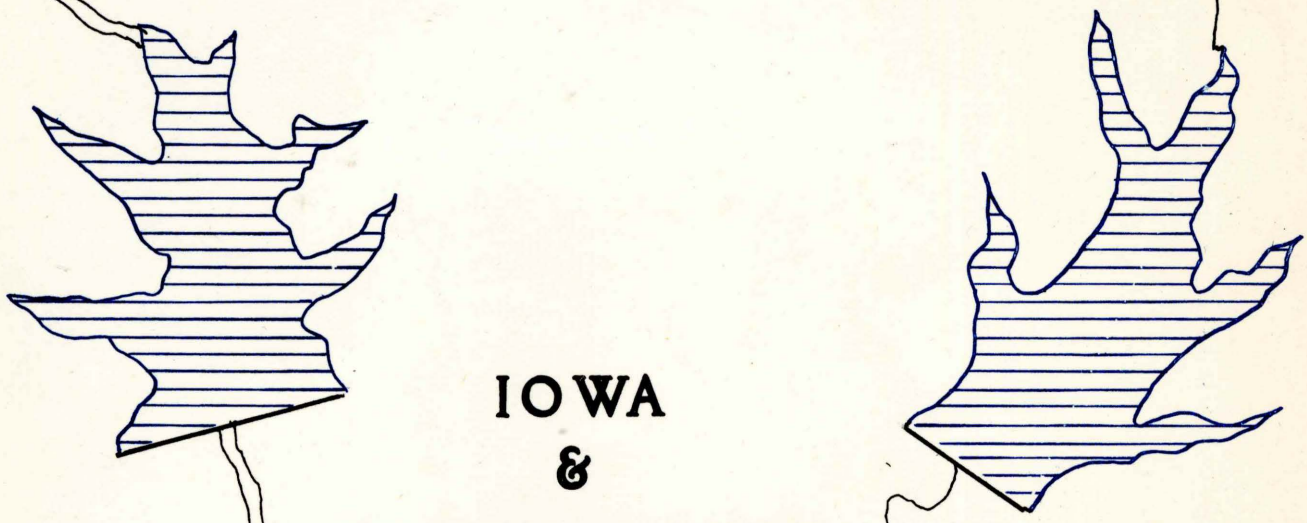
# PRELIMINARY REPORT

## COMPREHENSIVE WATERSHED DEVELOPMENT

## BIG SIOUX VALLEY



## IOWA
## &
## SOUTH DAKOTA



STATE CONSERVATION COMMISSION
IOWA

Honorable Norman A. Erbe
Governor of Iowa
State House
Des Moines, Iowa

Dear Governor Erbe:

The State Conservation Commission is pleased to submit its report, Preliminary Report Comprehensive Watershed Development in fulfillment of the State Conservation Commission's statement at Akron, Iowa, meeting of June 25, 1962, dealing with a proposed flood control project for the lower basin of the Big Sioux River.

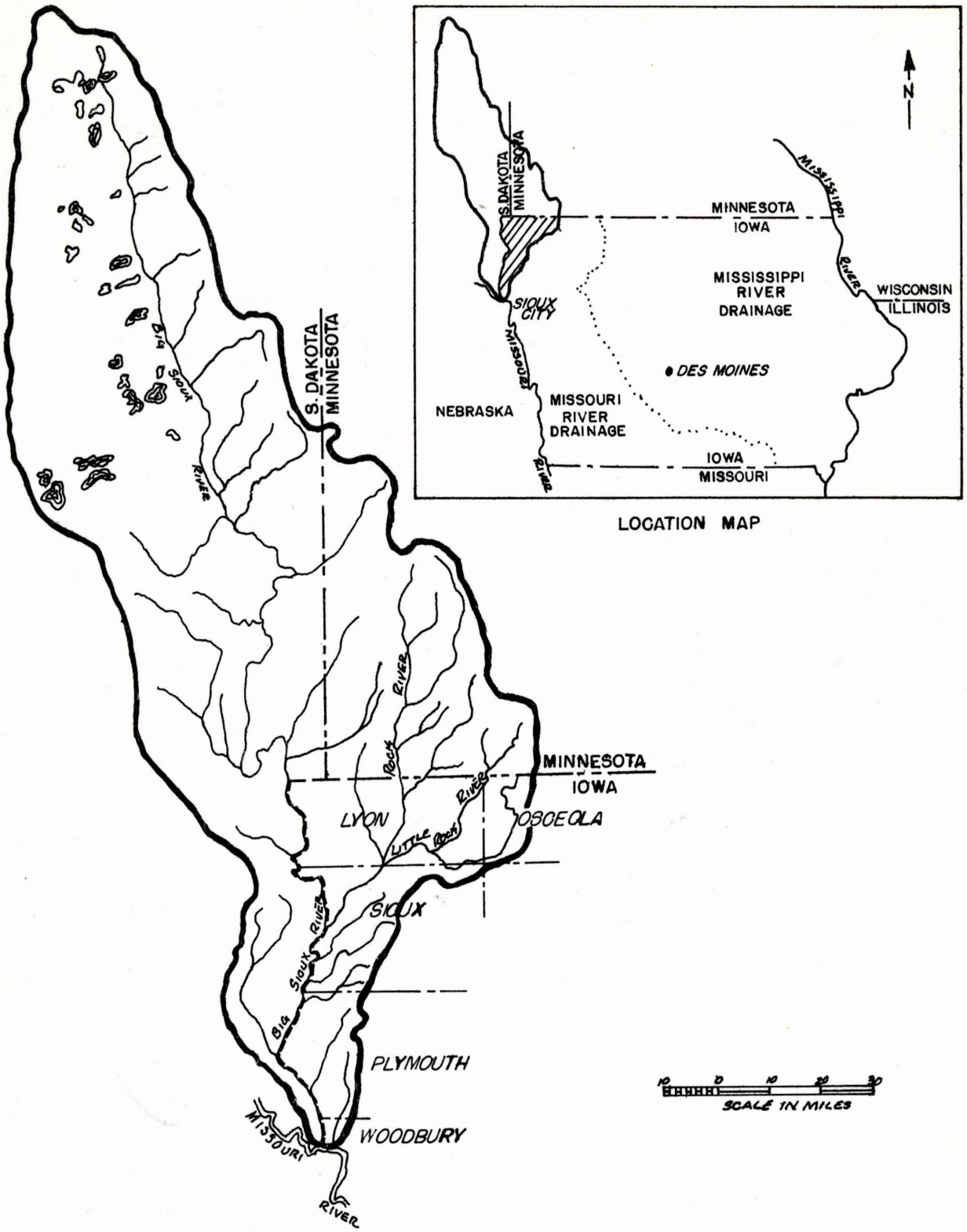
The State Conservation Commission feels that any waters projects proposed within the State of Iowa should be considered within the scope of a comprehensive over-all development plan which considers the needs of the people in the immediate area, and the needs of the people of the State of Iowa as a whole. Various state agencies within the organization of State Government who have an interest in waters should agree on any proposed projects before they are carried out to final design.

The Commission also feels strongly that the conservation and development of waters for fish, wildlife and recreation is vital to the people of Iowa and that we are charged with responsibility to protect our present facilities and promote the development of good projects which tend to increase these facilities to the general benefit of the State of Iowa.

The Commission further feels that this report, because of the time available will only encompass an over-all preliminary development plan and proposes an open-door approach to comprehensive water development plans for the Big Sioux River Valley. It is hoped that all federal and state agencies with overlapping interests in water developments, will study and develop water projects only after a comprehensive development or a master plan has been worked out for the complete basin in which a specific project is desired.

STATE CONSERVATION COMMISSION

By Glen G. Powers
Director




LOCATION MAP

THE BIG SIOUX RIVER BASIN

# WATERSHED MAP

## DESCRIPTION OF THE BASIN

### 1. LOCATION AND EXTENT.

The Big Sioux River basin lies in eastern South Dakota, northwestern Iowa, and southwestern Minnesota. It is relatively long and narrow, with a length of 210 miles and a maximum width of 75 miles. It has an area of about 9,310 square miles of which about 6,410 square miles are in South Dakota, 1,350 square miles are in Iowa, and 1,550 square miles are in Minnesota. From its source in northeastern South Dakota, the Big Sioux River flows generally southward to its confluence with the Missouri River just above Sioux City, Iowa, and in the lower third of its length constitutes the boundary between South Dakota and Iowa. Its principal tributary is the Rock River, which rises in southwestern Minnesota and drains a total of 1,713 miles, of which 944 square miles are in Minnesota and 769 square miles are in Iowa. It joins the Big Sioux River about 6 miles north of Hawarden, Iowa, approximately 80 miles above the mouth. Other tributaries below the mouth of the Rock River are smaller, draining an aggregate area of 436 square miles in South Dakota and 435 square miles in Iowa. Total drainage area below the mouth of the Rock River is 871 square miles.

2. TOPOGRAPHY.

The lower section of the Big Sioux Valley is marked by distinct bluffs and its meander through the country is well defined. The river itself flows within the banks which are 10 to 15 feet high. The upper part of the valley is very different. There are no bluffs and the country is so level that is impossible to detect the slope with the unaided eye. The river winds through the valley without the slightest variation to denote its presence and it is only by a line of low shrubbery that grows along it that one can tell from a distance where it is. The stream banks vary from three to five feet high at the upper end.

The lateral slopes of the upper valley is but little greater than the longitudinal slope and the tributaries present the same characteristics as the main stem. A rise in four feet in the river backs the water up in all directions from $\frac{1}{2}$ to 2 miles.

3. STREAM CHARACTERISTICS.

The Big Sioux River drops approximately 730 feet in a distance of 336 miles - or an average of about 2.17 feet per mile. Of this fall, some 200 feet is taken up in a distance of 50 miles near Dell Rapids where the river flows over an out-cropping of Sioux quartzite in that area. This leaves 530 feet in the remaining distance of 286 miles, or 1.9 feet per mile. In the upper part of the valley the fall averages about 2 feet per mile.

The Big Sioux River has banks between three and five feet high and a width of approximately fifty feet at the upper end and varies to between ten and fifteen feet banks at the lower end with a width of approximately 100 feet. The stream throughout its length is relatively free from sedimentation and erosion problems.

The lower six miles of the Big Sioux has a bank-full capacity of 20,000 c.f.s. This reach has had some channel work performed on it. For the most part, the Big Sioux below the confluence with the Rock River, has only a channel capacity of approximately 5,000 c.f.s.

The tributary streams draining the basin above the junction of the Rock River have about the same stream gradient as the Big Sioux and those streams draining the basin below the confluence with the Rock River have a steeper gradient than the Big Sioux.

# FLOOD PROBLEM

Local interests have desired to control floods along the Big Sioux River for years. The first studies available date back to the late 1800's. Most of the interest in flood control was from the City of Sioux Falls, South Dakota and land owners more recently along the lower Big Sioux Valley.

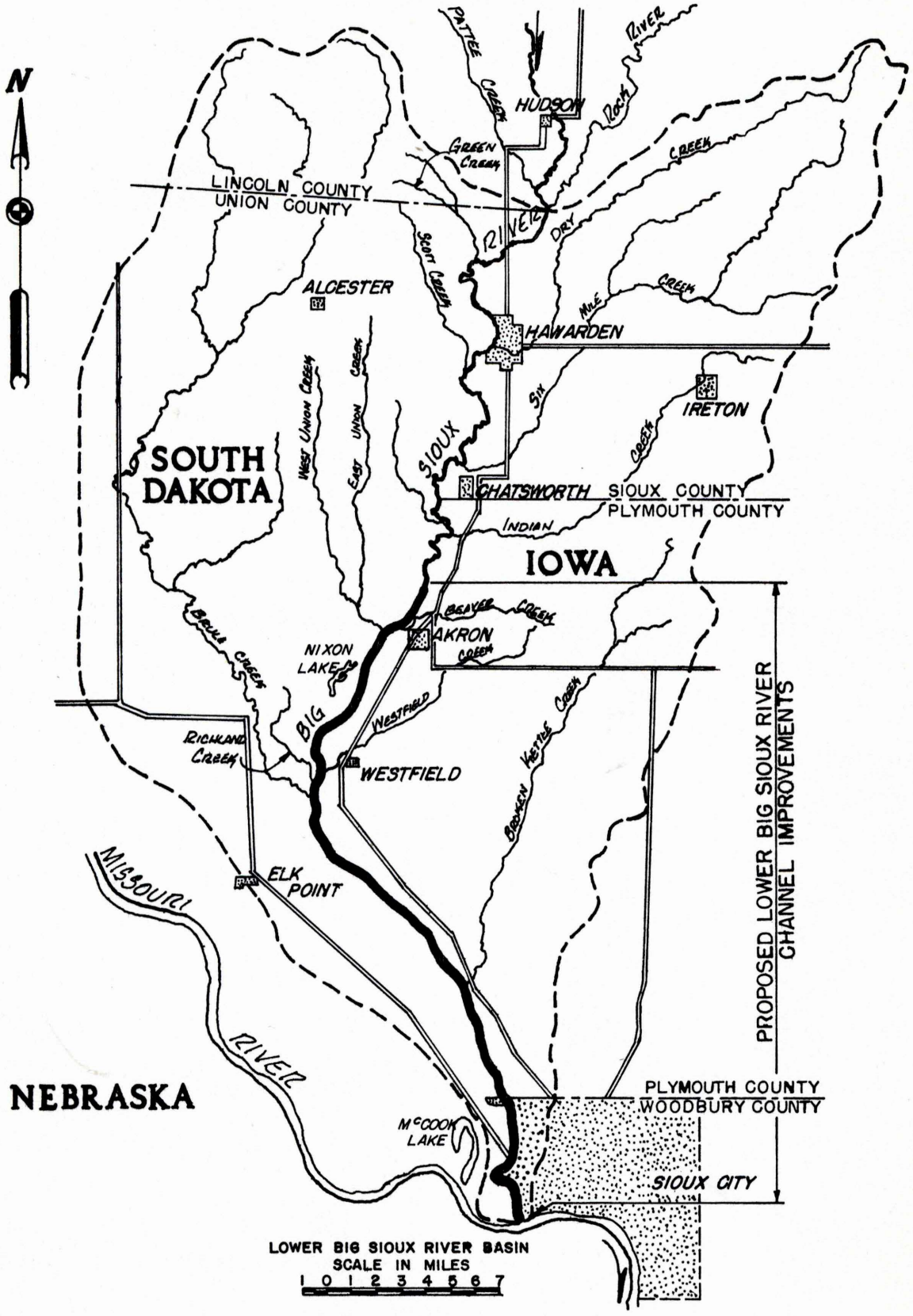
The local problem at Sioux Falls appears to have been at least partially solved by the local flood control works at Sioux Falls. However, the flood problems in the lower Big Sioux Valley have not been solved but aggravated by reclamation project above the affected areas.

Flood events on the lower Big Sioux have been about equally divided between those caused by snow melt and those caused by rainfall. The snow melt floods generally have a very large volume of total runoff and are usually of rather long duration, but this comes at a time of year when very little damage can be expected to predominately agricultural interests. General rains of a magnitude sufficient to cover the entire basin and cause general flooding can happen, but would be a very rare event - because of size and characteristic of the basin. The greatest potential for a rainfall flood on the Big Sioux below the mouth of the Rock River is from a heavy rainstorm on the basin above Sioux Falls and about three days later by another rainstorm centered over the Rock River basin.

The soils, the gentle slopes over most of the basin, the long, narrow slope of the basin and the drainage pattern - some to limit the flood effects of large storms. These factors, combined with the large amount of valley storage along the Big Sioux, cause floods on the main stem to be relatively slow to rise, to maintain near peak flows for several days, and to recede gradually to lower flows.

The Rock River has a flood-producing potential in the lower basin greater than that of the Big Sioux River above its confluence with the Rock River. The Rock River has a comparatively large channel with relatively little valley storage and has a considerably faster rise and fall of flood stages as a result.

Confluence of Big Sioux River on Left and Rock River at Right at Crest of 1962 Spring Flood


N
PATTEE CREEK
HUDSON
ROCK RIVER
GREEN CREEK
LINCOLN COUNTY
UNION COUNTY
ROCK RIVER
DRY CREEK
SCOTT CREEK
ALCESTER
HAWARDEN
MILE CREEK
WEST UNION CREEK
EAST UNION CREEK
SIOUX
SIX CREEK
IRETON
SOUTH DAKOTA
CHATSWORTH
SIOUX COUNTY
PLYMOUTH COUNTY
INDIAN CREEK
IOWA
BEAVER CREEK
AKRON
BRULE CREEK
NIXON LAKE
BIG
WESTFIELD
RICHLAND CREEK
WESTFIELD
KEYSTONE CREEK
BROWNEN
MISSOURI
ELK POINT
PROPOSED LOWER BIG SIOUX RIVER CHANNEL IMPROVEMENTS
RIVER
NEBRASKA
PLYMOUTH COUNTY
WOODBURY COUNTY
McCOOK LAKE
SIOUX CITY
LOWER BIG SIOUX RIVER BASIN
SCALE IN MILES
1 0 1 2 3 4 5 6 7

PROPOSED FLOOD CONTROL PROJECT
BIG SIOUX RIVER TRIBUTARIES
IOWA AND SOUTH DAKOTA
Prepared by the U. S. Army District, Omaha
Corps of Engineers
Omaha, Nebraska
October, 1960

## PROJECT DESCRIPTION.

The lower Big Sioux River channel would be improved between the Woodbury County line, which is approximately 8 miles upstream of mouth, and two miles north of Akron, Iowa. The improvement would consist of channel cut-offs to eliminate the larger bends together with clean-cut, deepening, and enlargement of the existing channel, where necessary, to contain the designed discharge without freeboard and without levies. The proposed project would have a total length of approximately 35 miles and about 20 miles shorter than the existing channel. No interior drainage structures or improvements at tributary stream outlets would be required as per report.

## DESIGN FOR DISCHARGES.

The proposed improvement for the lower Big Sioux River from the mouth to two miles north of Akron is predicated upon a design discharge of 19,100 c.f.s. The lower six miles of the existing channel now has approximately 20,000 c.f.s. capacity which provides protection against a flood of approximately 10% chance of occurrence. Improvement of the channel above this reach would cause the flow to build up so that the 10% flood would be increased

to 23,000 c.f.s.; therefore, the lower 63.7 miles of channel which is designed to pass 20,000 c.f.s. at the same stage, in order to maintain the existing degree of flood protection. The increased channel capacity as provided would also be sufficient to compensate for the build-up of larger flood flows.

PROJECT COST ESTIMATES.

A. First Cost: The total estimated first costs on the proposed plan of improvement, including preauthorization survey costs and allowances for contingencies, engineering, inspection during construction, and overhead based on January, 1960 price levels, is $7,020.000.00, of which $6,750.00 would be born by the Federal Government and $270,000.00, which would be born by local interest.

B. Annual Charges: The annual project charges based on the foregoing first cost of price levels would be $277,000., of which $244,000.00 would be charged to the Federal Government and $32,000.00 be charged to local interests. The latter item would include $20,000.00 for maintenance and operation of the complete project. In addition to the annual financial project costs, there would be an annual net loss income on the land acquired for the project right-of-way, which has been estimated at approximately $1,000. per year. Addition of this item to the estimate of project

financial costs gives the annual economic cost of $278,000., of which $244,000.00 would be Federal and $34,000.00 non-federal.

REQUIREMENTS OF LOCAL COOPERATION.

A. General Requirements: In conformance with established policy, local interest, would be required to provide, without cost to the Federal Government all lands, easements, and right-of-way required for the project, including all necessary alterations and relocations of utilities and provisions of new farm roads required; hold and save the federal government free from damages due to construction work; and maintain and operate the project after completion in accordance with regulations prescribed by the Secretary of the Army. Since the project is not designed to provide protection from extreme floods, local interests should also be kept adequately informed, that the project does not provide protection against maximum floods.

SPECIFIC REQUIREMENTS.

In accordance with the above requirement local interest must furnish approximately 1,135 acres of land for right-of-way to construct approximately 1.29 miles of gravel, surfaced roads to provide access to severed farm lands.

DETERMINATION OF BENEFITS.

a. The only benefits would be those attributed to the prevention of flood damage. Since no appreciable change in land use is anticipated as the result of the project construction, land enhancements would be negligible. No colateral benefits of importance would accrue to navigation and recreation.

b. The estimates of benefits include all primary flood damages prevented and emergency costs and expenses saved. Secondary and intangible benefits were not included nor any attempt made to evaluate them.

BENEFIT TO COST RATIO.

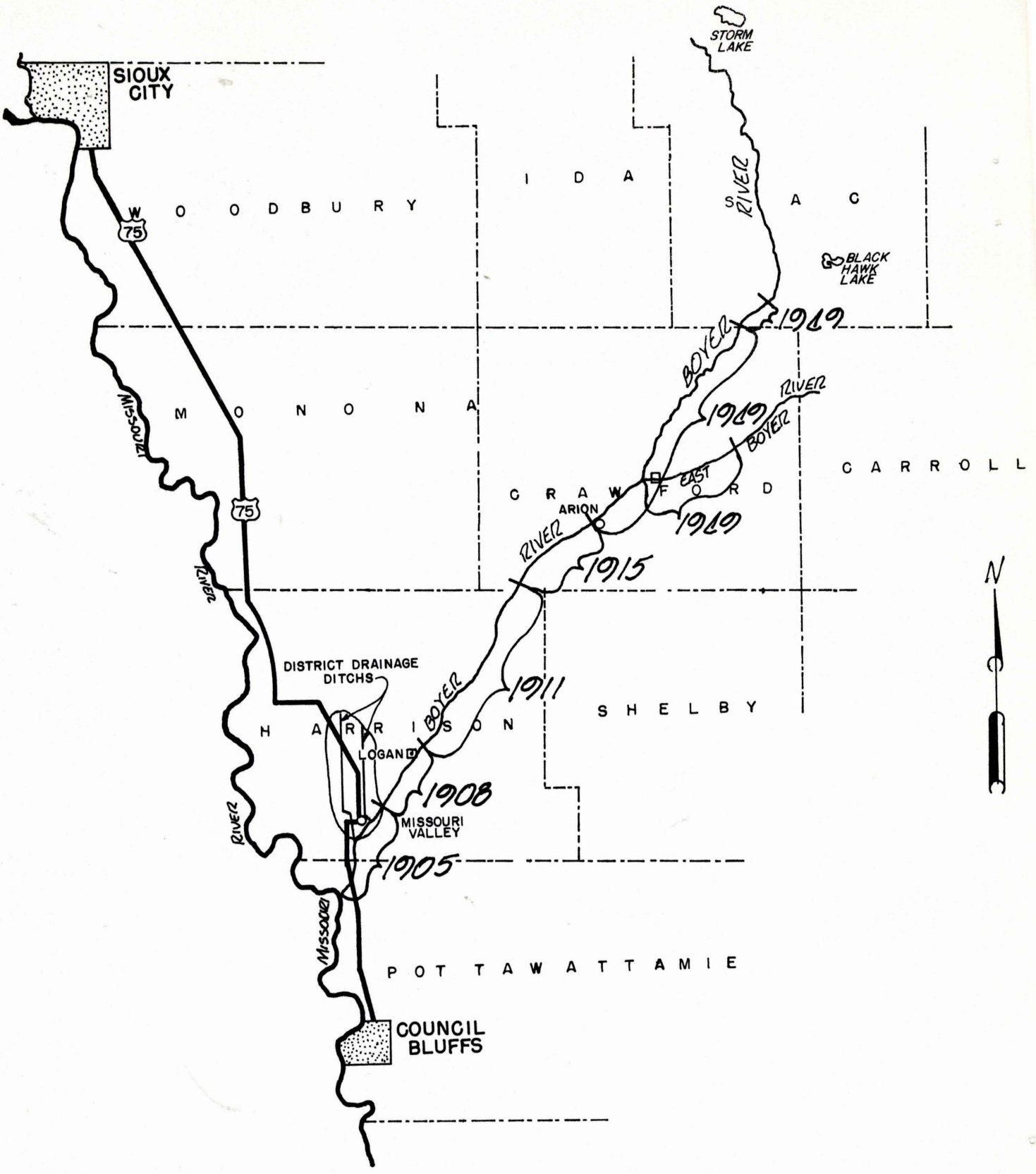
The benefit to cost ratio as indicated in the report was 1.1 to 1.

CONSERVATION PROBLEMS DEALING WITH FISH, WILDLIFE & RECREATION
UNDER THE PROPOSED FLOOD CONTROL PROJECT
OF CHANNEL STRAIGHTENING
LOWER END OF BIG SIOUX

The Commission feels that we have several examples in Iowa where river channel straightening has created havoc with fish, wildlife and recreation. Four of these areas among others, are reaches of the Nishnabotna River, Boyer River, Little Sioux River and the Skunk River, all in Iowa. The following effects have developed as a result of their projects:

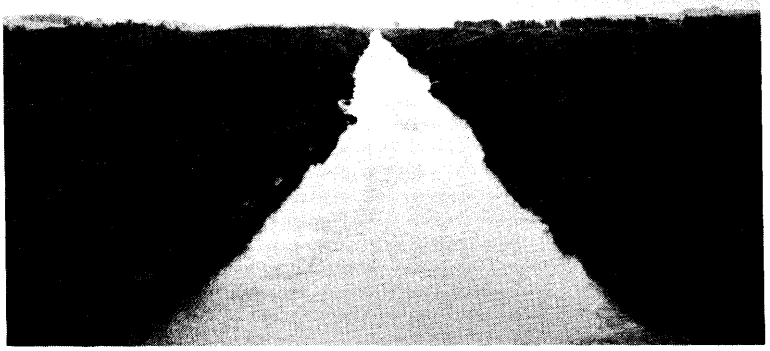
1. Complete destruction of fisheries in these streams. A specific example, from our experience, is that for 20-25 years following 1929 when 75% of the East and 90% of the West Nishnabotna River had been straightened, the fishing potential of these rivers was practically non-existent. Prior to straightening, the streams furnished excellent angling, especially for channel and flathead catfish. Again, over the past 5-10 years fishing has improved.

Once straightening of a river begins, property owners adjacent to the river upstream are seldom content - so straightening often begins at mouth and works upstream to headwaters.




# SEQUENCE OF CHANNEL STRAIGHTENING

# BOYER RIVER



Straightened Channel on Boyer River
One Mile Above the Sac
County Line

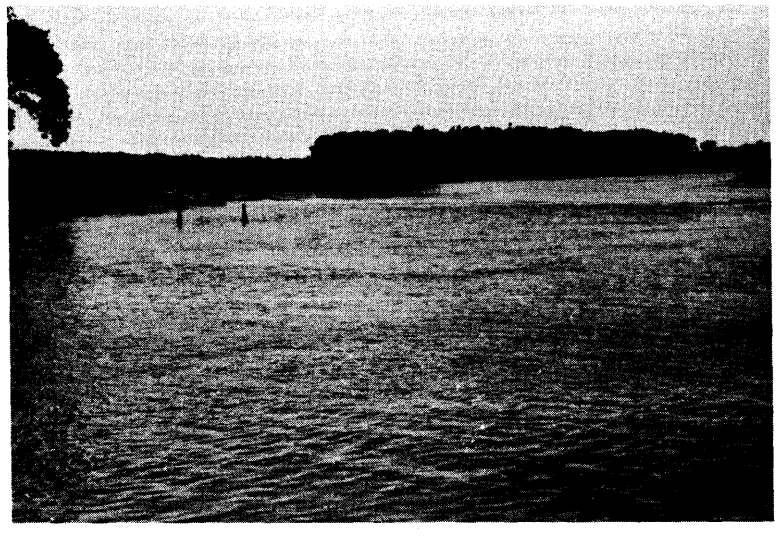
Straightening of the Boyer River began at its mouth in 1905 and was straightened to Missouri Valley. In 1908 this river was straightened between Missouri Valley and Logan, Iowa - in 1911 between Logan and the Crawford County line - in 1915 between the Crawford County line and Arion - in 1944 between Arion and the Sac County line. The East Boyer between Denison and Vail was also straightened in 1949. (See Sketch Page).

The direct maintenance costs for the H. & P. district, which extends from the confluence of the Boyer and the Missouri River to Missouri Valley, Willow River from Missouri Valley to Highway 75, and Allen Drainage Ditch north to Highway 75, and Boyer Sub, from Highway 75 northeast to Logan over a 16 year period - 1946 through 1961, amounted to $1,092,000.00.

2. The wildlife habitat which parallels the present stream is more often than not completely destroyed eventually by private property owners clearing to the very edge of bank or first terrace for cultivated crops. A specific example of this is private property along both the Boyer River and the Skunk River.

3. The straightening of any appreciable length of any stream reduces the surface areas very greatly, increases the slope of stream bed which increases the velocity of moving water in the river, and decreases normal storage of water within bed of river. An example of these are as follows:

   (a). Straightening the lower 35 miles of the Big Sioux would reduce the surface area and storage over 50%. Surface acres of water are already critically low from the standpoint of recreation in the Big Sioux area in Iowa.



Bank Erosion on Big Sioux River
at Iowa Public Service Low Head Dam
Near Sioux City, Iowa

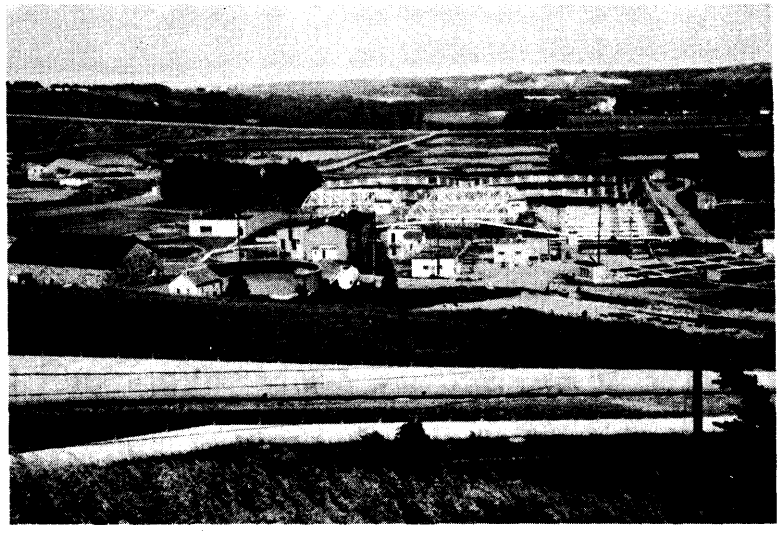
Bank Erosion Along Big Sioux River
Adjacent to Sioux City Country Club
Sioux City, Iowa

(b). Some straightening work has been done on the lower six to eight miles of the Big Sioux River, which incidentally, is the only reach of complete Big Sioux channel that shows erosion along bank line. This would be aggravated by increase in flows in this reach, which would occur in the project as planned under proposed project of channel straightening.

It is felt that no allowance was made for the above problems, which would accrue to the State Conservation Commission as a result of the proposed project should it be carried out as planned. The Commission in a statement found in the appendix of this report which was sent to the District Engineer, Omaha Engineer District, Corps of

Engineers on January 12, 1962, indicating at least partial values of losses to the people of Iowa in fish, wildlife and recreation (See Report).

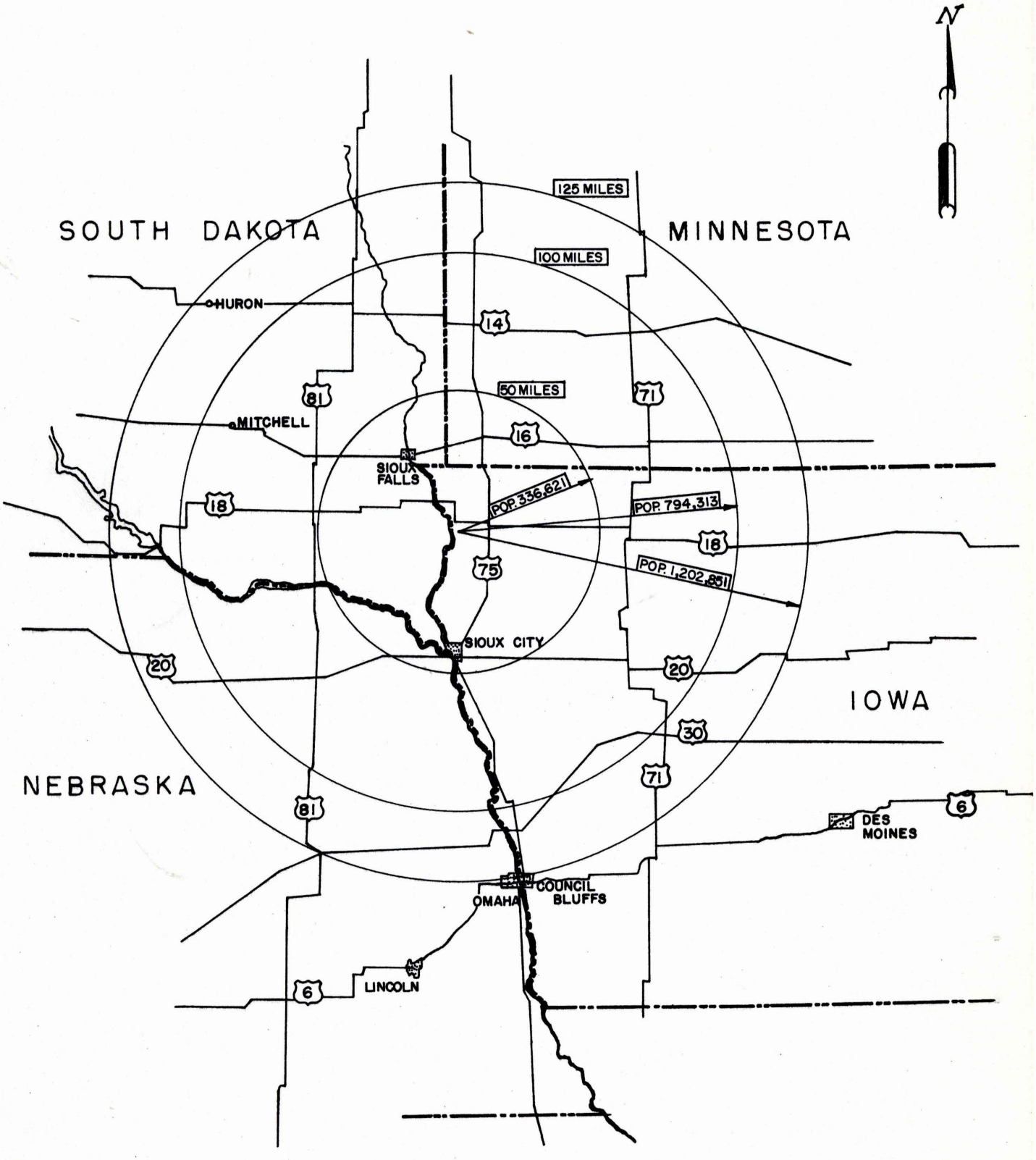
There has been some contention that silting on the Big Sioux is a problem, this is not founded at least in the channel itself. There is a report in appendix by a member of the Conservation Commission indicating that no real silting problem exists on the reach of the Big Sioux from the northern Iowa border to the mouth at Sioux City, Iowa.



New Sioux Falls, South Dakota
Sewage Disposal Plant

The quality of the water in the Big Sioux River below Sioux Falls, South Dakota, has improved greatly with the construction of the new sewage disposal plant and sanitary sewage collector system at Sioux Falls.

# POPULATION WITHIN VARIOUS RADIUSES OF DESIRABLE GENERAL WATER IMPOUNDMENT AREA

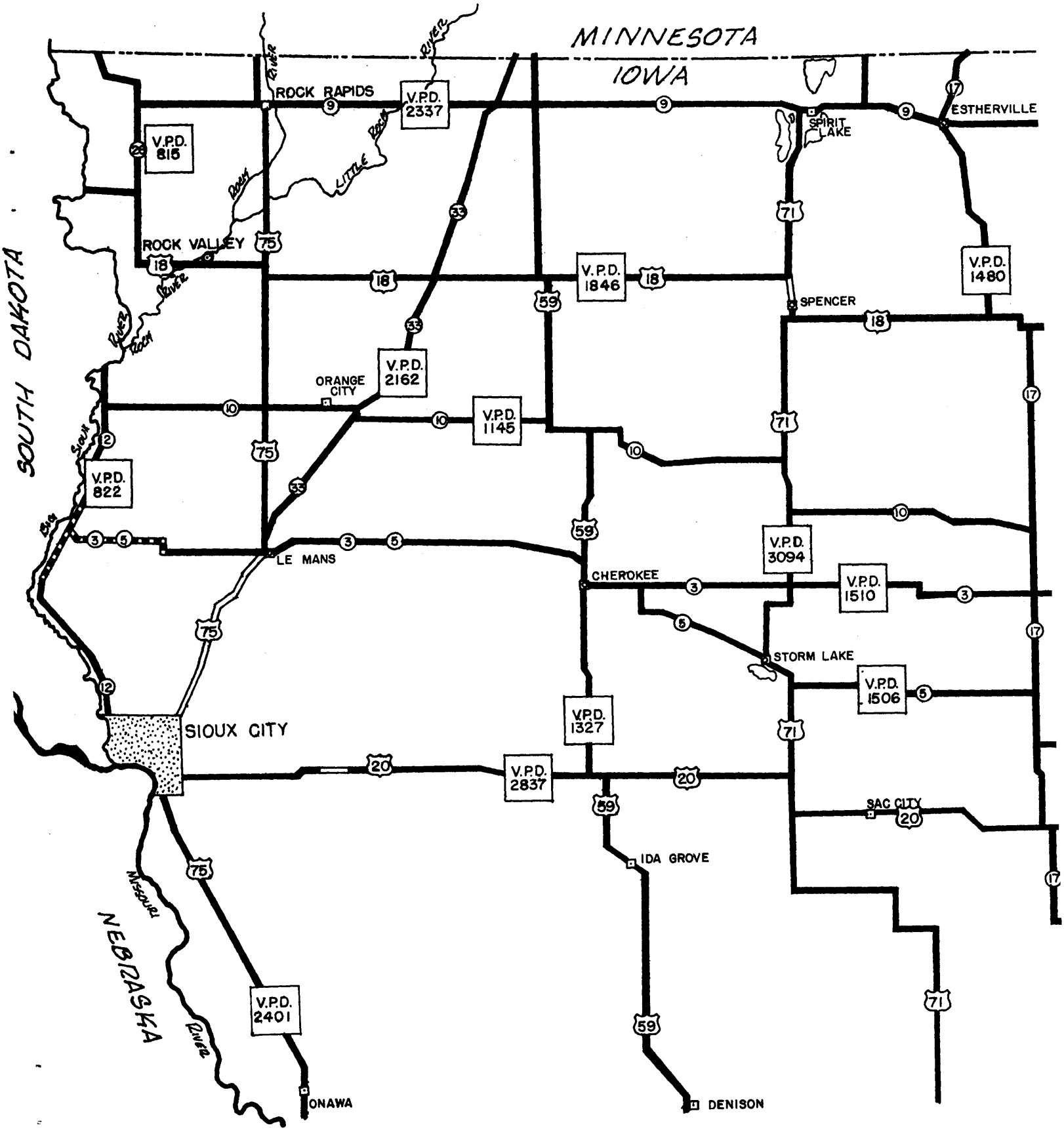


# PEOPLE AND RECREATION

A population study indicates that there are 1,202,851 people living within a radius of 125 miles of a possible series of multiple purpose reservoirs in the Big Sioux River Basin which is within a distance that many people in the midwest travel on weekends for water recreation.

Please note map of area indicating various populations within various radiuses of the general area.

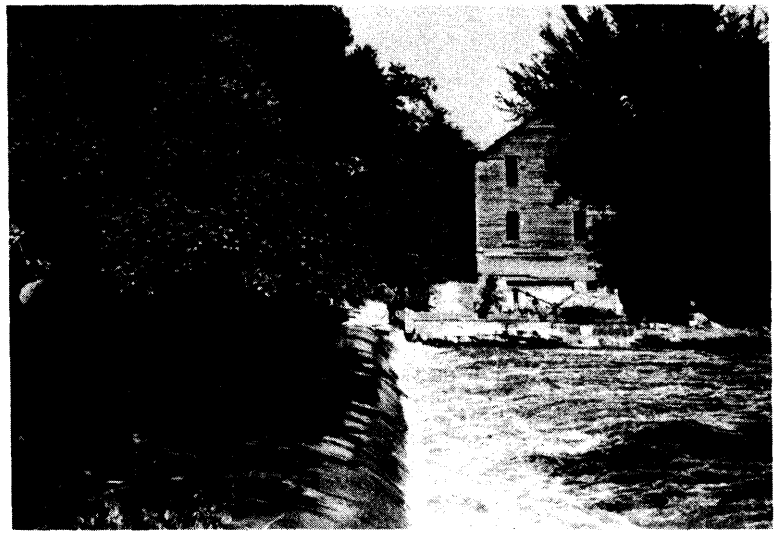
Vehicle travel is often an indication of people available in an area who may wish to relax - and relaxation to 75% of Americans can mean outdoor recreation. Since people often take their recreation when and where available we feel that the map showing average per day vehicle travel has significance in considering recreational needs of an area.




**TRAFFIC FLOW PATTERN IN N.W. IOWA,**
**NEAR THE LOWER BIG SIOUX RIVER BASIN**

The recreation potential of the Big Sioux River area along the Iowa border is relatively untapped by the general public, primarily because of the need for better access to water. In Lyon County, as an example, there are only eleven areas where County maps indicate county ownership to bank of river, however, many of these roads are not improved and only six roads can be readily found by the public.

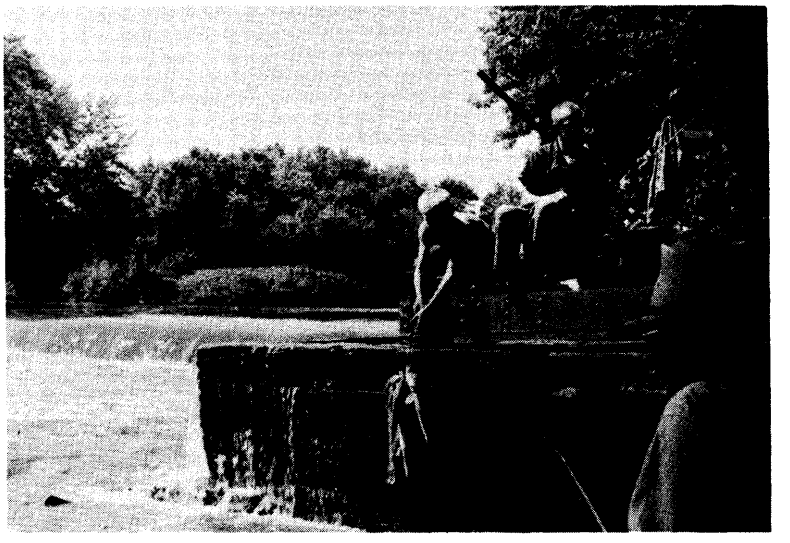
The old milldam site at Klondike, Iowa, while a popular place for local residents to fish and relax is little known to Iowa people outside the immediate area.



Old Abandoned Milldam and Mill
Klondike, Iowa

# FISHERIES ASPECTS, BIG SIOUX DEVELOPMENT

The Big Sioux and Rock Rivers are important and valuable sport fishery resources. They are important because conjointly they make up the bulk of the fishing waters occurring in the northwest corner of this state; they are valuable because they support continuing good populations of sport fishes.



Walleye and Sauger
Fishing Big Sioux River - Old Milldam
at Klondike, Iowa

In Iowa, these streams serve fishermen from such cities and towns as Sioux City, Hawarden, LeMars, Akron, Alton, Orange City, Sheldon, Rock Valley, and Rock Rapids, as well as from the rural communities of Woodbury, Plymouth, Sioux, O'Brien, Lyon and Osceola counties. Anglers catch large numbers of channel catfish, carp, and bullheads. Additionally, they take a few suckers, smallmouth bass and walleye or sauger.

Even though these streams are presently a valuable fishery resource, their worth could be enhanced considerably by development. A lack of convenient accesses to these streams and enormous variations in volume of flow are the principal factors limiting both fish and fishing.

With respect to the importance of convenient accesses to fishing waters, a little of the philosophy of the atomic age angler must be taken into account. The monetary worth of the catch is no longer of significance. Time spent in the out-of-doors and relaxation are the items most sought, and when fish are caught, this adds to the pleasure of the over-all activity of fishing. The vast majority of fishermen find little relaxation in, nor do they enjoy beating a trail through a tangle of brush, horseweeds, and nettles to get to fishing waters. For this reason, they seek out areas that can be reached conveniently by auto, and as a result many of the better stream fishing areas go unused or are used but very little. Observations of fishing activity reveal that stream anglers rarely use areas at distances exceeding a tenth of a mile from automobile access.

Presently, the Big Sioux and Rock Rivers have a minimum of access. Access to these streams consists of roads that cross the river or touch the banks in various places, and by lanes across private land. Although these accesses are quite numerous, they are, for the most part, perpendicular to the river and in fact open up a very small part of these streams for fishing.

Much improved access could be provided by roadways running parallel and adjacent to the stream bank. Ideally, a road traversing the entire length of these streams would be most desirable, and such a structure would increase the fishery many fold. It would accomplish this by making the better fishing areas readily available to the angler. In turn, this would result in larger catches which would encourage more and more people to fish.

Since it is unlikely that a road will be built along the entire length of the stream, a substantial benefit could be had by building segments of such a road. Priority for these segments should consider the proximity of population centers, as well as the quality of the river to produce and support fish populations at the site where the access would be located.

It was mentioned above that enormous variations in volume of flow exerted a limiting effect upon the fisheries of the Big Sioux and Rock Rivers. Low flows (especially during the open water season) depress all fish populations. At the opposite extreme, severe flood at critical times (spawning season) are not tolerated by some fish species that could otherwise flourish in these waters.

Flood control projects involving dams and water storage reservoirs would remedy these problems. Additionally, such structures would provide habitat for a variety of fishes not now found in the drainage systems of northwest Iowa.

For continued good fish populations of high type game fish, the design and operation of these dams should be of such nature to pro-

vide for a minimum flow of 60 c. f. s. for the Big Sioux, and 40 c. f. s. for the Rock River in the months December through February. During the remainder of the year, they should provide minimum flows of 200 c. f. s. for the Big Sioux and 100 c. f. s. for the Rock. Differences in minimum flows by seasons are recommended in light of the fact that fish need less space during their dormant or sub-dormant periods in winter than they require during the open water seasons when they are active.

Additionally, higher minimum flows for the open water months would improve the appearance of the stream. They would accomplish this by the rapid removal of unsightly debris and organic materials (slime, moss, algea, etc.) that collect during the low water periods.

Beside providing for the minimum space requirements for fish, higher flows would maintain the channel and stream bottoms in a much improved condition. Increased flows would maintain a deeper channel and keep it free of silt and sand which limit the production of bottom organisms. The bottom fauna is basic to the food chain of fishes and high type fish populations are directly dependent upon the quality and quantity of the fauna inhabitating the stream bottom.

The topic of dams and reservoirs and their effects upon fish and fishing presents a controversial subject. Much of the controversy comes from the tendency to be all for or all against dams. This arises from the fact that some impoundment projects have helped fishing while others have hurt. For the most part, dams have only

been harmful to fisheries resources in the northwest part of the United States, where they threatened extinction of the anadromous salmon and trout. In other areas of our country, they have been quite generally beneficial. In the T. V. A., for instance, angling increased 50-fold in the storage reservoirs and up to 15-fold in the main stream after dams were erected. Fishing in the tail waters immediately below T. V. A. dams increased immensely. In 1957, the tail waters of nine T. V. A. dams was host to over 900,000 man-days of fishing.

In our state, where we have only one such structure upon which to base our opinion, it, together with other basic information, leads to the belief that fishery-wise, there is much to be gained from flood control projects.

Without specific information about the size of the reservoir and conservation pool, together with the anticipated manipulation of the waters therein, it is not now possible to project a fishery value for such a structure for the Big Sioux and Rock Rivers. To indicate some of the benefits that would accrue, there are certain principles pertaining to fish life that can be generalized upon. These follow by numbered paragraphs:

1. Higher minimum flows below the dams would result in increased carrying capacity for these streams.
2. Control over excessive floods at critical times would permit an increase in smallmouth bass, walleye and sauger. Presently, these species exist as vestage populations.

3. Angling activity would increase. At the tail water sites, angler use would, in all probability, number in tens of thousands of fishermen-days per year.
4. The impounded areas would provide habitat for large-mouth bass, bluegill, crappie, and perhaps several other pan fish varieties. These species are not now present in the drainages.

To be of value to sport fishes, impounded waters must be of considerable size, both from the standpoint of surface area and depth.

Small impoundments (50 to 150 acres), such as those occurring behind the many lowhead river dams scattered over Iowa, have a decided tendency to favor rough fish. This probably results from an unfavorable ratio between the amount of shallow (2 to 3 feet deep) and deep (in excess of 6 feet) water areas. The unfavorable condition involves far too much shallow water in proportion to deep water.

Depth of water over large areas must be sufficient to discourage the growth of rooted aquatic plants. Extensive beds of vegetation provide too much cover for small fish which often results in stunted populations of fish.

To promote good fish and fishing conditions in an impoundment in the valley of the Big Sioux or Rock Rivers, the conservation pool size should not contain less than 1,000 surface acres, of which 70 percent should exceed six feet in depth. A pool of 500 acres with the same proportion of deep water might provide a fair angling re-

source, but smaller sizes would most assuredly result in negative values. The quality of angling in an impoundment greater than 1,000 acres would rise as the pool size increased up to 5,000 acres. From that point on, the fishery value on a surface acre basis would not change to any great degree.

# PRELIMINARY BIG SIOUX VALLEY WATER CONTROL DEVELOPMENT PLAN

1. Big Sioux Above Sioux Falls, South Dakota.

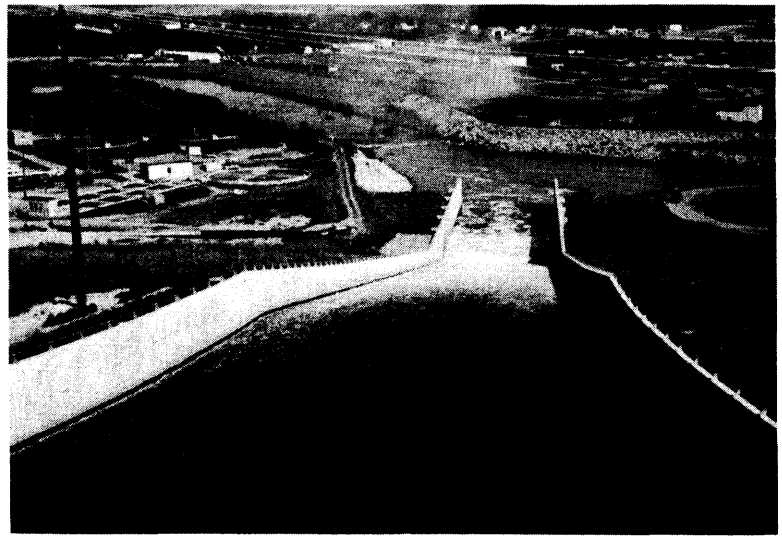
As in all instances where streams find their sources in extensive, flat regions, there abounds a great number of lakes and ponds. Some of these have a direct connection with the river, others have no connection and drain into the river only in time of extra-ordinary high water. As a general thing, these lakes have areas so large, compared with their watershed that the loss from evaporation and perculation equals the contributory rainfall and runoff as surfaces fluctuate with the season and also with longer periods of precipitation. When these lakes lie close to - and have direct connection with the river the flow is sometimes into these lakes - if flows in river are high and the flow is away from lakes when river flow is low. Even in their natural state they act in a limited state as reservoirs, for the high water of the stream flows in and stores water which flows out as high flows recede. After falling a certain distance both lake and river surface pass below the level of the bed of the outlet between them and flow is cut off.

Two principal lakes in the Big Sioux Valley above Sioux Falls, South Dakota are Kampeska and Poinsett. Both are large lakes, Kampeska covering about 5,000 acres and Poinsett about 8,300

acres. Both are connected by permanent and rather deep channels to the Big Sioux. The outlet of Kampeska is about one mile long and that of Poinsett about four miles long. Both of these sites could be utilized for artificial storage of water by exactly similar means. Small, low dams would be required in each case to intercept and divert the flow of the Big Sioux. From an old report of the Department of Army - Lake Poinsett itself could be managed to control about 58,000 acre feet of storage.

The Wetlands Program, under the Department of Interior, would also aid in eliminating runoff from the upper reaches of the watershed if this program were carried out in this very important area of the United States.

2. Flows at Sioux Falls, South Dakota.



Segment of Local Flood Control
Sioux Falls, South Dakota
Showing Sewage Disposal Plant in Upper Left

The local flood control project at Sioux Falls, South Dakota has provided a desired degree of protection to Sioux Falls and any storage added in the valley above this area would add to the level of protection.

3. Flows Between Sioux Falls, South Dakota and Confluence with the Rock River.

Possible Flood Control Structure Site
Big Sioux River Upstream from
Canton, South Dakota

Considerable watershed work on tributaries and sub-tributaries carried out under programs of the Department of Agriculture would aid, as well as, a possible flood control structure and impoundment above Canton, South Dakota. This impoundment in addition to storage of flood flows could aid in establishing better minimum flows for agricultural use, industry, fish, wildlife and

recreation in the lower Big Sioux Valley. Also, additional benefits could be provided to fish, wildlife and recreation through development of permanent pool aspects of the project.

4. Flows from Rock River.

Flows from the Rock River may contribute as much to the flood problems of the lower Big Sioux Valley as does that area of the Big Sioux above the confluence with the Rock River. It is felt that control of large flows from the Rock would greatly reduce both frequency and severity of floods in the lower Big Sioux Valley. The real flood problem in this area is caused primarily by the difference in the characteristics between the Rock River - with its rapid runoff flowing into the slow-moving Big Sioux. The Rock River watershed could use considerable work under various Department of Agriculture programs - including 566 projects.

There are several possible flood control structure sites on the Rock River watershed, however, the possible sites where permanent pools are relatively scarce and possibly costly to construct.

5. Flows from Direct Tributaries Below Confluence of the Big Sioux and Rock Rivers.

Tributary streams draining the basin below the mouth of the Rock River are steeper than the Big Sioux River, relatively small and well defined, and the storm runoff concentrates quickly, since the area extent of their watersheds are relatively small. Runoff from these

tributaries is generally dissipated before floodwaters from the Rock River and Upper Big Sioux River arrive into this segment of the river. Except for rare occasions of extremely heavy rainfall, runoff from the lower basin tributary streams is not considered a material factor in considering flood conditions on the lower Big Sioux River.

## RECOMMENDATIONS

Water is a prime factor in most outdoor activities. The Outdoor Recreation Resources Review Commission's Report to the President and to the Congress stated that 44% of the population prefer water-based recreation activities over all others. Water also enhances recreation on land. Choice camping sites and picnic areas are usually those adjacent to or withing sight of a lake or stream - and the touch of variety added by a pond, marsh or stream enriches the pleasures of hiking or nature study.

As the population grows and the interest in water-based recreation increases, the already heavy recreation pressures on water resources will reach critical proportions. The problems stemming from this pressure are among the most difficult in the entire outdoor recreation field.

With these facts in mind the following approach to development is desirable for the Big Sioux River Basin in Iowa.

1. Acquire access areas and water resources for public use by developing multi-purpose reservoirs on the Big Sioux River and the Rock River, which will provide a certain desirable degree of flood control to lower basin as well as recreation.
2. Secure public rights to cross private lands to gain access to provide better recreation on the Big Sioux River.

3. Construct and maintain access facilities to take full account of recreation needs and uses.
4. Establish flood plain zoning so that attractive areas along the Big Sioux River are not lost to outdoor recreation by default.
5. Public action is needed to resolve conflicts between recreation and other uses of water. Sound planning and coordination will assure that areas of particular value for outdoor recreation are maintained in as attractive settings as possible.
6. The Big Sioux River in Iowa should be preserved as near as possible in its free-flowing condition because of its natural scenic, esthetic and recreational values.

# PRELIMINARY REPORT
# COMPREHENSIVE WATERSHED DEVELOPMENT
# BIG SIOUX VALLEY

## APPENDIX

July 9, 1962

Mr. Glen Powers

Jerry Jauron

Report on the Big Sioux River and its Tributaries.

Dear Mr. Powers:

During the night of June 16th and 17th, 1962, a general rain fell on the Big Sioux watershed. This rain extended from Westfield on the lower reach to cover the area between this point and points such as Dell Rapids on the Big Sioux in South Dakota and Pipestone and Luverne, Minnesota on the Rock and Little Rock Rivers. These cities are located in the upper reaches of the two rivers.

This general rain had a minimum fall of two inches and a maximum fall of over five inches. This rain fell on ground that was already saturated by much previous moisture and in many places water stood on the ground.

A careful study was made of the entire area on the 17th, 18th, 19th of June, 1962, to ascertain where the largest run off occurred. The greatest run off occurred from the Rock River watershed, perhaps partly because of the density of rainfall and characteristics of the watershed. Even though four and five inches of precipitation fell in this area, very little flooding took place that caused permanent injury to crops. There was some further damage to crops in the lower reach of the Rock River on ground that had already had too much prior moisture. No buildings of any size were noted that had received damage from this run off.

The only damage noted on the Big Sioux Basin was to land that had already received too much prior rainfall.

Below the conflux of the Big Sioux and Rock Rivers some land was flooded but it consisted of grain and pasture land that already had too much prior moisture.

On June 20, 1962, a reconnaissance trip was made by boat from the northwest corner of the State of Iowa downriver on the Big Sioux to its mouth at Sioux City. This trip showed that the Big Sioux and Rock Rivers handled this enormous runoff in very satisfactory condition.

As this trip was made every effort was extended to observe the overflow occurring during this run off. This trip started after the water had fallen two feet at Klondike, Iowa and was completed riding the crest of the Big Sioux and Rock Rivers through the Sioux City area. The only overflow noted on the Iowa side of the Big Sioux during this 165 mile trip occurred between Hawarden and Westfield, Iowa. About 450 acres of farm land had water covering it caused by overflow and rainfall thereon. There was about 200 acres of pasture land inundated also. In only four places on the Iowa side observers noticed that the regular bank had been topped. Of course, the lowest and roughest are of flood plain where no crops were planted, was under water, but no apparent damage could be noticed.

On June 25, 1962 at Akron, Iowa it was stated by proponents of the straightening project that the Big Sioux had lost its carrying capacity because of siltation of the regular channel. So on July 6, 1962 a boat trip was made from Akron, Iowa to the mouth at Sioux City to ascertain the condition of the channel.

This date was picked because no applicable rain fall had occurred in this watershed for 20 days prior.

The following information was gathered from random soundings on this trip. It was attempted to take a sounding every 100 to 200 yards. No effort was put forth to find the deepest water and as a rule the center of the river was followed. As only a sounding pole of $12\frac{1}{2}$ feet in length was carried no readings could be made over this depth.

On this trip 622 soundings were made and the following readings were recorded:

8 between 5 and 6 feet in depth - "rock riffles"
47 between 6 and 8 feet in depth
309 between 8 and 10 feet in depth
131 between 10 and 12 feet in depth
127 over 12 feet in depth

Using the minimum overall soundings the river in this total distance had a 9.5+' average depth.

Also recorded was the nature of the river bottom. These findings are as follows:

64 - clay bottom (these were not observed as silt but as a very hard clay formation that was scoured clean and smooth.)
106 - gravel and rock
325 - sand
127 - where the bottom could not be reached with the available sounding shaft

Only one place was observed where any siltation had taken place and this area was about 100 yards upstream from the I. P. S. plant in Sioux City. This was caused by the river eroding itself to a 500 foot width above this area and dropping of the silt here. This occurred during the high water in the spring of this year.

It was also a part of the reconnaissance to note whether or not the river channel had diminished in width and no findings of this nature were found.

It appears from the observance made that the Big Sioux River in this reach has been approximately this width for many years as very little erosion has taken place except for the one instance before mentioned.

In closing this report it must be admitted that the observer making these findings had no idea whatever that this river maintained such a depth or a longer sounding shaft would have been obtained.

Sincerely,

Jerry Jauron
Supervisor II
Lands & Waters

JJ:gr
cc: Ray Mitchell

STATEMENT
by Jerry Jauron

Surely it is reasonable to believe that during the formation of the loess deposits into high hills in western Iowa that the Missouri River was adjacent to said deposits. It should also be reasonable to assume that the Missouri River extended in width from the bluffs in Nebraska to the deposit sites in Iowa, or surely some sign of loess deposits would be formed in the valley.

With the above in mind, such tributaries as the Little Sioux, Maple, Soldier, and Boyer Rivers must have entered the parent stream immediately after emerging from the loess deposits.

Then in later years as the Missouri River, for some reason or other, narrowed its channel, these tributary streams were forced to extend their channels southerly and westerly to again make contact with the Missouri River.

By the old cut off lakes appearing in the valley, it is very definitely shown that the Missouri has for the past hundred years been moving to the west. Old lakes, such as Browers, Sand Hill, Badger, and Round should surely prove this point.

As each of these movements were made, again the tributary streams had to extend in order to discharge their waters into the Missouri. As they extended across the old Missouri bed they often meandered restlessly, and therefore, many times overflowed their new channels.

As the Missouri River moved in a westerly direction it did not, in former years, deposit as much silt as it has recently. Therefore, the present topography shows that the land lying adjacent to the loess hills is much lower than the land lying next to the present river. This condition had caused many low land areas to become swampy and wet.

Because of the fertility of the Missouri River flood plains, the farmers in the area formulated plans to carry the water to the tributary streams by dredged canals, bounded by high dikes, directly from the loess hills to the main channel of the Missouri River. This is the father of channelization in western Iowa.

At the present time all tributary streams emerging from the loess hills have been dredged and straightened across the Missouri River plain. Of course, this proved very satisfactory to the residents of the Missouri River bottoms. In fact, it was so satisfactory that people living in the Nishnabotna, Boyer, Little Sioux, and Soldier flood plains decided if it would work for the people in the Missouri River plain it should work for them. The following will attempt to describe what happened on one of these tributaries... by name, the Boyer.

In 1905 the Harrison and Pottawattamie drainage district was formed to straighten, dredge, and levee the Boyer River from Missouri Valley, Iowa, to its conflux with the Missouri River. In 1908 a district was formed to do the same thing from Logan to Missouri Valley, Iowa. In 1911 another district was formed in Harrison

County to dredge and straighten the Boyer from Logan to the Crawford County line. In 1915 Crawford County set up its first drainage district and this was to straighten and dredge from the Harrison County line north to Arion, Iowa, in Crawford County. About this time some residents in Sac County decided to drain some low lands into the unstraightened Boyer River. This caused another drainage district to be set up in Crawford County. District No. 2 was set up to straighten and dredge from Arion to the Sac County line. In a time period of forty years, 90% of the Boyer River was straightened and dredged. Sounds good... but the following happened.

The original width of the Harrison and Pottawattamie canal was twenty feet, now it is over eighty feet; the other lower districts have increased their width in proportion. Also the levees have been raised accordingly. This has cost the H and P and Boyer sub-districts $1,092,000 in the past sixteen years. Even with this added expense, they are again placed in a perilous flood position because of all the straightening above them. In 1949 water topped the levee in the Missouri Valley, Iowa area and caused water up to ten feet in depth to ravage this city at a cost of over one-half million dollars. Also in the mid-1950's water closed Highway 30 between Dunlap and Woodbine. Water had never reached these two areas before. Also bridges have been destroyed with a value of over one million dollars. Every spring the City of Missouri Valley, Iowa has a flood alert until the ice clears from the river... more expense. In this case, as all the rest, the original idea was sound but added up, river-straightening places the lower river people in the same

precarious position they once were. It seems odd indeed that all of these high waters have occurred in the past twenty years. It would be wishful thinking to believe that it has been caused by more rainfall during this period. Lets consider the high water on the Floyd River in the mid-50's. Could this have been partially caused by straightening? (I personally, as a construction worker, helped straighten some of this in the early 40's). Also could the high water on the Nishnabotna, in the past twenty years, be blamed on more rainfall, or could it be blamed on more straightening?

In order to prove my point, let us now consider the Missouri River. Of course, every native of the Missouri River bottoms has sometime or other heard about the great flood of 1881. It seems strange indeed that the weather bureau in Omaha carried the following news release in May 1927: "The most spectacular rise and highest water on this river since 1881." Now consider this was a forty-six year period. Then in the 1930's a project was started on the Missouri River by a Federal agency. Their project was about the same as the original project on the tributary streams - straightening and dredging. Then if it takes imagination or wishful thinking to believe that straightening or dredging plays no part in flooding, why then the floods in 1943, 1944, 1945, 1947, 1949, 1952 and 1960...on the part of the Missouri River that was directly within their flood control project.

Many times have I heard the proponents of the straightening projects say about a flood...."An Act of God". The only way that this

writer can see that this statement applies is that, "God made the man that made the flood." In closing I must say, "I have seen, I must believe." I wonder how many of the victims of the Floyd and Nishnabotna floods would agree with me?

The author of the above was born in Salix, Iowa. He has lived along river - or worked on same for fifty years. Was a hunting guide on the river at the age of 16. Worked on channelization construction on river. Worked on Missouri River commercial freighters. Was Conservation Officer on river for 16 years. Took part in flood rescue work somewhere during all major floods in western Iowa the past thirty years. At present time is Water Supervisor in western Iowa for Lands and Waters Division of the State Conservation Commission.

# RESOLUTION IN OPPOSITION TO STRAIGHTENING THE LOWER BIG SIOUX RIVER

The Iowa State Conservation Commission, in regular meeting, November 1, 1961, unanimously resolves that the canalization of the Big Sioux River, as proposed by the U. S. Corps of Engineers, is inimicable to good conservation of Iowa's natural resources. The project would result in despoilation of a major outdoor recreation facility, and the Conservation Commission wishes to be on record as opposing the proposed project.

A calculated total evaluation of the present fishery resource of $28,000.00 per annum would be reduced by 95 percent if the project is completed. A loss of 5,647 acres of wildlife habitat (trees, forbes and shrubs), which adjoin the river would eventually be incurred resulting in elimination of deer, squirrel, raccoon, ducks, beaver and other game and fur animals from the region. An estimated 170 head of deer now reside in the area involved and 66 percent of all the deer in Plymouth County are found here. If the boundary is changed, problems would be of considerable magnitude. The shifting of 1,610 acres of land to the State of South Dakota and 760 acres from South Dakota to Iowa represents a net loss of 850 acres of Iowa land.

Fish and wildlife have practically disappeared from every portion of the many canalized streams in Iowa. Outdoor recreation has been eliminated to a like degree in these areas. Since it is our responsibility to promote, protect and conserve Iowa's heritage of fish and wildlife, we,

the State Conservation Commission, wish to be on record as opposing this project of flood control.

Alternative procedures, such as upstream impoundments, by-pass flood channels or small watershed projects, would be preferred and more in keeping with modern concepts of good water conservation.

IOWA STATE CONSERVATION COMMISSION

_____
Chairman

_____
Director

November 7, 1961

TO: Natural Resources Council
State House
Des Moines, Iowa

FROM: State Conservation Commission
East 7th and Court
Des Moines, Iowa

SUBJECT: Hearing on River Report on Flood Control for Big Sioux River and Tributaries - Iowa and South Dakota. Report and Appendices, U. S. Army Engineer District, Omaha, Nebraska, October, 1960.

The State Conservation Commission hereby objects to the straightening of the Big Sioux River as proposed in the above cited report. This objection is based upon the detrimental effects that would accrue to the fisheries, wildlife and associated recreational values of this river.

The state law that provided for a Conservation Commission set out the following general duty, "It shall be the duty of the Commission to protect, increase, preserve the fish, game, furbearing animals and protect birds of the state". Also, "matters relating to state waters, state parks, forests and forestry, and lakes and streams, including matters relating to scenic, scientific, historical, archeological, and recreational matters".

All wild game and fish are the property of the State and every citizen has his share of ownership. The above law is a mandate to the Conservation Commission to protect and preserve fish and game and to insure that all streams are considered in their scenic and recreational uses for all the people of Iowa.

Numerous examples of the catastrophic biological effects of stream straightening on fish and game may be cited. Portions of the Little Sioux, Skunk, Upper Iowa, Des Moines, Nishnabotna, Nodaway and many others have been virtually ruined from the standpoint of fishing and hunting, and other outdoor recreation by virtue of straightening. The elimination of river bends or oxbows from the flowage eliminates environmental conditions conducive to fishes and game endemic to the stream. Aesthetic values associated with a meandering type stream are lost by straightening and canalization.

Biological surveys conducted by the Conservation Commission in October, 1961, in that portion of the Big Sioux River considered for canalization, revealed a heavy population of channel catfish. Other important fish species present included yellow catfish, walleye, sauger, crappie, and bullhead. Under the proposed canalization program, some protions of these oxbows conceivably could be preserved for fish; however, the major game fishery would be eliminated since channel catfish prefer the present type environment. In addition, pollution abatement has recently increased the river's carrying capacity for fish, enhancing the stream from the biological and aesthetic standpoints. The city of Sioux Falls, South Dakota, which formerly heavily polluted the Big Sioux River, now has a modern sewage treatment plant in operation; thus, reducing the hazards of winter kill due to high bio-chemical oxygen demand that existed in years previous to this installation. The national program of pollution abatement will further enhance the fisheries of this stream as other communities install treatment facilities.

A loss of thousands of acres of wildlife habitat (shrubs, trees, forbes), which adjoin the present meandering river would be incurred if this project is completed, resulting in a serious decline of deer, squirrel, raccoon, beaver, muskrat and other animal populations associated with this habitat. At the present time, 66 percent of all the deer in Plymouth County reside in this area and will be eliminated if the habitat is removed. Economic losses, not calculated in the cost/benefit ratio include the loss of 5,647 acres of irreplaceable wildlife habitat which is difficult to appraise from the standpoint of outdoor recreation.

The state boundaries of Iowa and South Dakota cannot be changed without the approval of the state legislatures and Congress. When this is obtained, many hundreds of acres, now owned by Iowa, would be lost to South Dakota by the new channel boundary and Iowans could not fish or hunt on resident licenses in these areas. The present program of purchase of several desirable public accesses to this stretch of river has been delayed and will have to be abandoned if this program is approved.

At the present time, an estimated 1,000 boats use the lower Big Sioux River at Sioux City. Most of these use this portion to gain access to the Missouri River although smaller craft navigate upstream portions from this point. The upper reaches of the river slated for straightening has a public access at Westfield and is used by boaters, especially fishing craft; thus, the entire stretch under consideration is available for boating and is used heavily. Conservation officers'

counts indicate heavy angler use, especially on week-ends. As high as 250 angler cars have been counted on this stretch of river on Sundays. Creel census data by conservation officers show an average catch of around .6 of a fish per hour which is considered very good for this type of stream. Further abatement of pollution and increased soil conservation will increase populations of desirable game fish and result in improved fishing success, providing the straightening program is not consumated.

The outdoor natural resources of Iowa have been subject to encroachments from new highways and urban sprawl, eliminating many outdoor recreational areas. An estimated one million acres are lost in the United States annually from these two sources alone. Outdoor recreation is vital to the American way of life. According to the 1960 Survey of Hunting and Fishing, conducted by the Bureau of Census, over 30 million people spent nearly four billion dollars in pursuit of this type of recreation during that year. This is an increase of about 22 percent over 1955. In Iowa, fishermen and hunters spend approximately two million dollars for licenses alone, which represents only around 3 percent of the total cost to the people for this form of recreation. The stretch of river under consideration is one of the very few major recreation areas of western Iowa and should not be destroyed.

It is the firm conviction of the State Conservation Commission that the straightening of this stream or any portion of it, or for that matter, any stream in Iowa, is not compatible with the principles of good conservation of Iowa's natural resources. Conservation of water

is just as imperative as soil conservation. The nation's water supply just barely meets present needs and with the ever increasing population and industrial needs, real shortages are eminent. By what unfathomable logic can this program be justified as a flood control measure?

The proposed straightening of the Big Sioux River poses a number of legal questions which must be answered sooner or later. Following are some of these questions:

1. Would the proposed project involve the trading or exchange of land (river channel) with the State of South Dakota? If so, is such a trade or exchange authorized by present Iowa law? Also, what interest in the river, if any, would be granted to the United States government and would the State of Iowa have statuatory authority to make such a grant?

2. Federal legislation contemplates that the execution and administration of the proposed project be placed in the hands of more or less localized agencies such as drainage districts. The Big Sioux River is a meandered stream, and as such is under the jurisdiction of the State Conservation Commission. Does the Natural Resources Council have authority to remove meandered streams from the jurisdiction of the Conservation Commission and place them within the jurisdiction of drainage districts, or to order that the Conservation Commission cede jurisdiction to drainage districts?

3. Assuming jurisdiction, what powers may be exercised by the drainage districts or other agencies to affect the completion of the proposed project? Does such an agency have the authority to enter into interstate agreements with a similar agency in the State of South Dakota,

or could South Dakota and Iowa form a single joint agency with jurisdiction in both states?

4. Specifically, what legislation will be necessary before the proposed project could be entered into under presently existing Iowa law?

# AMENDMENT TO THE STATE CONSERVATION COMMISSION RESOLUTION IN OPPOSITION TO STRAIGHTENING THE LOWER BIG SIOUX RIVER

The Iowa State Conservation Commission, in regular meeting, November 1, 1961, unanimously resolved that the canalization or straightening of the Big Sioux River, as proposed by the U. S. Corps of Engineers, is inimicable to good conservation of Iowa's natural resources. The project would result in the despoliation of a mojor outdoor recreation facility and the Conservation Commission wishes to be on record as opposing the proposed project.

It is most difficult to ascribe economic values to wildlife and recreation. Intangibles are involved that transcend cash money evaluations, but are recognized as true values nevertheless. Minimal figures that can be ascribed to the annual fish and game losses involved, if this project is completed, are calculated to be as follows:

| | |
|---|---|
| Deer | $ 612.00 |
| Raccoon | 109.76 |
| Beaver | 547.25 |
| Squirrel | 661.50 |
| Cottontails | 423.00 |
| Pheasants | 150.00 |
| Mink | 93.42 |
| Muskrats | 894.87 |
| Canada Geese | 250.00 |
| Blue & Snow Geese | 500.00 |
| Ducks | 3,000.00 |
| Fish | 23,000.00 |
| Water Surface Area | 24,000.00 |
| | $54,241.80 |

A reduction of 400 surface acres of water would be equal to an annual loss of $24,000.00 per year which represents a recreation potential that would be 100% destroyed with the proposed project. This does

not include the economic recreational aspects of boating, swimming, picnicking, nature hikes, nor the evaluation of beauty inherent in the meandered stream as compared to a straight ditch. Stapled to this amended resolution are tables showing the calculation methods used by the Biology Section of the Conservation Commission.

A loss of 5,647 acres of wildlife habitat (trees, forbes, and shrubs) which adjoin the river would eventually be incurred resulting in elimination of deer, squirrel, raccoon, ducks, beaver and other furbearing and game animals from this region. If the boundary is changed, problems would be of considerable magnitude. The shifting of 1,610 acres of land to the State of South Dakota, and 760 acres from South Dakota to Iowa represent a net loss of 850 acres of land.

Fish and wildlife have practically disappeared from every part of the many canalized or straightened streams in Iowa. Outdoor recreation has been eliminated to a like degree in these areas. Since it is our responsibility to promote, protect, and conserve Iowa's heritage of fish and wildlife, we, the State Conservation Commission, wish to be on record as opposing this project of flood control.

Alternative procedures such as upstream impoundments, by-pass flood channels, or small watershed projects would be preferred and more in keeping with modern concepts of good water conservation.

IOWA STATE CONSERVATION COMMISSION

Date:_____ _____

# A REVIEW OF THE IOWA CONSERVATION COMMISSION'S OBJECTIONS TO STRAIGHTENING THE BIG SIOUX RIVER

## SUMMARY

"The Review Report on Flood Control for Big Sioux River and Tributaries, Iowa and South Dakota, Reports and Appendicies, U. S. Army Engineer District, Omaha, Nebraska, October 1960", was received by the State Conservation Commission in October of 1961. This report recommends a seven million dollar project to straighten the Big Sioux River from a point two miles north of Akron, Iowa to about six miles north of Sioux City, Iowa. This 55 mile stretch of winding, wooded river, would be shortened to approximately 35 miles.

In November 1961, a hearing was held at Sioux City by the Iowa Natural Resources Council, and the Iowa Conservation Commission presented its formal objection to the straightening of the Big Sioux River at that time. A copy of this objection is attached and in addition a copy of the resolution passed by the Iowa Conservation Commission in opposition to the project.

An assay of the recreational values of this portion of the river is included in this report for consideration by the Corps and others interested in this project. Also, included is a consideration of alternative proposals which would be acceptable to the Iowa Conservation Commission and the recreational interests of this State.

## RECREATIONAL ASSAY, BIG SIOUX RIVER

Following the receipt of the previously mentioned report of the Corps of Engineers, surveys were conducted by the Iowa Conservation

Commission to obtain a complete appraisal of the recreational values of the stretch of the Big Sioux River slated for straightening. The Corps of Engineers had not included in their calculation of cost-benefit ratios, any financial consideration ascribable to fish, wildlife or recreation. It was deemed imperative that this assay be made as rapidly as possible. The cost-benefit ratio cited in their report is 1.1 to 1.

It is most difficult to ascribe economic values to wildlife and recreation. Intangibles are involved that transcend cash money evaluations but are recognized as true values nevertheless. Minimal figures have therefore been ascribed to the annual fish, game and water losses involved if this project is completed. They are calculated as follows:

| | |
|---|---|
| Deer | $ 612.00 |
| Raccoon | 109.76 |
| Beaver | 547.25 |
| Squirrel | 661.50 |
| Cottontails | 423.00 |
| Pheasants | 150.00 |
| Mink | 93.42 |
| Muskrats | 894.87 |
| Canada Geese | 250.00 |
| Blue & Snow Geese | 500.00 |
| Ducks | 3,000.00 |
| Fish | 23,000.00 |
| Water Surface Area | 24,000.00 |
| | $ 54,241.80 - Annual loss |

The 50 year amortization figure used by the Corps of Engineers (Appendix II) (P. 6) may be used to indicate the magnitude of recreational loss in the same period. Multiplying the annual loss of $54,241.00 by 50, we have $2,612,090.00. The loss of wildlife habitat caused by the probable clearing of timber, shrubs and forbes, calculated at $100.00 per acre for the 5,647 acres involved in this stretch of river, means an additional loss of $564,700.00. This amount added to the accrued deficits gives a total of

$3,176,790.00 as the total loss of these values alone for a 50 year period. It does not include such aesthetic recreational intangibles such as picnicking, nature hikes, bird watching or other values inherent in a natural meandering stream as compared to the practically negligible values of a straight ditch.

## ALTERNATIVE PROPOSALS

It is the contention of the Iowa Conservation Commission, South Dakota Game, Fish and Parks Department, National and State and local Chapters of the Izaak Walton League of America, National Wildlife Federation and its local affiliates, plus other groups represented at the Sioux City hearing that some other plan of flood control should be considered instead of channel straightening.

Iowa has hundreds of miles of straightened rivers which provide practically no outdoor recreation. The elimination of fish and game habitat, automatically eliminates these animals from the environment, and at the same time abolishes the scenic attraction to those in search of outdoor recreation.

It is thoroughly recognizable that flood control is needed by the farmers in the lower flood plain of the Big Sioux; however, it is the contention of the Iowa Conservation Commission that the mitigation of floods by channel straightening is inimicable to modern concepts of conservation of natural resources. The retardation of floods by impoundments and watershed controls is, however, compatable with these concepts. The long-range planning for the nation's future needs of soil, water and recreation, must include the saving of water, soil and recreational

areas. Our nation's leading ecologists have warned repeatedly of the dangers of our civilization and standards of living if we continue the abuse of natural resources. The plundering of soils, waters and recreational areas to benefit individuals at public expense is inconsistent with and in diametric opposition to these postulates.

In the above Corps report some sites were mentioned as possible impoundments on the Big Sioux which would benefit flood control. The lack of good dam sites on the major tributary and Rock River was also mentioned. Here it is proposed that watershed controls by the Soil Conservation Service or other agencies should be explored for abatement of floods from this source. A re-appraisal of cost-benefit ratios by the Corps working in cooperation with the South Dakota Game, Fish and Parks Department, State Conservation Commission of Iowa and the U. S. Fish and Wildlife Service could conceivably result in a favorable cost-benefit ratio for a project of this nature.

## CONCLUSIONS

The State Conservation Commission of Iowa feels very strongly that recreation is vital to the people of Iowa. As populations increase and shorter work weeks are imposed, more and more demands will be made on the few vestiges of our formerly abundant recreational areas. It costs the State Conservation Commission from $1,000.00 to $5,000.00 or more per acre to create an artificial lake for recreation. The recreational benefits of impoundments on the Big Sioux could conceivably aid in creating a favorable cost-benefit ratio. Also the values of stored waters as such could be ascribed as a conservation asset.

It is with these thoughts in mind and a firm concept of our responsibility as an agency designed to foster recreation and conservation that we stand in opposition to straightening any portion of this stream. Also, we oppose compromise proposals which might involve the straightening of any portion of the Big Sioux River.

This report includes the major actions taken to date and the concensus of the lower reaches of the Big Sioux River.

Director, State Conservation Commission

by: Chief, Division Fish & Game