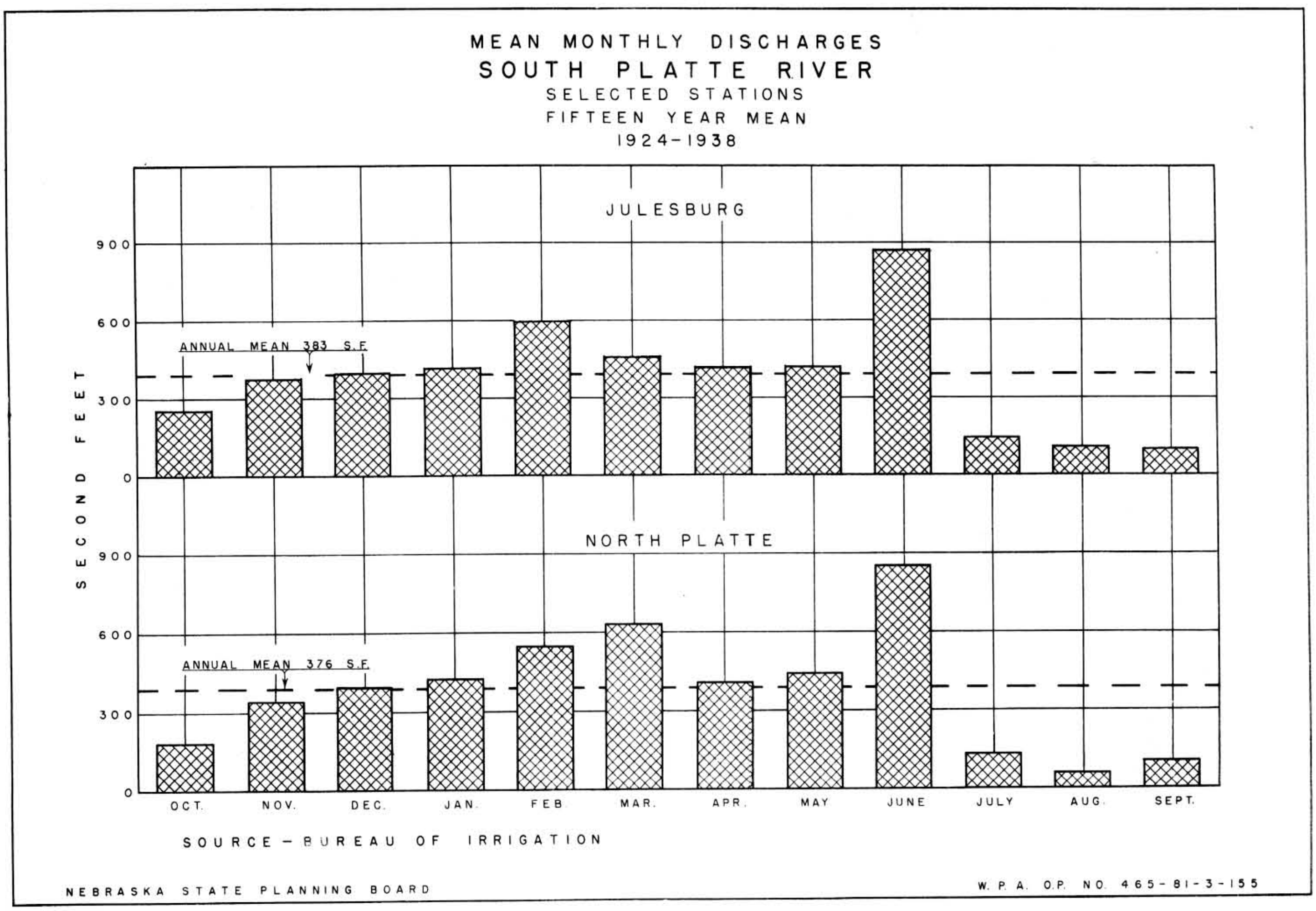
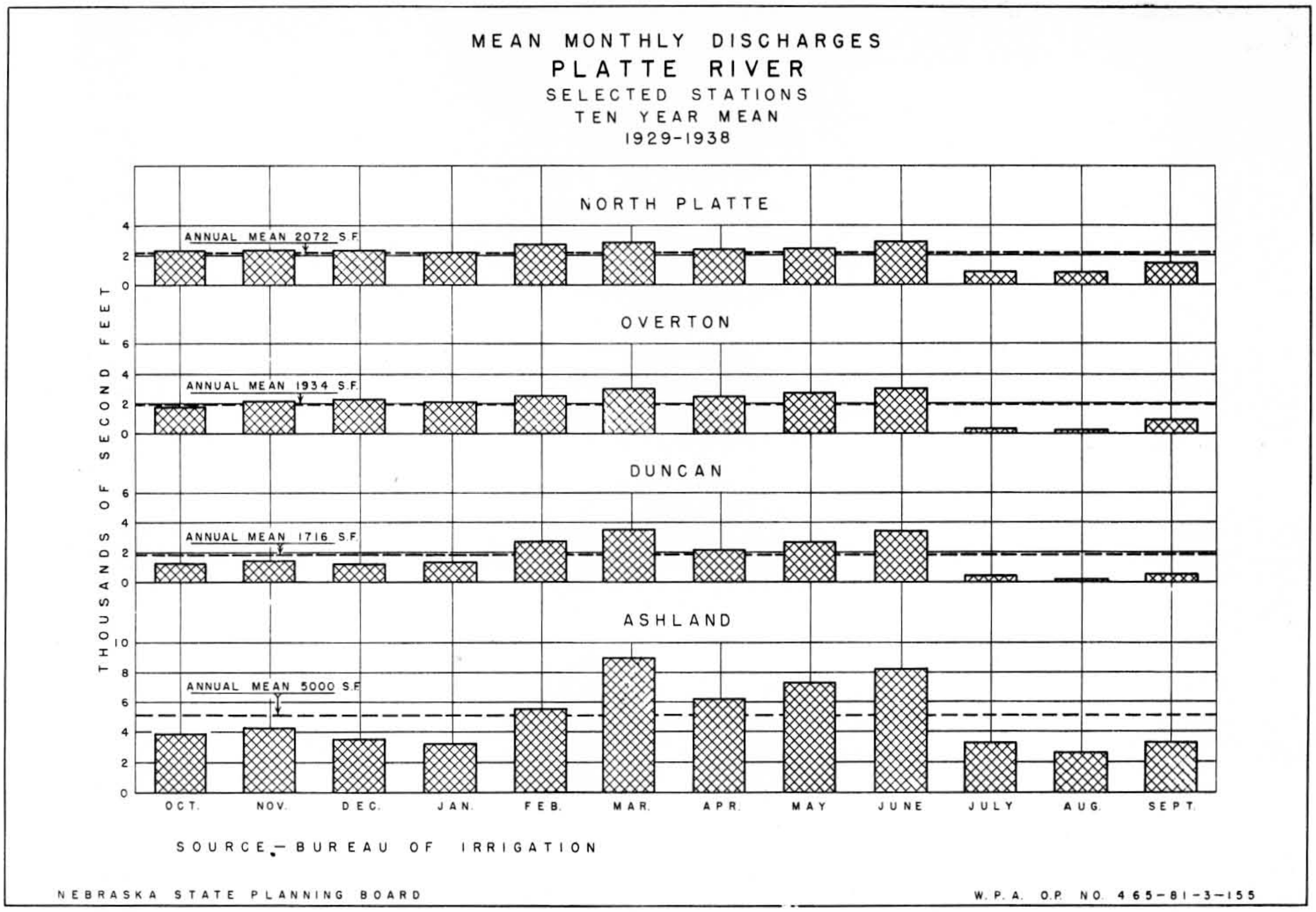
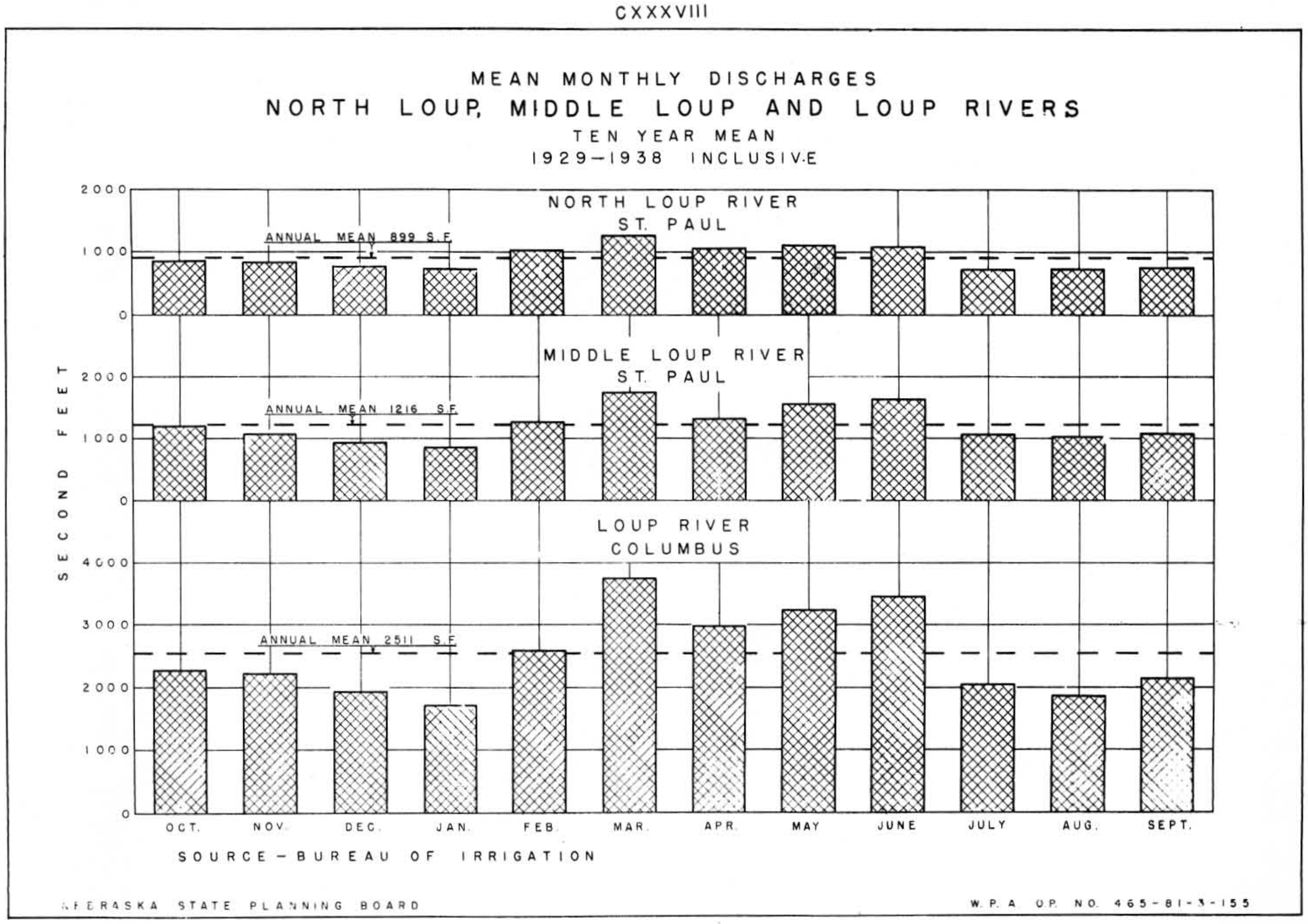
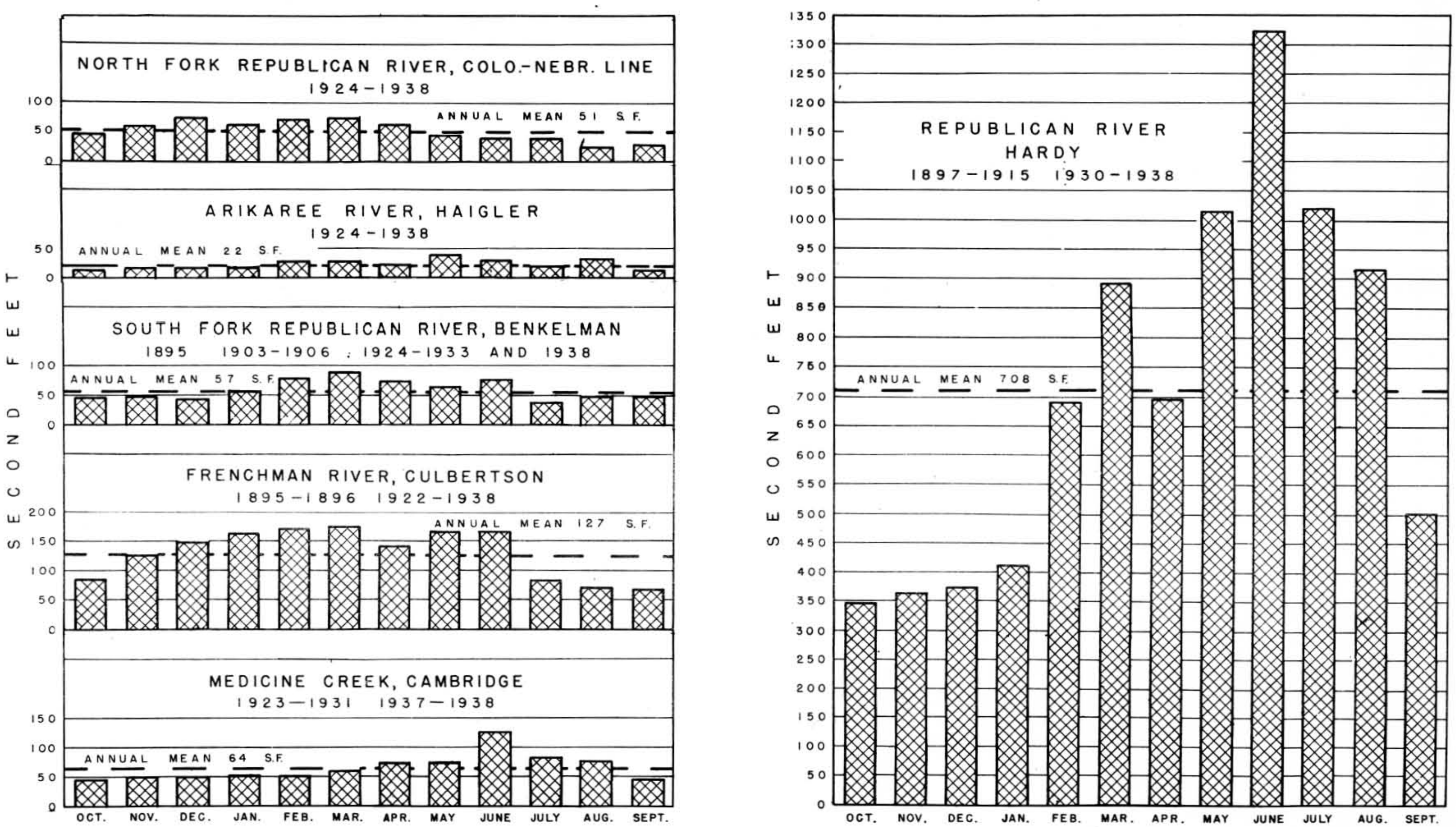


CXXXVII


MEAN MONTHLY DISCHARGES
PLATTE RIVER
SELECTED STATIONS
TEN YEAR MEAN
1929-1938
NORTH PLATTE
ANNUAL MEAN 2072 S.F.
OVERTON
ANNUAL MEAN 1934 S.F.
DUNCAN
ANNUAL MEAN 1716 S.F.
ASHLAND
ANNUAL MEAN 5000 S.F.
THOUSANDS OF SECOND FEET
OCT.
NOV.
DEC.
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
SOURCE — BUREAU OF IRRIGATION
NEBRASKA STATE PLANNING BOARD
W. P. A. O.P. NO. 465-81-3-155


MEAN MONTHLY DISCHARGES
NORTH LOUP, MIDDLE LOUP AND LOUP RIVERS
TEN YEAR MEAN
1929—1938 INCLUSIVE
NORTH LOUP RIVER
ST. PAUL
ANNUAL MEAN 899 S.F.
MIDDLE LOUP RIVER
ST. PAUL
ANNUAL MEAN 1216 S.F.
LOUP RIVER
COLUMBUS
ANNUAL MEAN 2511 S.F.
SECOND FEET
OCT.
NOV.
DEC.
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
SOURCE — BUREAU OF IRRIGATION
NEBRASKA STATE PLANNING BOARD
W. P. A. O.P. NO. 465-81-3-155

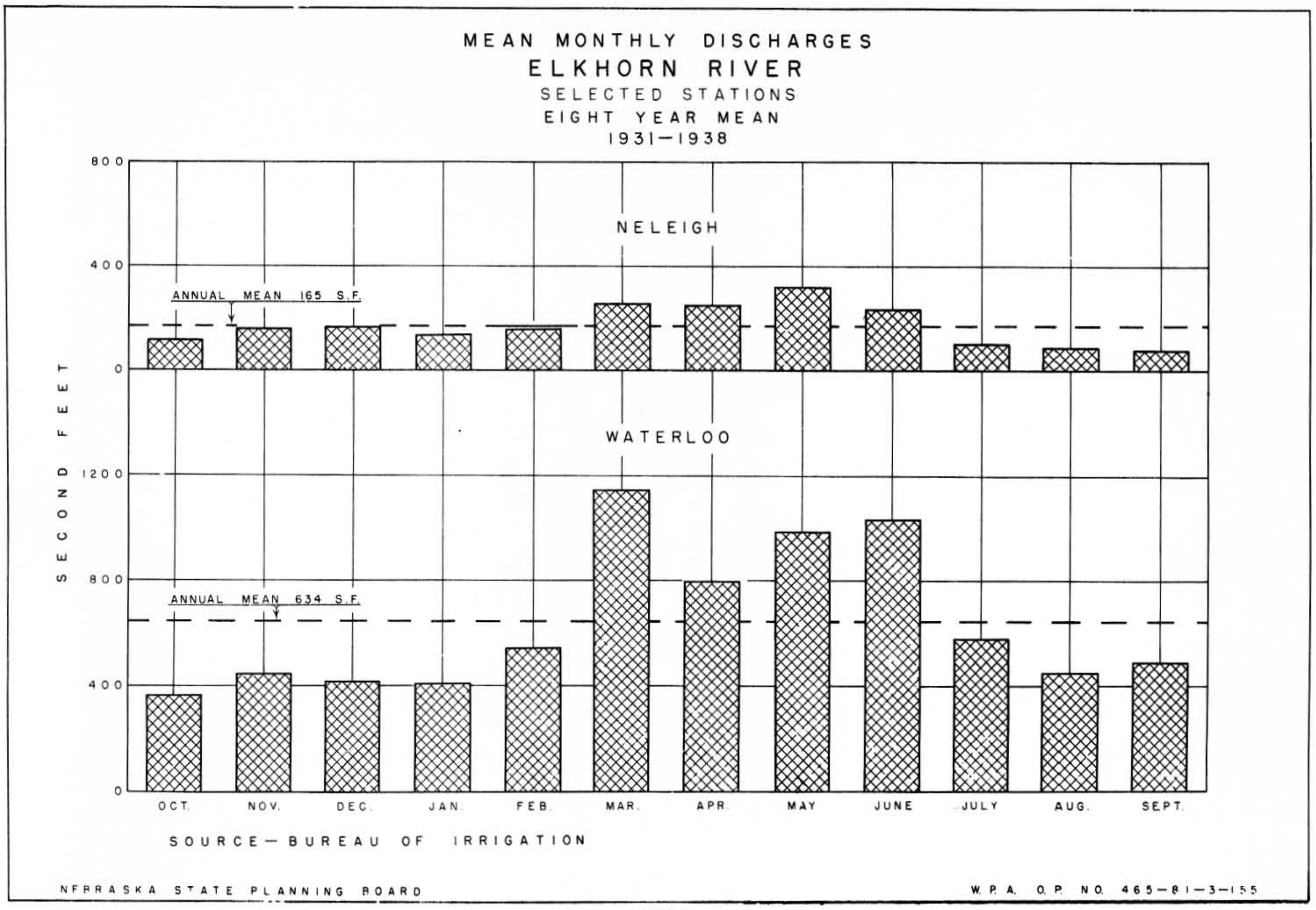
MEAN MONTHLY DISCHARGES
REPUBLICAN RIVER BASIN
FOR YEARS AS INDICATED



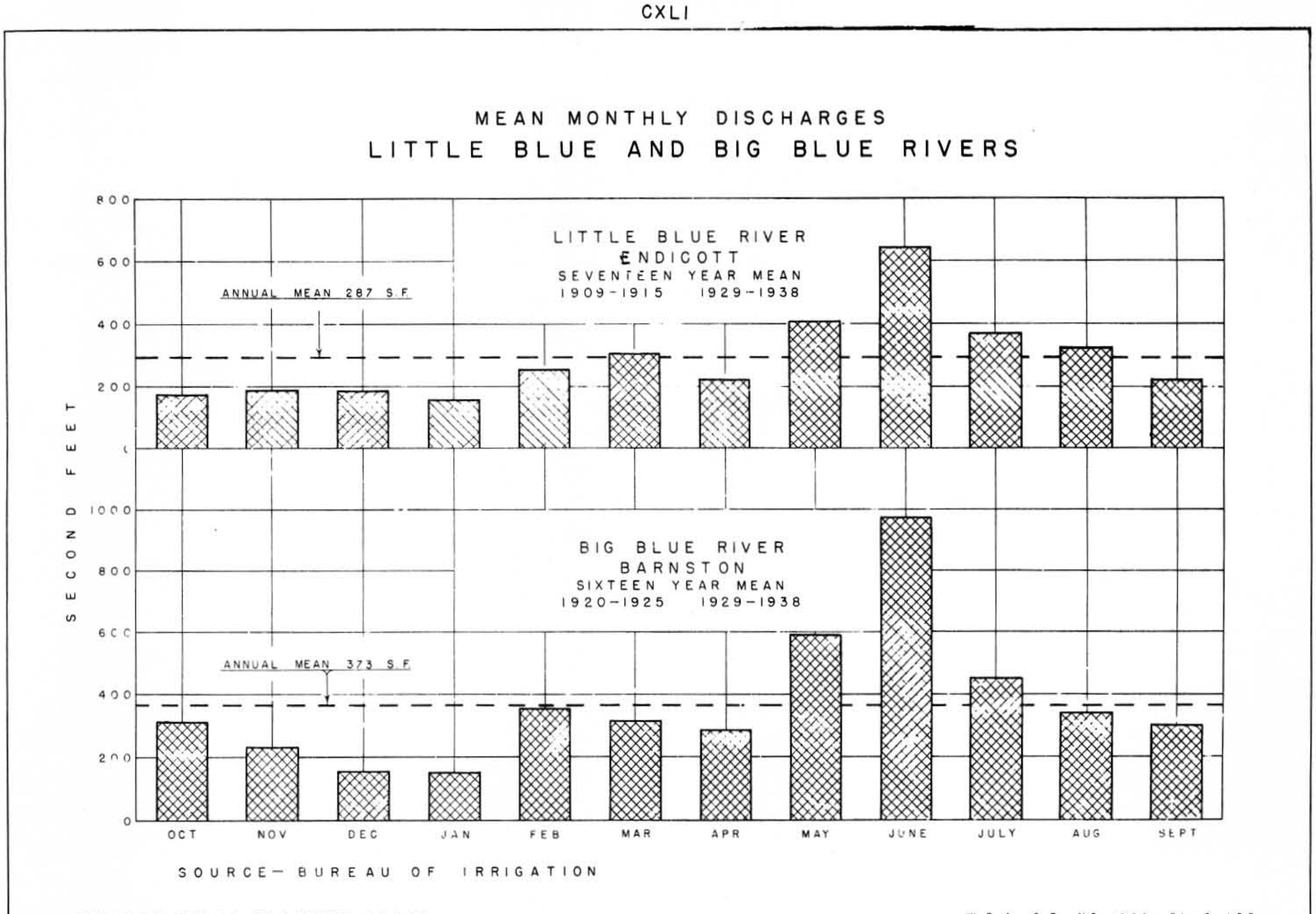
SOURCE—BUREAU OF IRRIGATION

NEBRASKA STATE PLANNING BOARD

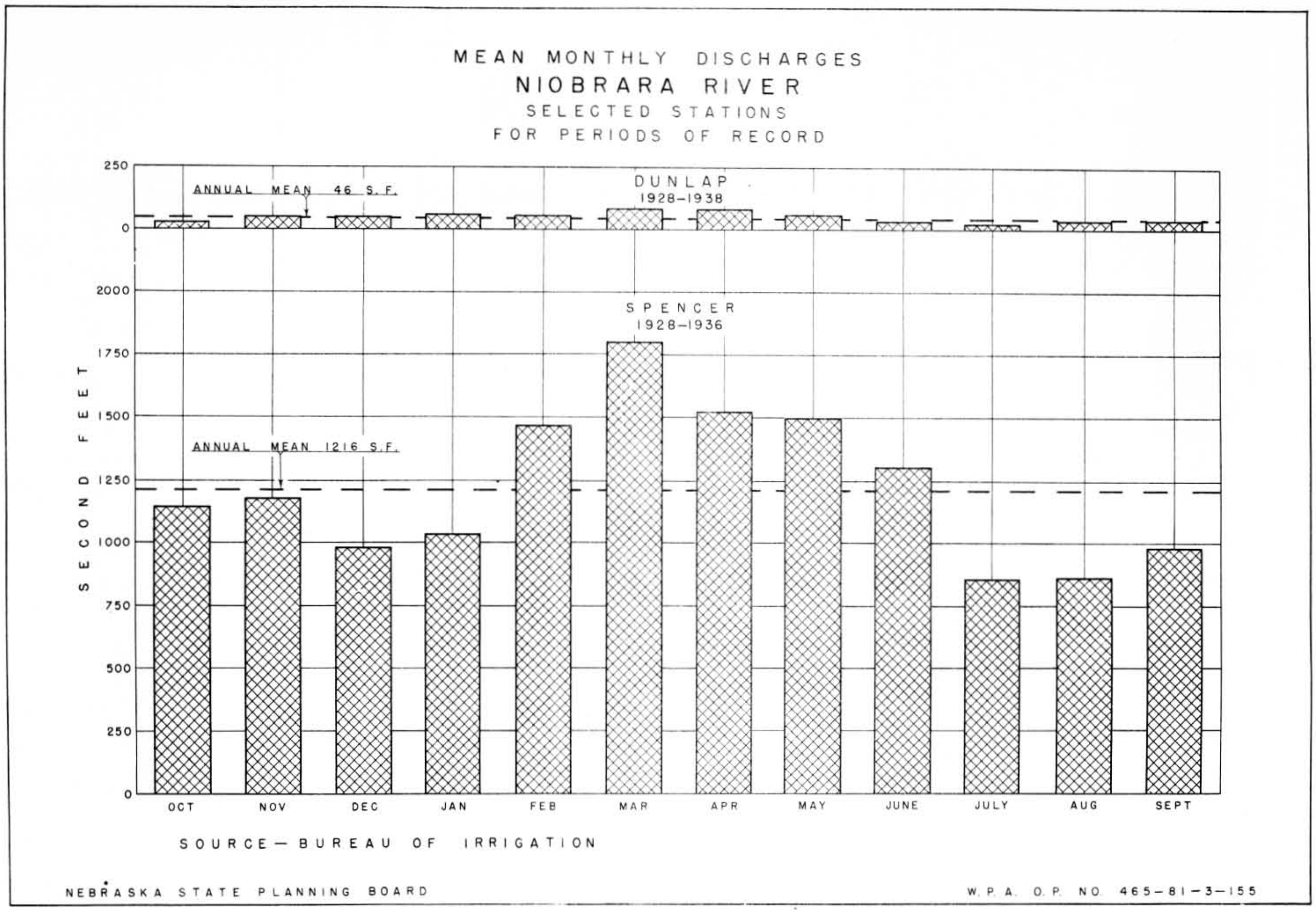
W. P. A. O. P. NO. 465—81—3—155


MEAN MONTHLY DISCHARGES
ELKHORN RIVER
SELECTED STATIONS
EIGHT YEAR MEAN
1931—1938
NELEIGH
ANNUAL MEAN 165 S.F.
WATERLOO
ANNUAL MEAN 634 S.F.
SECOND FEET
800
400
0
1200
800
400
0
OCT.
NOV.
DEC.
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
SOURCE— BUREAU OF IRRIGATION
NEBRASKA STATE PLANNING BOARD
W. P. A. O. P. NO. 465-81-3-155

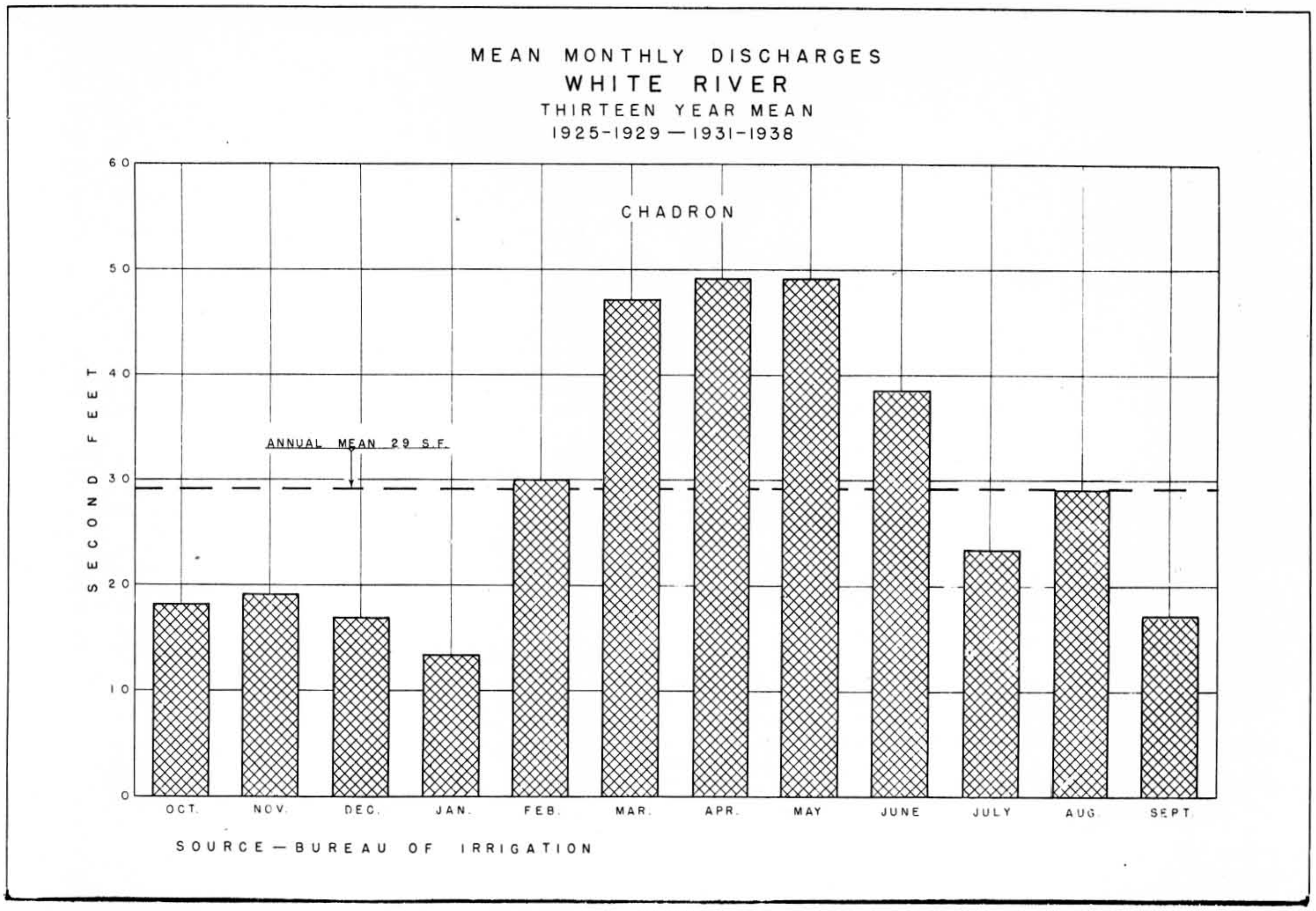
CXLI


MEAN MONTHLY DISCHARGES
LITTLE BLUE AND BIG BLUE RIVERS
LITTLE BLUE RIVER
ENDICOTT
SEVENTEEN YEAR MEAN
1909-1915 1929-1938
ANNUAL MEAN 287 S.F.
BIG BLUE RIVER
BARNSTON
SIXTEEN YEAR MEAN
1920-1925 1929-1938
ANNUAL MEAN 373 S.F.
SECOND FEET
800
600
400
200
1000
800
600
400
200
0
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
SOURCE— BUREAU OF IRRIGATION
NEBRASKA STATE PLANNING BOARD

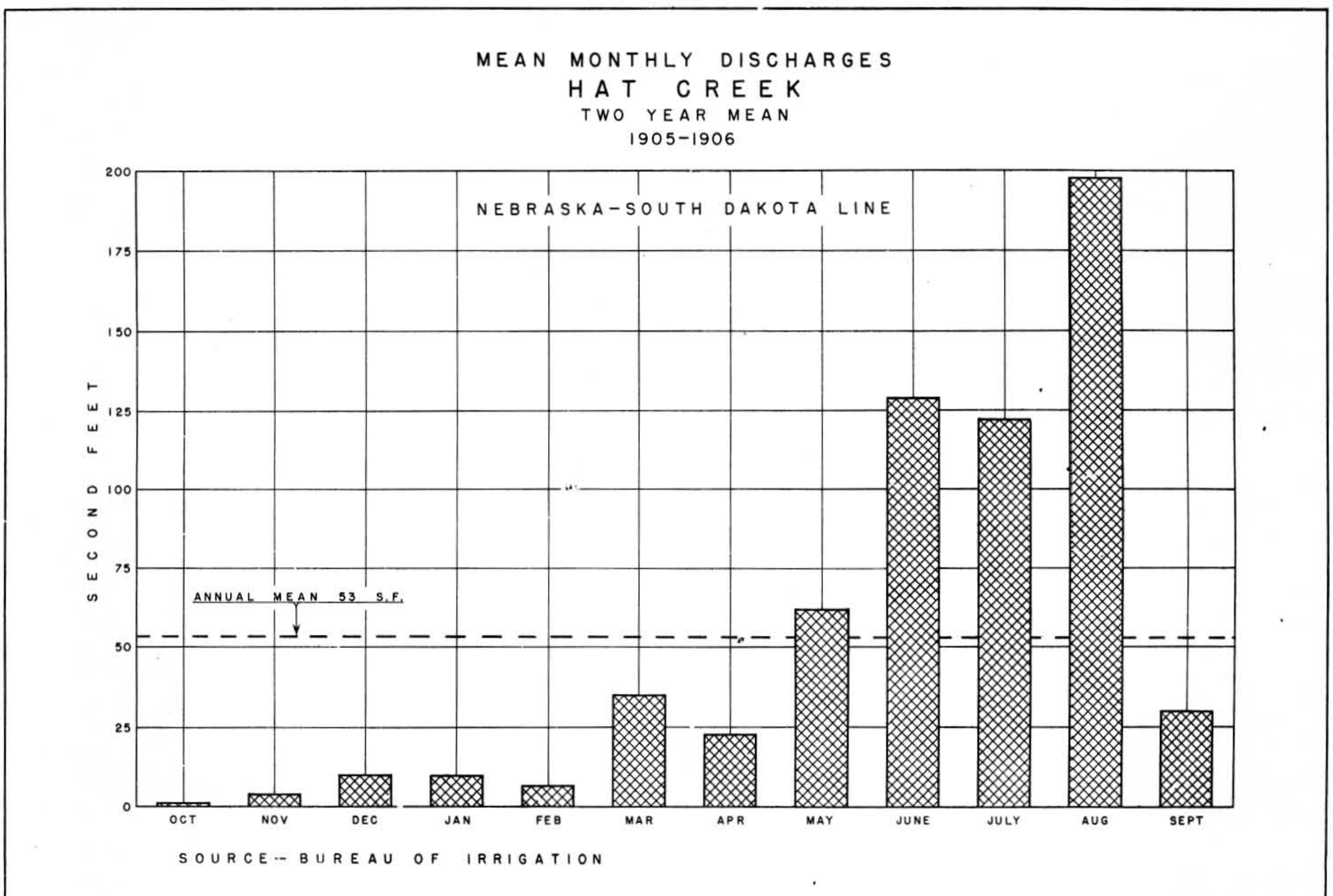
CXLII


MEAN MONTHLY DISCHARGES
NIOBRARA RIVER
SELECTED STATIONS
FOR PERIODS OF RECORD
DUNLAP
1928-1938
ANNUAL MEAN 46 S.F.
SPENCER
1928-1936
ANNUAL MEAN 1216 S.F.
SECOND FEET
250
0
2000
1750
1500
1250
1000
750
500
250
0
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
SOURCE — BUREAU OF IRRIGATION
NEBRASKA STATE PLANNING BOARD
W. P. A. O. P. NO. 465-81-3-155


MEAN MONTHLY DISCHARGES
MISSOURI RIVER
TEN YEAR MEAN
1929-1938
OMAHA
ANNUAL MEAN 23,382 S.F.
THOUSANDS OF SECOND FEET
60
50
40
30
20
10
0
OCT.
NOV.
DEC.
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
SOURCE — BUREAU OF IRRIGATION
NEBRASKA STATE PLANNING BOARD
W. P. A. O. P. NO. 465-81-3-155



CXLV



NEBRASKA STATE PLANNING BOARD W. P. A. O. P. NO. 465-81-3-155

CXLVI

WATER DIVERTED FOR IRRIGATION FROM THE
NORTH PLATTE AND PLATTE RIVERS BETWEEN
GUERNSEY, WYOMING AND OVERTON, NEBRASKA
May - September, 1925 - 1938
Values in Acre-feet

Location	May	June	July	Aug.	Sept.	Totals
1925						
Guernsey-Whalen	108,763	142,098	185,222	174,138	135,768	745,989
Whalen-Mitchell	40,440	83,797	102,954	94,303	52,290	373,784
Mitchell-Melbeta	5,940	8,943	12,455	8,707	6,736	42,781
Melbeta-Bridgeport	4,324	13,752	21,670	12,960	12,242	64,948
Bridgeport-Lemoyne	5,023	4,497	11,877	5,663	4,287	31,347
Lemoyne-North Platte	6,249	22,332	28,842	29,033	14,793	101,249
North Platte-Overton	7,677	23,824	24,225	31,433	22,178	109,337
Totals	178,416	299,243	387,245	356,237	248,294	1,469,435
1926						
Guernsey-Whalen	102,249	145,937	174,879	186,905	136,593	746,563
Whalen-Mitchell	55,372	46,347	93,527	109,204	73,211	377,661
Mitchell-Melbeta	5,693	7,355	10,583	13,244	7,783	44,658
Melbeta-Bridgeport	6,600	11,421	18,274	19,308	10,242	65,845
Bridgeport-Lemoyne	4,042	9,664	6,458	10,566	6,214	36,944
Lemoyne-North Platte	21,894	19,992	22,755	29,827	18,445	112,913
North Platte-Overton	19,831	27,708	24,868	41,264	24,894	138,565
Totals	215,681	268,424	351,344	410,318	277,382	1,523,149
1927						
Guernsey-Whalen	71,035	139,787	199,491	156,529	144,317	711,159
Whalen-Mitchell	12,214	73,934	109,280	81,324	83,382	360,134
Mitchell-Melbeta	188	7,418	13,853	12,914	11,094	45,467
Melbeta-Bridgeport	992	8,632	19,170	15,135	12,087	56,016
Bridgeport-Lemoyne	191	8,310	13,312	9,199	4,882	35,894
Lemoyne-North Platte	6,480	21,011	35,824	16,595	17,597	97,507
North Platte-Overton	8,856	15,417	38,863	30,157	31,356	124,649
Totals	99,956	274,509	429,793	321,853	304,715	1,430,826
1928						
Guernsey-Whalen	134,355	114,894	181,702	200,518	172,847	804,316
Whalen-Torrington	9,223	11,245	12,052	12,052	11,662	56,234
Torrington-Mitchell	66,839	67,830	72,558	103,364	101,923	412,514
Mitchell-Melbeta	3,504	8,032	8,731	13,097	11,900	45,264
Melbeta-Bridgeport	7,932	9,044	11,806	18,447	12,435	59,664
Bridgeport-Oshkosh	1,721	5,295	2,090	7,440	9,877	26,423
Oshkosh-North Platte	24,702	24,573	27,240	33,327	25,347	135,189
North Platte-Overton	27,609	23,681	48,577	53,373	48,373	201,613
Totals	275,885	264,594	364,756	441,618	394,364	1,741,217
1929						
Guernsey-Whalen	83,089	147,133	220,003	223,155	124,237	797,617
Whalen-Torrington	2,271	9,663	11,548	12,502	3,848	39,832
Torrington-Mitchell	28,102	83,032	118,188	119,586	68,090	416,998
Mitchell-Melbeta	1,059	2,173	13,844	15,995	8,577	41,648
Melbeta-Bridgeport	1,741	14,335	26,313	18,540	5,870	66,799
Bridgeport-Oshkosh	1,632	6,693	7,133	6,043	3,099	24,600
Oshkosh-North Platte	9,962	26,938	38,209	37,735	19,960	132,804
North Platte-Overton	0	12,147	46,439	57,553	32,422	148,561
Totals	127,856	302,114	481,677	491,109	266,103	1,668,859
1930						
Guernsey-Whalen	86,778	168,939	223,332	182,376	128,183	789,608
Whalen-Torrington	1,020	10,144	12,528	9,061	7,450	40,203
Torrington-Mitchell	31,125	80,303	101,805	84,782	72,574	370,589
Mitchell-Melbeta	143	6,392	14,064	8,991	8,049	37,639
Melbeta-Bridgeport	434	9,201	22,689	10,773	4,590	47,687
Bridgeport-Oshkosh	0	3,328	6,243	6,117	3,866	19,554
Oshkosh-North Platte	4,501	12,852	28,206	33,091	20,311	98,961
North Platte-Overton	0	389	17,583	35,923	19,777	73,672
Totals	124,001	291,548	426,450	371,114	264,800	1,477,913
1931						
Guernsey-Whalen	114,570	205,830	196,290	181,600	44,480	742,770
Whalen-State Line	9,370	26,060	23,370	22,420	14,470	95,690
State Line-Mitchell	31,390	93,600	93,200	86,820	54,090	359,100
Mitchell-Melbeta	5,370	16,070	15,970	16,270	9,890	63,570
Melbeta-Bridgeport	3,690	20,770	22,220	19,630	14,530	80,840
Bridgeport-Oshkosh	3,330	13,690	8,790	11,360	7,760	44,930
Oshkosh-North Platte	14,390	37,150	29,350	37,750	31,210	149,850
North Platte-Overton	13,570	24,560	12,470	12,920	27,990	91,510
Totals	195,680	437,730	401,660	388,770	204,420	1,628,260
1932						
Guernsey-Whalen	95,330	178,610	219,370	178,670	176,660	848,640
Whalen-State Line	4,420	23,590	27,560	25,160	17,320	98,050
State Line-Mitchell	26,500	85,800	98,600	93,400	78,800	383,100
Mitchell-Minatare	4,130	15,500	17,200	15,100	10,900	62,830
Minatare-Bridgeport	6,100	18,600	23,800	18,600	16,800	83,900
Bridgeport-Oshkosh	5,700	10,700	10,800	13,400	10,300	50,900
Oshkosh-North Platte	29,200	34,800	45,400	39,800	34,300	183,500
North Platte-Overton	33,500	21,900	48,100	47,100	43,600	194,200
Totals	204,880	389,500	490,830	431,230	388,680	1,905,120
1933						
Guernsey-Whalen	71,200	182,000	218,570	216,190	154,930	842,890
Whalen-State Line	4,865	22,240	25,800	25,310	18,250	96,465
State Line-Mitchell	21,800	90,200	98,400	93,800	65,200	369,400
Mitchell-Minatare	2,700	15,300	16,000	13,900	9,000	56,900
Minatare-Bridgeport	4,400	18,800	26,300	19,900	6,400	75,800
Bridgeport-Oshkosh	3,100	11,300	12,500	11,100	3,000	41,000
Oshkosh-North Platte	12,000	35,000	43,800	30,400	18,800	140,000
North Platte-Overton	18,700	28,700	43,400	45,400	45,300	181,500
Totals	138,765	403,540	484,770	456,000	320,880	1,803,955
1934						
Guernsey-Whalen	69,970	61,080	66,300	105,820	12,240	315,410
Whalen-State Line	21,280	19,200	14,890	17,910	15,230	88,510
State Line-Mitchell	38,000	57,140	46,710	20,720	23,270	185,840
Mitchell-Minatare	14,690	11,120	14,170	13,970	11,630	65,580
Minatare-Bridgeport	8,650	14,500	13,050	12,340	12,440	60,980
Bridgeport-Oshkosh	3,170	5,300	4,140	5,730	7,560	25,900
Oshkosh-North Platte	26,270	22,180	15,060	14,390	16,860	94,760
North Platte-Overton	35,550	25,510	4,320	1,970	14,870	82,220
Totals	217,580	216,030	178,640	192,850	114,100	919,200
1935						
Guernsey-Whalen	26,743	71,016	190,588	178,253	62,656	529,256
Whalen-State Line	9,789	5,994	24,926	18,837	11,924	71,470
State Line-Mitchell	9,974	30,217	87,991	70,357	55,383	253,922
Mitchell-Minatare	2,348	5,114	15,444	15,489	11,841	50,236
Minatare-Bridgeport	1,031	5,022	17,481	6,498	18,233	48,265
Bridgeport-Lisco	3,197	2,172	5,966	3,922	7,677	22,934
Lisco-Oshkosh	26	82	168	327	1,446	2,049
Oshkosh-North Platte	8,946	4,661	25,336	23,478	28,396	90,817
North Platte-Overton	22,678	3,092	20,038	9,656	15,797	71,261
Totals	84,732	127,370	387,938	326,817	213,353	1,140,210
1936						
Guernsey-Whalen	151,250	120,600	155,810	155,940	59,200	642,800
Whalen-State Line	25,050	20,620	21,485	17,780	12,335	97,270
State Line-Mitchell	61,299	65,502	83,398	70,364	50,615	331,178
Mitchell-Minatare	11,386	12,650	14,842	12,995	12,098	63,971
Minatare-Bridgeport	10,060	18,522	7,196	11,775	14,440	61,993
Bridgeport-Lisco	4,915	8,092	4,261	4,629	5,630	27,527
Lisco-Oshkosh	191	498	0	483	250	1,422
Oshkosh-North Platte	19,320	19,780	18,426	26,009	21,963	105,498
North Platte-Overton	28,264	12,990	14,407	8,497	3,652	167,810
Totals	311,735	279,254	319,826	308,472	180,183	1,399,469
1937						
Guernsey-Whalen	100,190	138,060	191,070	211,780	159,810	800,910
Whalen-State Line	19,530	18,477	25,762	25,643	12,353	101,765
State Line-Mitchell	50,692	59,036	88,014	85,116	55,813	338,671
Mitchell-Minatare	10,064	8,998	16,765	16,302	10,395	62,524
Minatare-Bridgeport	11,702	13,597	21,991	19,220	11,868	78,378
Bridgeport-Lisco	4,936	5,121	10,062	6,643	4,276	31,038
Lisco-Oshkosh	1,507	1,803	1,563	391	1,401	6,665
Oshkosh-North Platte	32,207	23,540	37,913	32,117	21,947	147,724
North Platte-Overton	31,332	18,893	19,644	8,041	24,482	102,392
Totals	262,160	287,525	412,784	405,253	302,345	1,670,067
1938						
Guernsey-Whalen	95,560	139,810	192,090	211,150	130,490	769,100
Whalen-State Line	8,814	19,500	25,972	23,803	13,918	92,007
State Line-Mitchell	15,197	58,745	71,257	84,318	42,973	272,490
Mitchell-Minatare	3,127	10,182	9,062	13,544	3,766	39,681
Minatare-Bridgeport	3,412	10,872	12,283	8,923	6,738	42,228
Bridgeport-Lisco	1,161	2,248	2,230	3,898	1,684	11,221
Lisco-Oshkosh	0	32	188	60	756	1,036
Oshkosh-North Platte	11,570	17,416	29,389	17,941	11,331	87,647
North Platte-Overton	23,186	22,208	32,457	5,685	29,796	113,332
Totals	162,027	281,013	374,928	369,322	241,452	1,428,742

Source: Nebraska Bureau of Irrigation

SECTIONAL RUN-OFF
PLATTE RIVER BASIN
1928

Stream and Station	Drainage Area (Sq.Mi.)	Drainage Area of Section (Sq.Mi.)	Discharge Passing Station (Sq.Mi.)	Diverted in Section (A. F.)	Available in Section (A. F.)	Total Sectional Increase (A. F.)	Run-off Per Sq. Mile (A. F.)	Depth of Run-off (In.)
NORTH PLATTE RIVER								
Northgate, Colo.	1,440	1,440	493,000	N.R.	493,000	493,000	342	6.4
Saratoga, Wyo.	2,880	1,440	1,248,900	N.R.	1,248,900	755,900	525	9.8
Pathfinder (Inflow)	10,700	7,820	1,725,283	N.R.	1,725,283	476,383	61	1.1
Whalen (Above)	16,300	5,600	2,012,300	*883,760	2,896,060	1,170,777	209	3.9
State Line	22,100	5,800	'1,654,000	71,005	**1,725,005	**569,861	98	1.8
Mitchell	24,300	2,200	1,637,322	397,743	2,035,065	381,065	173	3.2
Minatare	24,700	400	1,869,046	53,883	1,922,929	285,607	714	13.4
Bridgeport	25,300	600	2,155,465	54,859	2,210,324	341,278	569	10.7
North Platte	32,000	6,700	2,635,023	161,575	2,796,598	641,133	96	1.8
PLATTE RIVER								
Overton	58,400	26,400	3,074,937	166,971	3,241,908	606,885	23	0.4
Duncan	61,600	3,200	N.R.	0				
Ashland	83,800	22,200	N.R.	0				
Total	83,800	83,800		1,789,796			2,810	
Mean					(To Overton)	5,721,889	179	3.4

31 per cent of total annual supply above Overton diverted

1929

Stream and Station	Drainage Area (Sq.Mi.)	Drainage Area of Section (Sq.Mi.)	Discharge Passing Station (Sq.Mi.)	Diverted in Section (A. F.)	Available in Section (A. F.)	Total Sectional Increase (A. F.)	Run-off Per Sq. Mile (A. F.)	Depth of Run-off (In.)
NORTH PLATTE RIVER								
Northgate, Colo.	1,440	1,440	522,000	N.R.	522,000	522,000	363	6.8
Saratoga, Wyo.	2,880	1,440	1,219,100	N.R.	1,219,100	697,100	484	9.1
Pathfinder (Inflow)	10,700	7,820	1,902,430	N.R.	1,902,430	683,330	87	1.6
Whalen (Above)	16,300	5,600	2,143,700	*843,550	2,987,250	1,084,820	194	3.6
State Line	22,100	5,800	1,794,400	85,241	**1,879,641	**583,244	101	1.9
Mitchell	24,300	2,200	1,699,811	371,589	2,071,400	277,000	125	2.3
Minatare	24,700	400	2,035,167	50,137	2,085,304	385,493	964	18.1
Bridgeport	25,300	600	2,323,706	61,169	2,384,875	349,708	583	10.9
Oshkosh	27,500	2,200	2,371,975	36,149	2,408,124	84,418	38	0.7
North Platte	32,000	4,500	2,606,038	127,016	2,733,054	361,079	80	1.5
PLATTE RIVER								
Overton	58,400	26,400	2,898,660	152,970	3,051,570	445,532	17	0.3
Duncan	61,600	3,200	2,317,900	0	2,317,900	0	0	0
Ashland	83,800	22,200	4,922,500	0	4,922,500	2,604,600	117	2.2
Total	83,800	83,800		1,727,821		8,078,324	3,153	
Mean							96	1.8
					(To Overton)	5,473,724		

32 per cent of total annual supply above Overton diverted

(Continued)

1930

Stream and Station	Drainage Area (Sq.Mi.)	Drainage Area of Section (Sq.Mi.)	Discharge Passing Station (Sq.Mi.)	Diverted in Section (A. F.)	Available in Section (A. F.)	Total Sectional Increase (A. F.)	Run-off Per Sq. Mile (A. F.)	Depth of Run-off (In.)
NORTH PLATTE RIVER								
Northgate, Colo.	1,440	1,440	345,200	N.R.	345,200	345,200	240	4.5
Saratoga, Wyo.	2,880	1,440	690,900	N.R.	690,900	345,700	240	4.5
Pathfinder (Inflow)	10,700	7,820	1,072,534	N.R.	1,072,534	381,634	49	0.9
Whalen (Above)	16,300	5,600	1,458,029	*863,980	2,322,009	1,249,475	223	4.2
State Line	22,100	5,800	910,100	47,892	**957,992	**356,934	62	1.7
Mitchell	24,300	2,200	984,992	362,900	1,347,892	437,792	199	3.7
Minatare	24,700	400	1,245,438	43,353	1,288,791	303,799	759	14.0
Bridgeport	25,300	600	1,609,646	50,487	1,660,133	414,695	691	13.0
Oshkosh	27,500	2,200	1,741,211	26,060	1,767,271	157,625	72	1.4
North Platte	32,000	4,500	1,921,312	98,961	2,020,273	279,062	62	1.2
PLATTE RIVER								
Overton	58,400	26,400	2,356,641	74,119	2,430,760	509,448	19	0.4
Duncan	61,600	3,200	'1,786,470	0	1,786,470	0	0	0
Ashland	83,800	22,200	4,779,000	0	4,779,000	2,982,530	134	2.5
Total	83,800	83,800		1,567,752		7,763,894	2,750	
Mean							93	1.7
					(To Overton)	4,781,364		

33 per cent of total annual supply above Overton diverted

1931

Stream and Station	Drainage Area (Sq.Mi.)	Drainage Area of Section (Sq.Mi.)	Discharge Passing Station (Sq.Mi.)	Diverted in Section (A. F.)	Available in Section (A. F.)	Total Sectional Increase (A. F.)	Run-off Per Sq. Mile (A. F.)	Depth of Run-off (In.)
NORTH PLATTE RIVER								
Northgate, Colo.	1,440	1,440	182,370	N.R.	182,370	182,370	127	2.4
Saratoga, Wyo.	2,880	1,440	480,200	N.R.	480,200	297,830	207	3.9
Pathfinder (Inflow)	10,700	7,820	705,705	N.R.	705,705	225,505	29	0.5
Whalen (Above)	16,300	5,600	1,258,400	765,040	2,023,440	1,317,735	235	4.4
State Line	22,100	5,800	681,700	95,690	**777,390	**337,390	58	1.1
Mitchell	24,300	2,200	671,000	359,002	1,030,002	348,302	158	3.0
Minatare	24,700	400	839,900	63,566	903,466	232,466	581	10.9
Bridgeport	25,300	600	1,100,000	80,840	1,180,840	340,940	568	10.6
Oshkosh	27,500	2,200	1,260,000	35,630	1,295,630	195,630	89	1.7
North Platte	32,000	4,500	1,415,040	118,220	1,533,260	273,260	61	1.1
PLATTE RIVER								
Overton	58,400	26,400	1,768,696	74,517	1,843,213	428,173	16	0.3
Duncan	61,600	3,200	1,680,000	0	1,680,000	0	0	0
Ashland	83,800	22,200	2,043,960	0	2,043,960	363,960	16	0.3
Total	83,800	83,800		1,592,505		4,543,561	2,145	
Mean							54	1.0
					(To Overton)	4,179,601		

38 per cent of total annual supply above Overton diverted

(Continued)

1932

Stream and Station	Drainage Area (Sq.Mi.)	Drainage Area of Section (Sq.Mi.)	Discharge Passing Station (Sq.Mi.)	Diverted in Section (A. F.)	Available in Section (A. F.)	Total Sectional Increase (A. F.)	Run-off Per Sq. Mile (A. F.)	Depth of Run-off (In.)
NORTH PLATTE RIVER								
Northgate, Colo.	1,440	1,440	440,140	N.R.	440,140	440,140	305	6.0
Saratoga, Wyo.	2,880	1,440	1,023,400	N.R.	1,023,400	583,260	405	7.6
Pathfinder (Inflow)	10,700	7,820	1,506,835	N.R.	1,506,835	483,435	62	1.2
Whalen (Above)	16,300	5,600	1,472,700	879,850	2,352,550	845,715	151	2.9
State Line	22,100	5,800	634,000	98,050	**732,050	**239,858	41	0.8
Mitchell	24,300	2,200	510,000	383,165	893,165	259,165	118	2.2
Minatare	24,700	400	656,480	62,937	719,417	209,417	523	9.8
Bridgeport	25,300	600	843,900	83,841	927,741	271,261	452	8.5
Oshkosh	27,500	2,200	927,000	42,879	969,879	125,979	57	1.1
North Platte	32,000	4,500	1,040,900	151,867	1,192,767	265,767	59	1.1
PLATTE RIVER								
Overton	58,400	26,400	973,400	181,153	1,154,553	113,653	4	0.1
Duncan	61,600	3,200	1,090,000	0	1,090,000	116,600	36	0.7
Ashland	83,800	22,200	4,210,000	0	4,210,000	3,120,000	141	2.6
Total	83,800	83,800		1,883,742		7,074,250	2,354	
Mean							84	1.6
					(To Overton)	3,954,250		

48 per cent of total annual supply above Overton diverted

1933

Stream and Station	Drainage Area (Sq.Mi.)	Drainage Area of Section (Sq.Mi.)	Discharge Passing Station (Sq.Mi.)	Diverted in Section (A. F.)	Available in Section (A. F.)	Total Sectional Increase (A. F.)	Run-off Per Sq. Mile (A. F.)	Depth of Run-off (In.)
NORTH PLATTE RIVER								
Northgate, Colo.	1,440	1,440	258,750	N.R.	258,750	258,750	180	3.4
Saratoga, Wyo.	2,880	1,440	679,820	N.R.	679,820	421,070	292	5.5
Pathfinder (Inflow)	10,700	7,820	1,150,300	N.R.	1,150,300	470,480	60	1.1
Whalen (Above)	16,300	5,600	1,537,280	872,906	2,410,186	1,259,886	225	4.2
State Line	22,100	5,800	784,200	96,465	**880,665	**306,495	53	0.1
Mitchell	24,300	2,200	671,600	369,500	1,041,100	256,900	116	2.1
Minatare	24,700	400	894,000	56,956	950,956	279,356	698	13.1
Bridgeport	25,300	600	1,130,000	75,760	1,205,760	311,760	519	9.7
Oshkosh	27,500	2,200	1,300,000	30,764	1,330,764	200,764	91	1.7
North Platte	32,000	4,500	1,620,000	115,644	1,735,644	435,644	97	1.8
PLATTE RIVER								
Overton	58,400	26,400	1,520,000	158,216	1,678,216	58,216	2	0.0
Duncan	61,600	3,200	1,133,569	0	1,133,569	0	0	0
Ashland	83,800	22,200	3,450,000	0	3,450,000	2,316,431	104	2.0
Total	83,800	83,800		1,776,211		6,575,752	2,437	
Mean							78	1.5
					(To Overton)	4,259,321		

42 per cent of annual supply above Overton diverted.

(Continued)

1934

Stream and Station	Drainage Area (Sq.Mi.)	Drainage Area of Section (Sq.Mi.)	Discharge Passing Station (Sq.Mi.)	Diverted in Section (A. F.)	Available in Section (A. F.)	Total Sectional Increase (A. F.)	Run-off Per Sq. Mile (A. F.)	Depth of Run-off (In.)
NORTH PLATTE RIVER								
Northgate, Colo.	1,440	1,440	89,100	N.R.	89,100	89,100	62	1.2
Saratoga, Wyo.	2,880	1,440	238,600	N.R.	238,600	149,500	104	2.0
Pathfinder (Inflow)	10,700	7,820	382,230	N.R.	382,230	143,630	18	0.3
Whalen (Above)	16,300	5,600	602,390	443,795	1,046.185	663.955	45	0.8
State Line	22,100	5,800	360,300	'88,510	**448,810	**259.210	46	0.7
Mitchell	24,300	2,200	357,400	185,840	543,240	182,940	83	1.6
Minatare	24,700	400	487,900	65,580	553,480	196,080	490	9.2
Bridgeport	25,300	600	663,600	60,980	724,580	236,680	394	7.4
Oshkosh	27,500	2,200	815,700	25,900	841,600	178,000	81	1.5
North Platte	32,000	4,500	1,025,000	94,760	1,119,760	304,060	68	1.3
PLATTE RIVER								
Overton	58,400	26,400	899,000	82,220	981,220	0	0	0
Duncan	61,600	3,200	835,900	0	835,900	0	0	0
Ashland	83,800	22,200	2,467,000	0	2,467,000	1,631,100	73	1.4
Total	83,800	83,800		1,047,585		4,034,255	1,464	
Mean							48	1.0
					(To Overton)	2,302,945		

45 per cent of total annual supply above Overton diverted

1935

Stream and Station	Drainage Area (Sq.Mi.)	Drainage Area of Section (Sq.Mi.)	Discharge Passing Station (Sq.Mi.)	Diverted in Section (A. F.)	Available in Section (A. F.)	Total Sectional Increase (A. F.)	Run-off Per Sq. Mile (A. F.)	Depth of Run-off (In.)
NORTH PLATTE RIVER								
Northgate, Colo.	1,440	1,440	200,830	N.R.	200,830	200,830	139	2.6
Saratoga, Wyo.	2,880	1,440	528,120	N.R.	528,120	327,290	227	4.3
Pathfinder (Inflow)	10,700	7,820	696,160	N.R.	696,160	168,040	21	0.4
Whalen (Above)	16,300	5,600	831,640	557,011	1,388,651	692,491	124	2.3
State Line	22,100	5,800	425,800	71,470	**497,270	**235,660	41	0.8
Mitchell	24,300	2,200	296,300	253,922	550,222	124,422	57	1.1
Minatare	24,700	400	427,000	50,236	477,236	180,936	452	8.5
Bridgeport	25,300	600	581,600	47,645	629,245	202,245	337	6.3
Oshkosh	27,500	2,200	702,500	20,160	722,660	141,060	64	1.2
North Platte	32,000	4,500	933,800	69,800	1,003,735	301,235	67	1.3
PLATTE RIVER								
Overton	58,400	26,400	1,232,000	45,249	1,227,249	343,449	13	0.2
Duncan	61,600	3,200	1,175,000	0	1,175,000	0	0	0
Ashland	83,800	22,200	3,905,000	0	3,905,000	2,730,000	123	2.3
Total	83,800	83,800		1,115,628		5,647,658	1,665	
Mean							67	1.3
					(To Overton)	2,917,658		

38 per cent of total annual supply above Overton diverted

(Continued)

1936

Stream and Station	Drainage Area (Sq.Mi.)	Drainage Area of Section (Sq.Mi.)	Discharge Passing Station (Sq.Mi.)	Diverted in Section (A. F.)	Available in Section (A. F.)	Total Sectional Increase (A. F.)	Run-off Per Sq. Mile (A. F.)	Depth of Run-off (In.)
NORTH PLATTE RIVER								
Northgate, Colo.	1,440	1,440	332,100	N.R.	332,100	332,100	231	4.3
Saratoga, Wyo.	2,880	1,440	802,000	N.R.	802,000	469,900	326	6.1
Pathfinder (Inflow)	10,700	7,820	1,045,650	N.R.	1,045,650	243,650	31	0.6
Whalen (Above)	16,300	5,600	1,087,340	676,536	1,763,876	718,226	128	2.4
State Line	22,100	5,800	496,300	97,270	**593,570	**261,350	45	0.8
Mitchell	24,300	2,200	275,100	365,737	640,837	144,537	66	1.2
Minatare	24,700	400	391,000	68,914	459,914	184,814	462	8.7
Bridgeport	25,300	600	526,400	71,093	597,493	206,493	344	6.5
Oshkosh	27,500	2,200	605,300	40,099	645,399	118,999	54	1.0
North Platte	32,000	4,500	568,052	131,448	699,500	94,200	21	0.4
PLATTE RIVER								
Overton	58,400	26,400	592,700	112,190	704,890	136,838	5	0.1
Duncan	61,600	3,200	568,000	0	568,000	0	0	0
Ashland	83,800	22,200	2,494,000	0	2,494,000	1,926,000	87	1.6
Total	83,800	83,800		1,563,287		4,837,107	1,800	
Mean							58	1.1
					(To Overton)	2,911,107		

54 per cent of total annual supply above Overton diverted

1937

Stream and Station	Drainage Area (Sq.Mi.)	Drainage Area of Section (Sq.Mi.)	Discharge Passing Station (Sq.Mi.)	Diverted in Section (A. F.)	Available in Section (A. F.)	Total Sectional Increase (A. F.)	Run-off Per Sq. Mile (A. F.)	Depth of Run-off (In.)
NORTH PLATTE RIVER								
Northgate, Colo.	1,440	1,440	215,300	N.R.	215,300	215,300	150	2.8
Saratoga, Wyo.	2,880	1,440	645,700	N.R.	645,700	430,400	299	5.6
Pathfinder (Inflow)	10,700	7,820	1,130,600	N.R.	1,130,600	484,900	62	1.1
Whalen (Above)	16,300	5,600	1,278,810	800,910	2,079,720	949,120	170	3.2
State Line	22,100	5,800	552,200	110,211	**662,411	**283,391	49	0.9
Mitchell	24,300	2,200	372,000	338,671	710,671	158,471	72	1.4
Minatare	24,700	400	480,600	62,524	543,124	171,124	428	8.0
Bridgeport	25,300	600	620,500	78,378	698,878	218,278	364	6.8
Oshkosh	27,500	2,200	695,600	37,703	733,303	112,803	51	1.0
North Platte	32,000	4,500	683,700	147,724	831,424	135,824	30	0.6
PLATTE RIVER								
Overton	58,400	26,400	565,100	102,392	667,492	0	0	0
Duncan	61,600	3,200	371,000	0	371,000	0	0	0
Ashland	83,800	22,200	2,358,000	0	2,358,000	1,987,000	90	1.7
Total	83,800	83,800		1,678,513		5,146,611	1,765	
Mean							61	1.1
					(To Overton)	3,159,611		

53 per cent of total annual supply above Overton diverted

(Continued)

WATER APPROPRIATIONS

PLATTE RIVER BASIN

Minor Basin	Number of Appropriations	Second-feet	Average Second-feet Granted
Pumpkin Creek	48	129.13	2.69
Blue Creek	14	289.08	20.65
Birdwood Creek	3	111.57	37.19
North Platte River	182	7,981.53	43.85
Lodgepole Creek	97	162.44	1.67
South Platte River	8	239.88	29.99
Wood River	33	39.56	1.20
Platte River	115	4,412.66	38.37
Platte River Basin	500	13,365.85	26.73

LOUP RIVER BASIN

North Loup River	**48**	**479.93**	**10.00**
Middle Loup River	**33**	**498.36**	**15.10**
South Loup River	**45**	**65.91**	**1.46**
Loup River	**34**	**34.19**	**1.01**
Loup River Basin	**160**	**1,078.39**	**6.74**

REPUBLICAN RIVER BASIN

Arikaree River	1	171.00	171.00
So. Fork Republican	3	15.79	5.26
Frenchman River	51	401.82	7.88
Red Willow Creek	4	11.93	2.98
Medicine Creek	5	172.51	34.50
Republican River	150	879.79	5.87
Republican River Basin	214	1,652.84	7.72

ELKHORN RIVER BASIN

So. Fork Elkhorn River	1	33.00	33.00
No. Fork Elkhorn River	15	12.95	.86
Logan Creek	22	15.18	.69
Elkhorn River	37	170.68	4.61
Elkhorn River Basin	75	231.81	3.09

BLUE RIVER BASIN

Little Blue River	**39**	**41.45**	**1.06**
Big Blue River	**76**	**48.21**	**.63**
Blue River Basin	**115**	**89.66**	**.78**

NIOBRARA RIVER BASIN

Snake River	1	27.29	27.29
Plum Creek	3	26.86	8.95
Bone Creek	1	.14	.14
Keya Paha River	9	3.64	.40
Verdigre Creek	1	2.86	2.86
Niobrara River	151	256.72	1.70
Niobrara River Basin	166	317.51	1.91

MISSOURI RIVER BASIN ABOVE PLATTE RIVER

Missouri Above Platte*		**20.97**	**2.33**

MISSOURI RIVER BASIN BELOW PLATTE RIVER

Missouri Below Platte*		**21.89**	**2.43**

WHITE RIVER - HAT CREEK BASINS

White River*	**146**	**180.81**	**1.24**
Hat Creek*	**112**	**88.46**	**.79**

***Note: Only appropriations for water for irrigation or domestic use shown.**

APPROPRIATIONS FOR THE USE OF WATER
PUMPKIN CREEK IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Kelley Canal	D-915	5-10-86	Irrig.	Pumpkin Creek	Banner	1.45
Laing Canal	D-825	12-31-86	do	Lawrence Fork	Morrill	.50
Heard Canals 1 & 2	D-916	6- 1-87	do	Pumpkin Creek	Banner	1.29
Redington Canal	D-820	10- 9-89	do	Lawrence Fork	Morrill	.57
Logan Canal	D-902	7-16-90	do	Pumpkin Creek	Banner	4.00
Court House Rock Canal	D-840					
	D-1028	10- 6-90	do	do	Morrill	30.50
Smith-Wheeler South Canal	D-842a	10-16-90	do	do	do	1.57
Mutual Canal	D-843	11- 1-90	do	do	do	8.57
Trinnier Canal	D-849	4- 6-91	do	Greenwood Cr.	do	6.29
Crigler Canal	D-861	9-11-91	do	Lawrence Fork	do	.57
Spring Branch Canal	D-862	10-23-91	do	do	do	1.00
Nelson Canal	D-845	4- 1-92	do	Greenwood Cr.	do	3.00
Scheutz Canal	D-881	5-10-92	do	Scheutz Springs	do	.21
Capron Canal	D-890	1- 1-93	do	Greenwood Cr.	do	2.00
Meredith-Ammer Canal	D-876	2-20-93	do	Pumpkin Creek	do	14.00
Spring Branch Canal	D-893	5- 1-93	do	Lawrence Fork	do	.50
Last Chance Canal	D-883	4-12-94	do	Pumpkin Creek	do	6.47
Round House Rock Canal	D-884	5-29-94	do	do	do	2.77
Nunn Canal	D-884-R	5-29-94	do	do	do	.23
Bird Cage Canal	D-892	6- 1-95	do	Pumpkin Creek	do	1.00
Meglemre Canal	A-294	5- 6-96	do	Greenwood Cr.	do	.57
Smith-Wheeler North Canal	D-842b	6- 1-96	do	Pumpkin Creek	do	.71
Crigler Canal	A-456	11-25-98	do	Lawrence Fork	do	1.43
Niehus Canal	A-550	3-23-00	do	do	do	.86
Willow Springs Canal Number 1	A-650	1-21-02	do	Willow Creek	Banner	.57
Willow Springs Canal Number 2	A-651	1-21-02	do	do	do	.86
Spring Branch Canal	A-669	5-27-02	do	Lawrence Fork	Morrill	1.43
Peter Canal	D-913	7- 1-02	do	Pumpkin Creek	Banner	2.57
Airedale Canal No.1	A-698	1-24-03	do	do	do	5.52
Airedale Canal No.2	A-699	1-24-03	do	do	do	3.22
Scott Canal	A-711	6-24-03	do	do	do	1.31
Swanger Canal	A-851	2-28-07	do	do	Morrill	.43
Meglemre Canal	A-853	3-11-07	do	Greenwood Cr.	do	1.14
Randall Canal	A-1100	5-15-11	do	Lawrence Fork	do	2.40
Airedale Canal No.2	A-1135	10-26-11	do	Pumpkin Creek	Banner	1.48
Airedale Canal No.1	A-1380	9- 4-14	do	do	do	.51
King Canal	A-1440	12- 8-15	do	Lawrence Fork	Morrill	4.00
Airedale Canal No.3	A-1506	3-15-18	do	Pumpkin Creek	Banner	4.41
Trinnier Canal	A-1551	8-15-19	do	Greenwood Cr.	Morrill	1.65
Quinn Canal	A-1561	10-15-19	do	Pumpkin Creek	do	.23
King Canal	A-1587	7- 3-20	do	Lawrence Fork	do	1.00
Cress Canal	A-1808	5- 8-26	do	Willow Creek	Banner	1.70
Barden Pump	A-2086	6-17-29	do	Spring Creek	Morrill	.89
Sears Pump	A-2117	12-20-29	do	Pumpkin Creek	Banner	1.68
Court House Rock Enlargement	A-2315	4-11-33	do	Pumpkin Creek	Morrill	.08
Pearl Canal	A-2560	9-30-35	do	Lawrence Fork	do	.58
Scott Reservoir	A-711	6-24-03	Irrig.	Pumpkin Creek	Banner	-

Total Appropriations from Natural Flow for Irrigation 129.13

R Denotes Relocation

APPROPRIATIONS FOR THE USE OF WATER
BLUE CREEK IN NEBRASKA
August 15, 1938

Carrier	Appro- priation Number	Pri- ority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Union Canal	D-763	5-16-90	Irrig.	Blue Creek	Garden	23.44
Graf Canal	D-763-R	5-16-90	do	do	do	1.20
Hooper Canal	D-781	9- 7-93	do	do	do	12.25
Graf Canal	D-781-R	9- 7-93	do	do	do	.21
Blue Creek Canal	D-785	12-27-93	do	do	do	185.71
Graf Canal	D-788	4- 2-94	do	do	do	31.43
Hooper Canal	D-788-R	4- 2-94	do	do	do	.27
Blue Creek Canal	D-795	9-27-94	do	do	do	3.79
Paisley Canal	D-800	11-20-94	do	do	do	21.00
Midland-Overland Canal	A-1742	11-20-94	O. D. D-800	N. Platte R.	do	-
Paisley Canal	A-515	7-14-09	Irrig.	Blue Creek	do	4.00
Blue Creek Canal	A-1154	1- 4-12	do	do	do	.42
Crescent Lake Proj.	A-2365	1-30-20	do	Res. A-1575	do	2.06
Paisley Canal	A-1738	2-25-24	do	Blue Creek	do	3.30
Crescent Lake Proj.	A-1575	1-30-20	Irrig.	Crescent Lake	do	*7,000AF

Total Appropriations from Natural Flow for Irrigation 289.08

R Denotes relocation
O.D. Optional Diversion
* Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
BIRDWOOD CREEK IN NEBRASKA
August 15, 1938

Carrier	Appro- priation Number	Pri- ority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Birdwood Canal	D-646	10-21-93	Irrig.	Birdwood Creek	Lincoln	100.00
West Birdwood Canal	D-652	1-16-94	do	do	do	8.57
Beaucamp Canal	D-677	9-19-94	do	do	do	3.00

Total Appropriations from Natural Flow for Irrigation 111.57

APPROPRIATIONS FOR THE USE OF WATER
NORTH PLATTE RIVER BASIN" IN NEBRASKA
August 15, 1938

Carrier	Appro- priation Number	Pri- ority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Nelson-Radcliffe Canal	D-1034a	6- 1-82	Irrig.	Cedar Cr...	Morrill	2.77
Lamplough Lake	D-658	12-31-83	do	White Horse Cr.	Lincoln	2.86
North Platte Canal	D-635	5-31-84	do	N. Platte R.	do	300.00
Reiners Pump	A-2459	5-31-84	O. D. D-625	Lincoln County Dr'ge Ditch Number 2	do	-
Frame Pump	A-2694	5-31-84	O. D. D-635	Lincoln County Dr'ge Ditch Number 1	Lincoln	-
Radcliffe Canal #2	D-1034b	7- 1-85	Irrig.	Cedar Creek	Morrill	1.23
Tri-State (Farmers) Canal	D-918	9-16-87	do	N. Platte R.	Scotts Bluff	901.93
Ramshorn Canal	D-918-R	9-16-87	do	do	do	3.07
Stewart Canal	A-449	9-16-87	O. D. D-918	Wet Spotted Tail Creek	do	-
Sheep Creek Lateral	A-1176	9-16-87	do	Sheep Creek	do	-
Roberts Canal	A-1241	9-16-87	do	Dry Spotted Tail Creek	do	-
Sheep Creek Lateral	A-1398	9-16-87	do	Sheep Creek	do	-
O'halloran Canal	A-1473	9-16-87	do	Roth Draw	Morrill	-
Warner Canal	A-1769	9-16-87	do	Farmers Canal Seep	Scotts Bluff	-
Minatare Canal	D-919	1-14-88	Irrig.	N. Platte R.	do	249.43
Oberlies Canal	A-2502	1-14-88	O. D. D-919	Taylor Drain	do	-
Clear Creek Canal	D-748	7- 1-88	Irrig.	Clear Creek	Keith	2.86
Winters Creek Canal	D-952	10-18-88	do	N. Platte R.	Scotts Bluff	124.29
Winters Creek Canal	A-1446	10-18-88	O. D. D-952	Winters Creek	do	-
Enterprise Canal	D-920	3-28-89	Irrig.	N. Platte R.	do	138.70
Nelson Draw	A-1290	3-28-89	O. D. D-920	Nelson or Akers Draw	do	-
Enterprise Lateral	A-2409	3-28-89	do	Winters Creek	do	-
Fanning Pump	A-2413	3-28-89	do	Toohey Drain	do	-
Castle Rock Canal	D-921	4-18-89	Irrig.	N. Platte R.	do	82.57
Soehl Canal	D-697a	5-10-89	do	Lonergan Creek	Keith	2.00
Lonergan Canal	D-699	5-25-89	do	do	do	9.15
Bouton Canal	D-923	8-17-89	do	Winters Creek	Scotts Bluff	1.00
Logan Canal	D-821	10-17-89	do	N. Platte R.	Morrill	5.71
Belmont Canal	D-828	12-19-89	do	do	do	270.00
Cedar Creek Feeder	A-1397	12-19-89	O. D. D-82b	Cedar Creek	do	-
Atkins Canal	A-1450	12-19-89	do	Atkins Drain	do	-
Radcliffe Canal #3	D-1034c	2-14-90	Irrig.	Cedar Creek	do	.76
Mitchell Canal	'	6-20-90	do	N. Platte R.	Wyoming	194.29
Central Canal	D-926	6-23-90	do	do	Scotts Bluff	36.00
Finn Canal	D-836	7- 1-90	do	Deep Holes Cr.	Morrill	.50
McCarthy Canal	D-749	7-16-90	do	White Tail Cr.	Keith	1.00
Sheridan-Wilson C.	D-710	10- 9-90	do	N. Platte R.	do	10.00
Chimney Rock Canal	D-844 D-1031	12- 3-90	do	do	Scotts Bluff	60.00
Gillard Canal	D-812	12-31-90	do	Ash Creek	Garden	1.43
Otter Creek (Cascade) Canal	D-1032	4- 1-91	do	Otter Creek	Keith	3.30
Patrick Canal	D-725	5-31-91	do	Sand Creek	do	2.43
Empire Canal	D-858	6-25-91	do	N. Platte R.	Morrill	26.57
Gordon Canal	A-2248	6-25-91	O. D. D-850	Anderson Seep	do	-
Kah Canal	D-944	11- 1-91	Irrig.	N. Platte R.	Scotts Bluff	4.57
Brown Creek Canal	D-857 D-1033	1-20-92	do	do	Morrill	187.71
Camp Creek Canal	D-866	3-16-92	do	Camp Creek	do	1.43
Currie Canal	D-938	3-23-92	do	Kiowa Creek	Scotts Bluff	9.14
Cooper Canal	D-872	8-15-92	do	Lower Dug-out Creek	Morrill	.86
Alliance Canal	D-874 D-1035	12-26-92	do	N. Platte R.	do	100.00
Alliance Canal	A-1429	12-26-92	O. D. D-874	Red Willow Cr.	do	-
Alliance Canal	A-1776	12-26-92	do	Bayard Sugar Factory Dr'n	do	-
Ramshorn Canal	D-945	3-20-93	Irrig.	N. Platte R.	Scotts Bluff	45.71
Soehl Canal	D-697b	4-27-93	do	Lonergan Creek	Keith	.86
Short Line Canal	D-946	5- 1-93	do	N. Platte R.	Scotts Bluff	65.57
Barber Canal	D-754	5-30-93	do	Clear Creek	Keith	14.57
Halloway-Phelps C.	D-717	6- 1-93	do	White Tail Cr.	do	3.86
Lisco Canal	D-856	7- 1-93	do	N. Platte R.	Morrill	19.85
Nine Mile Canal	D-925	12- 6-93	do	do	Scotts Bluff	200.00
Nine Mile Canal	A-1431	12- 6-93	O. D. D-925	Nine Mile Draw	do	-
Cody-Dillon Canal	D-649	12-29-93	Irrig.	N. Platte R.	Lincoln	127.00
Keith-Lincoln Canal	D-722	2- 2-94	do	do	Keith	186.00
Paxton-Hershey C.	D-653	2-12-94	do	do	Lincoln	130.00
Lisco Canal	D-787	3-27-94	do	do	Morrill	5.37
North River Canal	D-787-R	3-27-94	do	do	do	16.00
Williams Canal	D-747	5-18-94	do	Clear Creek	Keith	1.00
Suburban Canal	D-662	5-22-94	do	N. Platte R.	Lincoln	183.00
Suburban Canal	A-2648	5-22-94	O. D. D-662	Lincoln County Dr'ge Ditch Number 1	do	-
Oasis Canal	D-567	6- 6-94	Irrig.	Snake Creek	Box Butte	54.86
Midland-Overland C.	D-789	6- 9-94	do	N. Platte R.	Garden	12.00
Spring Creek Canal	D-724	6-18-94	do	Spring Creek	Keith	.57
Midland-Overland C.	D-791	8-14-94	do	N. Platte R.	Garden	20.00
Hannah Canal	D-886	9-24-94	do	do	Morrill	5.71
Cold Water Canal	D-796	9-29-94	do	Cold Water Cr.	Garden	4.29
Oshkosh Canal	D-797	10- 5-94	do	N. Platte R.	do	40.00
Beerline Canal	D-887	10-13-94	do	do	Morrill	30.00
Keystone Canal	D-730	10-30-94	do	White Tail Cr.	Keith	8.00
Spohn Canal	D-801	12- 6-94	Irrig.	N. Platte R.	Garden	11.89
Rush Creek Canal	D-802	12-11-94	do	do	do	9.64
Lyons Canal	D-803	12-22-94	do	do	do	42.14
Signal Bluff Canal	D-807	1-16-95	do	do	do	30.13
Alfalfa Canal	D-738	3-25-95	do	do	do	100.00
Miller Canal	D-740	4- 1-95	do	Skunk Creek	Keith	2.29
Mathews Canal	D-750	4- 1-95	do	Mathews Creek	do	1.14
Reed Canal	D-751	5-15-95	do	White Tail Cr.	do	.57
Finch Canal	D-964	6-30-95	do	Clear Creek	do	1.43
Coon Creek Canal	A-69	7- 3-95	do	Coon Creek	do	.71
Theis Canal	A-160	9-17-95	do	Golden Creek	do	2.71
Steamboat Canal	A-186	10-22-95	do	N. Platte R.	Scotts Bluff	15.00
North River Canal	A-243	2-24-96	do	do	Morrill	157.00
Lisco Canal	A-243	2-24-96	do	do	do	9.00
Oshkosh Canal	A-243-R	2-24-96	do	do	Garden	2.29
Lamore Canal	A-327	7-18-96	do	do	Morrill	20.00
Steamboat Canal	A-350	7-22-96	do	do	Scotts Bluff	.86
Gering Canal	A-365	3-15-97	do	do	do	208.87
State Line Canal	A-407	9-10-97	do	Horse Creek	do	10.00
Sunflower Canal	A-411	9-17-97	do	Owl Creek	do	.79
Brogan Canal	A-410	9-24-97	do	Spring Branch	Keith	.57
Schermerhorn Canal	A-418	10-25-97	do	N. Platte R.	Morrill	29.71
Alliance Canal	A-2088	10-25-97	O. D. A-418	Camp Clark Seep & Red Willow Creek	do	-
Nissen Canal	A-606	3-18-01	Irrig.	Sand Creek	Keith	3.07
Kellums Canal	A-641	10-18-01	do	Kiowa Creek	Scotts Bluff	1.43
Little Spring Canal	A-659	4- 1-02	do	Little Spring Cr.	Keith	.57
Tri-State (Columbia) Canal	A-660	4-14-02	do	N. Platte R.	Scotts Bluff	600.00
Keystone Canal	A-662b	4-26-02	do	White Tail Cr.	Keith	39.00
Coyner Canal	P-185	4-26-02	O. D. A-662b	Paxton Creek	do	-
Haxberry Canal	A-717	7-17-03	Irrig.	Brown's Creek	Morrill	.43
Steward Reservoir	A-743	3- 2-04	do	Wet Spotted Tail Creek	Sioux	1.59
Little Moon Canal	A-745	3-23-04	do	Sheep Creek	do	1.00
Barrow Pitt Canal	A-751	4-23-04	do	Barrow Pitt	Scotts Bluff	.29
Inter-State Canal	A-768	9-19-04	do	N. Platte R.	Wyoming	1,572.00
Tri-State Canal	A-768	9-19-04	do	do	do	230.00
Gering and Fort Laramie Canal	A-768	9-19-04	do	do	do	784.00
Sunflower Canal	A-770	10-10-04	do	Owl Creek	Scotts Bluff	1.14
Card Canal	A-778	12-23-04	do	Huntington Spring	do	1.43
Keystone Canal	A-843	11-30-06	do	White Tail Cr.	Keith	4.30
Nebr. Res. Canal	A-859	5-18-07	do	Sheep Creek	Sioux	3.57
Mulloy Canal	A-865	7-18-07	do	Lower Dug-out Creek	Morrill	1.00
Empire Canal	A-866	7-20-07	do	N. Platte R.	do	1.00
West Fork Canal	A-871	9-21-07	do	Sheep Creek	Sioux	5.14
Lower Canal	A-875	11- 2-07	do	do	do	.37
Sunflower Canal No.2	A-879	11-29-07	do	Owl Creek	Scotts Bluff	1.14
Kellums Canal No. 2	A-880	11-29-07	do	Kiowa Creek	do	.06
Sunflower Canal No.1	A-881	11-29-07	do	Owl Creek	do	.57
Horse Camp Res.	A-885	1-20-08	do	Sheep Creek	Sioux	.43
Maddox Canal	A-918	10- 3-08	do	Buckhorn Spring	Keith	2.28
Marsh-Braziel Canal	A-921	11-24-08	do	Horse Creek	Wyoming	7.19
Huffman Canal	A-937	3-19-09	do	Seep from Lake	Scotts Bluff	1.60
Skunk Creek Canal	A-968	11- 5-09	do	Skunk Creek	Keith	5.00
Sand Creek Canal	A-974	1- 3-10	do	Gravel Creek (Sand Cr.)	do	15.71
Gilmore Canal	A-983	2-21-10	do	Horse Creek	Scotts Bluff	3.71
Lisco Canal	A-991	4- 6-10	do	N. Platte R.	Garden	3.00
State Line Canal	A-994	4-21-10	do	Horse Creek	Scotts Bluff	2.00
Jackson Canal	A-1000	5-19-10	do	do	do	1.00
Keystone Canal	A-1003	5-27-10	do	White Tail Cr.	Keith	7.41
Brown Canal	A-1072	3-17-11	do	Wet Spotted Tail Creek	Scotts Bluff	2.28
Kilpatrick North & South Canals	A-1159	6- 7-11	do	Res. A-1104	Box Butte	-
Barber Canal	A-1111	7- 5-11	do	Clear Creek	Keith	1.14

March-Braziel Canal	A-1126	9-18-11	do	Horse Creek	Wyoming	13.00
French Canal	A-1149	12-21-11	do	N. Platte R.	do	11.00
Sheep Creek Lateral	A-1176	2-26-12	do	Sheep Creek	Scotts Bluff	.10
Dobson Canal	A-1181	2-28-12	do	N. Platte R.	Morrill	3.14
Otter Creek Canal	A-1198	5-24-12	do	Otter Creek	Keith	10.71
Gatch Canal	A-1220	8-21-12	do	Springs, Trib. to North Platte R.	Scotts Bluff	.93
Coon Creek Canal	A-1225	9-16-12	do	Coon Creek	Keith	1.42
Hagerty Canal	A-1238	10-26-12	do	Lower Dug-out Creek	Morrill	1.00
Otter Creek (Holcomb) Canal	A-1	11- 6-12	do	Otter Creek	Keith	15.49
Otter Creek (Peterson) Canal	A-1240	11- 6-12	do	do	do	1.32
Shramek Canal	A-1295	6- 9-13	do	Little Spring Cr.	Scotts Bluff	1.53
Gilchrist Canal	A-1310	7-29-13	do	do	do	.14
Bratt Canal	A-1316	8-25-13	do	White Horse Cr.	Lincoln	6.00
Plum Creek Res.	A-1344	1-12-14	do	Plum Creek	Garden	.74
Plum Creek Res.	A-1344-R	1-12-14	do	do	do	.40
Stone Canal	A-1401	1-19-15	do	N. Platte R.	Morrill	1.00
Sheep Creek Lateral	A-1403	2-20-15	do	Draw Trib. to Sheep Creek	Scotts Bluff	.28
Dobson Lateral	A-1432	9-10-15	do	Red Willow Cr.	Morrill	2.00
Dobson Canal	A-1432	9-10-15	Supple. A-1181	do	do	-
French Canal	A-1433	9-11-15	Irrig.	N. Platte R.	Wyoming	3.00
Dobson Lateral	A-1436	11- 3-15	do	N. Platte R. & Red Willow Cr.	Morrill	.57
Liebhardt Lateral	A-1448	3- 1-16	Irrig.	N. Platte R.	Morrill	2.92
Shramek Enlargement	A-1492	7-30-17	do	Little Spring Cr.	Scotts Bluff	.57
Shramek Enlargement	A-1515	6- 3-18	do	do	do	.14
French Canal	A-1581	3-20-20	do	N. Platte R.	Wyoming	.60
Carter Canal	A-1691	10-13-22	do	Carter Creek	Scotts Bluff	3.38
Emma Canal	A-1740	3-17-24	do	Deep Holes Cr.	Morrill	1.40
Broncho Lake	A-1806	5- 7-26	do	Broncho Lake	Box Butte	1.16
Stafford Canal	A-2114	11-20-29	do	Willow Creek	Keith	.80
Campbell Pump	A-2118	12-23-29	do	Lost Creek	Garden	1.69
McCrone Pump	A-2127	3-10-30	do	White Horse Cr.	Lincoln	1.71
Gebauer Canal	A-2138	4-23-30	do	Gebauer Seep Lake	Morrill	.60
McFadden Canal	A-2142	5-26-30	do	Willow Creek	Keith	.80
Chimney Rock Canal	A-2190	2- 2-31	do	N. Platte R.	Scotts Bluff	.67
Scripter Canal	A-2288	10- 6-32	Irrig.	Clear Creek	Keith	2.49
Covington Pipe Line	A-2311	3-27-33	do	Nealy Springs	Scotts Bluff	.06
Harper Canal	A-2316	4-15-33	do	Clear Creek	Keith	2.97
Oliver Canal	A-2317	4-17-33	do	Famous Springs	Morrill	2.71
Glenn Canal	A-2324	5-29-33	do	Glenn Springs	Scotts Bluff	.16
Gering-Fort Laramie Canal	A-2336	7-19-33	do	N. Platte R.	Wyoming	2.11
Gering-Fort Laramie Canal	A-2378	5- 5-34	do	do	do	1.46
Nealy Canal	A-2454	8- 3-34	do	Nealy Springs	Scotts Bluff	.38
Miller Upper C. & Miller Lower C.	A-2646	10-19-36	do	Middle Creek	Morrill	1.41
Pathfinder Res.	A-768	9-19-04	do	N. Platte R.	Wyoming	*1,070,000AF
Frazier Lake	A-868	9- 6-07	Ice	Spring Creek	Lincoln	4.00
Kilpatrick Res. #1	A-1104	6- 7-11	Irrig.	Snake Creek	Box Butte	*2,000AF
Gering Hydro-electric Plant	A-1452	4-15-16	Power	N. Platte R.	Wyoming	250.00
Locomotive Water Supply	A-1472	1-19-17	Dom.	do	Lincoln	1.00
Klondyke Reservoir	A-15[illegible]	7-11-19	Supple. A-1238	Lower Dug-out Creek	Morrill	*3.35AF
Spring Creek Res.	A-1642	2- 6-22	Ice	Wet Spotted Tail Creek	Scotts Bluff	*20AF
Mitchell Factory	A-1582	3-24-20	Mfg	Dry Spotted Tail Creek	do	15.00
Scottsbluff Factory	A-1592	10- 4-20	do	Winters Creek	do	15.00
Bayard Factory	A-1593	10- 4-20	do	Hoth Draw	Morrill	15.00
Lyman Factory	A-1819	6-16-26	do	Horse Creek	Scotts Bluff	15.00
Water Supply	A-1912	3-16-27	Steam	N. Platte R.	Lincoln	.125
Gering Factory	A-2054	11-15-28	Mfg	do	Scotts Bluff	15.00
Gering Factory	A-2150	11-15-28	O. D. A-2054	do	do	
Sutherland Supply Canal	A-2350	1-13-34	Power	N. Platte R.	Keith	*140,000AF
Sutherland Supply Canal	A-2352	1-13-34	do	do	Lincoln	*6,000AF
Sutherland Supply Canal	A-2353	1-13-34	do	do	Keith	976.00
Sutherland Supply Canal	A-2361	2- 8-34	do	do	do	*150,000AF
Keystone Reservoir	A-2374	4-27-34	Stor.	do	do	*2,000,000AF
Sutherland Supply Canal	A-2640	9-19-36	Incr. Hd A-2353	N. Platte R.	Keith	-
Sutherland Head Race	A-2710	3- 8-37	Supple. A-2353	Sutherland Res.	Lincoln	*54,000AF

Total Appropriations from Natural Flow for Irrigation and Domestic Use . . . 7,981.53

" Exclusive of Pumpkin, Blue and Birdwood creek basins
O.D. Optional Diversion
' Mitchell Irrigation District's appropriation adjudicated in Wyoming
R Denotes Relocation
* Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
LODGEPOLE CREEK IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Bickel Canal	D-347	12-31-76	Irrig.	Lodgepole Creek	Kimball	.30
Owasco Canal	D-347-R	12-31-76	do	do	do	1.20
Gunderson Canal	D-305	6- 1-79	do	do	Cheyenne	1.43
Runge Canal No. 1	D-339	4-15-80	do	do	do	1.71
Runge Canal No. 2	D-338	4-15-82	do	do	do	.50
Anderson Canal No. 1	D-373	6-30-82	do	do	do	2.50
Circle Arrow Canal	D-346	7- 1-82	do	do	Kimball	3.71
Urbach Canal	D-308	9- 1-82	do	do	Cheyenne	.86
Hale Canal No. 3	D-320	4-30-83	do	do	do	.57
Hale Canal No. 4	D-321	4-30-83	do	do	do	.71
Hale Canal No. 5	D-322	4-30-83	do	do	do	.57
Lower Whitney Canal	D-317	5- 1-83	do	do	do	.29
Booth Canal	D-309 D-310	5-31-83	do	do	do	4.29
Libby Canal	D-312	12-31-84	do	do	do	2.00
Kinney Canal No. 2	D-348	12-31-84	do	do	Kimball	2.71
McAuliffe Canal	D-814	12-31-84	do	do	Deuel	2.29
Dickinson Canal	D-969	1- 1-85	do	do	Cheyenne	1.14
Howard Canal	D-336	4-10-85	do	do	do	.86
Krueger Canal No. 3	D-323	5- 1-85	do	do	do	1.14
Wolf Canal	D-813	12-31-85	do	do	Deuel	1.00
McIntosh Canal	D-351	4-16-86	do	do	Kimball	3.31
Krueger Canal No. 2	D-324	10-10-86	do	do	Cheyenne	2.29
Borquist Canal	D-300	4-30-87	do	do	do	.71
Borquist Canal	D-301	4-30-87	do	do	do	1.29
Upper Whitney Canal	D-316	5- 1-87	do	do	do	2.29
McLaughlin Canal	D-966	5- 1-87	do	do	do	1.00
Hale Canal No. 1	D-318	7- 1-87	do	do	do	1.14
Mitchell Canal	D-304	9- 1-87	do	do	do	.86
Tobin Canal	D-330	7-31-88	do	do	do	2.29
Bordwell Canal	D-303	8- 1-88	do	do	do	1.43
Premier Canal	D-340	4-11-89	do	do	Kimball	2.43
Bordwell Canal	D-302	4-27-89	do	do	Cheyenne	.86
Atkins-Polly Canal	D-342	5- 6-89	do	do	Kimball	.79
Independent Canal	D-343	5- 6-89	do	do	do	3.14
Atkins-Polly Canal	D-344	5- 6-89	do	do	do	.43
Kinney Canal	D-345	5-14-89	do	do	do	2.00
Young Canal	D-349	5-28-89	do	do	do	.50
Oberfelder Canal	D-307	5-29-89	do	Springs	Cheyenne	2.29
Ruttner (Old) Canal	D-350	6- 4-89	do	Lodgepole Creek	Kimball	.81
Ruttner (New) Canal	D-350-R	6- 4-89	do	do	do	.33
Oberfelder Canal	D-333	6-10-89	do	do	Cheyenne	.43
Bullock Canal	D-296	6-25-89	do	do	Deuel	1.43
Persinger Canal	D-297	6-25-89	do	do	do	4.57
Hale Canal No. 2	D-319	6-26-89	do	do	Cheyenne	.43
Krueger Canal No. 1	D-325	6-26-89	do	do	do	3.00
Brady Canal	D-352	8-16-89	do	do	Kimball	.71
Hoover Canal	D-353	9- 4-89	do	do	do	1.43
Ickes Canal	D-329	3-25-91	do	do	Cheyenne	2.50
Adams Canal	D-371	7- 1-91	do	do	do	1.43
Hurley-Lilly-Polly Canal	D-354	10- 1-91	do	do	Kimball	2.57
Christensen Canal	D-366	4-15-93	do	do	Cheyenne	.57
Christensen Canal	D-367	4-15-93	do	do	do	.43
Trognitz Canal	D-365	6- 1-93	do	do	do	1.00
Oberfelder Canal	D-306	12-30-93	do	do	do	2.00
Krueger Canal	D-968	5- 1-94	do	do	do	1.00
Lyngholm Canal	D-337	11- 1-94	do	do	do	.36
Private Canal	D-335	3-19-95	do	Springs	do	.04
Dickinson Canal	D-967	5-10-96	do	Lodgepole Creek	do	2.29
Bullock Canal	A-437	2-16-98	do	do	Deuel	.57
Maltese Cross Canal	A-454	5-16-98	do	do	Kimball	.21
Bushnell Canal	A-504	4-15-99	do	do	do	3.00
Weigand Canal	A-563	5-31-00	do	do	Deuel	2.00
Neuman Canals 1 & 2	A-565	6-12-00	do	do	do	1.89
Wertz Canal	A-600	2-14-01	do	do	do	2.86
Neuman Canal	A-611	4-17-01	do	do	do	1.29
Johnson Canal	A-612	4-17-01	do	do	do	2.01
Spring Branch Canal	A-623	7- 1-01	do	Springs	Cheyenne	.29
Naslund Canal	A-661	4-16-02	do	Lodgepole Creek	Deuel	.90
Bennet Res. Canal	A-691	10- 2-02	do	do	Kimball	1.22
Bennet Res. Canal	A-691	10- 2-02	Supple.	Res. A-657	do	-
Forsling Canal	A-703	4-24-03	Irrig.	Lodgepole Creek	do	1.60
Kinney Forsling Can.	A-718	7-25-03	do	do	do	1.07
Ruttner-Kinney Can.	A-718-R	7-25-03	do	do	do	.75
Bickel Canal	A-719	8- 3-03	do	do	do	.93
Pomeroy Canal No. 1	A-723	8-20-03	do	do	Cheyenne	.57
Faden Canal	A-724	9- 9-03	do	do	Kimball	.14
Owasco Canal	A-725	9-12-03	do	do	do	9.84
Ruttner (New) Canal	A-727	9-16-03	do	do	do	.51
McIntosh Enlargement	A-734	12-15-03	do	do	do	1.76
Smith Canal	A-850	8-16-06	do	do	Deuel	3.86
Ralton System	A-847	1- 7-07	do	do	do	2.69
Ruttner Canal	A-857	4- 9-07	do	do	Kimball	2.71
Ruttner (New) Canal	A-869	9-16-07	do	do	do	.63
Tracy Canal	A-870	9-21-07	do	do	do	.50
Ralton Canal	A-882	12- 4-07	Irrig.	Lodgepole Creek	Deuel	12.40
Kimball Canal	A-897	4-15-08	do	do	Kimball	-
Atkins-Polly Canal	A-897-R	4-15-08	do	do	do	.11
Wilds Canal	A-904	6- 2-08	do	do	Deuel	.57
Ruttner Canal	A-908	6-25-08	do	do	Cheyenne	.57
Bennett Canal No. 3	A-934	2-17-09	do	do	Kimball	1.00
Fifield Canal	A-1091	4-27-11	do	Flood Waters	do	.57
Soderquist Canal	A-1237	10-22-12	do	Lodgepole Creek	Deuel	2.00
Weigend Canal No. 3	A-1322	9-10-13	do	do	do	1.21
Weigend Canal No. 2	A-1323	9-10-13	do	do	do	.43
Soderquist Canal	A-1420	6-29-15	do	do	do	2.35
Neuman Canal	A-1445	1- 5-16	do	do	do	1.03
Sodman Canal	A-1485	4- 5-17	do	do	do	.79
McAuliffe Canal	A-1559	10- 6-19	do	do	do	1.77
Howard Ruttner Canal	A-1645	3- 7-22	do	do	Cheyenne	.20
Stuht Canal	A-1659	4-26-33	do	do	do	.40
Martin Pump	A-1695	11-22-22	do	do	do	1.23
Giesoking Canal	A-1801	3-31-26	do	do	Kimball	.90
Bluhm Canal	A-1811	5-24-26	do	do	Cheyenne	1.00
Kinney Canal	A-1826	7-14-26	do	do	Kimball	.20
Wearin Canal	A-1864	9-28-26	do	do	do	1.50
Bennett Res. Canal	A-1975	1-13-28	do	Res. A-657 & A-1974	do	-
Peterson Canal	A-2006	4-17-28	do	Lodgepole Creek	Deuel	.66
McLernon Canal	A-2027	9- 1-28	do	do	Cheyenne	.24
Pantenburg Canal	A-2113	11-15-29	do	do	do	1.00
Foster Wells	A-2200	4-29-31	do	Ground Water	do	.66
Thorstensen Pump	A-2569	3-10-36	do	Lodgepole Creek	do	.29
Anderson Pump	A-2659	2-14-38	do	Lodgepole Creek	Cheyenne	.20
Barrett Canal	D-334	-	do	do	do	-
Bennett Reservoir	A-657	3-13-02	do	do	Kimball	*700AF
Oliver Reservoir	A-897	4-15-08	Stor.	do	do	*20,000AF
McGinnis Ice Pond	A-1127	9-19-11	do	do	do	500AF
Bentley Reservoir	A-1478	2-14-17	Dom.	do	Cheyenne	*50AF
Bennett Reservoir Enlargement	A-1974	1-13-28	do	do	Kimball	*262AF

Total Appropriations from Natural Flow for Irrigation 162.44

R Denotes relocation

* Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
SOUTH PLATTE RIVER BASIN" IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Hollingsworth Canal	D-723	6- 5-94	Irrig.	S. Platte R.	Keith	30.00
Miller-Warren Canal	D-805	1- 5-95	do	do	Deuel	.57
Meyer Canal	A-283	4-14-96	do	do	Keith	1.46
Western Canal	A-393	6-14-97	do	do	do	'120.00
Beal Canal	A-1620	9-20-21	do	do	do	5.16
Western Canal	A-1804	4-13-26	do	do	do	11.43
Junge Canal	A-1857	9-11-26	do	do	Deuel	1.07
Paxton Canal	A-1874	11-22-26	do	do	Keith	70.19
Beal Power Plant	A-1619	9-20-21	Power	do	do	17.60

Total Appropriations from Natural Flow for Irrigation 239.88

" Exclusive of Lodgepole Creek Basin

' 120.00 Second-feet stipulated under Colorado-Nebraska South Platte River Compact

APPROPRIATIONS FOR THE USE OF WATER
WOOD RIVER IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
White Bridge Park	A-545a	3-14-00	Irrig.	Wood River	Buffalo	.03
Jacobsen Canal	A-1038	11-10-10	do	do	do	.50
Kimbrough Canal	A-1227	9-21-12	do	do	do	4.00
Haug Pump	A-1590	9- 7-20	do	do	do	.64
Peterson Pump	A-1611	7-11-21	do	do	do	1.07
Nutter Pump	A-1616	8-29-21	do	do	do	2.28
Rodgers Pump	A-1641	2- 4-22	do	do	do	.30
Shelton Academy Pump	A-1643	2-16-22	do	do	Hall	2.28
Haug Pump #2	A-1644	2-28-22	do	do	Buffalo	.92
Hallen Dam	A-1656	4-17-22	do	do	do	.47
Durtschi Pump	A-1668	5-22-22	do	do	Hall	1.37
Howe Pump	A-1679	7-14-22	do	do	do	.54
Wilson Pump	A-1693	11-15-22	do	do	Buffalo	1.21
Smith Pump	A-1702	1-12-23	do	do	do	1.04
Ross Pump	A-1743	4-28-24	do	do	do	.26
Foley Pump	A-1753	12- 2-24	do	do	do	1.76
Richardson Pump	A-1780	9- 8-25	do	do	do	.49
Wilcox Pump	A-1793	1-22-26	do	do	do	.90
Darby Pump	A-1794	2-10-26	do	do	do	.70
Kirk Pumps	A-1797	2-23-26	do	do	do	2.57
Langan Pump	A-1800	3-19-26	do	do	Hall	1.14
McConnell Pump	A-1805	4-21-26	do	do	Buffalo	3.43
Mercer Pump	A-1814	5-25-26	do	do	do	.80
Wood River Pump	A-1818	6-15-26	do	do	do	1.57
Carlson Pump	A-1830	7-19-26	do	do	do	1.10
Hayman Pump	A-1831	7-20-26	do	do	do	.57
Power Pump	A-1834	7-24-26	do	do	do	.41
Schnoor Pump	A-1867	10-18-26	do	do	do	.80
Oliver Pump	A-1987	2-29-28	do	do	do	.86
Nickel Pump	A-2148	7-16-30	do	do	do	1.95
Abels Pump	A-2186	1-10-31	do	do	do	1.23
Conklin Pump	A-2718	3-19-37	do	do	Merrick	2.09
Nye Irrig. Project	A-2785	9-11-37	do	do	Buffalo	.28
Ashburn Canal	D-993	11- 1-73	Power	do	do	40.00
Bearss Canal	D-995	5- 1-81	do	do	do	25.40
White Bridge Park	A-545b	3-14-00	do	do	do	10.00
Jacobsen Reservoir	A-1576	2- 3-20	Stor.	do	do	*3,000AF
Hallen Reservoir	A-1654	4- 4-22	do	do	do	*1AF
Conklin Power Plant	A-2717	3-19-37	Power	do	Merrick	10.00

Total Appropriations from Natural Flow for Irrigation 39.56

* Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
PLATTE RIVER BASIN" IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Kearney Canal	D-1023	9-10-82	Irrig.	Platte River	Buffalo	22.00
Peaker Pump	A-1744	9-10-82	O. D. D-1023	Kearney Tail Race	do	-
Gothenburg Canal	D-645a	7- 5-90	Irrig.	Platte River	do	200.00
Holcombe Canal	D-636	10-18-90	do	Pawnee Creek	do	6.00
Dawson Co. Canal	D-621-R	6-14-94	do	Platte River	Dawson	7.00
Dawson Co. Canal	D-622	6-26-94	do	do	do	1,142.86
Savins Pump	A-1495	6-26-94	O. D. D-622	Buffalo Creek	do	-
Doughty Pump	A-1648	6-26-94	do	do	do	-
Hodgson Pump	A-1868	6-26-94	do	do	do	-
Dawson Co. Canal	D-624-R	9-15-94	Irrig.	Platte River	do	1.14
Dawson Co. Canal	D-624-R	9-15-94	do	do	do	.57
Dawson Co. Canal	D-624-R	9-15-94	do	do	do	9.14
Dawson Co. Canal	D-624-R	9-15-94	do	do	do	1.71
Dawson Co. Canal	D-624-R	9-15-94	do	do	do	28.54
Dawson Co. Canal	D-624-R	9-15-94	do	do	do	2.30
Jurgenson Pump	A-2049	9-15-94	O. D. D-624	Strever Creek	do	-
Orthman Pump	A-2129	9-15-94	do	Dawson Co. Dr'ge Ditch Number 1	do	-
Beatty Well	A-2281	9-15-94	do	Ground Water	do	-
Beatty Well	A-2513	9-15-94	do	do	do	-
Gothenburg Canal	D-645b	9-22-94	do	Platte River	Lincoln	240.00
Excell Canal	A-1860	9-22-94	O. D. D-645b	Pedens Lake	Dawson	-
Thirty-Mile Canal	D-680	10-22-94	Irrig.	Platte River	Lincoln	40.00
Schmitt Canal	D-292a	12-17-94	do	Shell Creek	Platte	2.29
Cozad Canal	D-626	12-28-94	do	Platte River	Dawson	359.86
Orchard-Alfalfa Can.	D-627	1-23-95	do	do	do	85.00
Gottberg Canal	A-3	6- 6-95	do	Shell Creek	Platte	1.00
Eiche Plant	A-489	1- 4-99	do	Oak Creek	Lancaster	.71
Stevens Creek Canal	A-1335	11-19-13	do	Stevens Creek	do	1.00
Cottonwood Canal	A-1629	12-15-21	do	Platte River	Phelps	5.33
Kent-Burke Canal	A-1694	11-16-22	do	Pawnee Creek	Lincoln	5.85
Johnson Pump	A-1707	2-20-23	do	Warm Slough	Buffalo	.50
Rutherford Pump	A-1766	7- 1-25	do	Salt Creek	Lancaster	9.11
Jensen Canal	A-1772	7-27-25	do	Strever Creek (Buffalo Cr.)	Dawson	.56
Anders Canal	A-1773	7-27-25	do	do	do	1.10
Faught Pump	A-1784	10-20-25	do	Platte River	do	.80
Johnson Pump	A-1796	2-13-26	do	do	Buffalo	2.56
Kopf Pump	A-1799	3- 3-26	do	Buffalo Creek	Dawson	.57
Penitentiary Canal	A-1817	6-15-26	do	Salt Creek	Lancaster	3.00
Hagge Pump	A-1849	8-24-26	do	Platte River	Hall	4.58
Thirty-Mile Canal	A-1853	9- 7-26	do	do	Lincoln	275.06
Streiff Pump	A-1859	9-15-26	do	Buffalo Creek	Dawson	1.81
Robertson Pump	A-1870	11- 2-26	do	Platte River	do	.75
Gardner Pump	A-1924	4-11-27	do	Strever Creek (Buffalo Cr.)	do	1.00
Stryker Pump	A-1944	7-19-27	do	Buffalo Creek	do	1.62
Philpot Pump	A-1946	7-26-27	do	do	do	3.33
Gilmore Canal	A-1950	8-10-27	do	Clear Creek	Saunders	.86
Frost Canal	A-1957	9- 3-27	do	Platte River	Dawson	1.43
Priel Canal	A-1958	9- 3-27	do	do	do	2.27
Bowden Pump	A-1959	10-10-27	do	Buffalo Creek	do	1.65
Siebenaler Pump	A-1969	11-22-27	do	Strever Creek (Buffalo Cr.)	do	2.31
Thirty-Mile Canal	A-1976	12-13-27	do	Platte River	Lincoln	50.79
Lloyd Pump	A-1985	2-20-28	do	Buffalo Creek	Dawson	2.16
Potts Pump	A-1988	3- 5-28	do	do	Buffalo	4.43
Jones Pump	A-2012	4-30-28	do	do	do	.94
Schulz Pump	A-2038	10- 1-28	do	Platte River	Lincoln	2.10
Dawson Co. Canal	A-2039	10- 3-28	do	do	Dawson	91.11
Wengler Canal	A-2101	10- 3-28	O. D. A-2039	Strever Creek	do	-
Dworak Pump	A-2041	10-12-28	Irrig.	Lost Creek	Colfax	1.30
Wilson Canal	A-2052	11-12-28	do	Buffalo Creek	do	2.29
Scott Pump	A-2066	1-28-29	do	Elm Creek	Buffalo	1.14
Ulrich Canal	A-2068	2- 4-29	do	Mud Creek	Dawson	4.20
Ulrich Canal	A-2068	2- 4-29	do	Buffalo Creek	do	.52
Cheney Pump	A-2069	2- 6-29	do	Oak Creek	Lancaster	.45
Gilmore Pump	A-2074	3- 5-29	do	Buffalo Creek	Dawson	1.03
Thirty-Mile Canal	A-2077	4- 9-29	do	Platte River	Lincoln	4.57
Beatty Canal	A-2083	6- 3-29	do	Strever Creek (Buffalo Cr.)	Dawson	1.13
Armstrong Canal	A-2087	6-19-29	do	Buffalo Creek	Buffalo	.23
Phillips Pump	A-2089	7-13-29	do	do	Dawson	4.57
Jensen Pump	A-2090	7-17-29	do	do	do	1.00
Dawson Co. Canal	A-2093	8- 3-29	do	Platte River	do	3.00
Peterson Pump	A-2094	8- 8-29	do	Strever Creek	do	1.11
Bend Canal	A-2099	8-26-29	do	do	do	1.63
Elm Creek Canal	A-2104	9-17-29	do	Platte River	do	227.00
Dawson County Enlargement	A-2110	10-25-29	do	do	do	284.91
Hanich Pump	A-2115	11-21-29	do	Oak Creek	Lancaster	.15
Clark Pump	A-2132	4-11-30	Irrig.	Oak Creek	Lancaster	.14
Beatty Lateral	A-2145	6-14-30	do	Platte River	Dawson	14.21
Kopf Pump	A-2181	12-13-30	do	Res. A-2180	do	-
Eavey Pump	A-2191	2-20-31	do	Platte River	Lincoln	1.70
Jurgenson Pump	A-2202	5- 7-31	do	Strever Creek	Dawson	1.03
Stark Pump	A-2225	8- 6-31	do	Rock Creek	Saunders	1.08
Janssen Canal	A-2231	8-31-31	do	Pawnee Creek	Lincoln	8.42
Braeside Pump	A-2235	9- 8-31	do	Prairie Creek	Merrick	7.89
Cheney Pump	A-2239	9-22-31	do	Oak Creek	Lancaster	.66
Norris Canal	A-2253	2-18-32	do	Bull Drain	Lincoln	.93
Dawson County Canal	A-2262	3- 1-32	do	Platte River	Dawson	12.71
Witmer Pump	A-2301	2- 8-33	do	Oak Creek	Lancaster	.04
Hilt Pump	A-2326	6-12-33	do	Dee Creek	Cass	1.72
The Central Nebr. Supply Canal	A-2355	1-13-34	do	Platte River	Lincoln, Gosper & Kearney	1,171.00
Jeffrey Pump	A-2382	5-12-34	do	Rock Creek	Lancaster	.46
Splain-Bogan Pump	A-2412	6-18-34	do	Salt Creek	do	.11
Burcham Pump	A-2422	7-13-34	do	Oak Creek	do	1.73
Hanke Pump	A-2436	7-23-34	do	Silver Creek	Saunders	.50
Treptow Pumps	A-2444	7-25-34	do	Wahoo Creek	do	1.43
Breyer Pump	A-2463	8-15-34	do	do	do	.96
Bossung Pump	A-2527	3-14-35	do	Plum Creek	Gosper	.33
Arndt Pump	A-2603	7-31-36	do	Shell Creek	Platte	2.21
Ballon Pump	A-2628	8-28-36	do	Lost Creek (Slough)	Colfax	.91
Bennett Pump	A-2639	9-14-36	do	Oak Creek	Lancaster	1.49
Herde Pump	A-2642	9-28-36	do	Shell Creek	Colfax	.39
Scott Pump	A-2762	12-7-36	do	Res. A-2669	Lancaster	-
Wolfe Pump	A-2771	8- 9-37	do	Shell Creek	Colfax	.46
Trumble Pump	A-2760	7- 8-37	do	Springfield Cr.	do	.55
Wolfe Pump	A-2771	8- 9-37	do	Shell Creek	Colfax	.46
Herde Pump Project Enlargement	A-2782	9-10-37	do	Shell Creek	Colfax	.25
Carry Pump	A-2787	9-14-37	do	do	Platte	2.36
Kavan Pump	A-2798	11- 1-37	do	do	Colfax	.48
Marohn Pump	A-2814	12-10-37	do	do	do	.64
Kluck Pump	A-2815	12-18-37	do	do	Platte	.48
Ivers Pump	A-2823	1- 7-38	do	Middle Creek	Lancaster	.26
Reisch Pump	A-2824	1- 7-38	do	Lost Creek	Colfax	.51
J. A. Pettit Pump	A-2825	1-10-38	do	Turkey Creek	Buffalo	-
Bailey Pump Project	A-2871	5- 6-38	do	Shell Creek	Colfax	1.69
Kearney Canal	D-1023	9-10-82	Power	Platte River	Buffalo	140.00
Gothenburg Canal	D-645a	7- 5-90	do	do	Lincoln	200.00
Schmitt Canal	D-292b	12-17-94	do	Shell Creek	Platte	30.50
Fremont Canal	A-40	6-21-95	Power & Irrig.	Platte River	Butler	2,500.00
Armour & Co. Res.	A-415	10-18-97	Ice	Silver Creek	Saunders	10.00
Swift & Co. Ice Plant	A-524	12- 6-99	do	do	do	10.00
Malone Ice Plant	A-883	12-26-07	do	Middle Creek	Lancaster	10.00
Fremont-Omaha Canal	A-894	3-25-08	Power	Platte River	Butler	2,000.00
Platte River Plant	A-970	11-24-09	do	do	Douglas	2,500.00
Plattsmouth Plant	A-1379	9- 4-14	do	do	Cass	2,000.00
Kearney Canal	A-1577	2-12-20	do	do	Buffalo	485.00

Central Power Co. Steam Plant	A-1588	8-12-20	Steam	do	Merrick	925.00
C. B. & Q. Water Supply	A-1722	9-20-23	Dom.	Salt Creek	Lancaster	2.00
Uni. Shooting Club	A-1837	7-29-26	Resort	do	do	-
Kopf Reservoir	A-2180	12-23-30	Irrig.	Buffalo Creek	Dawson	*189AF
Ayr Lake	A-2184	12-30-30	Resort	Wahoo Creek	Saunders	*160AF
Valparaiso Plant	A-2233	9- 1-31	Power	Oak Creek	do	-
	A-2346	11-18-33	do	Platte River	Butler	-
The Central Nebr. Supply Canal	A-2351	4-27-34	Stor.	do	Lincoln	*509,000AF
The Central Nebr. Supply Canal	A-2354	4-27-34	Power	do	do	1,500.00
Ballon Reservoir	A-2406	6-11-34	Resort	Lost Creek	Colfax	*14AF
Wannhoo Park Res.	A-2442	7-25-34	Fish	Sand Creek	Saunders	*12AF
Dolezal Reservoir	A-2452	8- 1-34	do	do	do	*2.25AF
Scott Reservoir	A-2669	12- 7-36	Irrig.	Dry Gully	Lancaster	*72AF
Community Park Res.	A-2742	5-15-37	Resort	Lost Creek	Colfax	*15AF
Harvey Reservoir	A-2791	9-28-37	Irrig.	Dry Ravine	Buffalo	*35AF

Total Appropriations from Natural Flow for Irrigation and Domestic Use . . 4,412.66

O.D. Optional Diversion
" Excluding the North Platte, South Platte, Wood, Loup, and Elkhorn rivers
R Denotes Relocation
* Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
NORTH LOUP RIVER BASIN IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Homestead Canal	D-194	7-14-94	Irrig.	Cow Creek	Cherry	2.29
Erickson Canal	D-209	4- 3-95	do	Goose Creek	Brown	8.00
Giles Canal	D-187	6- 1-95	do	do	Cherry	10.00
Crook Canal	A-345	6- 2-96	do	do	Brown	6.80
Gracie High Line C.	A-397	7- 9-97	do	Gracie Creek	Loup	.29
Mira Reservoir C.	A-1239	3- 8-12	do	Res. A-1182	Valley	-
Koupal Canal	A-1207	7- 5-12	do	Dane Creek	do	.14
Hutchins Dam	A-1453	4-18-16	do	Mira Creek	do	.03
Calamus Canal	A-1785	10-31-25	do	Calamus River	Loup	121.18
Calamus Canal	A-1883	1-12-27	do	do	do	4.86
Naab Pump	A-2091	8- 3-29	do	N. Loup River	do	1.40
Rogers Pump	A-2107	9-30-29	do	Elm Creek	Valley	1.68
Lassen Pump	A-2108	10-10-29	do	Munson Creek	Howard	.50
Anderson Pump	A-2131	4- 5-30	do	N. Loup River	do	5.17
Smith Pump	A-2154	8- 6-30	do	do	Valley	2.25
Mortenson Pump	A-2155	8- 8-30	do	do	do	1.94
Stewart Pump	A-2158	8-11-30	do	do	do	.54
Bloomquist Pump	A-2178	11-26-30	do	do	Howard	.85
Sailing Pump	A-2187	1-14-31	do	do	do	.86
Cox Pumps	A-2255	2-25-32	do	do	Blaine	4.67
Newton Canal	A-2263	3-18-32	do	do	do	19.28
Phillips Pump	A-2273	6-13-32	do	Calamus River	Brown	.[illegible]
N. Loup River Public Power & Irrigation District	A-2312	3-28-33	do	N. Loup River	Loup, Valley & Garfield	260.00
Tetschner Pump	A-2323	5-24-33	do	do	Garfield	.21
Empire Ranch Canal	A-2405	6-11-34	do	Goose Creek	Cherry	1.[illegible]
Cole Pump	A-2417	7- 6-34	do	N. Loup River	Loup	1.[illegible]
Bales Pump	A-2427	7-14-34	do	do	Garfield	.[illegible]
Wells Pump	A-2455	8- 6-34	do	do	Loup	.[illegible]
Britton Pump	A-2467	8-20-34	do	N. Loup River	Loup	1.[illegible]
Almeria Canal	A-2469	8-28-34	do	do	do	12.[illegible]
Coble Canal	A-2485	10-10-34	do	do	Cherry	.[illegible]
Coble High Line C.	A-2574	10-10-34	do	Res. A-2486	do	-
Walker Pump	A-2490	11- 2-34	do	N. Loup River	Loup	.[illegible]
Bartz Pump	A-2501	12-20-34	do	Messenger Cr.	Valley	.[illegible]
Krebs Canal	A-2520	2-26-35	do	N. Loup River	Greeley	1.[illegible]
High Line Canal	A-2525	3-12-35	do	do	Cherry	1.[illegible]
Ferguson Pump	A-2635	9- 8-36	do	do	Blaine	1.32
Wells-Kilpatrick Pump	A-2660	11-14-36	do	N. Loup River	Howard	.12
Rusho Pump	A-2729	4- 8-37	do	do	Loup	1.11
Christensen Pump	A-2769	8- 4-37	do	Davis Creek	Howard	.25
Pemberton Pump	A-2790	9-27-37	do	N. Loup River	do	.46
Bloomquist Pumping Project Extension	A-2808	11-27-37	do	do	do	.11
Newton Canal	A-2863	4-26-38	do	do	Blaine	-
Almeria Canal	A-2868	4-29-38	do	do	Loup	-
Almeria Canal Enl.	A-2869	4-30-38	do	do	do	-
Von Diest Pump	A-2874	5-12-38	do	do	do	-
Mira Reservoir	A-1182	3- 8-12	Stor.	Mira Creek	Valley	*14AF
Calamus Reservoir	A-1816	6- 8-26	Irrig.	Calamus River	Loup	*650AF
Municipal Pipe Line	A-2349	1- 5-34	Dom.	N. Loup River	Valley	1.00
Coble Reservoir	A-2486	10-10-34	Irrig.	do	Cherry	*41AF

Total Appropriations from Natural Flow for Irrigation and Domestic Use . . . 479.93

* Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
MIDDLE LOUP RIVER BASIN IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Victoria Canal Number 1	D-210 D-212	3-17-94	Irrig.	Victoria Creek	Custer	.71
Victoria Canal Number 2	D-213	7-17-94	do	do	do	8.88
Laughran & Bell C.	D-217	9-22-94	do	do	do	.31
Bessey Nursery C.	A-1226	9-16-12	do	Middle Loup R.	Thomas	1.00
Loup Valley Canal	A-1294	5-31-13	do	do	Custer	.86
Lundy Lake C.	A-1300	6-27-13	Irrig.	Middle Loup R.	Custer	28.30
Lundy Pump	A-1307	7-19-13	do	do	do	6.34
Myers Canal	A-1843	8- 5-26	do	Victoria Creek	Custer	1.51
Victoria No. 2 Enl.	A-1845	8-12-26	do	do	do	1.01
Davis Pump	A-1895	2- 7-27	do	Lillian Creek	do	4.90
Knapp Pump	A-1940	7-18-27	do	Middle Loup R.	Sherman	5.49
McGraw Canal	A-1945	7-23-27	do	Victoria Creek	Custer	2.95
Myers Canal	A-1956	8-30-27	do	Lillian Creek	do	.11
McGraw Canal	A-2023	8- 6-28	do	Victoria Creek	do	2.86
Klausen Canal	A-2095	8-14-29	do	Middle Loup R.	Sherman	2.17
John Canal	A-2105	9-18-29	do	do	do	.89
Krogh Pump	A-2126	3- 5-30	do	Oak Creek	Howard	.53
Obermiller Pump	A-2139	5- 7-30	do	Middle Loup R.	do	.97
Haesler Pump	A-2222	7-27-31	do	do	Sherman	1.75
Bessey Nursery C.	A-2223	7-30-31	do	do	Thomas	.30
Mortensen Canal	A-2251	8-31-31	do	Res. A-2252	Howard	-
Tierney Pump	A-2271	5-17-32	do	Ash Creek	Custer	2.95
Middle Loup Public Power & Irrigation District	A-2293	12-28-32	do	Middle Loup R.	Custer, Valley & Sherman	300.00
Books Pump	A-2330	7- 8-33	do	do	Custer	1.36
Miller Res. Canal	A-2476	1-20-34	do	Res. A-2356	Howard	-
Leininger Pump	A-2395	6- 2-34	do	Middle Loup R.	Sherman	.93
McGraw Pump	A-2398	6- 4-34	do	Victoria Creek	Custer	.80
Rankin Canal	A-2477	9-22-34	do	Middle Loup R.	Blaine	21.56
Canal Number 1	A-2678	1- 4-37	do	do	Custer	3.00
Canal Number 2	A-2678	1- 4-37	do	do	do	76.98
Canal Number 3	A-2678	1- 4-37	do	do	do	4.00
Canal Number 4	A-2678	1- 4-37	do	do	do	14.80
McKoski Pump	A-2778	8-26-37	do	Turkey Creek	Howard	.24
McMillen Pump	A-2797	10-22-37	do	Middle Loup R.	Blaine	-
Hat Canal	A-2842	3- 4-38	do	Oak Creek	Howard	
Lundy Mill and Power Plant	D-1024	8- 1-86	Power	Middle Loup R.	Custer	200.00
Mullen Grist and Light Plant	A-1185	3-12-12	do	do	Hooker	124.00
St. Paul Power Plant	A-1216	8-12-12	do	do	Howard	2,000.00
Lundy Mill and Power Plant	A-1224	9-16-12	Res. Dam D-1024	do	Custer	400.00
Boelus Power Canal	A-1373	7-14-14	Power	do	Howard	1,000.00
Seneca Pipe Line	A-1396	12-28-14	Dom.	do	Thomas	.50
Dannebrog Reservoir	A-1556	9-16-19	do	Oak Creek	Howard	-
Mortensen Reservoir	A-2252	8-31-31	Stor.	Turkey Creek	Howard	*6.25AF
Miller Reservoir	A-2356	1-20-34	do	do	do	*600AF
Toman Lake Res.	A-2658	11-11-36	Resort	Lake Creek	do	*15AF
Dannebrog Lake	A-2809	11-29-37	do	Oak Creek	do	*58AF

Total Appropriations from Natural Flow for Irrigation and Domestic Use . . . 498.36

* Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
SOUTH LOUP RIVER BASIN IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Penn Canal	D-215	8-14-94	Irrig.	Mud Creek	Custer	.50
Tillson Canal	D-236	12-28-94	do	South Loup R.	Buffalo	15.67
Boblitz Canal	D-219a	1-17-95	do	do	Custer	.50
Brown Canal	A-363	2-23-97	do	do	do	.86
Hartzell Canal	A-390	5-18-97	do	do	Logan	.37
Haskill Canal	A-1357	2-27-14	do	Spring Branch	Custer	7.00
Troyer Pump	A-1447	2-21-16	do	Sand Creek	do	.24
Lang Pump	A-1848	8-20-26	do	Mud Creek	do	1.21
Skochdople Canal	A-1871	11- 8-26	do	Beaver (Mud) Creek	Buffalo	2.10
Wilson Pump	A-1879	12-10-26	do	Mud Creek	Custer	.51
Van Sant Pump	A-1880	12-13-26	do	do	do	.27
Sorenson Pump	A-1884	1-14-27	do	do	do	1.00
Sherbeck Pumps	A-1894	2- 7-27	do	Clear Creek	do	4.13
Willoughby Pump	A-1896	2- 8-27	do	Mud Creek	do	1.10
Vanda Pumps	A-1920	4- 4-27	do	Beaver (Mud) Creek	Buffalo	.90
Sutton Pump	A-1962	10-18-27	do	Clear Creek	Custer	2.43
Perkins Canal	A-1994	3-30-28	do	South Loup R.	do	3.77
Lowry Pump	A-2026	8-22-28	do	Clear Creek	do	1.11
Finch Pump	A-2037	9-27-28	do	South Loup R.	do	2.30
Dean Pump	A-2040	10- 9-28	do	Clear Creek	do	2.00
Morrison Pump	A-2045	10-17-28	do	Wiggle Creek	do	.30
Dorsett-Duke Amsberry Pump	A-2051	11-10-28	do	Mud Creek	do	2.41
Yeomen Pump	A-2059	1- 3-29	do	do	do	.47
Tracy Pump	A-2079	4-23-29	do	do	do	.13
Quest Canal	A-2143	6-13-30	do	South Loup R.	Howard	1.55
Banker Pump	A-2370	3-30-34	do	Clear Creek	Sherman	.13
Slote Pump	A-2391	5-31-34	do	Mud Creek	do	.64
Roth Pump	A-2400	6- 7-34	do	South Loup R.	Buffalo	.57
Wall Pump	A-2410	6-18-34	do	do	Logan	.32
Haller Pump	A-2423	7-13-34	do	Mud Creek	Sherman	.71
Lang Pump	A-2445	7-27-34	do	do	Custer	1.25
Dietrich Pump	A-2464	8-16-34	do	Beaver (Mud) Creek	Buffalo	1.26
The Maples	A-2475	9-13-34	do	Tucker Creek	Custer	.97
Perry Pump	A-2620	8-21-36	do	Beaver (Mud) Creek	Buffalo	.47
Amsberry Pump	A-2684	1-26-37	do	Mud Creek	Custer	.22
May Pump	A-2730	4- 8-37	do	South Loup R.	do	.75
Turley Pump	A-2740	5- 7-37	do	do	do	.32
Amsberry Pump	A-2789	9-18-37	do	Mud Creek	do	.56
Hall Pump	A-2792	10- 1-37	do	do	do	.54
Lang Pump	A-2793	10- 4-37	do	do	Sherman	1.15
Luther Pump	A-2794	10- 4-37	do	do	Custer	.39
Banning Pump	A-2800	11- 5-37	do	do	do	.40
West Pump	A-2802	11-16-37	do	do	do	.84
Pressey Pump #2	A-2841	2-28-38	do	South Loup R.	do	.19
Van Sant and Scott Pump	A-2844	3-12-38	do	Clear Creek	do	-
Callaway Mill	D-988	10- 1-89	Power	South Loup R.	do	83.00
Boblitz Canal	D-219b	1-17-95	do	do	do	20.00
Ravenna Pipe Line	A-1393	12-24-14	Dom.	South Loup R.	Buffalo	.50
Grand Island Plant	A-1400	1-18-15	Power	do	Howard	840.00
C. B. & Q. Water Supply	A-1550	7-26-19	Dom.	Beaver (Mud) Creek	Buffalo	1.00

Total Appropriations from Natural Flow for Irrigation and Domestic Use 65.91

APPROPRIATIONS FOR THE USE OF WATER
LOUP RIVER BELOW THE CONFLUENCE OF THE
NORTH AND MIDDLE LOUP RIVERS
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Monroe Canal	D-289	6-12-94	Irrig.	Looking Glass Creek	Platte	2.86
Hendryx Canal	D-290	6-25-94	do	Spring Creek	do	1.33
Pioneer Canal	D-287	12- 8-94	do	Beaver Creek	Boone	3.57
Windmill Project	A-277	3-31-96	do	do	Nance	.14
Christensen Pump	A-2240	9-29-31	do	Cedar River	do	2.37
Umbarger Pump	A-2329	7- 8-33	do	Beaver Creek	do	.99
Maxwell Pumps	A-2364	2-14-34	do	Cedar River	Boone	4.01
Haggerty Pump	A-2390	5-31-34	do	do	Greeley	.30
Peterson Pump	A-2471	9-10-34	do	Beaver Creek	Platte	.64
Peterson Pump	A-2554	8- 7-35	do	do	Boone	.63
Self Pump	A-2582	6-19-36	do	do	do	.38
Haggerty Pump	A-2592	7-20-36	do	do	Greeley	.78
Kinnier Pump	A-2617	8-17-36	do	do	do	.57
Battles Pump	A-2647	10-21-36	do	Beaver Creek	Nance	.19
Kellner Pump	A-2665	12- 1-36	do	do	Boone	.50
Dobson Pump	A-2702	2-24-37	do	Cedar River	do	2.09
Delarm Pump	A-2722	3-26-37	do	Beaver Creek	do	.27
Qualsett Pump	A-2733	4-19-37	do	Qualsett Creek	do	.26
Genoa State Hospital Canal	A-2735	4-21-37	do	Beaver Creek	Nance	1.28
Fisher Pump	A-2741	5-11-37	do	Bogus Creek	Boone	1.02
Myers Pump	A-2779	9- 1-37	do	Beaver Creek	do	.71
Qualsett Pump	A-2803	11-16-37	do	do	do	.29
Puetz Pump	A-2807	11-22-37	do	Cedar River	do	.65
Watson Pump	A-2811	12- 2-37	do	Beaver Creek	do	.44
Genoa Ranch Canal	A-2812	12- 6-37	do	do	Nance	.29
Batenhorst Pump	A-2819	12-29-37	do	Cedar River	Boone	2.00
Homan Irrigation Project Pump	A-2820	1- 6-38	do	Homan Creek	do	1.40
Bevins Pump	A-2830	1-25-38	do	Cedar River	do	1.09
John Homan Pump	A-2834	2- 7-38	do	do	do	.81
Olson Pump	A-2835	2- 8-38	do	Beaver Creek	Nance	.47
Mansfield Pump	A-2840	2-21-38	do	do	Boone	.38
Harris Pump	A-2843	3- 8-38	do	do	do	.39
Gillespie Pump	A-2846	3-16-38	do	do	do	.59
Hunter Pump	A-2856	3-24-38	do	do	do	.62
Stretter Pump	A-2866	4-28-38	do	do	do	-
Van Ackeren Plant	D-1049	5- 1-61	Power	Cedar River	do	290.00
Fullerton Power Plant	A-636	9- 9-01	do	do	Nance	200.00
Albion Power Plant	A-639	10- 3-01	do	Beaver Creek	Boone	67.00
St. Edward Plant	A-1058	2-11-11	do	do	do	130.00
Ericson Power Plant	A-1415	5-24-15	do	Cedar River	Wheeler	175.00
Albion Power Plant	A-1480	2-20-17	do	Beaver Creek	Boone	70.00
Fullerton Power Plant	A-1686	8- 8-22	Res. Dam A-636	Cedar River	Nance	250.00
Fullerton Power Plant	A-1758	1-27-25	Res. Dam A-636 & A-1686	do	do	-
Lake Ericson Power Plant	A-2061	5-17-29	Res. Dam A-1415	do	Wheeler	-
Columbus-Genoa Project	A-2287	9-15-32	Power	Loup River	Nance	3,500.00
Looking Glass Reservoir	A-2302	2-13-33	Power	Looking Glass Creek	Platte	*10,000AF
Beaver Creek Res.	A-2303	2-31-33	Stor.	Beaver Creek	Nance	*10,000AF
Monroe Reservoir	A-2305	2-22-33	Power	Monroe Creek	Platte	*2,000AF
Monroe Creek Plant	A-2325	6- 9-33	do	do	do	5.00
Columbus-Genoa Project	A-2573	4- 4-36	Incr. Head A-2287	Loup River	Nance	-

Total Appropriations from Natural Flow for Irrigation 34.19

* Represents reservoir capacity alleged by applicant

APPROPRIATION FOR THE USE OF WATER
ARIKAREE RIVER IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Haigler Reservoir Canal	A-979	1-21-10	Irrig.	Arikaree R.	State of Colorado	171.00

APPROPRIATIONS FOR THE USE OF WATER
SOUTH FORK OF THE
REPUBLICAN RIVER IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Karr Canal	D-155	7-28-94	Irrig.	South Fork, Republican River	Dundy	2.00
Riverside Canal	D-156	8- 5-94	do	do	do	13.00
McDonald Canal	A-644	11-15-01	do	do	do	.79

Total Appropriations from Natural Flow for Irrigation 15.79

APPROPRIATIONS FOR THE USE OF WATER
FRENCHMAN RIVER BASIN IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Aberdeen Canal	D-50a	7- 1-88	Irrig.	Frenchman R.	Chase	2.00
Harlan Canal	D-56	7- 1-88	do	do	do	2.00
Culbertson Canal	D-24-25 29-30	5-16-90	do	Frenchman R. & Stinking Water Creek	Hayes	215.00
Champion Canal	D-47	12-23-90	do	Frenchman R.	Chase	24.00
Aberdeen Canal	D-50b	2- 2-91	do	do	do	.50
Farmers Canal	D-10	12-19-93	do	do	Hitchcock	10.00
Ascher Canal	A-1523	12-19-93	O. D. D-10	Canyon No. 10	do	-
Farmers Canal	A-1573	12-19-93	do	do	do	-
Chase County Land & Livestock C.	D-57	3-10-94	Irrig.	Stinking Water Creek	Chase	2.86
Fuller Canal	D-62	6-12-94	do	Frenchman R.	do	25.00
Riverside Canal	D-18	7-28-94	do	do	Hitchcock	12.00
Frenchman Valley C.	D-38	8-23-94	do	do	Hayes	10.00
McLain Canal	D-65	9-24-94	do	Stinking Water Creek	Chase	2.50
Gould Canal	D-67	10- 9-94	do	Frenchman R.	do	2.00
Maranville Canal	D-70-71	12- 8-94	do	do	do	6.00
Chase County Land & Livestock Canal #7	D-72-175	12-21-94	do	Stinking Water Creek	do	4.57
North Guernsey	D-74	1-14-95	do	Frenchman R.	Chase	1.30
South Guernsey	D-75	1-14-95	do	do	do	22.57
Chase County Land & Livestock Canal #6	D-76	1-28-95	do	Stinking Water Creek	do	2.00
Chase County Land & Livestock Canal #5	D-77	1-29-95	do	do	do	1.50
Chase County Land & Livestock Canal #3	D-78	1-29-95	do	do	do	1.71
Inman Canal	D-79	2-28-95	do	Frenchman R.	do	1.50
Chase County Land & Livestock Canal #4	A-56	6-27-95	do	Stinking Water Creek	do	.91
Chase County Land & Livestock Canal #1	A-57	6-27-95	do	do	do	.70
North Side Canal	A-246	2-25-96	do	Frenchman R.	do	.79
Shallenberger Canal	A-423	12-21-97	do	do	do	1.77
Inman Canal	A-436	2-10-98	do	do	do	6.43
Follett-Krotter Pump	A-705	4-30-03	do	do	Hayes	4.29
Follett-Krotter Pump	A-720	8-11-03	do	do	do	2.57
Hagerman Canal	A-935	3-11-09	do	do	do	.86
Follett-Krotter C.	A-975	1-15-10	do	do	do	5.70
Krotter Canal	A-1046	12-15-10	do	Stinking Water Creek	do	3.00
Krotter Canal	A-1047	12-15-10	do	Frenchman R.	do	2.42
Hoke Canal	A-1094	5- 1-11	do	do	Chase	1.29
Kilpatrick Reservoir Canal	A-1160	6-22-11	do	Kilpatrick Res.	do	-
Aberdeen Enl.	A-1117	7-29-11	do	Frenchman R.	do	1.57
Oliver Canal	A-1285	4-28-13	do	do	Hayes	3.20
Lake Imperial	A-1467	5-14-17	do	do	Chase	4.57
Riverside Canal	A-1674	7- 3-22	do	do	Hitchcock	2.90
Severns Pump	A-1856	9-11-26	do	do	do	2.01
Follett-Krotter Enl.	A-2294	1- 6-33	do	do	Hayes	2.98
Harlan Canal	A-2331	7-11-33	do	do	Chase	1.26
Grimm Pump	A-2542	4-25-35	do	do	Hayes	1.19
Hoffmeister Reservoir Canal	A-2575	3-13-36	do	Hoffmeister Res.	Chase	-
Krausnick Pump	A-2705	3- 2-37	do	Frenchman R.	do	.56
Wise Canal	A-2772	8-10-37	do	do	Hayes	1.38
Follett-Witt Pump	A-2805	11-20-37	do	do	do	.46
Wauneta Mills	D-178	7-31-86	Power	Frenchman R.	Chase	35.00
Lamar Rolling Mills	D-1013	12-30-87	do	do	do	30.00
Champion Mills	D-179	12-31-87	do	do	do	28.30
Hoke Power Plant	A-591	12-12-00	do	do	do	34.40
Krotter Power Plant	A-1021	8-17-10	do	do	Hayes	55.00
Champion Supply Enl.	A-1108	6-22-11	Irrig.	do	Chase	*1,000AF
Wauneta Power Plant	A-1136	11-16-11	Power	do	do	75.00
Arteburn Reservoir	A-1142	11-28-11	Irrig.	do	do	*1,800AF
Inman Reservoir	A-1145	12- 8-11	do	do	do	*2,000AF
Oliver Power Plant	A-1284	4-28-13	Power	do	Hayes	50.00
Krotter Power Plant	A-1339	12- 2-13	do	do	do	65.00
Imperial Power C.	A-1474	2- 7-17	do	do	Chase	55.00
Krotter-Imperial Reservoir	A-1979	2-10-28	Irrig.	do	do	*7,000AF
Krotter-Imperial Power Plant	A-1980	2-10-28	Power	do	do	50.00
Wauneta Power Plant	A-2015	5- 7-28	Res. Dam D-178	do	do	-
Oliver Power Plant	A-2061	1-16-29	Res. Dam A-1284	do	Hayes	-
Grosbach-Williams Power Plant	A-2338	7-27-33	Power	do	Chase	75.00
Hoffmeister Res.	A-2570	3-13-36	Irrig.	Frenchman R. & Springs	do	*100AF

Total Appropriation from Natural Flow for Irrigation 401.82

* Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
RED WILLOW CREEK IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Red Willow Canal	D-647	12-20-93	Irrig.	Red Willow Cr.	Lincoln	2.00
Helm Canal	A-1042	12- 8-10	do	do	Red Willow	.93
Hadley Canal	A-1984	10-22-27	do	do	do	8.43
Fitzgerald Pump	A-2447	7-27-34	do	do	Hayes	.57

Total Appropriations from Natural Flow for Irrigation 11.93

APPROPRIATIONS FOR THE USE OF WATER
MEDICINE CREEK IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Cambridge-Arapahoe Canal	D-89	8-26-91	Irrig.	Medicine Creek	Furnas	170.00
Sanders Canal	D-83	2- 8-95	do	do	Frontier	1.43
Nelson Pump	A-1865	10- 2-26	do	do	do	.61
Young Canal	A-1921	4- 5-27	do	Bushy Creek	do	.20
Nelson Pump	A-1927	4-19-27	do	Curtis Creek	do	.27
Cambridge Mill	D-92-93	12-31-78	Power	Medicine Creek	Furnas	68.00
Curtis Lake	D-364	-	do	do	Frontier	-
Maywood Mills	A-858	6- 4-07	do	do	do	11.88
Wellfleet Dam	A-2210	6-15-31	Resort	do	Lincoln	*80AF

Total Appropriations from Natural Flow for Irrigation and Domestic Use 172.81

*Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
REPUBLICAN RIVER BASIN" IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Bloomington Canal	D-185	12-31-81	Irrig.	Big Cottonwood Creek	Franklin	.80
Phelan Canal	D-138	12-31-83	do	Rock Creek	Dundy	4.29
Horse Creek Canal	D-159					
	D-173	8-31-85	do	Horse Creek	do	1.86
Carson Canal #1	D-103	7- 1-88	do	Republican R.	Red Willow	1.43
Haigler Canal	D-1025	4- 4-90	do	do	Yuma, Colo.	'50.00
Sand Point Canal	D-115	9-25-90	do	do	Dundy	11.00
Allen-Larned Canal	D-117	10-16-90	do	Buffalo Creek	do	6.00
Dundy County Canal	D-116	11-22-90	do	Republican R.	do	45.00
Porter Canal	D-171	11-26-90	do	Buffalo Creek	do	2.68
Trite-Davenport C.	D-3	12-18-90	do	Republican R.	Hitchcock	7.00
Meeker Canal	D-4-7-8-9	12-22-90	do	do	do	143.00
Trenton Canal	D-5	12-24-90	do	do	do	32.00
Neighbors Canal	D-133	3-18-91	do	do	Dundy	2.86
Carson Canal #2	D-102	5- 5-91	do	do	Red Willow	18.00
Republican River Canal	D-147-148	5- 2-92	do	do	Dundy	30.00
White-Larned C.	D-150	4-29-93	do	do	do	3.00
Marr Canal	D-11	1-22-94	do	do	Hitchcock	4.29
Anderson Canal	D-151	1-26-94	do	do	Dundy	1.90
Thomas Canal	D-154	6- 5-94	do	do	do	2.00
Ballard Canal	D-91	6- 9-94	do	do	Furnas	8.00
Gregory Canal	D-182	8-11-94	do	Center Creek	Franklin	2.00
Wilcox Canal	D-109	10- 4-94	do	Republican R.	Red Willow	4.50
Delaware-Hickman C.	D-157	1- 7-95	do	do	Dundy	20.00
Allen Canal	D-110	1-26-95	do	do	Red Willow	14.00
Thompson-Van Sickle Canal	A-237	6-20-95	do	Indian Creek	Dundy	.93
Owens Canal	A-265	6-20-95	do	Rock Creek	do	.36
Wilson Canal	A-268	6-22-95	do	Indian Creek & Rock Canyon Cr.	do	1.42
Chamberlain Canal	A-240	10- 4-95	do	Indian Creek	do	.06
Benkelman Canal	A-373	12-31-96	do	Spring Creek	do	1.29
Pringle Canal	A-364	1-12-97	do	Springs Trib. to Republican River	do	.67
Private Canal	A-413	10- 7-97	do	Republican R.	do	1.00
Bloomington Mill	A-483	11-23-98	do	Big Cottonwood Creek	Franklin	1.06
Rock Creek Canal	A-526	12-16-99	do	Rock Creek	Dundy	.33
Walsh Canal	A-537	1-31-00	do	Republican R.	Red Willow	11.00
Pringle Canal	A-824	5-11-06	do	Trib. to Horse Creek	Dundy	1.67
Jenkins Canal #1	A-924	12-12-08	do	Buffalo Creek	do	4.67
Shadeland Park C.	A-1049	1- 3-11	do	Republican R.	Red Willow	38.00
McConnell Canal	A-1055	1-23-11	do	do	Hitchcock	180.00
Hurst-Day Canal	A-1068	3- 2-11	do	do	do	7.00
Stonberg Canal	A-1070	3-13-11	do	Indian Creek	Dundy	1.00
Cappel Canal	A-1093	5--1-11	do	Republican R.	Red Willow	1.57
Shadeland Park C.	A-1129	9-28-11	do	do	do	7.00
Cottonwood Canal	A-1172	2-19-12	do	do	Dundy	3.35
Rupert Canal	A-1192	4-19-12	do	do	Hitchcock	20.00
Parks Canal	A-1202	6-18-12	do	do	Dundy	16.00
Schmitz Canal	A-1287	5- 3-13	do	Driftwood Cr.	Red Willow	1.50
Porter Canal	A-1298	6-23-13	do	Buffalo Creek	Dundy	3.32
Murray Canal	A-1316	8-13-13	do	Elk Creek	Furnas	2.85
Easterworth Canal	A-1332	11-17-13	do	Driftwood Cr.	Red Willow	1.00
Sylvan Dell Canal	A-1340	12- 6-13	do	do	do	2.80
Everson Canal	A-1443	12-18-15	do	Republican R.	Harlan	1.07
Parks Canal	A-1444	12-31-15	do	do	Dundy	2.00
Cook Creek Canal	A-1491	7-21-17	do	Cook Creek	Harlan	2.20
Shaffer Canal	A-1517	7-10-18	do	do	do	1.08
Parks Enlargement	A-1555	9- 5-19	do	Republican R.	Dundy	1.14
Parks Enlargement	A-1609	6-29-21	Supple.	Rock Creek	do	-
Crystal Springs C.	A-1615	8-17-21	Irrig.	Crystal Springs	Franklin	.28
Ham Canal	A-1618	9-14-21	do	Republican R.	Dundy	3.47
Campbell Canal	A-1627	11-26-21	do	do	Hitchcock	9.27
Gardner Canal	A-1647	3-20-22	do	Little Cottonwood Creek	Franklin	1.14
Home Irrigation Plant	A-1661	4-27-22	do	do	do	.23
Crews Canal #2	A-1709	3-29-23	do	Republican R.	Dundy	2.39
Woessner Canal	A-1765	6-23-25	do	Crooked Creek	Webster	.30
Dunlay Pump	A-1768	7- 8-25	do	Republican R.	Harlan	5.00
Fishback Pump	A-1778	8-27-25	do	do	do	1.08
Stevenson Pump	A-1781	9-30-25	do	do	do	6.34
Drummond Pump	A-1782	10-13-25	do	do	do	2.37
Scott Pump	A-1789	12-22-25	do	do	do	3.37
Phillip Pump	A-1791	1- 9-26	do	Indian Creek	Webster	2.21
Ramey Pump	A-1792	1-19-26	do	do	do	3.87
Hasker Pump	A-1798	3- 2-26	do	Republican R.	Harlan	4.60
Republican Valley Pump	A-1821	6-18-26	do	do	do	2.06
Lake View Project	A-1824	6-29-26	do	do	do	1.15
Crews North Side Canal #3	A-1826	6-30-26	do	do	Dundy	4.00
Sindt Pumps	A-1838	7-30-26	do	Stream Trib. to Turkey Creek	Franklin	1.00
Daniels Canal	A-1854	9- 9-26	do	Indian Creek	Dundy	.05
Flodine Pump	A-1855	9- 9-26	do	Sappa Creek	Harlan	1.66
Carpenter Canal	A-1861	9-18-26	do	Turkey Creek	Furnas	.71
Worden Pump	A-1862	9-23-26	do	Republican R.	Nuckolls	1.04
Watson Pump	A-1876	11-30-26	do	Turkey Creek	Furnas	2.80
Workman Pump	A-1886	1-19-27	do	Republican R.	Harlan	1.10
Larson Pump	A-1898	2- 9-27	do	Muddy Creek	Furnas	3.63
Sheffrey Pump	A-1906	2-28-27	do	Republican R.	Harlan	1.85
Wintersteen Pump	A-1914	3-17-27	do	do	do	.11
Fults Pump	A-1922	4- 6-27	do	Sappa Creek	Furnas	1.48
Newton Pump	A-1923	4-11-27	do	Beaver Creek	do	.97
Post Pump	A-1933	5-27-27	do	Turkey Creek	Franklin	1.90
Johnson Pump	A-1934	5-30-27	do	do	Furnas	1.18
Best Pump	A-1936	6-30-27	do	Republican R.	Harlan	1.41
Wilson Pump	A-1937	7- 8-27	do	do	Webster	.57
Wengert Pump	A-1938	7- 9-27	do	Turkey Creek	Furnas	.94
Hoylman Canal	A-1948	8- 1-27	do	Craig Creek	Harlan	1.69
Weisaw Pump	A-1982	2-11-28	do	Beaver Creek	Furnas	1.22
Bradley Pump	A-1989	3- 7-28	Irrig.	Macklin Creek	Hitchcock	.36
Cemer Pump	A-1992	3-28-28	do	do	do	.09
Romjue Pump	A-2005	4-16-28	do	Republican R.	Webster	2.03
Jensen Pump	A-2017	5-14-28	do	do	Nuckolls	1.60
Blank and Joy Canal	A-2025	6-17-28	do	Center Creek	Franklin	2.82
Runck Pumps	A-2029	9-18-28	do	Republican R.	Harlan	3.29
Runck Pump No. 2	A-2030	9-18-28	do	Deep Creek	do	.65
Michel Pump	A-2042	10-13-28	do	Muddy Creek	Furnas	.29
Pleas Pump	A-2120	1- 4-30	do	Ashey Lake	do	2.31
Weber Pump	A-2166	8- 8-30	do	Beaver Creek	Red Willow	1.43
Keifer Canal No. 1	A-2167	8-22-30	do	Republican R.	Nuckolls	9.83
Furry Pumps	A-2171	11-10-30	do	do	Franklin	2.26
Keifer Canal No. 2	A-2176	11-17-30	do	do	Nuckolls	9.15
Lunt Reservoir C.	A-2201	11-19-30	do	Res. A-2176	do	-
Hevner Pump	A-2224	8- 8-31	do	Republican R.	Franklin	4.66
Kara Canal	A-2480	10-31-31	do	Res. A-2246	Dundy	-
Winslow Pump	A-2252	2-10-32	do	Sappa Creek	Furnas	.86
North Spring Canal	A-2278	7-27-32	do	Springs, North Trib. to Thompson Cr.	Franklin	.09
Sughroue Pump	A-2280	8-16-32	do	Berger Creek	Red Willow	.64
Sughroue Pump	A-2280	8-16-32	do	School Creek	do	.32
Mendell Canal	A-2283	9- 7-32	do	Republican R.	Nuckolls	2.61
Fishback Pump #1 Enlargement	A-2304	2-15-33	do	do	Harlan	-
Hill Pump	A-2314	3-29-33	do	do	Furnas	1.88
Valley Grove Pump	A-2318	4-17-33	do	do	Webster	.97
Broeker Pump	A-2332	7-12-33	do	do	Furnas	.57
Sherwood Pump	A-2333	7-19-33	do	do	do	.97
Fritzer Pump	A-2340	8- 3-33	do	do	do	1.29
Fletcher Pump	A-2342	8- 8-33	do	Beaver Creek	do	.43
Rasser Canal	A-2357	1-24-34	do	Elm Creek	Webster	1.02
Sappa Valley Pump	A-2385	5-23-34	do	Sappa Creek	Harlan	1.09
Mayfield Pump	A-2403	6- 8-34	do	Republican R.	Furnas	1.17
Best Pump	A-2492	11- 9-34	do	do	do	2.50
Ziegler Pump	A-2506	1-16-35	do	Thompson Cr.	Franklin	.73
Warner Pumps	A-2510	1-28-35	do	Republican R.	Furnas	.57
Lideen Pump	A-2516	2-20-35	do	do	Harlan	.29
James Canal	A-2521	2-28-35	do	Vining Creek	Franklin	.36
Eshelman Pump	A-2550	6- 6-35	do	Thompson Cr.	Franklin	.06
James Canal	A-2719	9-28-35	do	Res. A-2559	Franklin	-
Fisher Pump	A-2583	5-23-36	do	Republican R.	Furnas	.32
Post Pump	A-2621	8-21-36	do	Turkey Creek	Franklin	.79
Post Pump	A-2622	8-21-36	do	do	do	1.11
Riverside Pump	A-2698	2-16-37	do	Republican R.	Red Willow	.21
French Pump	A-2703	2-25-37	do	do	Furnas	.39
Davidson Pump	A-2753	6-12-37	do	Sacraments Cr.	Phelps	.50
Feese Pump Nos. 1 & 2	A-2768	8- 2-37	do	Prairie Dog Cr.	Harlan	1.13
Hoyt Pump	A-2780	9- 7-37	do	Driftwood Cr.	Hitchcock	.56
Seyler Pump	A-2786	9-13-37	do	Prairie Dog Cr.	Harlan	.80
Wood Pump	A-2796	10- 8-37	do	Beaver Creek	Red Willow	.88
Farr Pump	A-2833	2- 7-38	do	Deer Creek	Frontier	.22
Randel Pump	A-2849	3-16-38	do	Republican R.	Red Willow	-
Puets Pump	A-2857	4- 1-38	do	Beaver Creek	Red Willow	.71
Gardner Pump	A-2859	4- 2-38	do	Indian Creek	Dundy	-
Andrews Pump	A-2867	4-29-38	do	Republican R.	Furnas	.56
Wilt and Polly Canal	D-163	12-31-74	Power	Turkey Creek	Franklin	-
Guthrie Canal	D-1036	9- 1-77	do	Republican R.	Nuckolls	400.00
Arapahoe Star Mills	D-1029	7-24-79	do	Republican R.	Furnas	196.00
Bloomington Mills	A-483	11-23-98	do	Big Cottonwood Creek	Franklin	6.00
Harmon Canal	A-555	1-22-00	Ice	Republican R.	Red Willow	10.00
Fish Pond	A-665	5- 7-02	Fish	Crooked Creek	Webster	1.00
Burlington Pipe Line	A-1143	11-28-11	Dom.	Mauer Springs	do	1.48
Brush Cr. Reservoir	A-1201	6- 1-12	Irrig.	Brush Creek	Red Willow	*250AF
Slawson Ice Pond	A-1213	6- 8-12	do	Crooked Creek	Webster	*5AF
Benkelman Power Plant	A-1246	11-30-12	Power	Rock Creek	Dundy	20.00
Lake Disappointment	A-1442	12-18-15	Resort	Republican R.	Harlan	*60AF
Shaffer Reservoir	A-1522	8-24-18	Irrig.	Cook Creek	do	*24AF
Rudisell Dam	A-1970	11-26-27	do	Rock Canyon Cr.	Dundy	*5AF
Valley Reservoir	A-2013	4-30-28	do	Bell Creek	Nuckolls	*28AF
Twin Lakes Res.	A-2133	4-16-30	do	Spring Creek	Dundy	*7AF
Lunt Reservoir	A-2176	11-19-30	do	Valley Home Cr.	Nuckolls	*100AF
Kara Lake Res.	A-2246	10-31-31	do	Rock Creek	Dundy	*50AF
Rock Creek Lake	A-2366	2-28-34	Fish	do	do	*216AF
James Reservoir	A-2559	9-28-35	Irrig.	Vining Creek	Franklin	*22AF
Republican City Res.	A-2692	2- 1-37	do	Republican R.	Harlan	-

Total Appropriations from Natural Flow for Irrigation and Domestic Use . . . 879.79

" Excluding the Arikaree South Fork of the Republican and Frenchman rivers, Red Willow and Medicine creeks.
' 35.00 Second-feet for Nebraska, 15.00 Second-feet for Colorado
* Represents reservoir capacity alleged by applicant

APPROPRIATION FOR THE USE OF WATER
SOUTH FORK OF THE
ELKHORN RIVER IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Flouring Mill	A-464	9-21-98	Power	S. Fork of Elkhorn R.	Holt	33.00

APPROPRIATIONS FOR THE USE OF WATER
NORTH FORK OF THE
ELKHORN RIVER IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Warfield Pump	A-2065	6-15-29	Irrig.	North Fork of Elkhorn R.	Madison	1.03
Stahl Pump	A-2343	8-17-33	do	do	do	.42
Hagel Pump	A-2474	9-12-34	do	do	do	.50
Hathke Pump	A-2533	4- 4-35	do	do	do	.02
Warfield Pump	A-2577	5- 2-36	do	do	do	.53
Chilvers Pump	A-2588	7-14-36	do	North Fork of Elkhorn R. & Dry Creek	Pierce	5.91
Werner Pump	A-2597	7-24-36	do	North Fork of Elkhorn R.	Madison	.56
Kolterman Pump	A-2602	7-30-36	do	do	Pierce	1.89
Koehler Pump	A-2611	8-13-36	do	do	do	.71
Doughty Pump	A-2661	11-18-36	do	do	Madison	.24
Kirchmann Pump	A-2670	12-11-36	do	do	Pierce	.01
Hetrick Pump	A-2743	5-18-37	do	Willow Creek	do	.05
Stewart Pump	A-2747	6-25-37	do	North Fork of Elkhorn R.	Madison	.21
Richter Pump	A-2865	4-27-38	do	do	do	.43
Norfolk Nursery Pump	A-2875	5-26-38	do	do	do	.44
Norfolk Cereal & Flour Mill	D-996	3- 1-70	Power	do	do	100.00

Total Appropriations from Natural Flow for Irrigation 12.95

APPROPRIATIONS FOR THE USE OF WATER
LOGAN CREEK IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Johnson Pump	A-2192	2-20-31	Irrig.	Logan Creek (Oakland Drain)	Burt	1.71
Johnson Pump	A-2236	9-10-31	do	Oakland Drain	do	.92
Havekost Pump	A-2586	7-10-36	do	Logan Creek	Dodge	.37
Meyer Pump	A-2595	7-24-36	do	do	do	1.41
Schole Pump	A-2596	7-24-36	do	do	do	.38
Uehling Pump	A-2598	7-25-36	do	Logan Creek	do	.26
Meyer Pump	A-2599	7-27-36	do	Logan Creek	Cuming	1.33
Von Essen Pump	A-2604	8- 1-36	do	Logan Creek, Oakland Drain	Burt	.70
Beckman Pump	A-2613	8-15-36	do	Dog Creek	Wayne	.63
Hoegermeyer Pump	A-2615	8-17-36	do	Logan Creek	Dodge	.69
Golder Pump	A-2624	8-26-36	do	Logan Creek	do	.14
Novak Pump	A-2632	9- 2-36	do	Logan Creek, Pender Drain	Thurston	.78
Havekost Pump	A-2659	11-12-36	do	Logan Creek	Dodge	.43
Ronnenkamp Pump	A-2675	12-26-36	do	Logan Creek Bancroft Drain	Cuming	.26
Hall Pump	A-2688	1-28-37	do	Logan Creek	Wayne	.08
Beckenhauer Pump	A-2697	2-12-37	do	do	Cuming	.95
Burmeister Pump	A-2707	3- 2-37	do	Logan Creek, Pender Drain	Thurston	-
Moodie-Jordan Pump	A-2712	3- 9-37	do	Logan Creek	Cuming	1.42
Uehling Pump	A-2714	3-13-37	do	Logan Creek	Dodge	.26
Bartles Pump	A-2738	5- 3-37	do	Perrin Creek	Cedar	.66
Ross Pump	A-2739	5- 4-37	do	Logan Creek	Cuming	.76
Roscoe Pump	A-2795	10- 5-37	do	Logan Creek, Lyons Drain	Burt	1.04

Total Appropriations from Natural Flow for Irrigation 16.18

APPROPRIATIONS FOR THE USE OF WATER
ELKHORN RIVER BASIN* IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Elkhorn Canal	D-259 D-263	2- 3-94	Irrig.	Elkhorn River	Holt	131.43
Davis Canal	D-260	2- 8-94	do	do	do	1.43
Carlon Canal No. 1	D-261	2- 8-94	do	do	do	1.00
Carlon Canal No. 2	D-262	2- 8-94	do	do	do	5.00
Cain Canal	D-283	2-20-95	do	do	do	5.00
Sibberson Canal	A-1779	9- 5-25	do	do	do	2.50
Krueger Pump	A-2379	5- 9-34	do	Union Creek	Madison	.43
Eubank Pump	A-2416	7- 5-34	do	Elkhorn River	Antelope	.79
Steckelberg Pump	A-2461	8-13-34	do	Union Creek	Stanton	2.33
Luther Pump	A-2500	12-19-34	do	Maple Creek	Dodge	2.72
Heitzman Pump	A-2528	3-16-35	do	Elkhorn River	Cuming	.31
Fuchs Pump	A-2580	5-22-36	do	Union Creek	Stanton	.85
Dahl Pump	A-2589	7-17-36	do	Pebble Creek	Dodge	.46
Cowles Pump	A-2606	8- 7-36	do	Rawhide Creek	Douglas	.46
McGuire Pump	A-2612	8-14-36	do	Elkhorn River	Cuming	1.21
Lew Pump	A-2619	8-19-36	do	Taylor Creek	Madison	.65
Collins Pump	A-2630	8-31-36	do	Elkhorn River	Cuming	.39
Vakiner Pump	A-2637	9- 9-36	do	Pebble Creek	Dodge	1.63
Dwyer Pump	A-2641	9-22-36	do	Elkhorn River	Douglas	.08
Christian Pumps	A-2652	11- 4-36	do	Union Creek	Madison	1.68
Evergreen Pump	A-2653	11- 5-36	do	Elkhorn River	Douglas	1.10
Lewis Pump	A-2655	11- 9-36	do	Buffalo Creek	Madison	.79
Mastny Pump	A-2656	11- 9-36	do	Union Creek	Stanton	1.45
Young Pump	A-2663	11-24-36	do	Giles Creek	Antelope	.62
Torbert Pump	A-2674	12-21-36	do	Elkhorn River	Madison	.09
Rosmarin Pump	A-2704	3- 1-37	do	do	Stanton	.06
Walz Pump	A-2708	3- 3-37	do	Walz Lake	Madison	.17
Carlson Pump	A-2716	3-17-37	do	Cedar Creek	Antelope	.15
Jacobsen Pump	A-2720	3-20-37	do	Union Creek	Madison	.43
Boldt Pump	A-2734	4-21-37	do	do	Stanton	.27
Brink Pump	A-2750	6- 4-37	do	do	Antelope	.82
Hollingsworth Pump	A-2751	6- 9-37	do	Rawhide Creek	Douglas	.43
Long Pump	A-2761	7-15-37	do	Union Creek	Stanton	.72
Feldhahn Pump	A-2767	7-30-37	do	Elkhorn River	do	.69
Steward Pump	A-2850	3-18-38	do	do	Madison	.69
Longin Pump	A-2854	3-24-38	do	Union Creek	Stanton	-
Sunderland Pump	A-2860	4- 4-38	do	Elkhorn River	Douglas	1.86
Atkinson Mill	D-271	11- 1-83	Power	do	Holt	38.50
Battle Creek Mill	A-464	11-12-98	do	Battle Creek	Madison	10.67
Battle Creek Mill	A-818	4-20-06	do	do	do	20.00
Platte River Plant	A-971	11-24-09	do	Elkhorn River	Douglas	500.00
West Point Plant	A-1260	12-26-12	do	do	Cuming	400.00
Union Valley Roller Mills	D-998	-	do	Taylor Creek & Union Cr.	Madison	-

Total Appropriations from Natural Flow for Irrigation 170.68

" Excluding the North and South Forks of the Elkhorn River and Logan Creek

APPROPRIATIONS FOR THE USE OF WATER
LITTLE BLUE RIVER BASIN IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Lyon Canal	A-1411	4-26-15	Irrig.	Little Blue R.	Nuckolls	4.00
Crystal Lake	A-1526	6-17-12	do	do	Adams	-
Hurlburt Canal	A-1685	8- 7-22	do	do	Jefferson	.90
Kistler Pump	A-1869	11- 1-26	do	do	Adams	.08
Vap Pump	A-1878	12- 8-26	do	do	Clay	.51
Gaudreault Pump	A-1903	2-22-27	do	do	Adams	.39
Pratt Pump	A-1904	2-23-27	do	do	do	1.01
Logan Canal	A-1907	3- 7-27	do	do	Clay	1.88
Knopf Pumps	A-1908	3- 8-27	do	do	Adams	1.60
Graham Pump	A-1909	3- 8-27	do	do	do	.80
Hornberger Pump	A-1978	1-24-28	do	do	do	2.19
Bergt Pump	A-2134	4-17-30	do	do	Thayer	1.50
Blue Haven Pumps	A-2152	8- 4-30	do	do	do	5.24
Midwest Garden Pump	A-2165	9- 4-30	do	do	Jefferson	1.74
Riverside Pump	A-2193	2-24-31	do	do	Thayer	2.23
Nehrig Pump	A-2194	3-10-31	do	do	do	5.00
Sanford Pump	A-2238	9-22-31	do	do	Adams	.28
Heiler Pump	A-2241	9-30-31	do	do	do	.46
Weyenberg Pump	A-2243	10- 8-31	do	do	Clay	1.20
Zweifel Pump	A-2277	7-25-32	do	do	Jefferson	.25
Paus Pump	A-2321	8-15-33	do	do	Clay	.22
Peters Pump	A-2389	5-31-34	do	do	Nuckolls	.71
Meyer Pump	A-2394	6- 2-34	do	do	do	1.31
Davis Pump	A-2399	6- 5-34	do	do	Clay	.66
Wilson Pump	A-2425	7-14-34	do	Rose Creek	Jefferson	1.01
Stokebrand Pump	A-2451	8- 1-34	do	Little Blue R.	Thayer	.84
Johnston Pump	A-2460	8-13-34	do	do	Nuckolls	1.14
Rural Rehab. Project No. 1	A-2466	8-18-34	do	Stream- No name	Jefferson	.34
Kasparek Pump	A-2491	11- 5-34	do	Little Blue R.	do	.54
Endicott Pump	A-2511	2- 1-35	do	do	do	.46
Powell Pump	A-2517	2-20-35	do	do	do	.54
Brinegar Pump	A-2537	4-11-35	do	Big Sandy Cr.	Thayer	.45
Ferebee-Bartlett Pump	A-2553	8- 7-35	do	Little Blue R.	Nuckolls	.21
Corliss Pump	A-2682	1-25-37	do	do	Thayer	.93
Hubbell Pump	A-2689	1-30-37	do	do	Clay	.04
Hubbell Pump	A-2690	1-30-37	do	Little Blue R. and Liberty Cr.	do	.07
Hill Pump	A-2725	3-26-37	do	Little Blue R.	do	.33
Hubbell Pump No. 2	A-2749	5-25-37	do	do	Adams	.61
McKenzie Pump	A-2799	11- 2-37	do	do	Thayer	.30
Crystal Lake	A-1219	6-17-12	Ice	do	Adams	*32AF
Lyon Power Plant	A-1410	4-26-15	Power	do	Nuckolls	150.00
Meyer Hydro-electric Power Plant	A-1467	7-27-16	do	do	do	150.00
Hebron Power Plant	A-1538	3-31-19	do	do	Thayer	216.00
Blue Valley Plant	A-1542	5-28-19	do	do	do	200.00
Larkins Canal	A-1594	11-29-20	do	do	Adams	1.50
Blue Valley Yacht Club	A-1745	5-23-24	Resort	do	do	-
Fairbury Plant	A-1963	10-22-27	Mfg.	do	Jefferson	16.70
Massie Lake	A-2307	3-10-33	Resort	Pawnee Cr.	Clay	*65AF

Total Appropriations from Natural Flow for Irrigation 41.45

* Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
BIG BLUE RIVER BASIN IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Lane Model Canal	A-81	7-16-95	Irrig.	Turkey Creek	Saline	.09
Lane Model Canal	A-84	7-18-95	do	do	do	.-
Mares Canal	A-1314	8-12-13	do	Big Blue River	do	2.28
Mangus Pump	A-1887	1-24-27	do	Bear Creek	Gage	.50
Nelson Pump	A-1899	2-11-27	do	West Fork, Big Blue R.	Clay	.48
Warren Pump	A-1971	11-26-27	do	do	Adams	.16

Feeble-Minded Institute Pump	A-2010	4-22-28	do	Bear Creek	Gage	.95
Show Pump	A-2048	10-19-28	do	West Fork, Big Blue R.	York	.42
Swanson Pump	A-2076	4- 4-29	do	do	Adams	1.20
Muirhead Canal	A-2103	9-13-29	do	do	Hamilton	.93
Johnson Pump	A-2130	3-26-30	do	Big Blue River	Polk	1.29
Sondregger Pump	A-2164	8-29-30	do	do	Gage	.43
Andrews Pump	A-2196	4- 3-31	do	Stream Trib. to Big Blue River	do	.20
Show Pump	A-2368	3-16-34	do	West Fork, Big Blue R.	York	.82
Pecka Pump	A-2376	5- 3-34	do	Turkey Creek	Saline	1.23
Blevins Pump	A-2384	5-19-34	do	Big Blue River	Polk	.57
Divoky Pump	A-2386	5-25-34	do	Turkey Creek	Saline	1.13
Dilley Pump	A-2414	6-30-34	do	do	do	2.11
Belka Pump	A-2424	7-13-34	do	do	do	.58
Schmidt Pump	A-2426	7-14-34	do	West Fork, Big Blue R.	Fillmore	.43
Casteel Pump	A-2429	7-18-34	do	do	Saline	1.43
Nave Pump	A-2430	7-18-34	do	do	do	.39
[illegible] Pump	A-2432	7-19-34	do	Turkey Creek	do	.73
Johnson Pump	A-2435	7-23-34	do	West Fork, Big Blue R.	Seward	.37
Cekal Pump	A-2438	7-24-34	do	Big Blue River	Gage	.41
Martz Pump	A-2440	7-24-34	do	do	Seward	.64
Quackenbush Pump	A-2441	7-25-34	do	do	Gage	.07
Olson Pump	A-2453	8- 1-34	do	do	Seward	.64
Mohlman Pump	A-2458	8- 9-34	do	West Fork, Big Blue R.	Adams	.56
Chermak Pump	A-2470	9- 5-34	do	Big Blue River	Seward	.58
Jorgenson Pump #1	A-2473	9-11-34	do	do	Butler	1.59
Jorgenson Pump #2	A-2479	9-26-34	do	do	do	.74
Karpisek Pump	A-2495	11-20-34	do	do	do	.61
Ritterbush Pumps Numbers 1 & 2	A-2496	11-22-34	do	Lincoln Creek	Seward	.67
Fink Pump	A-2518	2-23-35	do	Indian Creek & Spring Branch	Gage	.17
Weston Pump	A-2540	4-18-35	do	Big Blue River	do	1.39
Rehor Pump	A-2543	4-30-35	do	West Fork, Big Blue R.	Seward	.41
Hasenohr Pump	A-2546	5- 3-35	do	Turkey Creek	Saline	.33
Stokebrand Pump	A-2562	10-18-35	do	do	Gage	.49
Stokebrand Pump	A-2563	10-18-35	do	Big Blue River	do	.22
Sondregger Pump	A-2565	10-25-35	do	do	do	.50
Budler Pump	A-2581	6-15-36	do	West Fork, Big Blue R.	Fillmore	.08
Morford Pump	A-2593	7-21-36	do	West Fork, Big Blue R.	Seward	.29
Gilmore Pump	A-2600	7-27-36	do	do	York	.43
Miller Pump	A-2601	7-29-36	do	Big Blue River	Gage	.15
Kaliff Pumps	A-2614	8-15-36	do	West Fork, Big Blue R.	York	1.10
Semler Pump	A-2626	8-27-36	do	do	Seward	.25
Morrill Pumps	A-2629	8-28-36	do	Big Blue River	Polk	.42
Mares Pump	A-2636	9- 9-36	do	do	Saline	.05
Ebke Pump	A-2645	10-16-36	do	Turkey Creek	do	.40
Franz Pump	A-2649	10-24-36	do	West Fork, Big Blue R.	York	.12
Sandy Pump	A-2650	11- 2-36	do	do	do	.11
Hamouz Pump	A-2651	11- 3-36	do	Turkey Creek	Fillmore	.04
Sheppard Pump	A-2662	11-19-36	do	Big Blue River	Butler	.93
Hronik Pump	A-2677	12-26-36	do	do	Saline	.70
City Trust Company Pump	A-2695	2- 6-37	do	West Fork, Big Blue R.	York	.71
Cloverdale Pump	A-2725	3-27-37	do	do	Saline	.49
Smith Pump	A-2728	4- 6-37	do	Swan Creek	do	.03
Miller Pump	A-2732	4-17-37	do	do	do	.97
Rathbun Pump	A-2737	4-28-37	do	Big Blue River	Gage	1.00
Miller Pump	A-2758	7- 6-37	do	West Fork, Big Blue R.	Saline	.35
Birky Pump	A-2759	7- 7-37	do	Big Blue River	Seward	.34
Ritterbush Canal Extension	A-2764	7-22-37	do	Lincoln Creek	do	.36
Imig Pump #1	A-2765	7-27-37	do	do	do	.31
Imig Pump #2	A-2766	7-27-37	do	Big Blue River	do	.53
Nelson Pump	A-2773	8-18-37	do	Lincoln Creek	do	.66
Gard Pumping Plant	A-2775	8-19-37	do	West Fork, Big Blue R.	do	-
Oak Park Pump	A-2776	8-24-37	do	Big Blue River	Seward	.65
United Insurance Company Pump	A-2783	9-10-37	do	West Fork, Big Blue R.	do	.37
Simmons and Matzke Pump Project	A-2784	9-11-37	Irrig.	West Fork, Big Blue R.	Seward	.31
Novak Pump	A-2788	9-16-37	do	Big Blue River	Saline	.33
Gruntorad Pump	A-2816	12-20-37	do	Big Blue River	do	.97
Dunker Pump	A-2822	1- 6-38	do	do	Butler	.07
Yokel Pump	A-2853	3-24-38	do	Turkey Creek	Saline	.96
Curry Pump	A-2861	4-12-38	do	Lincoln Creek	Seward	.94
Anderson Pump	A-2862	4-16-38	do	Big Blue River	Polk	.99
Black Brothers Plant (Beatrice)	D-1048	1-11-60	Power	do	Gage	300.00
Milford Mills	D-1044	66	do	do	Seward	300.00
Black Brothers Plant Number 2 (Blue Springs)	D-1047	68	do	do	Gage	450.00
DeWitt Mill	D-1046	1- 1-75	do	do	do	200.00
Wright Mill	D-963	11- 1-78	do	Beaver Creek	York	40.00
Holmesville Power Plant	D-1021	4- 82	do	Big Blue River	Gage	500.00
DeWitt Mill	D-1046	1- 1-03	Res. Dam	do	do	-
Blue River Power Station No. 1	A-1006	7- 8-10	Power	do	Seward	200.00
Holmesville Power Plant	A-1095	5- 3-11	Res. Dam D-1C21	do	Gage	-
Jacobs Power Plant	A-1135	11-13-11	Power	do	Seward	40.00
Big Blue Plant #2	A-1153	1- 3-12	do	West Fork, Big Blue R.	do	100.00
Barnston Power Plant	A-1262	2-18-13	do	Big Blue River	Gage	500.00
Blue River Plant #3	A-1265	3-13-13	do	West Fork, Big Blue R.	Saline	100.00
C. B. & Q. Pipe Line	A-1366	4-30-14	Dom.	Big Blue River	Seward	.50
Wymore Pipe Line	A-1391	12-24-14	do	do	Gage	.50
Seward Pipe Line	A-1395	12-24-14	do	do	Seward	.50
Blue River Plant #4	A-1463	8-14-16	Power	do	do	100.00
Power Plant #5	A-1476	2-13-17	do	West Fork, Big Blue R.	Salin	100.00
Blue Park Dam	A-1494	5- 4-17	do	West Fork, Big Blue R. & School Cr.	Fillmore	66.00
Shestak Power Plant	A-1506	2- 6-18	do	Big Blue River	Saline	200.00
Big Blue Plant #2	A-1520	8-21-18	Res. Dam A-1153	West Fork, Big Blue R.	Seward	-
Blue River Plant #3	A-1521	8-21-18	Res. Dam A-1265	do	Saline	-
Barnston Power Plant	A-1585	5-27-20	Res. Dam A-1262	Big Blue River	Gage	-
Bow Span Plant	A-1595	12-17-20	Power	West Fork, Big Blue R.	Seward	100.00
Big Bend Plant	A-1596	12-17-20	do	do	Saline	100.00
Wilber Power Plant	A-1597	12-17-20	do	Big Blue River	do	200.00
Blue River Plant #3	A-1599	12-28-20	Res. Dam A-1265	West Fork, Big Blue R.	do	-
Power Plant #6	A-1690	10- 7-22	Power	Big Blue River	Gage	400.00
Power Plant #2	A-1692	11- 7-22	Dredge D-1047	do	do	-
Power Plant #2	A-1698	12-16-22	do	do	do	-
Blue River Plant #3	A-1733	1-30-24	Dredge A-1265	West Fork, Big Blue R.	Saline	-
Blue River Plant #3	A-1751	11-21-24	do	do	do	-
Blue River Plant #4	A-1752	11-25-24	Dredge A-1463	Big Blue River	Seward	-
Shestak Power Plant	A-1761	5-30-25	Dredge A-1506	do	Saline	-
Barnston Power Plant	A-1788	12-17-25	Dredge A-1262	do	Gage	-

Total Appropriations from Natural Flow for Irrigation and Domestic Use 48.21

APPROPRIATIONS FOR THE USE OF WATER
SNAKE RIVER IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Bachelor Canal	A-2506	1-17-35	Irrig.	Boardman Creek	Cherry	27.29

APPROPRIATIONS FOR THE USE OF WATER
MINICHADUZA CREEK IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Pierce Milling Plant	A-359	9-12-96	Power	Minichaduza Creek	Cherry	35.00
Valentine Power Plant	A-1279	4-16-13	do	do	do	40.00
Community Lake Res.	A-2568	12-13-35	Resort	do	do	*27AF
Valentine Hatchery Reservoir	A-2878	7-15-38	Fish	do	do	*98AF

* Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
PLUM CREEK IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Johnstown Canal	D-405	12-18-94	Irrig.	Plum Creek	Brown	26.00
Wilbert Canal	A-329	5- 8-96	do	do	do	.43
Cedar Creek Canal	A-1027	9-28-10	do	Cedar Creek	do	.43
Plum Creek Plant	A-947	5-15-09	Power	Plum Creek	do	150.00

Total Appropriations from Natural Flow for Irrigation 26.86

APPROPRIATIONS FOR THE USE OF WATER
BONE CREEK IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Grant Canal	D-400	1- 1-95	Irrig.	Stream- No name	Rock	.14
Long Pine Light & Power Plant	A-941	4- 2-09	Power	Long Pine Creek	Brown	48.00

APPROPRIATIONS FOR THE USE OF WATER
KEYA PAHA RIVER IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Akers Canal	D-611	8- 1-94	Irrig.	E. Holt Creek	Keya Paha	.14
Yocum Canal	D-573	9- 7-94	do	Keya Paha River	Boyd	1.14
Soper Canal	D-592	11- 6-94	do	Huggins Creek	Keya Paha	.14
Schoettger Canal	D-595	2-23-95	do	Holt Creek	do	.14
Mutz Canal	D-608b	6-30-95	do	Crooked Creek	do	1.00
Burton Creek Canal	D-608b	6-30-95	do	Burton Creek	do	.57
Lewis Canal	A-139	8-30-95	do	Lewis Springs	do	.14
One Trip Canal	A-142	9- 2-95	do	Burton Creek	do	.36

Green Canal	A-747	4- 1-04	do	Kibby Creek	Boyd	.01
Mutz Canal	D-606a	12-31-89	Power	Crooked Creek	Keya Paha	3.00
Bruce Roller Mills	A-729	10- 5-03	do	Keya Paha River	Boyd	100.00
Horse Shoe Lake Res.	A-2380	5-10-34	Fish	Spring Creek	Keya Paha	*16AF

Total Appropriations from Natural Flow for Irrigation 3.64

* Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
VERDIGRIS CREEK IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Drayton Canal	D-248	8-11-94	Irrig.	Verdigris Cr.	Antelope	2.86

APPROPRIATIONS FOR THE USE OF WATER
NIOBRARA RIVER BASIN" IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Lakotah Canal	D-554	10- 1-83	Irrig.	Niobrara River	Sioux	5.85
McGuire Canal	D-606	6- 1-84	do	Middle Creek, East Branch	Keya Paha	.71
Van Koten Canal	D-619	1- 1-85	do	Rock Creek	do	.07
Earnest Canal No. 1	D-514a	5- 1-85	do	Niobrara River	Sioux	2.86
McGinley-Stover Lower North C.	D-513a	5- 1-87	do	do	do	8.21
Moore Canal	D-593	6-30-87	do	Rock Springs Creek	Keya Paha	1.43
Pioneer Canal	D-442a	8- 1-87	do	Niobrara River	Dawes	7.14
McLaughlin Canal	D-566	5- 1-88	do	do	Box Butte	7.14
Skinner Canal	D-609	6-20-88	do	Bear Creek	Keya Paha	.23
Newman Canal	D-617	7- 1-88	do	Newman Creek	do	.21
Hutchinson Canal	D-615	9- 1-88	do	Cross Creek	do	.21
McGinley-Stover Lower South C.	D-513b	5- 1-90	do	Niobrara River	Sioux	1.71
Hughes Canal	D-987a	5-31-90	do	do	Box Butte	.57
Earnest Canal No. 2	D-514b	5-15-91	do	do	Sioux	2.14
Byington Canal	D-582	5-19-91	do	Rickman Creek	Keya Paha	1.00
Cook Canals 1 & 2	D-980	5-31-91	do	Niobrara River	Sioux	3.54
Allen Canal	D-616	6- 1-91	do	Middle Creek, West Branch	Keya Paha	.60
Bigelow and Seymour Canal	D-510	6- 8-91	do	Niobrara River	Sioux	2.40
McCully Canal	D-604	6-10-91	do	Wyman Creek	Keya Paha	.60
Beeman Canal	D-620	5-20-92	do	Beeman Creek	do	1.00
Barnard Canal	D-603	6- 1-92	do	do	do	.43
Harris-Neece Canal	D-517	7- 1-92	do	Niobrara River	Sioux	6.57
Meridan Canal	D-459	1-10-94	do	do	Dawes	.57
Enterprise Canal	D-461	1-27-94	do	do	do	5.71
Furman Canal	D-462	2- 2-94	do	do	do	3.64
Hughes Canal	D-987b	4-15-94	do	do	Box Butte	.30
Johnson Canal	D-511	5- 1-94	do	do	Sioux	2.86
Old Canal	D-607	5- 1-94	do	Snider Creek	Keya Paha	.01
Kuhre Canal	D-612b	6- 1-94	do	Fairfield Cr.	Brown	.14
Horton Canal	D-587	6- 5-94	do	Wyman Creek	Keya Paha	.14
McMannis-Neeland Canal	D-463	6-15-94	do	Niobrara River	Dawes	.86
Tissue-Patterson C.	D-618	6-30-94	do	Cub Creek	Keya Paha	.03
McCarthy Canal No. 1	D-264	7- 1-94	do	Brush Creek, East Branch	Holt	.50
McCully Canal	D-583	8- 7-94	do	Niobrara River	Keya Paha	8.57
McComber Canal	D-589	8-15-94	do	Cub Creek	do	.10
McCarthy Canal No. 2	D-266	8-15-94	do	Brush Creek, West Branch	Holt	.64
Mullen Canal	D-267	8-18-94	do	Black Bird Cr.	do	1.60
Murphy Canal	D-273	9- 7-94	do	Blue Bird Cr.	do	1.00
Bokhof Canal	D-275	9-18-94	do	Eagle Creek	do	2.86
Flenken Canal	D-575	10- 1-94	do	Niobrara River	Boyd	1.00
Wilson Canal	D-591	10-18-94	do	do	Keya Paha	5.71
B. L. Canal	D-590	10-23-94	do	Jewitt Creek	do	.71
Becker Canal	D-274	11-30-94	do	Eagle Creek, South Branch	Holt	1.14
Necessity Canal	D-595	1-17-95	do	Rock Creek	Rock	.36
Lichte Canal	D-479	1-24-95	do	Niobrara River	Dawes	1.43
Warneke Canal	D-505	2-13-95	do	do	Sioux	1.57
Morrissey Canal	D-481	2-16-95	do	Cottonwood Cr.	Dawes	.71
McGinley-Stover Upper Canal	D-521	2-25-95	do	Niobrara River	Sioux	2.86
LaBelle Canal	D-518	3-12-95	do	do	do	2.00
Eagle Valley Canal	D-280	3-15-95	do	Eagle Creek	Holt	2.29
Snow Canal	D-485	3-26-95	do	Niobrara River	Dawes	2.86
Wile Canal	D-597	4- 3-95	do	Rock Creek	Rock	.86
Lee Canal	D-973	4-25-95	do	Gordon Creek	Cherry	6.86
Excelsior Canal	D-568	5-15-95	do	Niobrara River	Box Butte	2.86
Home Canal	A-65	6- 6-95	do	Whistle Creek	Sioux	.86
Bourett Canal	A-4	6- 8-95	do	Niobrara River	do	2.00
Bourett South Canal	A-5	6-10-95	do	do	do	1.16
Whistle Creek Canal	A-58	6-28-95	do	Whistle Creek	do	1.00
LaBelle Canal	A-60	7- 3-95	do	Niobrara River	do	3.14
Usher Canal	A-82	7-17-95	do	do	Sheridan	1.16
Moore Canal	A-88	7-22-95	do	do	Sioux	5.71
Bruce Canal	A-149	9- 7-95	do	Horse Head Cr.	Keya Paha	.17
Conger Canal	A-158	9-16-95	do	Stream- No name	do	.10
Fullerton Canal #2	A-278	3-23-96	do	Abitz Creek	Holt	.36
Mettlen Canal	A-292	4-27-96	do	Niobrara River	Sioux	4.90
Fendrich-Lichte C.	A-336	5- 9-96	do	Cottonwood Cr.	Dawes	.64
Harvey-Lamb Canal	A-311	6-13-96	do	Young Creek	Holt	.21
Lamb Canal	A-322	7- 6-96	do	Shobe Branch	do	.14
McMannis-Neeland Canal	A-448	4- 9-98	do	Niobrara River	Dawes	1.07
Meridian Canal	A-469	8-29-98	do	do	do	5.14
Cedarburg Canals Numbers 1 & 2	A-479	10- 3-98	do	Bear Creek	Keya Paha	.02
Billys Canal	A-533	1-13-00	do	Box Butte Cr.	Sheridan	.21
LaRue Canal No. 1	A-539	2- 9-00	do	Turkey Creek	Keya Paha	.43
Bourett Canal	A-542	3- 5-00	do	Niobrara River	Sioux	1.00
J. S. Bourett Canal	A-546	3-17-00	do	do	do	2.00
Garden Canal	A-555	3-30-00	do	Spring Creek	Cherry	.09
Montague Canal	A-575	9-27-00	do	Niobrara River	Dawes	.43
Chladek Canal	A-607	3-18-01	do	do	do	.30
Fendrich Canal	A-616	6- 1-01	do	do	do	.39
Fendrich Canal	A-617	6- 1-01	do	do	do	.27
Badger Canal	A-667	5-16-02	do	Big Sandy Cr.	Holt	1.14
Ashburn Canal	A-676	6-17-02	do	Ashburn Creek	Cherry	.43
Allen Canal	A-753	5- 2-04	do	Middle Creek, West Branch	Keya Paha	1.00
LaRue Canal No. 2	A-754	5-11-04	do	Turkey Creek	do	2.00
Tayler Canal	A-766	5- 3-04	do	Niobrara R. & Pepper Cr.	Dawes	4.57
Antelope Canal	A-798	6-29-05	do	Antelope Creek	Cherry	.36
Pole Creek Canal	A-799	6-29-05	do	Pole Creek	do	.57
Gilmore Canal	A-863	7- 5-07	do	Canyon	Sioux	14.29
Beiser Canal	A-1056	1-23-11	do	Niobrara River	do	.50
Bourett Enlargement	A-1057	1-23-11	do	do	do	.75
Glenseve Canal	A-1067	3- 1-11	do	Glenseve Spring	Brown	.86
Lichte Canal	A-1086	4- 7-11	do	Niobrara River	Dawes	2.26
Camille Canal	A-1087	4-10-11	do	do	Sheridan	1.53
Lichte Canal	A-1088	4-19-11	Irrig.	Niobrara River	Dawes	.71
Dunlap Canal	A-1113	7-18-11	do	Cottonwood Cr.	do	.36
Lichte Canal	A-1152	1- 2-12	do	Niobrara River	do	.24
Bourett Canal #1	A-1188	3-25-12	do	do	Sioux	.11
Wells Pump	A-1193	5- 2-12	do	do	Cherry	1.64
Bourett Canal #2	A-1209	7-19-12	do	do	Sioux	.21
Mettlen Canal	A-1248	12-18-12	do	do	do	.75
Bennet Canal	A-1249	12-18-12	do	do	do	3.45
George Hitshew C.	A-1260	2-17-13	do	do	Box Butte	6.00
Coffee Canal #3	A-1362	3-24-14	do	do	Sioux	2.50
Morton Nursery C.	A-1488	6-15-17	do	do	Cherry	.50
Dugger Canal	A-1539	4-24-19	do	Rock Creek	Rock	4.57
Davison Canal	A-1662	4-27-22	do	Niobrara River	Sioux	.21
Woods Bros. Canal	A-2035	9-21-28	do	Bear Creek	Cherry	11.78
Peacock Canal	A-2112	11-14-29	do	Sand Creek	Rock	.02
Lansberry Canal	A-2166	9-18-30	do	Louise Creek	Boyd	.50
Mettlen Enlargement	A-2244	10-13-31	do	Niobrara River	Sioux	1.14
Kay Canal #2	A-2245	10-15-31	do	do	do	.43
Kay Canal	A-2250	11-18-31	do	do	do	3.14
Cole Project	A-2254	2-24-32	do	Bear Creek	Cherry	8.19
Excelsior Enl.	A-2264	3-28-32	do	Niobrara River	Box Butte	1.92
Montague Canal	A-2266	3-31-32	do	do	Dawes	1.76
Harris-Neece Enlargement	A-2275	7-11-32	do	do	Sioux	7.27
Bates Project	A-2276	7-12-32	do	Bear Creek	Cherry	6.50
Bar Ninety-nine Ranch Canal	A-2282	8-31-32	do	do	do	.80
Nellis Pump	A-2319	4-24-33	do	Niobrara River	Boyd	.09
Louks Pump	A-2322	5-22-33	do	Antelope Creek	Sheridan	.12
Leonard Pump	A-2344	8-17-33	do	Coon Creek	Rock	1.00
Leonard Pump	A-2344	8-17-33	do	Laughing Water Creek	do	.43
Lamb Canal	A-2359	2- 3-34	do	Elk Creek	do	.01
Green Pump	A-2387	5-29-34	do	Antelope Creek	Sheridan	.09
Prouty Canal	A-2393	6- 1-34	do	Prouty Springs	Holt	1.44
Stuart Canal	A-2408	6-14-34	do	Turkey Creek	Keya Paha	.03
Watson Canal	A-2418	7- 7-34	do	Coyote Springs	Sioux	1.41
Wrede Canal	A-2449	7-28-34	do	Wrede Springs	Holt	.31
Logan Canal	A-2457	8- 7-34	do	Turkey Creek	Keya Paha	.03
Prime Rose Pump	A-2489	10-29-34	do	do	do	.07
Coakley Pump	A-2499	12-15-34	do	Sand Creek	Holt	.57
Hitshew Canal #2	A-2509	1-28-35	do	Niobrara River	Box Butte	.92
Spinar Canal	A-2519	2-25-35	do	Spring Creek	Holt	.29
Lichte Enlargement	A-2523	3- 2-35	do	Niobrara River	Dawes	2.95
Spinar Enlargement	A-2535	4- 9-35	do	Spinar Springs	Holt	.23
Johnson Pump	A-2541	4-23-35	do	Stream Trib. to Turkey Creek	Keya Paha	.01
Dry Creek Canal	A-2552	7- 8-35	do	Dry Creek	Cherry	.41
Johndreau Pumps	A-2555	8- 9-35	do	Niobrara River	Sheridan	.96
Potmesil Canal	A-2566	10-29-35	do	do	Dawes	6.76
Coyote Springs Reservoir C.	A-2579	4- 1-36	do	Res. A-2572	Sioux	-
Nissen Pump	A-2578	6- 5-36	do	Niobrara River	Sheridan	1.54
Woodhouse Pump	A-2623	8-25-36	do	do	do	.34
Kuchera Pump	A-2654	11- 6-36	do	do	do	.90
Bar Ninety-Nine Ranch Canal	A-2696	2- 9-37	do	Bear Creek	Cherry	.47
Moreland Canal	A-2745	5-22-37	do	Dry Creek	do	.93
Montague Canal	A-2754	6-14-37	do	Niobrara River	Dawes	.29
Lichte Canal Extension	A-2837	2-11-38	do	do	do	1.46
Iodence Pump	A-2838	2-11-38	do	do	do	1.64
Metzger Canal #1	A-2851	3-21-38	do	Hukel Creek	Cherry	.71
Metzger Canal #2	A-2852	3-21-38	do	do	do	.14
Bruce Mill	D-610	4- 1-86	Power	Niobrara River	Keya Paha	60.00
Pine Creek Mills	D-415	6- 5-93	do	Pine Creek	Sheridan	32.00
Pioneer Canal	D-442b	8- 1-93	do	Niobrara River	Dawes	10.00
Kuhre Pond	D-612a	9- 1-93	do	Fairfield Cr.	Brown	25.00
Roll Mill	D-970	9-10-93	do	Niobrara River	Box Butte	35.00
Armstrong Canal	A-452	5-14-98	do	do	Boyd	150.00
Brush Creek Plant	A-474	9-28-98	do	Brush Creek	Holt	15.00
Valentine Plant	A-652	1-29-02	do	Niobrara River	Cherry	1,600.00
Badger Mill	A-685	8-28-02	do	Big Sandy Cr.	Holt	35.00
Nebraska Power Company Plant	A-961	9-24-09	do	Niobrara River	Knox	900.00
Nebraska Power Company Plant	A-1019	8- 9-10	do	do	do	700.00
Northern Nebraska Plant #1	A-1725	10-30-23	do	do	Boyd-Holt	1,450.00
Northern Nebraska Plant #1	A-1777	8-20-25	Res. Dam A-1725	do	do	-
Northern Nebraska Plant #1	A-1955	8-29-27	do	do	do	-
Hackberry Lake Supply Canal	A-2288	10-18-32	Fish	Gordon Creek (Hackberry Lake)	Cherry	*5,000AF
Lamb Power Plant	A-2360	2- 3-34	Power	Elk Creek	Rock	3.00
Pine Grove Res.	A-2375	4-30-34	Fish	do	do	*1AF
Barnes & Phillips Reservoir	A-2539	4-15-35	Stor.	Hay Springs Cr.	Sheridan	*12AF
Walgren Lake Res.	A-2549	5-20-35	Fish	do	do	*1,280AF
Coyote Springs Res.	A-2572	4- 1-36	Irrig.	Coyote Springs	Sioux	*15AF

Total Appropriations from Natural Flow for Irrigation 273.17

" Excluding Snake and Keypaha rivers and Long Pine, Minnechaduza, Plum and Verdigris creeks.

* Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
MINOR NEBRASKA TRIBUTARIES OF THE
MISSOURI RIVER BASIN ABOVE PLATTE RIVER
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Spring Branch Canal	A-29	6-18-95	Irrig.	Springs	Sarpy	.07
Benedict Water Wheel	A-2198	4-17-31	do	Bazille Creek	Knox	.13
McGill Pump	A-2242	10- 1-31	do	do	do	1.03
Stoehl Pump	A-2564	10-25-35	do	Spring Creek	do	.03
Borman-Peters Pump	A-2594	7-24-36	do	Papillion Dr'ge Ditch	Sarpy	.82
Dalton Pump	A-2616	8-17-36	do	Bazille Creek	Knox	.96
Krska Pump	A-2657	11-10-36	do	North Fork, Big Papillion Creek	Sarpy	1.53
Arc Lodge Pump	A-2673	12-19-36	do	Bow Creek	Cedar	1.00
Norwood-Huigens Pump	A-2693	2- 5-37	do	Bazille Creek	Knox	.15
Bow Valley Mills	D-1050	Spring of 1869	Power	Bow Creek	Cedar	52.00
Creighton Mills	A-914	9-24-08	do	Bazille Creek	Knox	30.00
Crystal Lake Dam	A-1714	4-12-23	Dom.	Elk Creek (Jackson Chute)	Dakota	15.00
Crofton Municipal Project	A-2169	10-29-30	do	Springs & Underground Water	Knox	.25
Nye Reservoir	A-2631	8-31-36	Irrig.	Springs	Antelope	*15AF

Total Appropriations from Natural Flow for Irrigation and Domestic Use 20.97

*Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
MINOR NEBRASKA TRIBUTARIES OF THE
MISSOURI RIVER BASIN BELOW PLATTE RIVER
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Estes Pumps	A-2159	8-15-30	Irrig.	North Fork of Nemaha River	Johnson	1.43
Goracke Pump	A-2377	5- 4-34	do	North Fork of Nemaha River (Drainage Channel)	do	4.20
Goracke Pump	A-2428	7-16-34	do	do	do	.54
Goracke Pump	A-2478	9-26-34	do	do	do	1.12
Kimmel Pump	A-2625	8-27-36	do	Walnut Creek	Otoe	.46
Uni. of Nebr. Pump	A-2664	11-27-36	do	Weeping Water Creek	Cass	.57
Stevenson Pump	A-2668	12- 5-36	do	Rock Creek	Otoe	.70
Nebr. State Pump	A-2681	1-18-37	do	Weeping Water Creek	Cass	.71
Cedar Drive Stock Farm Pump	A-2806	11-20-37	do	Little Nemaha River	Nemaha	1.23
Gilmore Pond	A-955	8- 5-09	Ice	Weeping Water Creek	Cass	8.00
C.B.&Q. Water Supply	A-1687	8- 8-22	Dom.	Nemaha River	Pawnee	1.00
Humbolt Lake Supply Canal	A-2551	6-20-35	Resort	North Fork of Nemaha River	Richardson	*25AF
City Supply	A-2605	8- 5-36	Dom.	Nemaha River	do	4.63
City Supply	A-2634	9- 5-36	do.	North Fork of Nemaha River	Johnson	2.30
Elk Lake	A-2864	4-26-38	do	Nemaha River	Johnson	-
Missouri Pacific Pump Station	A-2873	5-11-38	Dom.	Little Nemaha River	Nemaha	3.00

Total Appropriations from Natural Flow for Irrigation and Domestic Use 21.89

* Represents reservoir capacity alleged by applicant

APPROPRIATIONS FOR THE USE OF WATER
WHITE RIVER BASIN IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
Stumph Canal	D-447-R	5-31-80	Irrig.	E. Branch of Ash Creek	Dawes	1.00
Ox-Yoke (Tomlin) C.	D-447-R	5-31-80	do	do	do	1.38
Rodgers Canal	D-546	4-30-83	do	Soldier Creek	Sioux	.14
Tucker Canal	D-557	6- 1-83	do	Spring Branch (Tucker Cr.)	do	.17
Mace Canal	D-428	7-31-84	do	W. Branch of Ash Creek	Dawes	1.00
Locket Canal	D-494	6-30-86	do	Big Bordeaux Creek	do	.07
Deep Creek Canal	D-525	5- 1-87	do	Deep Creek	Sioux	.06
Mozeter Canal	D-1014	5- 3-88	do	Spring Creek	Dawes	1.14
Barren Canal	D-438-R	7- 1-88	do	E. Branch of Ash Creek	do	1.14
Bauersach Canal	D-492	12-31-89	do	Hooker Creek	do	1.00
Kemery Canal	D-493	9- 1-90	do	Dead Horse Cr.	do	.01
Gallup Canal	D-426	12-20-90	do	Chadron Creek	do	.09
Thomas Stuart Canal	D-425	12-21-90	do	Little Cottonwood Creek	do	.36
Goff Canal	D-441	4- 2-91	do	Spring Trib. to Dead Horse Cr.	do	.14
Flag Butte Canal	D-427	4-10-91	do	Dead Horse Cr.	do	.03
McFarland Canal	D-960	5-18-91	do	White Clay Cr.	do	1.64
Stumph Canal	D-1023½	9- 5-92	do	E. Branch of Ash Creek	do	.20
Lockler Canal	D-1017	9-15-92	do	Beaver Creek	do	1.83
Mann Canal	D-975	12-31-92	do	Big Bordeaux Creek	do	.23
Adams Canal	D-450	3- 5-93	do	do	do	.14
Hartsell Canal	D-448	6- 1-93	do	Little Bordeaux Creek	do	.57
W. Ash Creek Canal	D-452	7- 4-93	do	W. Branch of Ash Creek	do	1.62
Tug Wilson Canal	D-453	7-13-93	do	Chadron Creek	do	.20
Dawes County Canal	D-983	7-31-93	do	Big Bordeaux Creek	do	.14
Seegrist Canal	D-489	11- 1-93	do	Indian Creek	do	.03
Harris-Cooper Canal	D-464a	3- 9-94	do	White River	do	13.14
Squaw Creek Canal	D-466	5-10-94	do	Spring Creek	do	.40
Butler Canal	D-443	6- 1-94	do	Little Bordeaux Creek	do	.11
Harris-Cooper Canal	D-464b	6-15-94	do	White River	do	1.57
Rasher Canal	D-467	6-20-94	do	do	do	1.14
Getchell Canal	D-418	8- 1-94	do	Sheridan Creek	Sheridan	.07
Spring Creek Canal Number 1	D-473	12- 1-94	do	Spring Creek	do	2.00
Spring Creek Canal	A-2078	12- 1-94	O. D. D-473	do	do	-
White River Canal	D-477	12-31-94	Irrig.	White River	do	6.71
White River Canal	D-477	12-31-94	do	White Clay Cr.	do	1.00
Hall Canal Number 2	D-478c	1-10-95	do	White River	do	12.60
Braddock Canal	D-423	4-15-95	do	Beaver Creek	Sheridan	.36
Braddock Canal	D-974	4-15-95	do	do	Dawes	.04
Stuart Brothers C.	A-8	6-10-95	do	Little Cottonwood Creek	do	2.86
Cooper Canal	A-42	6-22-95	do	White Clay Cr.	do	3.66
Cooper Canal	A-42-R	6-22-95	do	do	do	.05
Smock Canal	D-465	6-28-95	do	Trunk Butte Cr.	do	.07
Bendix Canal	A-189	11-19-95	do	Sand Creek	Sioux	.57
Cooper Canal	A-333	5- 8-96	do	Squaw Creek	Dawes	2.29
Jones Canal	A-391	5-21-97	do	White River	do	.71
Braddock Canal	A-453	11-24-97	do	Beaver Creek	do	.64
O'Donnell Canal	A-432	1-17-98	do	Big Bordeaux Creek	do	.14
Wall (W. Ash Cr.) Canal	A-434	2- 3-98	do	W. Branch of Ash Creek	do	.57
Rasher Canal	A-456	5-23-98	do	White River	do	.50
Connell Canal	A-459	6-17-98	do	Ash Creek	do	.63
Sheldon Canal	A-493	1-26-99	do	E. Branch of Ash Creek	do	1.43
Cilek Canal	A-513	6-19-99	do	Beaver Creek	Sheridan	.36
Todd Canal	A-520	9-12-99	do	E. Branch of Ash Creek	Dawes	.38
Rasher Canal	A-534	1-16-00	do	White River	do	1.43
Kusel Canal No. 2	A-560	5-19-00	do	Spring Creek	do	.43
Rinicker Canal	A-618	6- 8-01	do	White Clay Cr.	do	.57
Dunn Canal	A-649	1-14-02	do	Little Cottonwood Creek	do	1.43
Stuart-Maple Canal	A-656	3-10-02	do	do	do	.70
Geiser Canal	A-658	3-18-02	do	Dead Horse Cr.	do	.16
Forbes Canal No. 1	A-663	4-28-02	do	Spring Creek	do	.43
Kusel-Spearman C.	A-677	6-30-02	do	Little Cottonwood Creek	do	.71
Rickman Canal	A-681	7- 2-02	do	Beaver Creek	Sheridan	1.00
Hutzel Canal	A-704	4-30-03	do	White Clay Cr.	Dawes	.57
Braddock Canal	A-706	5- 4-03	do	Rush Creek	do	3.00
Cripps Canal	A-735	12-26-03	do	Ash Creek	do	1.14
Slattery Canal	A-749	4- 6-04	do	Dead Horse Cr.	do	1.29
Schwabe Canal	A-758	6-13-04	do	White River	do	.57
Dams	A-771	10-17-04	do	Madden Creek & North Creek	do	.57
McDowell Stor. Sys.	A-772	10-24-04	do	English Creek	do	.57
Collins Reservoir	A-780	2-27-05	do	Big Bordeaux Creek	do	.31
Alcorn Canal	A-803	11-17-05	do	Hooker Creek	do	1.21
Schwabe Canal	A-815	3-19-06	do	White River	do	.26
Cripps Canal	A-835	8-27-06	do	Ash Creek	do	.57
Little Saw Log Canal	A-849	1-23-07	do	East Saw Log Creek	do	.71
Little Saw Log C.	A-849	1-23-07	Irrig.	White Clay Cr.	Dawes	
Stephenson Canal	A-852	3- 8-07	do	East Saw Log Creek	do	.33
Baker Canal	A-884	1- 3-08	do	do	do	.04
Schwabe Canal	A-908	7-23-08	do	White River	do	3.43
Souther Lake	A-915	9-24-08	Irrig.	Hooker Creek	do	1.43
Campbell Canal	A-919	11- 9-08	Irrig.	Dry Run	do	1.00
South Branch of White River C.	A-936	3-11-09	do	White River	do	1.43
Townsend Canal	A-1054	1-21-11	do	White Clay Cr.	Sheridan	.80
Earnest Canal	A-1061	2-20-11	do	Dry Draw	Dawes	3.71
Van Treek Canal	A-1098	5- 8-11	do	East Saw Log Creek	do	.37
Pinney Reservoir Canal No. 2	A-2493	8-10-11	do	Res. A-1122	do	-
Forbes Enlargement	A-1128	9-26-11	do	White River	do	.80
Squaw Creek Canal	A-1631	10- 5-11	do	Res. A-1152	do	-
Bonnold-Wilson C.	A-1199	5-25-12	do	Trib. to Indian Creek	do	.07
Broadhurst Canal	A-1264	2-25-13	do	Little Cottonwood Creek	do	3.29
Dodd-McDowell Canal	A-1571	4-15-13	do	Res. A-1276	do	-
Arner Canal	A-1289	5- 6-13	do	Flood Waters	Sioux	.14
Guse Canal	A-1345	1-13-14	do	Dry Run	Dawes	1.76
Harsh-Weston Canal	A-1361	3-11-14	do	do	do	3.00
Chaulk Canal	A-1406	3-13-15	do	Trunk Butte Cr.	do	3.00
Heath Canal	A-1612	2- 7-17	do	Res. A-1475	Sioux	-
Betson Canal	A-1481	3-22-17	do	Dry Canyon	Dawes	1.00
Seegrist Canal	A-1569	11-29-19	do	Indian Creek	do	.80
Whitney Pipe Line	A-1787	4-25-21	do	Res. A-1625	do	-
Whitney Pipe Line	A-1604	5- 2-21	do	White River	do	3.60
Norman Canal	A-1614	8- 3-21	do	Indian Creek	do	1.91
Whitney Pipe Line	A-1625	11- 7-21	do	White River	do	25.00
Whitney Pipe Line	A-1626	11-18-21	do	do	do	2.07
Whitney Pipe Line	A-1660	4-26-22	do	do	do	.41
Bendix Enlargement	A-1669	5-27-22	do	Sand Creek	Sioux	.83
Harris Reservo'r C.	A-1996	9-29-22	do	Res. A-1689	Dawes	-
Elmer Canal	A-1704	1-17-23	do	Indian Creek	do	.77
Thomas Canal	A-1748	9-12-24	do	Big Bordeaux Creek	do	2.13
Benthack Canal	A-1749	9-12-24	do	Spring Creek	do	4.71
Seegrist Canal	A-1823	6-21-26	do	Res. A-1822	do	-
Norman Canal	A-1952	8-16-27	do	Indian Creek	do	1.28
Harry Canal	A-2179	8-22-27	do	Res. A-1953	do	-
Slattery Enl.	A-2021	6-15-28	do	Dead Horse Cr.	do	.55
Barron Enlargement	A-2024	8-15-28	do	East Branch of Ash Creek	do	.80

Braddock Enl.	A-2033	9-19-28	do	Beaver Creek	Sheridan	.39
Lockler Canal	A-2034	9-19-28	do	do	Dawes	.49
O'Donnel Enl.	A-2036	9-22-28	do	Big Bordeaux Creek	do	.63
Hageman Canal	A-2046	10-18-28	do	White River	do	1.14
Thomas Canal	A-2057	12-17-28	do	East Branch of Ash Creek	do	1.00
Crawford Pump	A-2075	3-12-29	do	White River	do	.57
Minnepazuta Res.	A-2149	7-21-30	do	Minnepazuta Cr.	do	.14
Kelso Pump	A-2151	7-24-30	do	Big Bordeaux Creek	do	.10
Larabee Canal	A-2197	4-14-31	do	Larabee Creek	Sheridan	1.12
Flood Canal	A-2216	7-16-31	do	Indian Creek	do	.10
Kelso Pump #1	A-2279	8-11-32	do	Big Bordeaux Creek	do	.14
Bartlett Canal	A-2285	9- 8-32	do	White River	do	.30
Sanders Canal	A-2290	11- 2-32	do	Cuff Canyon	do	.07
Kelso Pump #2	A-2328	7- 7-33	do	Big Bordeaux Creek	do	.03
Deep Creek Canal	A-2335	7-19-33	do	Deep Creek	Sioux	.22
Preble Pump	A-2339	7-28-33	do	Little Bordeaux Creek	Dawes	.02
Simons Canal	A-2363	2-12-34	do	Little Cottonwood Creek	do	.77
North Pump	A-2369	3-26-34	do	White Clay Cr.	Sheridan	.38
Mobley Pump	A-2381	5-10-34	do	White River	Dawes	.05
Peterson Pump	A-2392	5-31-34	do	Big Bordeaux Creek	do	.06
Gochnauer Canal	A-2420	7-11-34	do	do	do	.17
Kelso Pump #3	A-2456	8- 6-34	do	do	do	.14
Cripps Pump	A-2571	9-28-34	do	Res. A-2481	do	-
Whitney Water Supply	A-2627	8-28-36	Dom.	White River	do	2.00
Martens Pump	A-2801	11-16-37	do	do	do	.21
Greenwood Pump	A-2845	3-14-38	do	Patton Creek	Sheridan	1.07
Halls Mill	D-478a	9-10-85	Power	White River	do	24.85
Chadron Water Works	D-1022	12-31-88	Dom.	Chadron Creek	do	1.00
C. B. & Q. Line at Crawford	D-1030	9-14-89	do	White River	do	.80
Crawford Water Sys.	D-1026	10- 1-90	do	do	Sioux	5.00
Schwabe Power Canal	A-759	6-13-04	Power	do	Dawes	5.00
Harris-Cooper Supply Canal	A-1122	8-10-11	Irrig.	do	do	*50AF
Squaw Creek Res.	A-1132	10- 3-11	do	Squaw Creek	do	*200AF
Dodd-McDowell Res.	A-1276	4-15-13	do	Little Cottonwood Creek	Sioux	*480AF
Lenehan Reservoir	A-1278	4-16-13	do	Flood Waters	Dawes	*640AF
Handschugel Lake	A-1441	12-17-15	Supple. A-618	White Clay Cr.	Dawes	*100AF
Heath Reservoir	A-1475	2- 7-17	Irrig.	Dry Draw	Sioux	*200AF
Water Works Enlargement	A-1583	4- 8-20	Dom.	Chadron Creek	Dawes	4.50
Whitney Reservoir Canal	A-1603	4-28-21	Irrig.	White River	do	*10,000AF
Harris Reservoir	A-1689	9-29-22	do	Saxson Draw	do	*7AF
Renfro Reservoir	A-1822	6-21-26	do	Indian Creek	do	*60AF
Norman Barron Canal	A-1953	8-22-27	do	Indian Creek & E. Ash Creek	do	*776AF
Chadron State Park Supply Canal	A-2007	4-17-28	Resort	Chadron Creek	do	*10AF
Cooper Supply Canal	A-2063	1-22-29	Fish	White Clay Cr.	do	*30AF
McDowell Res. #1	A-2064	1-22-29	do	English Creek	do	*36AF
McDowell Res. #3	A-2064	1-22-29	do	do	do	*5AF
Seegrist Power Plant	A-2140	5-20-30	Power	East Branch of Ash Creek	do	3.00
Tulless Pond	A-2141	5-22-30	Fish	Beaver Creek	Sheridan	*4AF
Belle Isle Supply Canal	A-2144	6-13-30	do	Big Bordeaux Creek	Dawes	*15AF
Reservoir Number 4	A-2249	11-12-31	do	Squaw Creek	do	*4AF
Holberg Supply C.	A-2334	7-19-33	do	Deep Creek	Sioux	*1.5AF
Cripps Reservoir	A-2481	9-28-34	Irrig.	Ash Creek	Dawes	*90AF
Simmons Supply C.	A-2607-S	8-11-36	do	Little Cottonwood Creek	do	*350AF
Blust Supply C.	A-2607-S	8-11-36	do	do	do	*2,000AF
Pilster, Stewart & Balwin Res.	A-2608-S	8-11-36	do	Dry Creek	do	*1,400AF
Stewart-Balwin Reservoirs	A-2609-S	8-11-36	do	White River	do	-

Total Appropriations from Natural Flow for Irrigation and Domestic Use . . . 180.81

R Denotes Relocation
O.D. Optional Diversion
* Represents reservoir capacity alleged by applicant
S Supplemental to A-1603

APPROPRIATIONS FOR THE USE OF WATER
HAT CREEK BASIN IN NEBRASKA
August 15, 1938

Carrier	Appropriation Number	Priority Date	Use to Which Applied	Source	County	Provisional Grant Sec.-Ft.
W. Hat Creek Canal	D-553a	6- 1-80	Irrig.	Hat Creek	Sioux	.43
Warbonnet Canal	D-548	7-31-80	do	Warbonnet Creek	do	3.63
Coffee Canal	D-512	9- 1-81	do	Hat Creek	do	4.29
Schilts Cedar Creek Canal	D-507	5-15-85	do	Cedar Creek	do	.57
Schilts Prairie Dog Canal	D-508	5-15-85	O. D. D-507	Prairie Dog Cr.	do	1.14
Valdez Canal	D-976	4- 5-86	Irrig.	Cedar Creek	do	.50
W. Hat Creek Canal	D-553b	5-31-86	do	Hat Creek	do	.57
Bannon Canal	D-560	7- 1-86	do	Boggy Creek, Middle Br.	do	.06
Nolan Canal No. 1	D-957	3-15-87	do	Warbonnet Creek	do	.01
Key Canal	D-958	5- 1-87	do	N. Branch, Warbonnet Cr.	do	.14
Old Sow Belly Canal	D-533	6- 1-87	do	Sow Belly Creek	do	3.00
Big Monroe Canal	D-506	5- 1-88	do	Monroe Creek	do	1.43
Nolan Canal No. 2	D-959	5- 1-88	do	Warbonnet Creek	do	.29
Harrison Canal	D-547	5-30-88	do	Spring Branch Trib. to White Head Cr.	do	.06
Schilts-Monroe Can.	D-509	7- 2-88	do	Monroe Creek	do	.50
Holly Canal	D-956	12-31-88	do	Boggy Creek	do	.11
Hall Spring Canal	D-550	3-26-89	do	Spring Creek	do	.57
Dout Brothers Canal	D-981	5-15-89	do	Jim Creek	do	.86
Dout Canal	D-539a	5-31-89	do	N. Branch, Warbonnet Cr.	do	.71
Woodruff S. Canal	D-536	5- 1-90	do	Jim Creek	do	.36
Homestead Canal	D-984	5-31-90	do	Stream- No name	do	.22
Dunn Canal	D-552	6- 1-90	do	Squaw Creek	do	.36
Montgomery Canal	D-559	12- 1-90	do	Sow Belly Creek	do	1.00
Jim Creek Canal	D-502	12-15-90	do	Jim Creek	do	.43
Biehle Canal	D-538	4- 1-91	do	Sprin- Branch Trib. to Warbonnet Cr.	do	.23
Hamlin Canal	D-555	4- 1-91	do	Squaw Creek	do	.01
Slattery Canal	D-543	5-31-91	do	Jim Creek	do	.29
Dout Canal	D-539b	12-31-91	do	Warbonnet Creek	do	.29
Smith Canal	D-526	5- 1-92	do	Boggy Creek	do	.29
Cherry Creek Canal	D-549	5- 1-93	do	Cherry Creek	do	.03
Zerbst Canal	D-551	5- 1-93	do	Little Red Cr.	do	.14
Spring Creek Canal	D-532	6- 1-93	do	Spring Creek	do	.29
Garton Canal	D-503	10-16-93	do	Spring Branch, Trib. to Warbonnet Cr.	do	1.43
Turner Canal	D-537	10-31-94	do	S. Branch, Antelope Cr.	do	1.14
Jordan Canal	D-556	6- 1-95	do	Sow Belly Creek	do	.43
Noreisch Canal	A-83	7-19-95	do	Monroe Creek	do	.04
Dunn Reservoir Canal	A-100	8- 5-95	do	Squaw Creek	do	.57
Story Canal	A-168	11-11-95	do	N. Branch, Antelope Cr.	do	2.00
Jordan Canal	A-424	5-11-96	do	Sow Belly Creek	do	.50
Ellis Canal	A-338	5-17-96	do	S. Branch, Antelope Cr.	do	.29
Miller Canal	A-341	5-19-96	do	Hat Creek	do	.37
Marten Canal	A-342	5-19-96	do	Middle Branch, Boggy Creek	do	.36
Dunn Canal	A-376	1-22-97	do	Squaw Creek	do	.19
Mutto Canal	A-404	9- 4-97	do	Sow Belly Creek	do	.43
Hunter Canal	A-451	5-12-98	do	Stream- No name	do	.03
Carroll Canal	A-516	7-12-99	do	Sow Belly Creek	do	.14
Zimmerman Canal	A-532	1-11-00	do	do	do	.57
Lickett Canal	A-549	3-21-00	do	Lickett Creek	do	1.43
Wasseburger Canal	A-581	10-13-00	do	E. Jim Creek	do	2.29
O'Connell Canal	A-587	11-10-00	do	Long Branch	do	.20
Antrim Canal	A-594	12-24-00	do	Hat Creek	do	.57
Thomas Canal	A-627	7-23-01	do	Squaw Creek	do	.50
Ebert Canal	A-635	8-22-01	do	Long Branch	do	.14
Jordan Canal	A-668	5-26-02	do	Sow Belly Creek	do	.14
Wickersham Canal	A-701	2-28-03	do	Boggy Creek	do	3.00
Gayhart Canal	A-760	6-18-04	do	Antelope Creek	do	2.43
Konrath Canal	A-808	12-28-05	do	Canyons	do	1.43
Antrim Canal	A-834	8-20-06	do	Hat Creek	do	.57
Cornelius Jordan Can.	A-841	11-12-06	do	Monroe Creek	do	2.20
Cornelius Jordan Can.	A-841	11-12-06	Supple. A-841	Res. A-841	do	-
Hill Canal	A-886	1-20-08	Irrig.	W. Branch, Boggy Creek	do	.86
Warbonnet Canal No. 2	A-892	3-11-08	do	Warbonnet Creek	do	1.50
Coffee & Son Flood Canal	A-1236	10-22-12	do	Hat Creek	do	6.00
O'Connell Canal	A-1288	5- 5-13	do	Sow Belly Creek	do	10.00
Kite Canal	A-1375	7-30-14	do	Monroe Creek	do	2.00
Child Canal	A-1376	8-14-14	do	Dry Gulch	do	.57
Cornelius Jordan Can.	A-1469	1-14-15	Supple. A-841	Res. A-1399	do	-
Kite Canal	A-1470	1-14-15	Supple. A-1375	Res. A-1399	do	-
Zerbst Canal No. 2	A-1404	3- 6-15	Irrig.	Warbonnet Creek	do	.17
Zerbst Canal No. 1	A-1405	3- 6-15	do	Branch of Warbonnet Cr.	do	.03
Story Canal	A-1509	3-26-18	do	N. Branch, Antelope Cr.	do	5.71
Grammercy Dam	A-1591	9-24-20	do	do	do	3.71
Turner Res. Canal	A-1676	7- 3-22	Supple. D-537	Res. A-1675	do	-
Turner Res. Canal	A-1677	7- 3-22	Irrig.	do	do	1.68
Caladonia Canal	A-1681	7-20-22	do	Res. A-1680	do	-
High Line Canal	A-1682	7-20-22	do	Jim Creek	do	.34
Caladonia Canal	A-1683	7-20-22	do	Res. A-1680	do	-
Slattery Canal	A-1683	7-20-22	Supple. D-543	do	do	-
Crystal Lake Supply Canal	A-2286	8-22-27	Irrig.	Res. A-1954	Sioux	-
Shepherd Canal	A-1965	10-24-27	do	Squaw Creek	do	3.16
Gieke Canal	A-1967	11- 4-27	do	Gieke Creek	do	.43
Dout Canal Number 1	A-2000	4- 2-28	do	Res. A-1999	do	-
Dout Canal Number 2	A-2002	4- 2-28	do	Res. A-2001	do	-
Zerbst Canal	A-2003	4- 3-28	do	Little Red Cr.	do	.90
Plunkett Canal	A-2070	9-18-28	do	Res. A-2031	do	-
Richard Jordan C.	A-2032	9-19-28	do	Monroe Creek	do	1.67
Dan Jordan Canal	A-2072	2-20-29	do	Res. A-2071	do	-
Wickersham Res. C.	A-2203	12-24-30	do	Res. A-2182	do	-
Wickersham Canal	A-2204	5-15-31	do	Boggy Creek	do	.96
Keel Canal	A-2228	8-20-31	do	Monroe Creek	do	.02
O'Connell Canal	A-2274	6-20-32	do	Warbonnet Creek	do	.35
Schaefer Canal #1	A-2484	2-27-33	Supple. D-533	Res. 1, A-2306	do	-
Schaefer Canal #2	A-2484	2-27-33	do	Res. 2, A-2306	do	-
Big Monroe Canal	A-2372	4-16-34	Irrig.	Monroe Creek	do	2.10
Andrews Canal	A-2558	3-26-35	do	Res. A-2530	do	-
Plunkett Canal	D-985	-	do	Cedar Creek	do	-
Cornelius Jordan Res.	A-841	11-12-06	Irrig.	Monroe Creek	do	*271AF
Barnes Reservoir	A-1268	3-24-13	do	Sow Belly Creek	do	*50AF
Wooden Shoe Res.	A-1377	8-24-14	do	Dry Draw	do	*75AF
Jordan Reservoir Enlargement	A-1399	1-14-15	do	Monroe Creek	do	*400AF
Zerbe Reservoir	A-1407	3-25-15	do	Hat Creek	do	*25AF
Turner Reservoir	A-1675	7- 3-22	do	S. Branch of Antelope Cr.	do	*250AF
Caladonia Reservoir	A-1680	7-20-22	do	Jim Creek	do	*42AF
Crystal Lake Supply Canal	A-1954	8-22-27	do	Spring Creek	do	*40AF
Dout Reservoir #1	A-1999	4- 2-28	do	Jim Creek & N. Jim Cr.	do	*30AF
Dout Reservoir #2	A-2001	4- 2-28	do	Jim Creek	do	*3AF
Plunkett Reservoir	A-2031	9-18-28	do	Prairie Dog Cr.	do	*110AF
Dan Jorden Res.	A-2071	2-20-29	do	Jordan Draw	do	*50AF
Wickersham Supply Canal	A-2182	12-24-30	do	Boggy Creek	do	*250AF
Shepherd Reservoir	A-2189	1-29-31	Supple. A-1965	S. Squaw Creek	do	*80AF

M[illegible]roe Reservoir	A-2297	1-16-33	Fish	Monroe Creek	do	*3AF
Old Sow Belly Supply Canal	A-2306	2-27-33	Irrig.	Sow Belly Creek	do	*150AF
New Sow Belly Supply Canal	A-2306-R	2-27-33	do	do	do	*150AF
Andrews Supply C.	A-2530	3-26-35	do	do	do	*24AF

Total Appropriations from Natural Flow for Irrigation 88.46

O.D. Optional Diversion
* Represents reservoir capacity alleged by applicant
R Denotes Relocation

PRINCIPAL EXISTING IRRIGATION PROJECTS ON THE PLATTE RIVER FROM THE NEBRASKA-WYOMING LINE TO GRAND ISLAND, NEBRASKA

Name of Project and Organization	Source of Water Supply	Irrigable Area	Description
Mitchell Canal (Mitchell Irrigation District)	North Platte River	16,280	Wyoming diversion, but all lands in Nebraska. Wyoming water rights have 1890 priority. Originally Mitchell Canal & Irrigation Co., incorporated in 1890. In 1897 made agreement with Gering Irrigation District for joint use of main canal. Mitchell Irrigation District organized in 1897.
Gering Canal (Gering Irrigation District)	do	14,700	Nebraska water right; 1890 priority; direct flow, with Warren Act contract for 35,500 acre-feet storage. Originally Central Irrigation Com. & Water Power Co. District organized in 1895. In 1897 made contract for use of Mitchell Main Canal.
Tri-State Project or Farmers Canal (Farmers Irrigation District)	do	65,000	Nebraska diversion; 1887 priority; direct flow, with Warren Act contract for 180,000 acre-feet storage. Originally Farmers Canal Co., succeeded by Tri-State Land Co., in 1904. District organized in 1897, but did not succeed Tri-State Co., until 1913.
Ramshorn Canal (Ramshorn Irrigation District)	North Platte River and Sheep Creek	2,542	Nebraska diversion; 1893 priority; direct flow; no storage. Landowners organized mutual stock company in 1894 and completed canal 6½ miles long at cost of $6,250. Later organized district.
Enterprise Canal (Enterprise Irrigation District)	North Platte River and Akers Draw	7,275	Nebraska diversion; 1889 priority; direct flow; no storage. Originally Enterprise Ditch Co., a mutual concern. District organized in 1898.
Winters Creek Canal (Winters Creek Irrigation Company)	North Platte River and Winters Creek	5,840	Nebraska diversion; 1888 priority; direct flow; no storage. Mutual organization, in which the Imperial Land Co., a subsidiary of the Scottsbluff Sugar Co., now owns a large block of stock.
Central Canal (Central Irrigation District)	North Platte River	2,611	Nebraska diversion; 1890 priority; direct flow, with Warren Act contract for 4,050 acre-feet storage water. Originally Mutual Irrigation & Water Power Co., organized in 1890. In 1891 sold to Central Irrigation & Water Power Co. District organized in 1901.
Minatare Canal (Minatare Mutual Canal & Irrigation Company)	do	9,316	Nebraska diversion; 1888 priority; direct flow; no storage. Originally Minatare Canal Co., a mutual organization. In 1895 Minatare Mutual Canal & Irrigation Co., was organized and took over the project.
Steamboat Canal (Steamboat Ditch Company)	do	830	Nebraska diversion; 1895 priority; decreed; direct flow; no storage; mutual water company. Canal 6 miles long, built by farmers in 1896 at a cost of $2,500. Operation and maintenance charges 50 cents per acre per annum. Principal crops are alfalfa, sugar beets, and potatoes.
Castle Rock Canal (Castle Rock Irrigation District)	do	6,000	Nebraska diversion; 188[illegible] priority; direct flow; no storage. Originally Castle Rock Irrigation & Water Power Co. Organized in 1889. District organized in 1898, but did not take over project until 1912.
Nine Mile Canal (Nine Mile Irrigation District)	North Platte River and Nine Mile Creek	6,328	Nebraska diversion; 1893 priority; direct flow; no storage. Originally Bayard Irrigation Canal & Water Power Co. In 1893 Nine Mile Canal & Reservoir Co. incorporated and purchased project. District organized in 1906.
Short Line Canal (Short Line Irrigation District)	North Platte River	3,000	Nebraska diversion; 1893 priority; direct flow; no storage. Originally a cooperative concern known as Short Line Irrigation Co., farmers worked out stock. Six miles of main canal built at cost of $6,000. District organized in 1912.
Chimney Rock Canal (Chimney Rock Irrigation District)	do	7,000	Nebraska diversion; 1890 priority; direct flow, with Warren Act contract for 10,300 acre-feet of stored water. Originally Chimney Rock Irrigation Canal & Water Power Co., a cooperative concern in which farmers worked out stock. District organized in 1912 and succeeded old company in 1913.
Alliance Canal (Alliance Irrigation District)	North Platte River and Red Willow Creek	7,000	Nebraska diversion; 1892 priority; direct flow; no storage. Originally Alliance Irrigation Canal & Water Power Co., a cooperative concern in which farmers worked out stock. District organized in 1921 and succeeded company.
Belmont-Empire Canal (Bridgeport Irrigation District Empire Canal Company)	North Platte River and Cedar Creek	27,320 2,280	Nebraska diversion; 1889 and 1891 priorities. Canals have joint diversion. Bridgeport Irrigation District has Warren Act contract for 37,478 acre-feet storage. Belmont Canal & Water Power Co., a private concern selling water. Bridgeport Irrigation District organized about 1915 and took over Belmont Canal Empire Canal Co., a mutual concern organized in 1891.
Shermerhorn Canal (A. D. Shermerhorn)	North Platte River	2,400	Nebraska diversion; 1897 priority; direct flow; no storage. Mutual stock company, built 7-mile main canal.
Logan Canal (Logan Irrigation Company)	do	480	Nebraska diversion; 1889 priority; direct flow; no storage. Mutual stock company. Main canal 1.5 miles long, built by settlers.
Brown's Creek Canal (Brown's Creek Irrigation)	do	9,500	Nebraska diversion; 1892 priority; direct flow, with Warren Act contract for 19,900 acre-feet stored water. Originally Brown's Creek Canal Co., which rented water but did not sell rights. District organized in 1912 and arranged for stored water.
Court House Rock Canal (Court House Rock Irrigation Company)	Pumpkin Creek	2,100	1890 priority; direct diversion; no storage. Mutual stock company built 5 miles of canal in 1891. Land on south side of creek. Principal crop is hay.
Meridith Ammer Canal (C. A. Sweet)	do	1,000	1893 priority; direct diversion; no storage. Privately constructed and owned. Total of 4.5 miles of canal built in 1893. Land on both sides of creek. Hay is principal crop.
Beerline Canal (Beerline Canal Company)	North Platte River	2,040	1894 priority; direct diversion. Warren Act contract for 1,639 acre-feet per annum of Pathfinder storage water. Built in 1894 by mutual company. Now a mutual company. Canal 7 miles long. Land north side river near Broadwater, Nebr. Principal crops are hay, alfalfa, and some sugar beets.
Lamore Canal (Remich Duer Company)	North Platte River	1,620	1896 priority; direct diversion; no storage. Built as partnership enterprise. Now owned by private stock company. Canal 5 miles long, built in 1896. Land on south side of river. Hay is principal crop.
Lisco-North River Canal (Lisco Irrigation District & North River Irrigation District)	North Platte River and Cold Water Creek	9,420	1893 and 1896 priorities; direct diversion; no storage. Canal 38 miles long. Upper 5 miles built in 1893 as private ditch. Lower 33 miles built in 1896 by mutual company. Lower 26 miles abandoned after 1900. Private party obtained legal possession to upper 12 miles of canal in 1910. Succeeded by new mutual company that year. Lisco Irrigation District organized May 1, 1918, and took over upper 12 miles of canal. North River Irrigation District organized Nov. 19, 1918 and rebuilt lower 26 miles of canal.
Hannah Canal (Hannah Irrigation Company)	North Platte River	400	1894 priority; direct diversion; no storage. Canal 3 miles long, built 1891 by mutual company. For many years canal not in use but operated at present time. Land on south side of river. Hay is principal crop.
Rush Creek Canal (Rush Creek Irrigation Company)	do	600	1894 priority; direct diversion; no storage. Canal 3.5 miles long, built in 1895 by mutual company. Land on south side of river. Principal crops are hay, and alfalfa.
Spohn Canal (William Spohn)	do	1,020	1894 priority; direct diversion; no storage. Canal 2 miles long. Built in 1895 as private enterprise. Land on north side of river. Principal crop is hay.
Lyons Canal (Lyons Irrigation District)	do	2,890	1894 priority; direct diversion; no storage. Canal 6 miles long. Constructed in 1894 by Lyons Irrigation Canal & Water Power Co. Succeeded by present irrigation district in 1917 or 1918. Land on north side of river. Principal crops are hay, alfalfa, and sugar beets.
Oshkosh Canal (Oshkosh Irrigation District)	do	2,900	1894 priority; direct diversion; no storage. Canal 4.3 miles long. Constructed in 1892 as a partnership enterprise. Oshkosh Irrigation District organized in 1918. Land on north side of river. Principal crops are alfalfa, sugar beets, and small grain.
Midland-Overland Canal (C. F. Roberts and Chas. Countryman)	do	2,260	1894 priority; direct diversion; no storage. Built in 1894 as 2 separate canals, totaling 9.5 miles in length. Both private enterprises. In 1905 canals combined as operating unit but not in ownership. Length 5 miles. Now privately owned by two individuals. Land on north side of river. Principal crops are alfalfa and sugar beets.
Signal Bluff Canal (Western Land & Cattle Company)	do	2,100	1895 priority; direct diversion; no storage. Canal 4.5 miles long. Built in 1895, by partnership enterprise. Present owners obtained canal in 1915 or 1916. Land on south side of river. Principal crops are hay and alfalfa.

Crescent Lake Project (Lake Water Carrying Company)	Blue Creek	220	1920 priority to 7,000 acre-feet of storage in Crescent Lake. Two miles of canal deliver water to 220 acres of hay land near lake. Two miles of canal deliver supplemental water to headwater of Blue Creek for use on Paisley, Blue Creek, and Hooper Irrigation districts, and the Union and Graff canals
West Side-Paisley Canal (Paisley Irrigation District)	Blue Creek	1,640	1894 priority; direct diversion witn storage in Crescent Lake. Built in 1894 and 1898 by private interests. Present irrigation district organized in 1898. Canal 6 miles long. Principal crops are hay and alfalfa.
Blue Creek Canal (Blue Creek Irrigation District)	do	3,170	1893 priority; direct diversion with storage in Crescent Lake Canal 12.5 miles long. Built in 1894 by private corporation.Later Blue Creek Irrigation District organized and succeeded original concern. Principal crops are hay, alfalfa, and some sugar beets.
Hooper Canal (Hooper Irrigation District)	do	1,240	1893 priority; direct diversion with storage in Crescent Lake. Canal 3.5 miles long. Built by private company in 1893. Hooper Irrigation District organized April 26, 1926. Principal crops are hay, alfalfa, and some sugar beets.
Union Canal (Union Irrigation & Water Power Company)	do	1,200	1890 priority; direct diversion with storage in Crescent Lake. Canal 4 miles long. Built in 1890 by Union Irrigation & Water Power Co. Principal crops are hay and alfalfa.
Graff Canal (Meeker Ditch Company)	do	2,260	1894 priority; direct diversion with storage in Crescent Lake. Canal 8 miles long. Built in 1894 by Robert E. Graff. Succeeded by present mutual company in 1917 or 1918. Principal crops are hay and alfalfa.
Alfalfa Canal (Alfalfa Irrigation District)	North Platte River	6,170	1895 priority; direct diversion; no storage. Canal 18 miles long. Built in 1895 by Alfalfa Irrigation District. Land on south side of river. Principal crops are alfalfa, corn, and hay.
Barber Canal (Clear Creek Irrigation Company)	Clear Creek	1,040	1893 priority; direct diversion; no storage. Canal 3.7 miles long. Built in 1893 by private parties. Present company organized in 1917 or 1918. Hay and alfalfa are the principal crops.
Holcomb Canal (E. J. Peterson)	Otter Creek	1,084	1895 priority; direct diversion; no storage. Canal 4 miles long. Built in 1895 with diversion from North Platte River. Changed to Otter Creek in 1914. Constructed by private individuals. Hay is principal crop.
Keystone Canal (Keystone Irrigation Company)	White Tail Creek and Little Spring Creek	4,320	1902 priority; direct diversion; no storage. Canal 9 miles long. Built in 1909 by mutual stock company. Principal crops are hay and alfalfa.
Keith-Lincoln County Canal (Sometimes called Sutherland & Paxton Canal) (Keith & Lincoln County Irrigation District)	North Platte River	8,560	1894 priority; direct diversion; no storage. Canal 28 miles long. Built in 1894. Sutherland Land & Irrigation Co., constructed canal. Succeeded by Keith & Lincoln Counties Irrigation Co., in 1905. Present district organized Oct. 30, 1905. Land on south side of river. Principal crops are alfalfa, corn, small grain, sugar beets, and some fruit.
Sheridan & Wilson Canal (The Sheridan Estate)	do	700	1890 priority; direct diversion; no storage. Canal 3.5 miles long. Built in 1892 or 1893 as private enterprise. Not operated for several years but now repaired and operating.
North Platte or Platte Valley Canal (Platte Valley Irrigation District)	North Platte River	12,650*	1884 priority; direct diversion; no storage. Canal 25 miles long. Built in 1884 by North Platte Irrigation & Land Co. Succeeded by North Platte Land & Water Co., in 1892. In 1911 went into hands of receiver. In 1912 project was transferred to Platte Valley Irrigation District.
Paxton and Hershey	do	7,630*	1894 priority; direct diversion; no storage. Canal 10 miles long. Built in 1894 by Paxton and Hershey Irrigation Canal & Land Co. Succeeded by present mutual company.
Birdwood Canal (Birdwood Irrigation District)	Birdwood Creek	5,680	1893 priority; direct diversion; no storage. Canal 20 miles long. Built in 1894 by Equitable Farm and Stock Improvement Co. Succeeded by present district in 1906. Much of the land is subirrigated.
Suburban Canal (Sometimes called the Farmers and Merchants Canal (Suburban Irrigation District)	North Platte River	6,920*	1894 priority; direct diversion; no storage. Canal 18 miles long. Built in 1894 and 1895. Suburban Irrigation District organized April 20, 1896, and purchased canal. Principal crops are alfalfa, small grain, hay, and sugar beets.
Cody-Dillon Canal (Cody Land & Cattle Company)	do	5,640	1893 priority; direct diversion; no storage. Canal 13 miles long. Built in 1894 by Cody and Dillon Irrigation Canal Co., a partnership. At present a private development. Principal crops are hay and alfalfa.
Thirty Mile Canal (Thirty Mile Canal Company)	Platte River	22,000	1925 priority; direct diversion; no storage. Organized in 1894 as a private company. Rights were canceled. New company is a mutual concern. 15-mile canal diverts from south bank 2 miles east of Brady Island.
Gothenburg Canal (Gothenburg Power & Light Company)	do	28,000	Two filings 1890 and 1894. Irrigation and power. Direct diversion 10 miles above Gothenburg. No storage. Power plant at Gothenburg. Canal extended 20 miles east of Gothenburg in 1894 for irrigation. Private company; permanent water rights sold. Water also rented year to year.
Six Mile Ditch (Six Mile Ditch Company)	do	1,500	A mutual company. Organized 1894; direct flow rights dated 1894; no storage. Canal constructed 1895, was in disuse for a number of years and reconstructed in 1914. Canal diverts from south bank 5 miles west of Gothenburg, Nebr.
Cozad Canal (Cozad Ditch Company)	do	38,000	15-mile canal built 1895-1896 priority 1894. No storage. Direct diversion from left bank near Gothenburg. Tail-race of Gothenburg power plant discharges into canal. Originally a private company now a mutual farmers' organization.
Orchard & Alfalfa Canal (South Side Irrigation Company)	do	10,000	Farmers' organization. Direct diversion with priority right of 1896. No storage. 16 miles of canal built in 1896. Land lies on right bank of Platte River directly south of Cozad, Nebr. Original filing 300 second-feet; 215 second-feet canceled about 1925.
Dawson County Canal (Dawson Canal Irrigation Company)	do	97,000	Organized 1894 as a farmers' corporation. Direct diversion; 1894 priority; no storage. Reorganized in 1913, old rights recognized. 60 miles of main canal and laterals on north side of Platte River near Lexington, Nebr.
Elm Creek Canal (Elm Creek Canal Company)	Platte River	15,900	Originally the Farmers' Union Canal. Built in 1894. Direct flow rights; no storage. Canal abandoned but reconstructed by Elm Creek Canal Co., in 1930. Refiling 1929 on 227 second-feet direct flow. 20 miles of main canal being rebuilt. Land lies adjacent to Elm Creek, Nebr.
Kearney Canal (Central Power Company)	do	9,000	Combination irrigation and power canal, constructed about 1883. Date of priority 1882. Direct diversion on right bank 3 miles southwest of Elm Creek, Nebr. 16 miles of main canal. No storage. Private company; temporary water contracts with farmers.

*Some lands, with rights under any one of these canals, are so located that they can be irrigated more advantageously from some other canal and have been so irrigated in recent years.

WATER APPROPRIATIONS FOR COLORADO, WYOMING, AND NEBRASKA
VALUES IN SECOND-FEET-YEARLY TOTALS

	Colorado		Wyoming			Nebraska	
Year	N. Platte Basin	Laramie Basin	N. Platte Basin	Laramie Basin	Horse Cr. Basin	N. Platte & Platte Basins	Totals
1866			48.60				48.60
1867							
1868			.54	46.79			47.33
1869				1.57			1.57
1870			.23	1.90			2.13
1871			.62	32.97			33.59
1872				1.96			1.96
1873			.75	6.27			7.02
1874			103.21	15.53	9.04		127.78
1875			12.86	27.74	17.50		58.10
1876			8.00	52.12	12.15		72.27
1877			3.22	30.11	149.49		182.82
1878			23.81	65.15	11.13		100.09
1879		7.60	62.80	104.27	25.12		199.99
1880	4.00	30.84	15.24	43.86	18.82		112.76
1881	2.50	51.23	27.01	146.49	22.70		294.93
1882	30.50	58.18	91.67	65.16	55.10	24.77	325.38
1883	44.00	39.56	160.67	824.18	256.27		1344.68
1884	46.50	37.94	217.89	571.17	385.75	302.86	1562.11
1885	134.00		461.41	200.04	93.56	1.23	890.24
1886	128.00	14.31	268.62	172.67	146.86	1.43	731.89
1887	386.65	24.50	194.57	213.20	127.02	906.79	1852.73
1888	702.95	3.07	173.34	158.37	13.65	252.29	1303.67
1889	393.50		139.17	57.98	1.12	357.71	949.48
1890	331.50	13.88	262.39	146.54	3.37	737.47	1495.51
1891	114.78	405.52	124.05	27.77	8.28	161.23	841.63
1892	154.80	7.40	31.30	36.30		207.92	437.72
1893	113.80	25.14	118.81	2.28	6.67	279.38	547.98
1894	100.45	39.22	36.43	21.80		2721.30	2919.20
1895	170.30		90.36	63.04		790.80	1114.50
1896	50.27	81.42	72.39	29.96	1.42	205.43	440.89
1897	69.00	4.22	59.00	16.95	2.20	220.23	371.60
1898	158.80		115.58	20.54		29.71	320.63
1899	44.90	288.00	77.98	27.12	1.00	6.14	445.14
1900	119.90	76.57	134.13	55.83	1.85	.89	389.17
1901	584.90	44.80	397.53	29.32	1.47	3.07	1061.09
1902	274.10	886.90	170.88	47.49	21.47	646.43	2047.27
1903	193.24	15.30	177.60	31.63	3.36	10.48	431.61
1904	265,66	63.76	281.48	49.64	13.41	2588.88	3262.73
1905	317.14		245.31	34.68	3.99	2.57	603.69
1906	34.10	16.00	114.71	26.68	11.78		203.27
1907	72.00	10.00	124.26	49.53	170.81	16.58	443.18
1908	112.46	7.00	150.59	40.28	13.83	2.57	326.73
1909	99.90	31.97	162.91	45.56	4.45	11.07	355.66
1910	654.79	6.00	159.14	52.95	11.39	37.83	922.10
1911	384.22	6.75	132.93	13.56	14.27	19.32	571.05
1912	78.38		87.24	9.92	1.75	33.20	210.49
1913	99.82	29.40	131.35	18.48	2.86	25.48	307.41
1914	62.03		98.23	18.56	1.44	2.64	182.91
1915	58.50		54.84	12.31	.21	6.28	132.14
1916	46.70		48.22	11.24	3.00	7.49	116.65
1917	58.73		54.77	6.80	2.45	.57	123.32
1918	10.00		35.02	2.40	4.59	4.55	56.56
1919	59.38		46.01	3.53		1.65	110.57
1920	9.70		56.73	24.61	.18	4.53	95.75
1921	1.25		43.32	7.43		3.35	55.35

ELECTRIC POWER

PRODUCTION OF ELECTRICITY
KWH GENERATED BY TYPE OF PRIME MOVER
PUBLICLY OWNED PLANTS
Nebraska, 1920-1938

Year	Steam KWH	Steam Percentage of Total	Internal Combustion KWH	Internal Combustion Percentage of Total	Hydro KWH	Hydro Percentage of Total	Total Production of KWH
1920	19,252	81.5	4,360	18.5			23,612
1921	22,633	78.1	6,307	21.8	34	.1	28,974
1922	23,509	77.0	6,642	21.7	398	1.3	30,549
1923	25,057	73.9	8,485	25.0	365	1.1	33,905
1924	29,764	74.1	9,618	24.0	750	1.9	40,132
1925	33,069	76.2	9,557	22.0	762	1.8	43,388
1926	38,805	77.7	10,331	20.7	770	1.6	49,906
1927	44,572	79.2	10,982	19.5	694	1.3	56,248
1928	48,808	78.7	13,170	21.2	74	.1	62,052
1929	54,217	77.0	16,142	22.9	67	.1	70,426
1930	56,100	74.5	19,038	25.4	77	.1	75,215
1931	60,039	75.4	19,471	24.5	76	.1	79,586
1932	54,683	73.3	19,799	26.5	147	.2	74,629
1933	50,020	72.4	18,838	27.3	162	.3	69,020
1934	57,941	72.8	21,202	26.7	360	.5	79,503
1935	60,763	71.4	24,082	28.2	360	.4	85,205
1936	70,465	71.6	27,816	28.2	223	.2	98,504
1937	75,782	68.3	28,858	26.0	6,297	5.7	110,937
1938*	72,416	59.3	35,103	28.7	14,610	12.0	122,129

Source: Compiled by the Analysis and Reports Section of the Federal Power Commission for the Nebraska State Planning Board.

* Report of 1938 Power Statistics by the Federal Power Commission.

PRODUCTION OF ELECTRICITY FOR PUBLIC USE
KWH GENERATED BY TYPE OF PRIME MOVER
PRIVATELY OWNED PLANTS
Nebraska, 1920-1938
(In Thousands)

Year	Steam KWH	Steam Percentage of Total	Internal Combustion KWH	Internal Combustion Percentage of Total	Hydro KWH	Hydro Percentage of Total	Total Production of KWH
1920	202,019	90.3	9,163	4.1	12,584	5.6	223,766
1921	209,653	88.9	9,502	4.0	16,579	7.1	235,734
1922	226,712	89.5	9,591	3.8	16,971	6.7	253,274
1923	250,259	88.4	10,269	3.6	22,395	8.0	282,923
1924	263,105	88.2	10,901	3.7	24,116	8.1	298,122
1925	282,706	87.6	11,800	3.7	28,281	8.7	322,787
1926	296,228	86.3	13,630	4.0	33,332	9.7	343,190
1927	324,869	86.7	15,928	4.2	33,952	9.1	374,749
1928	353,698	87.9	16,863	4.2	31,537	7.9	402,098
1929	410,120	88.6	22,000	4.8	30,467	6.6	462,587
1930	445,362	89.1	22,107	4.4	32,091	6.5	499,560
1931	454,448	88.1	27,092	5.3	34,110	6.6	515,650
1932	413,182	86.8	28,480	6.0	34,349	7.2	476,011
1933	413,734	85.0	28,601	5.9	44,273	9.1	486,608
1934	463,368	87.2	33,251	6.2	34,902	6.6	531,521
1935	469,315	87.7	33,766	6.3	32,211	6.0	535,292
1936	535,665	89.1	34,653	5.8	30,815	5.1	601,133
1937	535,232	89.2	34,617	5.7	30,161	5.1	600,010
1938*	519,247	86.6	42,577	7.1	37,713	6.3	599,537

Source: Compiled by the Analysis and Reports Section of the Federal Power Commission for the Nebraska State Planning Board
* Report of 1938 Power Statistics by the Federal Power Commission

TOTAL PRODUCTION OF ELECTRICITY FOR PUBLIC USE
KWH GENERATED BY TYPE OF PRIME MOVER
Nebraska, 1920-1938
(In Thousands)

Year	Steam KWH	Steam Percentage of Total	Internal Combustion KWH	Internal Combustion Percentage of Total	Hydro KWH	Hydro Percentage of Total	Total Production of KWH
1920	221,271	89.4	13,523	5.5	12,584	5.1	247,378
1921	232,286	87.7	15,809	6.0	16,613	6.3	264,708
1922	250,221	88.2	16,233	5.7	17,369	6.1	283,823
1923	275,316	86.9	18,754	5.9	22,758	7.2	316,828
1924	292,869	86.6	20,519	6.1	24,866	7.3	338,254
1925	315,775	86.2	21,357	5.8	29,043	8.0	366,175
1926	335,033	85.2	23,961	6.1	34,102	8.7	393,096
1927	369,441	85.7	26,910	6.2	34,646	8.1	430,997
1928	402,506	86.7	30,033	6.5	31,611	3.8	464,150
1929	464,337	87.1	38,142	7.2	30,534	5.7	533,013
1930	501,462	87.2	41,145	7.2	32,168	5.6	574,775
1931	514,487	86.4	46,563	7.8	34,186	5.8	595,236
1932	467,865	84.9	48,279	8.8	34,496	6.3	550,640
1933	463,754	83.5	47,439	8.5	44,435	8.0	555,628
1934	521,309	85.3	54,453	8.9	35,262	5.8	611,024
1935	530,078	85.4	57,848	9.3	32,571	5.3	620,497
1936	606,130	86.6	62,469	8.9	31,038	4.5	699,637
1937	611,014	86.0	63,475	8.8	36,458	5.1	710,947
1938*	591,663	82.0	77,680	10.7	52,323	7.3	721,666

Source: Compiled by the Analysis and Reports Section of the Federal Power Commission for the Nebraska State Planning Board
* Report of 1938 Power Statistics by the Federal Power Commission

ELECTRIC POWER PLANTS
PLATTE RIVER BASIN
NEBRASKA, 1937

Location	Company	Installed Capacity Steam	Installed Capacity Int.Comb.	Installed Capacity Hydro.	Output Thousands K.W.H. Steam	Output Thousands K.W.H. Int.Comb.	Output Thousands K.W.H. Hydro.
Alliance	Municipal	3,600			5,082		
Bridgeport	Western P. S. Co.		182				
Broadwater	Western P. S. Co.		30				
Chappell	Municipal		480			648	
Cozad	Western P. S. Co.		134				
Dalton	Western P. S. Co.		60				
Fremont	Municipal	6,500			12,341		
Gothenburg	Gothenburg Lt.&Pr. Co.		315	525		134	2,609
Grand Island	Central Pr.Co. Riverside Pl.	13,500			29,596		
Grand Island	Municipal	6,000			10,708		
Kearney	Central Pr. Co.	937	1,352	2,100		202	3,421
Kimball	Municipal		996			1,122	
Lexington	Western P. S. Co.	500	780			3,927	
Lincoln	Municipal	8,900			18,060		
Lincoln	Iowa-Nebr. Lt.&Pr.Co.2nd.St.Pl.	10,000			5,065		
Lincoln	Iowa-Nebr. Lt.&Pr.Co.X St.Pl.	19,220			60,623		
Lodgepole	Municipal		130			239	
Morrill	Municipal		90				
North Platte	Northwestern P.S.Co. Poplar Pl.	2,800			9		
North Platte	Northwestern P.S.Co. Cody Pl.	3,000			6,674		
Ogallala	Western P. S. Co.		1,746			3,186	
Oshkosh	Western P. S. Co.		72			7	
Potter	Municipal	80	224			240	
Schuyler	Municipal	1,268			1,809		
Scotts Bluff	Western P. S. Co.	2,180			4,935		
Sidney	Western P. S. Co.	380	883			3,378	
Sutherland	Platte Valley P.Pr.&Id. Dist.			25,000			5,549
Sutherland	Municipal		316			189	
Wahoo	Municipal	1,780			2,300		
Totals		79,495	7,641	27,625	150,930	13,262	11,579

Source: Compiled by the Analysis and Reports Section of the Federal Power Commission for the Nebraska State Planning Board.

ELECTRIC POWER PLANTS
LOUP RIVER BASIN
NEBRASKA, 1937

Location	Company	Installed Capacity Steam	Installed Capacity Int.Comb.	Installed Capacity Hydro.	Output Thousands K.W.H. Steam	Output Thousands K.W.H. Int.Comb.	Output Thousands K.W.H. Hydro.
Albion	Central El. & Tel. Co.		200	125		10	121
Ansley	Municipal		289			352	
Arnold	Municipal		261			382	
Coelus	Central Power Co.			2,000			4,183
Broken Bow	Municipal		800			1,606	
Broken Bow	Western P. S. Co.		440			136	
Burwell	Municipal		300			408	
Callaway	Callaway El. Co.		220	370		13	223
Cedar Rapids	Central Power Co.		786	300		1,861	469
Columbus	Northwestern P. S. Co.	2,000			215		
Ericson	Western P. S. Co.			350			858
Fullerton	Iowa-Nebr. Lt. & Pr. Co.			390			1,234
Lake Doris	Western P. S. Co.			200			892
Loup City	Western P. S. Co.		140			348	
Mullen	Municipal		98			120	
Ord	Ord Lt. & Wt. Plant	300	520		1,425		
Palmer	Central Pr. Co.		100				
Ravenna	Central Pr. Co.	150					
St. Edward	Iowa-Nebr. Lt.& Pr. Co.Pl.#1			75			152
St. Edward	Iowa-Nebr. Lt.& Pr. Co.Pl.#2			95			243
Sargent	Municipal		270			384	
Seneca	Western P. S. Co.		110			286	
Spaulding	Cedar Valley Roller Mill		100	175		19	386
Totals		2,450	5,034	4,080	1,640	5,927	8,761

Source: Compiled by the Analysis and Reports Section of the Federal Power Commission for the Nebraska State Planning Board.

ELECTRIC POWER PLANTS
REPUBLICAN RIVER BASIN
NEBRASKA, 1937

Location	Company	Installed Capacity Steam	Installed Capacity Int.Comb.	Installed Capacity Hydro.	Output Thousands K.W.H. Steam	Output Thousands K.W.H. Int.Comb.	Output Thousands K.W.H. Hydro.
Alma	Municipal		375				
Arapahoe	Western P. S. Co.		170			44	
Beaver City	Municipal		304			535	
Benkelman	Municipal		260			690	
Bertrand	Municipal		150			226	
Bloomington	Western P. S. Co.		40				
Cambridge	Municipal		800			924	
Culbertson	M. M. Bree El. Co.		296			383	
Curtis	Municipal		515			607	
Franklin	Municipal		295			237	
Grant	Western P. S. Co.		160			12	
Haigler	Southern Nebr. Pr.		60			46	
Holdrege	Municipal	1,677			2,788		
Holdrege	Western P. S. Co.		240			1,066	
Imperial	Imperial Hydro. El.Sys.		500	140		166	361
McCook	Nebr. Lt.&Pr. Co.		2,358			5,082	
Orleans	Western P. S. Co.		725			3,194	
Oxford	Municipal		510			340	
Red Cloud	Municipal		800			982	
Stratton	Municipal		228			364	
Superior	Southern Nebr. Pr. Co.		150	560			2,865
Upland	Municipal		138			120	
Wauneta	Wauneta Lt.&Pr. Co.		200	220		93	387
Totals		1,677	9,274	910	2,788	15,613	3,613

Source: Compiled by the Analysis and Reports Section of the Federal Power Commission for the Nebraska State Planning Board.

ELECTRIC POWER PLANTS
ELKHORN RIVER BASIN
NEBRASKA, 1937

Location	Company	Installed Steam	Capacity Int.Comb.	Hydro.	Output Steam	Thousands Int.Comb.	K.W.H. Hydro.
Elgin	Interstate Pr. Co.		156			42	
Emerson	Municipal		352			330	
Laurel	Municipal		180			360	
Leigh	Municipal		130			240	
Lyons	Municipal		314			558	
Madison	Municipal		600			1,114	
Neligh	Interstate Pr.Co.Pl.#1		185			8	
Neligh	Interstate Pr.Co.Pl.#2		400			1,717	
Norfolk	Iowa-Nebr. Lt.&Pr. Co.	5,000			10,796		
Pender	Municipal		310			600	
Pierce	Iowa-Nebr. Lt.&Pr. Co.	120					
Plainview	Municipal		405			516	
Randolph	Municipal		220			480	
Scribner	Elkhorn Valley Pr. Co.		485			1,417	
Stuart	Municipal		142			309	
Wakefield	City Light Plant		310			386	
Wausa	Interstate Pr. Co.		175			674	
Wayne	Municipal	400	900			1,734	
West Point	Municipal		885			1,147	
Winside	Winside El. Lt.&Pr. Co.		145				
Wisner	Winside El. Lt.&Pr. Co.		540			636	
Totals		5,520	6,834	0	10,796	12,568	

Source: Compiled by the Analysis and Reports Section of the Federal Power Commission for the Nebraska State Planning Board.

ELECTRIC POWER PLANTS
BLUE RIVER BASIN
NEBRASKA, 1937

Location	Company	Installed Steam	Capacity Int.Comb.	Hydro.	Output Steam	Thousands Int.Comb.	K.W.H. Hydro.
Aurora	Iowa-Nebr. Lt.&Pr. Co.	210			56		
Barneston	Beatrice Pr. Co.			780			2,004
Beatrice	Gage Co. El. Co.Pl.#1		670			2,743	
Beatrice	Gage Co. El. Co.Pl.#8			140			580
Beaver Crossing	Iowa-Nebr. Lt.&Pr. Co.Pl.#7			180			617
Blue Hill	Municipal	96	155			262	
Blue Springs	Gage Co. El. Co.Pl.#2			415			815
Clay Center	Southern Nebr. Pr. Co.		300			164	
Crete	Municipal		1,125			1,080	
Crete	Iowa-Nebr. Lt.&Pr. Co.Pl.#5			200			560
David City	Municipal	1,114			1,080		
Deshler	Southern Nebr. Pr. Co.	370			16		
DeWeese	DeWeese Pr. Co.			60			200
DeWitt	Municipal		145			167	
Dorchester	Iowa-Nebr. Lt.&Pr. Co.Pl.#8			100			571
Fairbury	Municipal	5,600			6,377		
Geneva	Iowa-Nebr. Lt.&Pr. Co.	120					
Harvard	Southern Nebr. Pr. Co.		180				
Hastings	Municipal	6,800			15,227		
Hebron	Southern Nebr. Pr. Co.			130			290
Holmesville	Iowa-Nebr. Lt.&Pr. Co.			280			1,048
Milford	Iowa-Nebr. Lt.&Pr. Co.			170			260
Milford	Iowa-Nebr. Lt.&Pr. Co.Pl.#1			240			247
Minden	Municipal	310	280		1,200		
Oak	Southern Nebr. Pr. Co.		180	60			383
Osceola	Iowa-Nebr. Lt.&Pr. Co.	180					
Seward	Iowa-Nebr. Lt.&Pr. Co.Pl.#4			100			268
Seward	Iowa-Nebr. Lt.&Pr. Co.Pl.#5			180			910
Seward	Iowa-Nebr. Lt.&Pr. Co.Pl.#6			180			560
Wilber	Municipal	125			302		
Wymore	Gage Co. El. Co.Pl.#6		700			778	
York	Iowa-Nebr. Lt.&Pr. Co.	665			974		
York	Iowa-Nebr. Lt.&Pr. Co.Pl.#2		1,400			387	
Totals		15,080	6,066	3,186	25,880	6,061	9,540

Source: Compiled by the Analysis and Reports Section of the Federal Power Commission for the Nebraska State Planning Board.

ELECTRIC POWER PLANTS
NIOBRARA RIVER BASIN
NEBRASKA, 1937

Location	Company	Installed Steam	Capacity Int.Comb.	Hydro.	Output Steam	Thousands Int.Comb.	K.W.H. Hydro.
Ainsworth	Interstate Pr. Co.			350			1,040
Ft. Niobrara	Interstate Pr. Co.			280			1,264
Gordon	Western P. S. Co.		375			321	
Harrison	Municipal		188			214	
Long Pine	Interstate Pr. Co.			150			468
Minichadusa	Interstate Pr. Co.			200			193
Valentine	Interstate Pr. Co.	140	200			351	
Totals		140	763	980	0	886	2,965

Source: Compiled by the Analysis and Reports Section of the Federal Power Commission for the Nebraska State Planning Board

ELECTRIC POWER PLANTS
MINOR MISSOURI RIVER BASIN ABOVE PLATTE
NEBRASKA, 1937

Location	Company	Installed Steam	Capacity Int.Comb.	Hydro.	Output Steam	Thousands Int.Comb.	K.W.H. Hydro.
Blair	Municipal	850			1,450		
Bloomfield	Bloomfield Lt.&Pr. Co.		214			309	
Creighton	Interstate Pr.Co.Pl.#2		200			108	
Hartington	Interstate Pr.Co.		416			170	
Omaha	Nebraska Pr. Co.	106,500			397,617		
Walthill	Central States El. Co.		460			797	
Totals		107,350	1,290	0	399,067	1,384	0

Source: Compiled by the Analysis and Reports Section of the Federal Power Commission for the Nebraska State Planning Board.

ELECTRIC POWER PLANTS
MINOR MISSOURI RIVER BASIN BELOW PLATTE
NEBRASKA, 1937

Location	Company	Installed Steam	Capacity Int.Comb.	Hydro.	Output Steam	Thousands Int.Comb.	K.W.H. Hydro.
Auburn	Western P. S. Co.		1,205			1,654	
Auburn	Municipal	175			364		
Falls City	Municipal	368	960			4,011	
Humboldt	Iowa-Nebr. Lt.&Pr. Co.	480			10		
Nebr. City	Central Pr. Co.	2,500			3,901		
Pawnee City	Iowa-Nebr. Lt.&Pr. Co.	370			1		
Peru	Municipal		225			406	
Syracuse	Municipal		540			513	
Tecumseh	Municipal		750			1,200	
Totals		3,893	3,680	0	4,276	7,784	

Source: Compiled by the Analysis and Reports Section of the Federal Power Commission for the Nebraska State Planning Board.

ELECTRIC POWER PLANTS
WHITE RIVER BASIN
NEBRASKA, 1937

Location	Company	Installed Steam	Capacity Int.Comb.	Hydro.	Output Steam	Thousands Int.Comb.	K.W.H. Hydro.
Chadron	Western P.S. Co.	1,150	1,000		5,745		
Crawford	Western P.S. Co.	144			13		
Totals		1,294	1,000	0	5,758	0	0

Source: Compiled by the Analysis and Reports Section of the Federal Power Commission for the Nebraska State Planning Board.