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OXBOW LAKES

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HEARING
BEFORE THE
COMMITTEE ON WATER RESOURCES
OF THE
COMMITTEE ON PUBLIC WORKS
UNITED STATES SENATE
NINETY-FOURTH CONGRESS

FIRST SESSION

ON

S. 1799

A BILL TO AUTHORIZE THE SECRETARY OF THE ARMY
TO CARRY OUT CERTAIN DREDGING AND RELATED AC-
TIVITIES ON THE MISSOURI RIVER OXBOW LAKES

SEPTEMBER 27, 1975—COUNCIL BLUFFS, IOWA

SERIAL NO. 94-H24

Printed for the use of the Committee on Public Works



U.S. GOVERNMENT PRINTING OFFICE

WASHINGTON : 1975

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DREDGING ON THE MISSOURI RIVER OXBOW LAKES

SATURDAY, SEPTEMBER 27, 1975

UNITED STATES SENATE,
COMMITTEE ON PUBLIC WORKS,
SUBCOMMITTEE ON WATER RESOURCES,
Council Bluffs, Iowa.

The subcommittee met at 10:10 a.m., pursuant to call, at Lake Manawa, Council Bluffs, Iowa, Hon. John C. Culver, presiding.

Present: Senators Culver and Clark.

OPENING STATEMENT OF HON. JOHN C. CULVER, U.S. SENATOR FROM THE STATE OF IOWA

Senator CULVER. I wonder if those who are here to attend the meeting will now be kind enough to take their seats and we can get started.

I am delighted to welcome all of you to this hearing of the Water Resources Subcommittee of the Senate Public Works Committee on S. 1799. Joining me at this panel is Senator Dick Clark.

S. 1799, jointly introduced by Senator Clark and myself, would authorize the Secretary of the Army, acting through the Corps of Engineers, to carry out dredging, shoreline stabilization work, and other related activities on Lake Manawa and the other Missouri River oxbow lakes.

The dredging would be undertaken to improve these lakes for recreation and fish and wildlife purposes as determined and carried out by the State and other public agencies. The bill would require the Federal Government to pay only half of the cost of the dredging program.

There is no question that the Corps of Engineers has been very beneficial to the development of our Nation and its public works programs. From the earliest days of our country, this highly professional organization has had a long and outstanding history of contributing to America's growth and welfare.

It has made such great rivers as the Missouri and Mississippi navigable and open to traffic of barges carrying grain and other commodities, and it has been instrumental in providing hydroelectric power and instituting urgently needed dikes and dams for flood control.

Its projects and planning have also had important byproducts for pollution abatement, conservation efforts, and recreational development. Opportunities for outdoor water sports have been increased through the creation of still-water lakes behind various dams for flood control projects.

These reservoirs include the Red Rock Reservoir on the Des Moines River and the Coralville Reservoir, both used by boaters and fishermen. It is obvious that the Corps has been responsible for much more than simply straightening rivers and indiscriminately building dams.

The dredging of Lake Manawa and other Missouri River oxbow lakes, as established in S. 1799, would enable the Corps to continue its interest in preserving and improving recreational areas that are decaying.

I think it is worthwhile to have the Corps become involved with State and local projects, and this cooperative venture between the Corps and the State of Iowa would be particularly fitting in renovating Lake Manawa because this popular lake is essentially a regional recreational area in the truest sense of the word.

Serving the Omaha, Nebr. metropolitan area, nearly 40 percent of the lake's visitors live out of the State of Iowa. In addition, the Federal Government should perhaps share partial responsibility for the cost and operation of any dredging program because the lake was once part of the Missouri River and its water level was once dependent upon the water level of the Missouri River.

Though reports are conflicting as to the lake's present dependence on this river for subsurface recharge, the scouring of the Missouri River may affect its water level.

Anyone familiar with the history of Lake Manawa and the other Missouri River oxbow lakes readily knows that this popular recreational spot has suffered from serious problems of siltation for many years. The lake is shallow, highly vegetated, and much lake bank erosion has taken place.

Its organic and nutrient content and water quality are deteriorating, and the shallowness of the lake and the constant maintenance of water level are continuing problems. The plight of Lake Manawa has been bluntly stated in a recent study by the Iowa Conservation Commission.

The Commission concluded that:

It is difficult to see how Manawa can exist more than another generation . . . It is very conceivable that in the next 20 years, Lake Manawa could become an urbanized backwater swamp of the Missouri River.

The local metropolitan area and the State of Iowa are strongly behind any project to renovate Lake Manawa. The Iowa Conservation Commission, as authorized by the Iowa General Assembly, has conducted a study of eight Iowa lakes to determine the impact of and need for dredging the lakes.

This study has concluded that Lake Manawa, of the lakes studied, has the highest need for dredging and renovation. Furthermore, the Iowa General Assembly has passed legislation providing \$500,000 in matching funds for the dredging of Iowa lakes.

The Iowa Conservation Commission would determine which lakes should be dredged, and this money cannot be expended without Federal matching funds. Finally, an energetic local task force under the direction of Ken Bedwell has been assembled to study the problems facing Lake Manawa.

This lake is a haven for boaters, swimmers, fishermen, campers, sailors, picnickers, and other recreational and sports enthusiasts; and

continued deterioration would definitely affect the supply of recreational opportunities among the residents of southwestern Iowa and eastern Nebraska.

At a time when water sports are increasing in popularity, every opportunity should be made to reduce the pollution of the lake, improve fish and wildlife habitat, and make boating safer. The dredging program should result in economic benefits to the Council Bluffs-Omaha metropolitan area and greater attendance at the lake.

This morning and afternoon, we will have an opportunity to hear from many witnesses about Lake Manawa and the proposed dredging program. I hope the testimony will demonstrate the need for dredging, explain the serious nature and genesis of the problems, and show how any renovation plan will affect this region favorably.

Senator Clark, would you like to make a statement?

**OPENING STATEMENT OF HON. DICK CLARK, U.S. SENATOR FROM
THE STATE OF IOWA**

Senator CLARK. Yes.

Thank you, very much, John.

I think Senator Culver has outlined very accurately and very clearly the nature of this hearing and the kind of hopes that we share in terms of developing this lake and the area around it.

I particularly want to thank Senator Culver, who is a member of the Senate Public Works Committee, for chairing these meetings and for making this hearing generally possible.

I think, rather than reviewing the specific aspects which have been very clearly outlined here, I would like to simply say that in the period of time that I have had occasion to visit here in Council Bluffs, I have been particularly impressed by the degree of cooperation that has existed on this project.

I think about 2 years ago, I was over visiting the Iowa School for the Deaf and walking out south of town, Ken Bedwell came over and walked for about 5 miles with me and told me for the first time about Lake Manawa and the problem that you had and asked in fact if the Federal Government could not have some role, could not participate in some way in the development of this lake.

Then, many of you whom I see here now, met out in the building over here about a year ago or a little less when various people from this community presented information and papers, the mayor and others, on what the role could be of local government, State government, and the Federal Government.

I know that as John has said, Ken and the rest of the task force deserve the highest recognition and praise for their efforts because that is really where the impetus for this came from. Their work is certainly an outstanding example of what people can accomplish if they work together at the grassroots, at the local level.

As Senator Culver has said, we are here today to view, to get a first-hand view for which the Federal Government should assist in providing funds for the dredging of this lake.

This is the primary significance right now of the legislation that we are considering, but I would like to point out that this legislation doesn't just relate to Lake Manawa, as Senator Culver has said.

It provides the authority for Federal funds to be used for redevelopment of any oxbow lake along the Missouri River and if we are successful in getting this legislation enacted, it means that Lake Manawa will be the first lake to receive its benefits.

This is because the State of Iowa has designated this lake as its No. 1 redevelopment priority and the initial groundwork for this project is further along than any of the others.

But other lakes in the area, such as Blue Lake near Onawa, which I have had the occasion to visit and to walk around, I see their condition and they will also be eligible for Federal funds once the State is willing to put up half of the redevelopment costs for them as well.

I should also state that the Federal funds available through this legislation that we are discussing and having hearings on today will be for dredging and related work only. They will not be used for refurbishing parks, picnic areas, or similar shoreline projects. That is going to come as it is already, through the State and local activities.

Hearings like this particular one that we are having here today is an important part of the legislative process and I thought I might just outline for you very briefly why we have these hearings and how it fits into what we hope to do in the legislative process.

First of all, after a bill is introduced in the Senate and as Senator Culver has said we have introduced that bill jointly, it is referred to the committee which has jurisdiction over the bill's subject matter; in this case, the Public Works Committee which is meeting here today.

The committee then refers the bill to whichever of the subcommittees specializes in the bill's specific project area. Once that is done, if the bill is deemed to be an important one, public hearings are held and that is, of course, why we are here.

Following these hearings, we will hope that the Public Works Committee will then report to the full Senate committee favorably this legislation and following that, it will go to the House of Representatives and if passed, then, of course, would be signed by the President.

So we are at a fairly early stage in this process and yet we are at the most important stage because if a bill gets to hearings, that means that it ought to be reported and ought to be considered.

Finally, I want to say that, most of all, I think this legislation, the dredging of this lake, really represents the best that federalism has to offer. Federal in the real sense of the word as the founding fathers meant it, because the initiation did not come from Dick Clark, John Culver, or the Federal Government.

It came from those of you who are here today, particularly from Ken Bedwell, who certainly deserves enormous credit as everyone in this community knows, and it came from the task force of people all around this community because they put it together, they came together and they went to local officials, at the city level, at the county level, and at the State level.

They went to the Chamber of Commerce, to the conservation groups, to everybody that is interested in this. It was a grassroots movement and then they in turn, after they had the support of local government, went very logically to the State legislature and to those of us in the Federal Government.

And the State legislature, working in a very nonpartisan and a very cooperative way, passed this legislation. That is the way it is going to be handled at the Federal level.

So it is matching, it is fully cooperative with private and public groups. It is federalism at its very best. We are both pleased to be here and to join with you in hearing the evidence with regard to this project and this legislation.

Thank you, very much, John.

Senator CULVER. Thank you, very much, Senator Clark.

[The bill, S. 1799, follows:]

94TH CONGRESS
1ST SESSION

S. 1799

IN THE SENATE OF THE UNITED STATES

MAY 21, 1975

Mr. CLARK (for himself and Mr. CULVER) introduced the following bill; which was read twice and referred to the Committee on Public Works

A BILL

To authorize the Secretary of the Army to carry out certain dredging and related activities on the Missouri River Oxbow Lakes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*
3 That subject to the conditions in section 2 of this Act the
4 Secretary of the Army, acting through the Chief of Engi-
5 neers, is authorized to carry out such dredging and related
6 activities and shoreline stabilization work on the Missouri
7 River Oxbow Lakes, with particular attention to Lake
8 Manawa in the State of Iowa, as the Secretary determines
9 necessary to fully implement the general improvement pro-
10 gram in and around such lakes for recreation and fish and

1 wildlife purposes being carried out by such State and other
2 public agencies.

3 SEC. 2. The authorization in the first section of this Act
4 shall be subject to the conditions that—

5 (1) non-Federal interests pay 50 per centum of the
6 cost of the dredging and other work authorized; and

7 (2) not less than 20 per centum of the shoreline of
8 the lakes in the general improvement program described
9 in the first section is made available for use by the gen-
10 eral public without discrimination on the basis of race,
11 creed, or color, on either a free basis or for a fee deter-
12 mined to be reasonable by the Secretary of the Army.

Senator CULVER. We are also delighted to welcome Ms. Donna Slater from Representative Tom Harkin's office. I know Congressman Harkin has worked extremely hard on this and has personally spoken to both me and the Senator about how he regretted very much that his schedule commitments made it impossible for him to personally be here and present his own views on this. But he has talked with us and we are in close coordination with him on this problem and this project. We certainly are delighted to have you here and make his statement for him.

STATEMENT OF DONNA SLATER ON BEHALF OF HON. TOM HARKIN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF IOWA

Ms. SLATER. Thank you.

Senator Clark, Senator Culver, I am happy to be here today to represent the Congressman. I do have a statement to read on his behalf.

"Senator Clark, Senator Culver, Mr. Bedwell, ladies and gentlemen, I apologize for not being able to be with you today at this most important hearing. I deeply regret that I had a long-term, prior commitment which prevents me from attending.

"I fully support the urgently needed effort to revitalize one of this region's most valuable and popular water recreational areas, Lake Manawa.

"Your presence at this hearing indicates the great support that this worthy project enjoys and is an especially fitting tribute to the long hours of hard work put into the project by Ken Bedwell, Chuck Hannan, our State legislators, and the rest of you to move this project along.

"A special measure of thanks must also go to Dick Clark and John Culver for the leadership they have exercised in Washington. It seems as though every time Dick Clark sets out walking somewhere; good things start to happen.

"When he finished his walk through the State back in 1971, he became our U.S. Senator. Now he has promised to finish the stroll he began last March around Lake Manawa someday and find a beautiful recreation area for Iowans; and I know you have got to believe him.

"At a time when more and more Americans are moving to the outdoors to enjoy our Nation's natural beauty as a means of recreation, we are finding many existing and potential recreational lakes in a sadly deteriorated condition. Lake Manawa is a good example.

"Not too many years ago, nearly a million people visited the lake and surrounding area to take advantage of the recreational opportunities it offers. By 1973, less than 600,000 people used the lake. It is probably safe to say that the number decreased even more this past summer.

"As you all know, I have introduced a bill in the House identical to the one introduced by Senators Clark and Culver which would authorize the Army Corps of Engineers to begin dredging Lake Manawa. There can be no denying that Lake Manawa, though a State lake, is a valuable regional recreational spot, which benefits the residents of not only Iowa and Nebraska, but other midwestern States as well.

"Just as it has been truly a cooperative effort at the local level and between the States of Iowa and Nebraska, it should likewise be a cooperative effort by the Federal Government and the State of Iowa.

"As I have said, the strong expression of local support for the revitalization of Lake Manawa, the creation and subsequent hard work of the Council Bluffs' area Lake Manawa Task Force, headed by Ken Bedwell, and the unmistakable willingness on the part of the State, thanks to the appropriation by the Iowa Legislature to match Federal funds for the project should ring loud and clear to those in Washington that this is indeed a cooperative venture in which the Federal Government should have considerable interest and responsibility in assisting.

"You people have done your job to this point, and have done it well. Now it is up to those of us in Congress to persuade the Federal Government to lend a hand.

"I am confident that we can finish the job in Washington, and that Dick Clark will someday soon be able to finish the stroll he started around Lake Manawa last March.

"Thank you."

Senator CULVER. Our first witness will be Mr. Duscha, representing the Corps of Engineers. I understand you have a prepared statement.

**STATEMENT OF LLOYD DUSCHA, CHIEF, ENGINEERING DIVISION,
MISSOURI RIVER DIVISION, CORPS OF ENGINEERS**

Mr. DUSCHA. Yes, I have, Senator Culver.

I am Lloyd Duscha of the U.S. Army Corps of Engineers, Missouri River Division, where I serve as Chief of the Engineering Division. I am appearing on behalf of the Office of Chief of Engineers to present the views of that office and the Department of the Army relative to legislation proposed under Senate bill 1799, 94th Congress.

The purpose of S. 1799 is to authorize the Secretary of the Army, acting through the Chief of Engineers, to carry out dredging and related activities and shoreline stabilization work on the Missouri River oxbow lakes with particular attention to Lake Manawa in the State of Iowa as the Secretary determines necessary to fully implement general improvement programs in and around such lakes for recreation and fish and wildlife purposes being carried out by the State and by public agencies.

The bill, if enacted, would require that nonFederal interests pay 50 percent of the cost of the dredging and other authorized work and that not less than 20 percent of the affected lakes be made available for recreation uses by the general public.

Lake Manawa encompasses approximately 600 acres in the Omaha, Nebraska-Council Bluffs, Iowa, area of the Missouri River and was formed in 1881. It is a major recreational area for Nebraska and Iowa residents, serving over 500,000 recreational visitors in 1974.

This visitation has been declining, however, due to adverse conditions at the lake such as shallow depth, mud bottom, and large areas of water lily growth. The Department of the Army is aware of the deficiency in water based recreation opportunities in the area.

Moreover, the Corps of Engineers has participated in recreational development when such development is to be related to our flood

control or navigation work. The project which the bill would authorize, however, is a single-purpose recreation project unrelated to any Corps work.

In addition, this project has not been the subject of any Federal study as to its engineering, economic or environmental feasibility, and justification. Accordingly, the Department of the Army recommends against enactment of S. 1799 and suggests that the views of the Environmental Protection Agency and the Bureau of Outdoor Recreation would be pertinent as to the Federal interest in preserving and rehabilitating Lake Manawa and related waters in the area for recreation purposes.

The Office of Management and Budget advises that from the standpoint of the Administration's program, there is no objection to the presentation of this report for the consideration of the committee.

This concludes my presentation, Senator CULVER.

Senator CULVER. Thank you, Mr. Duscha.

As you indicated, the Corps, in making a statement for the record on this particular legislative approach to this problem is doing so without benefit of any study.

Mr. DUSCHA. That is correct, sir.

Senator CULVER. So that the extent to which you understandably feel competent to make an unqualified assessment of this total situation is necessarily inhibited to that extent.

Mr. DUSCHA. That is correct, sir.

Senator CULVER. You state that Lake Manawa is a single-purpose recreation project unrelated to any Corps work. Could you possibly state with no doubt at all that the siltation problems experienced by Lake Manawa over the years bear absolutely no relation to the Corps of Engineers' activities on the Missouri River and particularly in absence of a study?

Mr. DUSCHA. I don't know if I could unqualifiedly make such a statement, but I don't think any siltation since 1950 has been caused by any river projects or by flooding of the Missouri River.

Senator CULVER. Do you make that observation with the benefit of any Federal study as to its engineering, economic, or geological basin?

Mr. DUSCHA. No, sir.

Senator CULVER. What do you base that observation on?

Mr. DUSCHA. Primarily by virtue of the fact that there haven't been any floods over the area to carry silt since the fifties.

Senator CULVER. But you don't really have any scientific basis or judgment with regard to subsurface recharge and so forth?

Mr. DUSCHA. No; I would hesitate to comment on the nature of the subsurface recharge without a study.

Senator CULVER. Are you familiar with the so-called McCook Lake rehabilitation project that was undertaken by the Corps in South Dakota, I think in 1955?

Mr. DUSCHA. Yes, sir, I am somewhat familiar with that particular project.

Senator CULVER. It seems to me that that provides an interesting precedent. McCook Lake, for the benefit of the record, was an oxbow lake or is an oxbow lake that was formed when the Missouri River made a cutoff in the southeastern tip of South Dakota. The lake

area has been developed by local residents as a resort and many have built permanent homes on its shores.

In that case, it is true there was a succession of floods which did deposit much silt and the lake became clogged, causing the water level to drop and exposing extensive mud flats.

The project was undertaken by the Corps of Engineers at that time, through an act of Congress, and I understand, too, at that time the Corps submitted an adverse opinion on that project. Is that correct?

Mr. DUSCHA. That is true, sir. The District Engineer concluded in a survey scope report that there was no Federal interest in the dredging of McCook Lake.

Senator CULVER. But that was only after you had conducted a survey and a study?

Mr. DUSCHA. That is correct, sir.

Senator CULVER. At that time, of course, the costs we were talking about, the magnitude of that problem was relatively kind of modest in terms of the numbers we are talking about in terms of this project. I think there were only \$150,000 in Federal funds in that.

Mr. DUSCHA. Yes; it was less than one-half million. I don't recall the exact figure.

Senator CULVER. The question I have, too, is I understand you have nearly finished a survey study of water resources needed in the Omaha and Council Bluffs area that was requested in January 1972, I believe by Senator Hruska.

Can you tell us at this stage what conclusions and recommendations will be made, if any, relating to recreational needs and possible means of filling such needs in this area?

Mr. DUSCHA. The urban study that you made reference to is a generalized study which identifies the basic recreation needs in the area and will point out what can be done to satisfy these needs. It does reflect a deficiency in recreation opportunities in the metropolitan area.

It doesn't go into specifics as to how these needs may be satisfied, but does point out some broad courses of action. Lake Manawa could be used to satisfy part of these needs, as could other lakes in the area.

Senator CULVER. In the event that we felt it appropriate and desirable to call upon the Corps to make a more serious Federal study of the engineering, economic, and environmental aspects and the feasibility and justification of the Lake Manawa project, what would be your thoughts with regard to the possibility or desirability of having an addendum to this present survey work you are doing?

How compatible would that kind of undertaking be with what you are currently involved in or would it be appropriate, more appropriate to think in terms of an independent request for such information from you?

Mr. DUSCHA. I feel it would be more appropriate to think of an independent study. The urban study is nearing completion and we would not want to hold up that study for an addendum.

Senator CULVER. Senator Clark, do you have some questions?

Senator CLARK. Just a couple of questions really in followup of Senator Culver's questions. I was particularly curious about your

answer to his first question as which I took to mean that you felt that silting from the Missouri River did not affect this lake prior—you particularly limited it to the 1950's?

Mr. DUSCHA. Yes; I said I didn't think we had any siltation caused by the river subsequent to the early fifties.

Senator CLARK. Why subsequent to the fifties? His question didn't have anything to do with the fifties. I am curious about why you put that limitation on.

Mr. DUSCHA. Because we didn't have any floods to carry water over this area.

Senator CLARK. What about 1952?

Mr. DUSCHA. I wasn't here in 1952, but we had levees constructed in 1950 and I understand the only effect here was water back-feeding through the intake, not overland flooding.

Senator CLARK. Do you feel that any of the silting that exists in this lake as we look at it now is due to Missouri River flow and flooding?

Mr. DUSCHA. I am sure if you go back in history, there is some siltation caused by the Missouri River here.

Senator CLARK. So that in fact, your answer to Senator Culver is yes; if you go back before the fifties.

I am just not quite sure why you put the fifties limitation on it. Why wouldn't the Federal Government or the Corps of Engineers or the Missouri River be equally responsible before 1950 as for the period after 1950?

Mr. DUSCHA. I was merely trying to distinguish when you could get silt in this lake from the river.

Senator CLARK. Thank you, very much.

Senator CULVER. Just one or two brief additional questions. Manawa, the lake here, you are prepared to concede at one time was dependent on the water level of the Missouri?

Mr. DUSCHA. Yes; this lake was at one time part of the Missouri River.

Senator CULVER. You are not able in the absence of any study to have any confident judgment as to the dependency on the Missouri River today for subsurface recharge?

Mr. DUSCHA. Not as far as how it would affect the lake level, sir.

Senator CULVER. I have no further questions at this time.

I appreciate your cooperation and appearing today as a witness.

Mr. DUSCHA. Thank you, sir.

Senator CLARK. Senator Culver, I wonder if I might make available at this point in the record the specific law in the McCook case in South Dakota that you referred to?

Senator CULVER. Without objection, it is so ordered.

[The information referred to follows:]

[FROM PUBLIC LAW 84-163]

Provided further, That funds herein appropriated shall be available for expenditure, in addition to funds heretofore made available for the OAHE, Gavins Point, and Fort Randall Dams and Reservoir projects on the Missouri River, shall be available to cooperate with the State of South Dakota in restoring a reasonable water level to a portion of McCook Lake, Union County, South Dakota, which water level has been impaired and surrounding residential properties damaged by the reduced flow

of the Missouri River due to the construction of the Oahe, Fort Randall, and Gavins Point Dam projects: *Provided further*, That the cost to the United States shall not exceed \$150,000: *Provided further*, That the State or local agencies shall contribute an equal amount to the cost of the restoration works which restoration shall be accomplished by agreement between the Game, Fish, and Parks Commission of the State of South Dakota and the Secretary of the Army acting through the Corps of Engineers.

Senator CULVER. We are very pleased to welcome as our next witness Mr. Ken Bedwell, the Chairman of the Lake Manawa Task Force, who has been so dedicated and conscientious in his efforts to bring about the kinds of changes and improvements in the situation involving the lake that we share and seek together.

It is a great pleasure, Mr. Bedwell, to welcome you at this subcommittee hearing of the Senate Public Works Committee and we are extremely anxious to have the benefit of your recommendations and judgments on this problem.

STATEMENT OF KEN BEDWELL, CHAIRMAN, LAKE MANAWA TASK FORCE

Mr. BEDWELL. Thank you, Senator Culver.

I want to welcome Senator Culver, Senator Clark, and the committee.

Before we actually get into this, I would like to take it upon myself to make one little announcement, that we would like to request your cooperation throughout the day in helping to keep the area clean.

We do have sandwiches, a catering facility out at the road. He will be glad to take all the money you want to spend out there. We also have restrooms for both men and women for those of you who may be staying here all day.

I wanted to let you know we do have a few facilities at Lake Manawa, even if it is in bad shape.

In the early 1970's, there was an organization that called themselves the Lake Manawa Association. It was originated to develop Lake Manawa. With their support, this road around the west and south sides of the lake was paved, the camping area was developed and public boat ramps were put in to load and unload boats. Due to change of residence for many of its members, the Manawa Association dissolved.

Early in 1974, a representative of the Council Bluffs Fish and Wildlife Club and myself met Senator Clark walking east of Council Bluffs on Highway 275. After introducing ourselves, we asked him if there was anything he could do as a U.S. Senator to help us with the siltation problem at Lake Manawa.

Shortly after this time, the Corps of Engineers were requested to make a siltation study, depth soundings, and core sample test of our lake. About the same time, the Lake Manawa Task Force was originated.

The Lake Manawa Task Force was formed as a working element of the Council Bluffs Chamber of Commerce River Front Steering Committee. The steering committee was established as a coordinating group to provide a liaison between the public and private sectors to stimulate new community developments.

The committee is made up of chamber members, public officials, and individuals with special interests in selected development projects. As the committee initiates activities in the various functional areas

identified by its members, it adds more resource people to support those activities.

Each task force is charged with a specific responsibility for accomplishment and the steering committee meetings serve as the forum for progress reports and comments.

Very early in establishing priority projects, the steering committee recognized the need for a local organization to address itself to the redevelopment of Lake Manawa. The lake is one of Council Bluffs' most significant assets and its continued vitality is critical to the city.

In response to this the Lake Manawa Task Force was appointed and began to look at the potential and limitations of redeveloping Lake Manawa.

The Lake Manawa Task Force is composed of not only members of the Manawa neighborhood who definitely have a vested stake in the character of the lake, but also of people from all across the community who reflect different perspectives on the use of Lake Manawa and the surrounding area.

Government officials, both elected and appointed, are on the task force to assure that whatever happens at the lake will be coordinated with local, State, and Federal development programs.

One of the first formal activities of the task force was to hold an informational meeting to determine what the local priorities were for Manawa. Nearly 40 people attended that meeting and they in turn had discussed the situation with many others. The outcome of that meeting was a list of objectives or priorities.

Because of the number of people involved and because of the different preferences across the community, no effort was made to monitor the suggestions. The only limitation on the final selection was that the list identify specific activities relating to the Lake Manawa area that would contribute to its continued development. It was also recognized that the development process would require extensive State support, and therefore, priorities should be limited to activities that had potential of receiving State funding for implementation.

Following are the 11 priorities of the task force:

1. Acquire land necessary to deposit spoil from dredging.
2. Dredge the lake to a minimum average depth of 9 feet.
3. Establish source of water supply and quality.
4. Define limitation of uses and set criteria to optimize alternative uses.
5. Stabilize shoreline.
6. Zone the lake to control boating.
7. Develop natural areas away from the lake.
8. Build shelter houses for public use.
9. Improve beach facilities.
10. Develop environmental center to complement Gifford Tract.
11. Program full-year activities and park service.

As already mentioned, these priorities were not altered in any way, but were the top 11 requests of all of the people contacted.

In recent years, the Iowa Conservation Commission has set up a new standard to be used for their redevelopment programs for their State-owned lakes.

1. *Significance.*—Basically relates to potential area and population to be served. Lake Manawa has better than 1 million users per year.

According to the dredge study, if lake is dredged, it could increase by 57 percent in the next 10 years.

2. *Activity*.—Based upon regional priorities for specific types of facility development, priorities based upon regional supply and demand. Every facility that we have is used to the utmost.

3. *Accessibility*.—An expression of ease of access for potential area users, based upon distance from major transportation routes and type or condition of access roads. We have a major highway system with I-29 and I-80 within 1 mile of our lake, with Highways 92, 375, 192, 275 with a distance of a little more.

4. *Area classification*.—Based upon regional priorities for specific types of area development; based upon supply and demand. Includes the development we now have, but also the additional interests that are becoming new each day.

5. *Multi-use development potential*.—Based upon the range of recreational activities encompassed by the proposed projects. Also takes into account possible future facility development and use. In general, a project including a variety of uses would display a higher rating than one involving only one use.

6. *Public interest and support*.—A measure of public interest in, and support of projects, and input from individuals and citizen groups.

With these six priority rating characteristics, the Iowa Conservation Commission uses, you can see the reason for the community enthusiasm, support, high spirits, and organization. You see on this project, Lake Manawa has all of the characteristics the Iowa Conservation Commission requires.

This community is one solid body in support to get the lake dredged and have shoreline stabilization along with the overall redevelopment plans of the park area.

During May of 1975, Senator Dick Clark revisited Lake Manawa, and toured our problem lake supporting our efforts to get dredging, shoreline stabilization, and redevelopment work done. Thus, the reason for our gathering today, for this congressional hearing, to hear the pros and cons of S. 1799, the bill that Senator Clark introduced in the U.S. Senate and which was supported by Senator John Culver.

This bill was introduced to get Federal funds which were to match funds available from the State of Iowa. This bill pertains only for matching funds for dredging and shoreline stabilization. Congressman Harkin introduced the same bill in the House.

In 1974, the Iowa Legislature passed a bill allocating \$500,000 for dredging Iowa lakes. The 1975 legislature retained this \$500,000 for dredging, stipulating that it must be matched with Federal funds in order to be used for dredging.

After this bill was passed in the 1974 legislature, the Iowa Conservation Commission retained a consultant to make a study of eight Iowa lakes for possible dredging. The dredging study was conducted under these basic headings: environmental considerations, engineering considerations, and economic considerations.

The results of the dredging study showed that Lake Manawa was rated No. 1 in the State for needed dredging, the least amount of environmental problems, less problems in the engineering standpoint and economically figuring the payback ratio of \$2.25 per recreational day, which is well within the Federal scope. The payback time was 9.1 years, the least by far to the next competitive lake.

When I say the least in environmental problems, I mean that through dredging and shoreline stabilization, most of our environmental problems could be corrected.

Our lake consists of 660 acres. It was recommended in the dredging study that 405 acres be dredged to various depths. This resulted in an overall spoil content of 2.1 million cubic yards. At the estimated cost of \$1.50 per cubic yard, it was estimated to have a dredging cost of \$3.7 million dollars. When the water level is low on account of dredging operations, the shoreline could be ripped for stabilization.

Other estimated costs associated with dredging are spoil disposal construction, \$1,418,000; spoil disposal site procurement, \$130,000; lake surveying and mapping, 165,000; spoil site surveying and mapping, \$17,000; field investigations, \$297,000; engineering and administration, \$714,000; and contingencies, \$1,454,000; for a total estimated associated cost of \$4,874,000 plus \$3,700,000 for estimated actual dredging, and \$150,000 for estimated shoreline stabilization costs which equals an estimated grand total of \$8.7 million.

Figuring the estimated costs, the task force feels that possibly the actual dredging costs may be inflated considerably. Visiting with dredging organizations tells us that costs could possibly be done as low as \$1 to \$1.05 per cubic yard, figured against the \$1.50 figure the consultant estimated.

We feel that the Lake Manawa project for the community is a large undertaking and rates in second place only to urban renewal, which was the largest undertaking this community has ever supported in the history of Council Bluffs.

With the interstate highway system we have in this locality, the completion of the southside viaduct and other State highways, Lake Manawa lies in a location of the metropolitan area where it is estimated 500,000 people could be at the lake in 30 minutes.

In closing, I would like to make one final statement. With our neighbors across the river, our friends from this community, this county, State and Federal levels, the Lake Manawa Task Force feels it has almost exhausted its objectives to the point, that the next step is to raise the money to start pumping silt from the bottom of the lake, and stabilize our shoreline. We ask your support.

Thank you.

Senator CULVER. Thank you, very much, Mr. Bedwell, for an outstanding statement.

This will be, of course, part of the record and we will study it very carefully in terms of making the most effective and persuasive case we can to bring about appropriate assistance not only at the Federal level, but as you properly cite, at the State level as well.

I have just one or two quick questions and then I thought we can consult independently about some of the other matters where I know you will be of continuing value to us.

Do you know how many other Missouri River oxbow lakes could qualify for work under this legislation, how much money would be involved? What were those dollar figures again?

Mr. BEDWELL. I don't have the figures in my head, but it is in the overall redevelopment study that was made by Economic Research Associates, the consultant that was retained by the Iowa Conservation

Commission. There is a possibility that the little, green folder that I passed out may possibly have this information in it.

Senator CULVER. Perhaps you could check that and we could submit it for the record at this point.

Mr. BEDWELL. I will do that.

[The information requested follows:]

As to the question of how many oxbow lakes on the Missouri River could qualify for work under this legislation; I don't know. Only one other oxbow lake was studied under ERA for possible dredging, and that was Blue Lake, at Onawa, Iowa, 14 million cubic yards of spoil to be pumped out of Blue Lake—estimated costs of \$300,000, plus \$40,000 for shore line protection. Estimated costs associated with dredging, \$405,000. So you would be estimating in the neighborhood of \$750,000 for Blue Lake at Onawa, Iowa.

Senator CULVER. Second, has there been any estimate of how long it might be before dredging of the lake might be again necessary? I am thinking really about the non-Federal public bodies bearing all the costs of operation and maintenance.

Do you think Iowa and Nebraska are willing to incur any part of such responsibilities?

Mr. BEDWELL. I think Iowa has already got a good start. I want to clarify that the \$500,000 that is actually retained by the Iowa Legislature does not definitely say Lake Manawa.

Consequently, I am sure that if we could get the program started—in other words, if we can get a dredge dropped in our lake, I am sure we can get support on the State level to give us the additional money in dollars and so forth that it takes to get the job completed.

[The following was subsequently supplied:]

In your question as to having an estimate of how long it might be before dredging of the lake might be again necessary, there has been none that I know of. However, with the city planning sanitary sewers completely around the lake within 3 years, the dredging of the lake, to eliminate a lot of algae, and plant growth, other than necessary, and shoreline stabilization, to stop shore line erosion, and mosquito creek water shed programs, we (the task force) can see a long lived lake, possibly as long as the year 2030. Another factor in this is, that the State has seeded all of thier open areas, that connect to the lake, thus eliminating both wind and water erosion. All of these factors definitely assist in lengthening the life of the lake.

With reference to your question as to my opinion of whether Iowa and Nebraska would be willing to incur any part of such responsibilities? As I have already stated, I feel Iowa has already got a good start. With reference to additional moneys to complete this project, from a non-Federal body, legislation is already in the making to match whatever amount of Federal funding that becomes available. It was the Iowa Legislature that funded and requested the study of these Iowa lakes with our friends in Des Moines, and here at home. I am very sure that they can be persuaded to follow the outcome of their own requests.

With reference to Nebraska, I can not say, except that I am sure they would say "No" to helping dredge an Iowa lake with their State funds.

Senator CULVER. As you indicated, we are talking now about the Iowa Legislature saying last year that they would appropriate \$500,000 statewide for this purpose. The Clark-Culver bill would qualify for 50 percent State sharing in order to qualify for assistance.

The ball-park dollar figures, the cost of dredging of just Lake Manawa alone is estimated to be \$3.7 million?

Mr. BEDWELL. That is correct.

Senator CULVER. \$3.7 million, which under the terms of our legislation would allocate about \$2 million to non-Federal interests.

Do you have any reason to believe that the State of Iowa is prepared to make this kind of expenditure for the dredging of Lake Manawa and as Senator Clark points out, we are talking about Federal legislation which has to be uniformly available and applied nationally in this country?

Mr. BEDWELL. I am sure—I can't definitely say this as a sound statement—but I am sure that with a couple of the Iowa legislators that you have here that will be testifying, I think that they could possibly answer this question better than I in that they can give you the viewpoints of what they have within their own mind and the preparations that they have made for the assembling of the next general assembly.

Senator CULVER. Mr. Bedwell, I think that there is really quite an exhaustive list of aspects to this problem where you are so extremely knowledgeable and competent to assist us.

What I would like to do on this occasion is again commend you for really a remarkable effort in terms of marshaling this information, mobilizing the task force activities and, second, to say how anxious we are to work with you in a cooperative way to try to meet these obvious problems and to do so consistent with perhaps a variety of Federal approaches where possible and appropriate.

Your presentation here will be of valuable assistance for this record and I also wanted you to know that we will undoubtedly have a great list of additional questions. We may even wish to take the opportunity, after more carefully reviewing your own task force recommendations, to make up some questions of our own after we have a chance to pursue that, submit those written questions to you and then you could perhaps for the record specifically reply to them.

That procedure is permitted under our hearing processes and I think that that will help develop a record that would be in the best interests of the ultimate progress on this project.

Mr. BEDWELL. I will be more than glad to.

Senator CULVER. Thank you.

[Mr. Bedwell's responses to additional questions follow:]

COUNCIL BLUFFS, IOWA,
October 27, 1975.

Hon. JOHN C. CULVER,
U.S. Senate, Washington, D.C.

DEAR SENATOR CULVER: With reference to my testimony at the Water Resources Subcommittee hearing in Council Bluffs, on September 27, I will endeavor to answer your additional questions, to be added to the transcript of the hearing.

Question 1. You state that early in 1974 the Corps of Engineers was requested to make a siltation study, depth soundings, and a core sample test of Lake Manawa. Who requested this study and what is its status at the present time?

Answer. United States Senator Dick Clark. Enclosed, please find the communication between Senator Clark, and Col. Russell Glenn, District Engineer for the Corps of Engineers, requesting the involvement of the Corps of Engineers. We will call this Exhibit "A".

What is the status at the present time? This study has been completed, and the results enclosed, as Exhibit "B".

Question 2. Has the land for the dredged spoil disposal actually been purchased?

Answer. The legal work, and all signatures are affixed to the contract. There will be no transfer of title, or purchasing monies until January 2, 1976. This was at the request of the land owner. At that date, all transfers will be completed.

Question 3. You state that the lake should be dredged to a minimum average depth of nine feet. Is this enough for recreational boating?

Answer. Yes. We are only trying to be fair about the dredging end of the redevelopment. Of course, everyone would like to see a fifty foot deep lake, but again, we are only trying to be fair and realistic.

Question 3a. Is the cost estimate of \$3.7 million for dredging predicated on a nine foot depth?

Answer. As I stated, I said a minimum average depth of nine feet. Enclosed, please find a map marked Exhibit "C". On this map you will see the area to be dredged, depth of dredging, and the amount of Cubic Yards to be removed, totaling the estimated cost of \$3.7 million dollars. The original of this enclosed map is found in Economic Research Associates completed study results on Page III-60, Figure 7.¹

Question 4. You estimated that the percentage of the Manawa shoreline which is privately owned is no more than 20 percent, all of which is already developed. Is this figure correct, or should it be revised?

Answer. This figure is correct. Actually, the percentage of privately owned property on the total lake shore is less than 20 percent. Please see notations on map, and receive this as Exhibit "D".¹

Question 4a. Can you supply for the Committee a map of the lake, showing the privately owned sections as well as the State and city owned portions?

Answer. Enclosed, please find a map, the best that I have available, I have drawn in the area on the lake, in red, that is privately owned. Please see notations on the map.

I hope I have not confused you with the drawn in green area. Actually, all of this area also is, and will be retained by the State. Only after redevelopment by the State, will this area be turned over for City management, still being retained for public use.¹

I hope I have answered your questions thorough enough. Please feel free to ask any additional questions you may have pertaining to Lake Manawa.

Sincerely,

KENNETH C. BEDWELL,
Chairman, Lake Manawa Task Force,
Council Bluffs, Iowa.

EXHIBIT A

JUNE 25, 1974.

Col. RUSSELL A. GLENN,
District Engineer, Corps of Engineers,
Missouri River Division, Omaha, Nebr.

DEAR COLONEL GLENN: I would like to request that you include—as a special portion of the "Omaha Metropolitan Study"—a report on Lake Manawa in Pottawattamie County, Iowa.

As you no doubt know, Lake Manawa, located at the south edge of the city, has been filling in with silt at a rapid rate in recent years. Its average depth is now only about three feet. Manawa is the only lake of its size in this area, and its full recreational value should be recovered, if at all possible. It would be a shame if this opportunity for thoroughly examining the feasibility of doing so were missed.

It is my hope that you can do an analysis of the lake as to its future potential, and make some recommendations as to the needs of the lake and what alternatives are possible. It would be very helpful if cost factors could be included.

I look forward to hearing your reaction to this request. Please direct your response to: Senator Dick Clark, Post Office Box D, Council Bluffs, Iowa 51501.

Sincerely,

DICK CLARK,
U.S. Senate.

¹ Retained in committee files.

DEPARTMENT OF THE ARMY,
OMAHA DISTRICT, CORPS OF ENGINEERS,
Omaha, Nebr., June 28, 1974.

Hon. DICK CLARK
*U.S. Senate,
Council Bluffs, Iowa.*

DEAR SENATOR CLARK: Your letter of 25 June 1974 requested the inclusion of a study on Lake Manawa in our Metropolitan Omaha, Nebraska-Council Bluffs, Iowa Study.

Water related recreation, water quality management, and conservation of fish and wildlife resources are areas of concern in the study. We would be most happy to include an analysis of Lake Manawa as a part of the study. The Bureau of Outdoor Recreation is assisting us on our recreation studies, and full coordination will be maintained with the Iowa Conservation Commission and local interests.

Our target for completion of the study is June 1975. Therefore, we will begin immediately to consider the situation at Lake Manawa.

If I can be of any further assistance to you, please call on me.

Sincerely yours,

RUSSELL A. GLENN,
Colonel, Corps of Engineers, District Engineer.

EXHIBIT B

DEPARTMENT OF THE ARMY,
OMAHA DISTRICT, CORPS OF ENGINEERS,
Omaha, Nebr., Sept. 20, 1974.

Mr. KENNETH BEDWELL,
Council Bluffs, Iowa.

DEAR MR. BEDWELL: We have completed our survey of Lake Manawa. Inclosure 1 is a contour map (Scale 1"=500') that presents Lake Manawa bed elevations referenced to mean sea level. Inclosure 2 is an explanation of the work performed and a tabulation of sediment density observations.

If further explanation or additional information is required, please do not hesitate to contact us.

Sincerely yours,

C. F. THOMAS,
Chief, Planning Division.

2 Incls (Map under S/C) as stated.

DEPARTMENT OF THE ARMY,
OMAHA DISTRICT, CORPS OF ENGINEERS,
Omaha, Nebr., Feb. 20, 1975.

State Senator LOUIS CULVER,
Dunlap, Iowa.

DEAR LOUIE: This responds to your telephone request to Dick Rowland relative to the Corps of Engineers authority to participate in the dredging of Lake Manawa and Blue Lake, Iowa to restore the recreational use of the lakes.

The Corps of Engineers has no specific congressional authority to participate in such a project. Our previous experience in a similar project is limited to McCook Lake, South Dakota, which is located just north of Sioux City, Iowa. That project was authorized by Public Law 163, 84th Congress, 1st Session, and provided for 50-50 cost share cooperation between the State of South Dakota and the Corps of Engineers to restore a reasonable water level of a portion of the lake. The project was completed in November 1956.

The Corps of Engineers could, in a similar manner if authorized by Congress, participate in the dredging of Blue Lake and Lake Manawa.

As you are aware, the Omaha District is also preparing a report on the water resource problems, needs and alternative solutions for the Omaha, Nebraska-Council Bluffs, Iowa region. The Iowa counties of Harrison, Pottawattamie, and Mills are included in the study area. Thus, Blue Lake and Lake Manawa are both within the study area.

The report which is now scheduled to be submitted shortly after the end of this fiscal year will contain programs and recommendations for development of the area's water resources. However, in the absence of a specific request by the State of Iowa or other local governing body to the Corps of Engineers to cost share in such lake restoration project, we would be unable to formulate such a recommendation in the report. To date we have not received any official request.

Sincerely yours,

C. F. THOMAS,
Chief, Planning Division.

SEPTEMBER 17, 1974.

MROED-HF (9 July 1974)

Subject: Sedimentation Survey of Lake Manawa, Iowa.

From: Chief, Engineering Division.

To: Chief, Planning Division.

1. The requested lake survey has been completed and two copies of the results are inclosed. The sonic soundings were made on 3, 4 and 5 September 1974, and the density determinations were completed on 10 September 1974.

2. Inclosure 1 is a contour map (Scale 1"=500') that presents Lake Manawa bed elevations referenced to mean sea level. The water surface elevation at the time of the survey was 967.3. Contours were drawn from point elevations determined along parallel range lines which were established at 500 foot intervals. Circled numbers demonstrate the location of sediment density observations. Portions of the south and east parts of the lake were covered by water lilies. These areas are delineated on the inclosed map.

3. The results of the sediment density measurements are presented in tabular form in the second inclosure. In addition to the measured densities at various levels throughout the depth of the deposit, we have shown the water surface, top of deposit, and maximum penetration elevations. All measurements were made with a radioactive sediment density probe. No physical samples were collected. The bottom materials at location numbers 1 and 8 were sufficiently dense so that the probe could not be forced into the deposit to a great enough depth to permit an accurate density determination. At other locations, number 5 for example, the top of the deposit was extremely light but the materials became more dense with depth. At all test locations the probe probably penetrated to a depth at or near the original river bed.

4. Mr. Steve Brenton of the Iowa Conservation Commission was informed during a telephone conversation on 5 September by Duane Sveum and Richard Rowland that the deposits were probably extremely light. During the soundings the survey crew performed some hand sounding in the number 7 area to bar check and adjust the sonic sounder. It was noted at that time that the materials were extremely light and it was felt this may extend over the entire lake. Our investigation demonstrated that the densities of the bottom materials do vary. For example, at location number 7 we were able to penetrate the deposit to a depth of 10.6 feet and at location number 1 we could force the probe to only 1.5 feet. The difference in densities should be considered in determining the equipment needs and the quantities of materials to be dredged.

5. It should also be noted that the lake level is approximately 6 feet higher than the river stage immediately south of the lake. The type of material and extent of dredging should be considered. If fine sediments have formed a seal that impedes seepage to the groundwater it is possible that dredging could result in lower water-surface levels or that greater quantities of water could be required to maintain the lake at its present level.

6. Questions concerning the topographic map or the density observations can be directed to Duane Sveum, Ext. 4558.

R. G. BURNETT,
Chief, Engineering Division.

2 Incls: as.

SEDIMENT DENSITY OBSERVATIONS, LAKE MANAWA, IOWA, SEPTEMBER 10, 1974

Location ¹	Elevation m.s.l.				Densities lbs./ft ³	
	Water Surface	Top of Deposit	Probe Centroid	Maximum Penetration ²	Wet	Dry
1.....	967.3	962.8	962.2	961.3	95.3	³ 52.84
2.....	967.3	963.2	961.8		96.6	55.31
			960.7		114.7	84.03
			959.1		115.3	84.93
3.....	967.3	959.1	958.6	957.7	113.8	82.68
			957.2		82.4	32.12
			955.9		91.4	46.57
			954.5		113.6	82.23
4.....	967.3	959.8	954.0	953.1	115.1	84.70
			959.1		94.5	51.52
			958.9	958.0	98.5	57.96
5.....	967.3	958.5	956.9		79.7	27.78
			955.9		80.1	28.43
			954.9		80.0	28.27
			953.9		81.5	30.67
			952.9		108.2	73.55
			951.9		115.6	85.38
			951.6	950.7	113.7	82.04
6.....	967.3	962.3	960.9		98.5	57.91
			959.9		90.7	45.39
			958.9		100.7	61.51
			958.0	957.1	97.2	55.76
7.....	967.3	958.4	956.9		79.1	26.85
			955.9		79.7	27.78
			954.9		80.3	28.72
			953.9		80.1	28.43
			952.9		82.3	31.96
			951.9		90.0	44.32
			950.6		94.6	51.71
			949.0		90.1	44.49
			948.7	947.8	89.2	43.42
8.....	967.3	961.0	960.6	959.7	92.0	³ 47.54
9.....	967.3	962.3	960.9		88.9	42.46
			959.9		100.5	61.13
			958.9		100.8	61.71
			958.5		101.4	62.53
			957.9	957.0	106.2	70.34

NOTE.—Densities determined thru use of radioactive sediment density probe.

¹ Locations shown on inclosed map.

² Probe tip is 0.9 feet below probe centroid.

³ Densities may be heavier than shown due to inadequate penetration of probe into sediment deposit.

Senator CULVER. Senator Clark?

Senator CLARK. Thank you, very much.

I think, Ken, I have just a couple of questions of a technical nature. Is any of the shoreline around the lake privately owned?

Mr. BEDWELL. Yes.

Senator CLARK. What percentage would you think?

Mr. BEDWELL. I would say less than, not over 20 percent at the very most is privately owned.

Senator CLARK. Of that privately owned area, how much of that 20 percent would be undeveloped or is it all developed?

Mr. BEDWELL. I would say it is all developed.

Senator CLARK. Has there been any estimate made of the appreciation effect on private properties along the shoreline if this lake were to be dredged?

Mr. BEDWELL. The only thing that I can recall is it is mentioned in the study of the value of the property and so forth that does lie around the lake that is privately owned, that it will certainly increase the valuation of this property and consequently, everybody knows, the city assessor will be down knocking at your door and taxes are going to be going up and it is going to be bringing more revenue in the city and the State.

[Mr. Bedwell supplied the following:]

The Pottawattamie county assessor in Council Bluffs, maintaining records of sales of properties, disclosed that twenty-two properties located in Westlake Village, Lakeview Acres, Lakoma addition, Lacoma Annex, Manawa Park, and Lakewood Villas experienced an average annual rate of value appreciation of 33 percent from 1970 to 1974. In 1973, these residential areas had a combined market value of approximately \$4.6 million.

Senator CLARK. Ken, we are deeply grateful to you, as Senator Culver has indicated. This project simply would not and could not be done without the kind of effort that you and your task force have exerted. We are very, very grateful to you.

Thank you, very much.

Mr. BEDWELL. Thank you, Senator Clark.

[A report from the Lake Manawa Association follows:]

A Response
In Support of
Iowa Senate File 274
Dredging Lake Manawa

In August 1974, Economic Research Associates and Engineering Consultants, Inc., of Los Angeles were retained by the Iowa Conservation Commission to perform a study of costs, benefits, and the impact of dredging programs for eight Iowa lakes. The study was commissioned by the Iowa General Assembly with an appropriation of \$100,000.

This study was completed in December of 1974, and the written report consists of 241 pages of data.

Using the material developed by this study, the Lake Manawa Association has prepared this booklet to provide a quick overview of the urgent need to improve the water quality of Lake Manawa through dredging and shore-line protection, and to call to your attention the fact that Lake Manawa was pinpointed by this study as the most qualified lake for dredging.

The Lake Manawa Association has some 2,500 members, and is made up of citizens of the Lake Manawa area who are concerned with the continued degradation of this lake. A complete copy of the study prepared by Economic Research Associates and Engineering Consultants, Inc. can be obtained by contacting the Iowa Conservation Commission.

The study covered the following eight Iowa lakes -- Backbone, Black Hawk, Blue, Five Island, Manawa, Mill Creek, Rock Creek and Silver. However, the non-availability of spoil disposal sites, coupled with rapid resedimentation rates resulting from watershed-reservoir imbalance, eliminated Backbone, Mill Creek and Rock Creek from further consideration of dredging's feasibility. (The following map shows the location of the eight lakes. Table (1) shows the amount of visitation to each lake for the period of 1960-1973.)

According to the study, "The organic content, the nutrient content, and questionable water quality of Lake Manawa are problems that will all be compounded greatly by the passage of time. Eutropic growth varies from lake to lake and rates of growth certainly cannot be predicted. However, it is difficult to see how Manawa can exist more than another generation. Not only will recreational activities cease but unless some sort of corrective measures are undertaken, Manawa will be a very disagreeable place near which to live. One also must remember that the water level here, as at Blue Lake, is artificially maintained. At the present time there are only rudimentary controls over the sediment content of this water supply and no controls over the nutrient content. It is very conceivable that in the next 20 years Lake Manawa, without any action taken, could become an urbanized backwater swamp of the Missouri River."

There are no data available, but Lake Manawa appears to have the poorest water quality of all the lakes studied. Dredging will certainly improve

Table (1)

ANNUAL ATTENDANCE BY LAKE
1960-1973

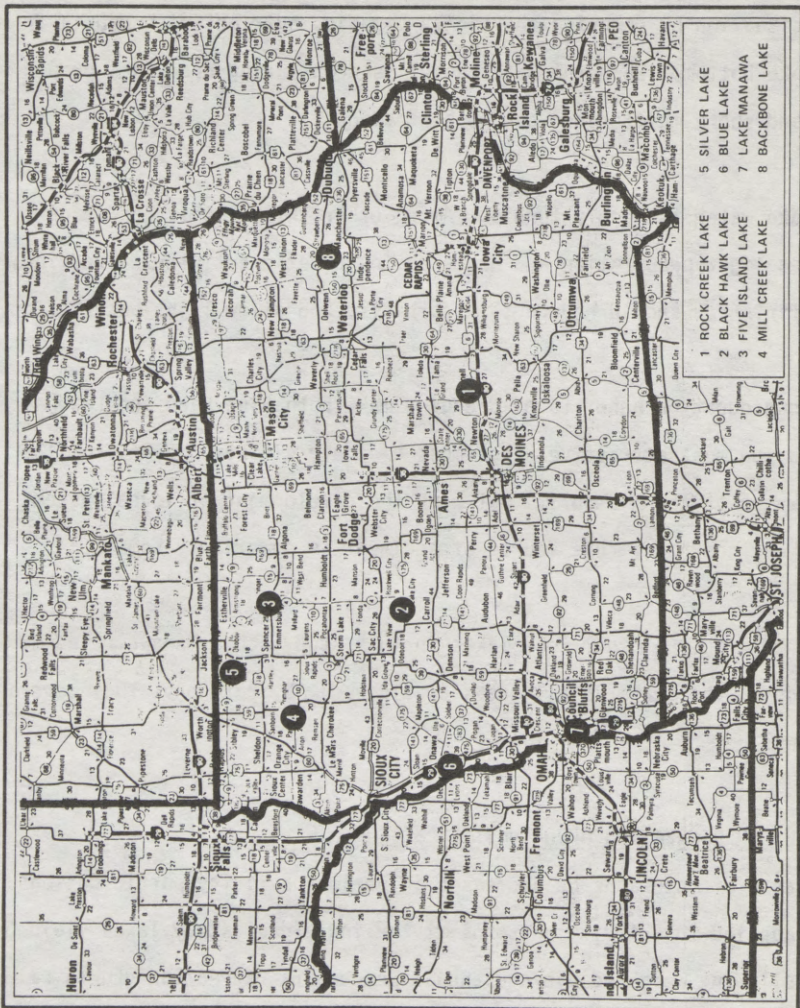
Lake	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Backbone	317,052	276,175	322,870	389,706	494,920	319,946	278,104	248,678	245,101	354,305	294,359	275,563	258,759	269,371
Black Hawk	216,820	132,719	225,150	264,045	291,694	341,625	344,520	332,380	372,480	344,407	239,775	237,605	297,970	292,510
Blue	121,935	172,500	190,020	195,110	193,020	198,090	199,920	165,910	197,175	224,300	215,725	218,140	223,960	315,053
Manawa	489,422	686,920	432,750	710,755	363,595	601,205	437,910	617,180	450,263	853,359	623,843	705,248	315,600	594,580
Mill Creek	55,732	54,534	44,869	46,507	51,199	47,136	54,655	36,808 ^{1/}	22,680 ^{1/}	18,130 ^{1/}	34,750 ^{1/}	37,375	20,284	8,913 ^{1/}
Rock Creek	274,416	338,510	262,426	325,701	334,988	397,055	462,129	464,580	504,529	378,450	446,163	521,098	709,220	476,275
Silver	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	2,145 ^{2/}	n. a.	n. a.	n. a.	33,120 ^{3/}

n. a. means not available.

^{1/} Six months attendance.^{2/} Two months attendance.^{3/} Nine months attendance.

Source: Iowa Conservation Commission.

- a. The big jump in 1969 was the result of the water level being restored in the lake, and because of promotional efforts of the Lake Manawa Association to renew interest in the lake.
- b. The big drop in attendance in 1972 resulted from closing the roads around the lake for resurfacing.



Source: Economics Research Associates.

LOCATION OF STUDY LAKES

this situation by removing the highly organic, nutrient-rich debris from the lake bottom. When the water level is down during dredging, proper bank and shore maintenance can be performed.

The lake water is highly turbid. Among other things, this condition reduces light penetration and hence photosynthetic activity. Dredging, when finished, should reduce this turbidity and allow light penetration.

The long-duration benefits of dredging make both Blue Lake and Lake Manawa the most attractive since most of their siltation came from the floodwater of the Missouri, "but with the development of levee systems and other controls, this source of sediment is now fairly remote."

Compared with the other four lakes in this study, Lake Manawa rated at the top of the scale in all areas considered. By category, they were as follows:

DEMAND FOR RECREATION OPPORTUNITIES

Forecasts of increases or decreases in various activity participations, when applied to activity patterns at the individual study lakes yielded the following weighted average annual per capita recreation growth rate:

Backbone	0.45%
Black Hawk	0.45%
Blue	0.48%
Five Island	0.43%
Manawa	0.57%
Mill Creek	0.32%
Rock Creek	0.55%
Silver	0.38%

RECREATIONAL QUALITY ENHANCEMENT

Using the five lakes where dredging is feasible, a scale of 10 to negligible was used to compare the effectiveness of dredging. This assessment takes into consideration the fact that a costly program at one lake would have little impact, while a moderate effort at another would dramatically affect its quality and recreational appeal. The study lakes' ratings on this scale were:

<u>Lake</u>	<u>Recreational Quality Enhancement Rating (Scale of Ten)</u>
Black Hawk	7
Blue	4
Five Island	5
Manawa	9
Silver	5

USER BENEFITS

Using a range of values suggested by government standards (\$0.75 to \$2.25) a factor of \$2.00 was selected for Blue, Black Hawk, Five Island and Silver lakes. Lake Manawa was assigned a value of \$2.25 per person per recreation day due to its location, which is unique among the study lakes, and because competition for recreation expenditures is a more significant factor. Based on consideration of recreational quality, enhancement, population trends, general recreation demand trends and competition, the following scale shows the impact of dredging in terms of recreation days:

<u>Lakes</u>	<u>Average Annual Benefit (Thousands of Dollars)</u>	
	<u>To 1990</u>	<u>After 1990</u>
Black Hawk	\$ 82.7	\$1,100.0
Blue	24.4	32.6
Five Island	54.1	67.6
Manawa	964.0	1,508.9
Silver	30.3	37.0

IMPACT OF DREDGING ON RECREATION

The effects of the proposed dredging programs on recreation activities will be partly qualitative, partly quantitative. In programs of extensive dredging, improvements will encourage greater recreational use of the impacted lakes. Thus, the effect of dredging is quantitative.

A quantitative aspect can be made if impacts are rated on a scale of 10 ranging from negligible impact to substantial. Figure (1) summarizes the rated impacts of proposed dredging programs on the enhancement of recreation potentials at the five lakes.

Figure (1)

IMPACT OF DREDGING ON ENHANCEMENT OF
RECREATION POTENTIALS AT FIVE IOWA LAKES

(Rated on Scale of Ten)

<u>Lake</u>	<u>Rating</u>
Black Hawk	7
Blue	4
Five Island	5
Manawa	9
Silver	5

Source: Economics Research Associates.

BENEFIT COST ANALYSIS

This section describes benefits that might offset costs and, in an economic sense, might be considered the return on investment. Benefits consist of increased recreational activity, increased commercial activity, and higher property values for real estate in the vicinity of the improved lakes. These benefits are stated in monetary terms and presented in current values.

COSTS

Project engineers have estimated dredging costs based on lake depth contours mapped by various sources. Bottom samples were not adequate to determine precisely the types of sediment that will be dredged, so that cost estimates are preliminary. The estimated volume of spoil and costs of dredging and shore-line protection are summarized below for each of the five lakes where dredging is feasible.

<u>Lake</u>	<u>Volume of Spoil (Million cu. yd.)</u>	<u>Estimated Cost of Dredging (Thousands of Dollars)</u>	<u>Estimated Cost of Shore-Line Protection (Thousands of Dollars)</u>
Black Hawk	3.02	\$4,250	\$200
Blue	0.14	300	40
Five Island	1.67	2,500	260
Manawa	2.10	3,700	150
Silver	2.20	3,000	37

Costs associated with dredging, enumerated in Figure (2), represent a substantial addition to the estimated dredging and shore-line protection

Figure (2)

ESTIMATED COSTS ASSOCIATED WITH DREDGING
(Thousands of Dollars)

	Lake				
	<u>Black Hawk</u>	<u>Blue</u>	<u>Lake Five Island</u>	<u>Manawa</u>	<u>Silver</u>
Spoil Disposal Construction	2,264	139.0	1,418	2,097	1,656
Spoil Disposal Site Procurement	138	8.8	104	130	138
Lake Surveying and Mapping	240	50.0	120	165	175
Spoil Site Surveying and Mapping	17	1.3	13	17	18
Field Investigations	336	24.0	209	297	235
Engineering and Administration	806	57.5	502	714	563
Contingencies	<u>1,650</u>	<u>124.4</u>	<u>1,025</u>	<u>1,454</u>	<u>1,164</u>
Total--Estimated Associated Costs	5,451	405.0	3,391	4,874	3,949

Source: Engineering Consultants, Inc.

costs. The following table represents our best current estimate of total dredging and off-site costs for each of the lakes under consideration.

<u>Lake</u>	<u>Total Cost</u> <u>(Thousands of Dollars)</u>
Black Hawk	\$9,901
Blue	745
Five Island	6,151
Manawa	8,724
Silver	6,986

It should be pointed out that of the total cost estimate for Lake Manawa, that \$130,000 is for Spoil Disposal Site procurement. The state of Iowa has already made plans to acquire a 300-acre parcel of land southwest of the lake. This would be the site for the spoil disposal, and in effect, this spoil will help the state utilize this land for park expansion.

BENEFITS VERSUS COSTS

Having previously established 1) forecasts of lake attendance with and without dredging; 2) approximate costs of dredging; and 3) dollar value of recreation use and attendance at the lakes, it is now possible to compare in monetary terms the costs and benefits of dredging. Figure (3) shows dredging costs, average annual benefit values, and the number of benefit years required to recover costs. As discussed previously, the value of each recreation-day is estimated to be \$2.00 at each lake except for Manawa which is \$2.25.

It should be emphasized that annual benefits derived from dredging are defined as the difference between the recreation value assuming dredging

Figure (3)

COMPARISON OF BENEFITS AND COSTS OF DREDGING

Lake	Total Costs (Thousands of Dollars)	Average Annual Benefit (Thousands of Dollars) ^{1/}		Years Required to Recover Costs
		To 1990 ^{2/}	After 1990	
Black Hawk	\$9,901	\$ 82.7	\$ 100.0	101.4
Blue	745	25.4	32.6	25.9
Five Island	6,151	54.1	67.6	93.8
Manawa	8,724	964.0	1,508.9	9.1
Silver	6,986	30.3	37.0	191.4

^{1/} Assumes \$2.00 per incremental recreation day for all lakes except Manawa which is calculated at \$2.25 per recreation day. Benefit values are in constant dollars. It is assumed that increases in annual benefits are offset by the discount factor applying to future values.

^{2/} From 1977 through 1990 is 14 years.

Source: Economics Research Associates.

and assuming no-dredging. This is as opposed to comparing the value if dredged with the existing value.

Since the benefits derived from dredging will extend for many years, it is useful to consider the number of years which would be required to recover the dredging costs based on incremental benefit values derived from dredging. Years to recover, therefore, becomes one measure of dredging feasibility based on the standard of economic benefit/cost. As shown in Figure (3), the years to recover vary from a maximum of 191.4 for Silver Lake to a minimum of 9.1 years at Manawa Lake.

CONCLUSION

It is beyond the authority and responsibility of the study team to determine whether or not the subject lakes should be dredged. Rather, we have attempted to provide the Iowa General Assembly guidance in reaching a public policy decision regarding the future of the lakes. In this regard, the study team concluded that based on environmental and engineering considerations it would definitely not be in the public interest to dredge three of the lakes: Backbone, Mill Creek, and Rock Creek.

From an economic perspective it appears that Lake Manawa should definitely be dredged, providing sewer and nutrient problems are first resolved. The utility of dredging Blue Lake is marginal, given the substantial number of years (25.9) required to recover costs of a modest dredging program. The advisability of dredging Black Hawk, Five Island, or Silver is doubtful, since the number of years required to recover the costs probably exceeds the lives of the lakes.

SUMMARY

Figure (4) offers a summary review of specific dredging efforts for each of the eight study lakes. This should assist the reader in bringing into perspective the various findings of this benefit-cost study. Each of the eight study lakes is rated on a scale of 1 to 10 for each of seven categories of dredging effects. A rating of 10 represents a maximum positive or minimum negative effect. For example, a rating of 9 for spoil area availability at Manawa indicates little or no problem in finding adequate area for spoil deposit within the proposed dredging program. A rating of 1 at Blue Lake for impact on property values indicates very little effect on property values at Blue Lake as a result of dredging. A rating of 0 indicates that the problem is so serious as to preclude a lake from further consideration as a candidate for dredging.

A high total rating for a lake suggests the relative desirability of dredging that lake. As shown in the table, Manawa achieves the highest index score (53), followed by Black Hawk (46). The remaining three lakes are relatively close behind in the following order: Silver (36), Blue (33), and Five Island (32). A maximum score would have been 70, a minimum score, 7.

The years required to recover costs based on economic recreation benefits from dredging, as discussed previously, are reiterated on the last line of the table. It is interesting to compare the rating totals, which are essentially non-economic indicators of dredging desirability, with the "years to recover" figures, which represent the economic (benefit/cost) measure of dredging desirability. Only in the case of Lake Manawa do we

Figure (4)

SUMMARY RATING OF DREDGING EFFECTS OR CONSIDERATIONS FOR THE EIGHT IOWA STUDY LAKES^{1/}

Category of Effect or Consideration	Backbone	Lake						
		Black Hawk	Blue	Five Island	Manawa	Mill Creek	Rock Creek	Silver
1. Availability of Spoil Area	1	9	8	8	9	0	0	6
2. Rate of Siltation	0	10	10	9	10	0	0	9
3. Need for Shore Protection	0	3	8	1	4	0	0	6
4. Recreational Quality Enhancement	0	7	4	5	9	0	0	5
5. Impact on Property Values	0	7	1	3	10	0	0	3
6. Regional Economic Impact	0	4	1	1	1	0	0	2
7. Environmental Effects	0	6	1	5	10	0	0	5
Rating Totals	0	46	33	32	53	0	0	36
Total Dredging Costs (Millions of Dollars)	0	\$9.9	\$0.7	\$6.2	\$8.7	0	0	\$7.0
Years Required to Recover Costs	0	101.4	25.9	93.8	9.1	0	0	191.4

^{1/}Note: For each category of effect lakes are rated on a scale from 1 to 10 with 10 representing the maximum positive (or minimum negative) effect. A rating of 0 in Category 1-3 was considered so seriously low as to preclude the lake from subsequent rating or consideration as a dredging candidate.

Source: Engineering Consultants, Inc., and Economics Research Associates

find a high non-economic incentive to dredge as well as a strong economic motivation. Manawa achieves the highest total rating (53) and also required the fewest years (9.1) to recover dredging costs from recreation benefit values generated. Black Hawk, on the other hand, achieved the second highest total rating (46) and yet required 101.4 years to recover dredging costs. The explanation for this apparent anomaly lies in the fact that while environmental dredging is very desirable at Black Hawk the strong impact of competition from new reservoirs will severely reduce attendance potentials for the lake whether or not it is dredged.

RESPONSE

Members of the Lake Manawa Association feel this study highlights the urgent need to improve the conditions of Lake Manawa.

It serves a major metropolitan population in an area that is already water recreation depressed. Improvements cited in the study are needed just to maintain present property values.

While the study provides positive proof of the poor water quality of Lake Manawa, it recommends that dredging should not be initiated until septic and sewer facilities around the lake are surveyed and leaks on the systems corrected. Action is already underway to correct these conditions. A new sewer and water system has been installed in Manawa Village, located on the east side of the lake, and the Association is working with the Council Bluffs Planning Department to improve the sewage disposal systems around the remainder of the lake. The timetable for completing necessary sewage facilities is geared to coincide with the implementation of the overall development plan for Lake Manawa.

Senator CLARK. The next witnesses will be the State senator and State representative. I think we are going to hear first from Jim Griffin, the State senator.

I do want to say that these two gentlemen worked diligently in the State legislature, and very cooperatively and we had the cooperation of the State legislature and State government generally. So we know the importance of your work and we compliment you for it.

You may proceed in any way you think appropriate.

STATEMENT OF HON. JAMES GRIFFIN, IOWA STATE SENATOR

Mr. GRIFFIN. Thank you, Senator Clark.

My name is James Griffin. I represent the Fiftieth Senatorial District of the State of Iowa which basically composes the majority area of Council Bluffs, but it does not include the Lake Manawa proper itself.

I am starting my eighth legislative session soon. I have served in the past on the Appropriations Subcommittee for Conservation, have been somewhat close to it.

I would like to commend you Senator Clark and Senator Culver for bringing your public hearing to our great southwest Iowa where we have much to offer. It is my understanding that this is basically the first public hearing of this sort in modern history of Iowa in this community. So speaking for the constituents of my community, we thank you for coming here.

My remarks, I would like to basically point to State government of which I am happy to be involved with and that is this: I hope that the record will show obviously that I support all the efforts toward Lake Manawa of what we have tried to do because in the past, I have been coordinator of the meetings we had in Des Moines and the dinners and things like this.

So there is no question that I certainly support these efforts. I am somewhat concerned and I hope there are some State conservation people here today, that we have much to be thankful for in the past for the commission.

We have a director here, Mr. Jim—his name slips me, but he will never forgive me for forgetting his name—Bixler; Jim Bixler, and Fred Prewert who is the Director of Iowa conservation, who has done a fine job.

But I am somewhat concerned as a State senator—and I am going to express these concerns—that after we passed the test in the Iowa General Assembly about appropriations for Iowa dredging projects members of the conservation staff came to our community and made the remarks at a public meeting that it doesn't look like Lake Manawa is going to get their funds because the Governor is going to veto or item veto the proposed appropriations bill.

The fact of the matter is that the conservation staff man apparently didn't know what he was talking about because that did not happen and it wasn't even close to happening.

We read at later dates that conservation representatives come to our community and say we need another survey from the Corps of Engineers. Now they come back and say we need to do some more work on the dikes.

This concerns me that our own State staff people, and they are dedicated people, have concern that maybe perhaps they are dragging their feet a little bit. I hope they are not because the general assembly has passed not only once, but twice, and we went through conference and we political people, we State legislators and you Federal legislators know what conference committees get down to.

So I am concerned by past actions recently that our State conservation people have continually put up some obstacles or roadblocks that we weren't aware of in the past. I would like to ask at this public hearing through your channels to our State conservation people, give us some better efforts and some concentration so we can move forward.

Thank you.

Senator CLARK. Thank you, very much.

We are going to hear next from State Representative Craig Walter who is also very instrumental in helping to see this legislation through the State legislature.

Craig?

STATEMENT OF HON. CRAIG WALTER, IOWA STATE REPRESENTATIVE

Mr. WALTER. Thank you, Senator Clark.

I would like to thank you and Senator Culver for taking the opportunity to come before this hearing and relate several points concerning the importance of the Federal bill to Council Bluffs.

Briefly, what I wish to do is to relate to you the activities that took place in the Iowa Legislature which brought us to this point today.

In the early part of the 66th Iowa General Assembly, I, along with Senator Lewis Culver started talking about the needs of the recreational facilities in our areas. We discovered that one of the main areas of recreational activity deals with the lakes in our districts.

It provides fishing, swimming, boating, and various other related activities that are so important to the southwest Iowa citizens. With these points in mind, we undertook an investigation of what best could be done in our districts and areas.

After studying the Economic Research Associates and engineering consultant's report and conferring with individuals in both the Manawa and Blue Lake areas which makes up Senator Culver's area, we concluded that to maintain a high quality recreational area, these lakes both needed to be dredged.

According to the report, it seemed in a few short years, Manawa would be a swamp, probably only really good for duck hunters. Senator Culver and I both had companion bills drawn for our respective houses, based upon the study by the Los Angeles firm.

This bill called for a \$700,000 appropriation to Lake Manawa and a \$225,000 appropriation to Blue Lake, to be spent on dredging by the State Conservation Commission

This bill was cosponsored by every southwest Iowa Representative and Senator, along with support throughout the State by other members of the general assembly. This bill was then sent to the respective appropriations committees in both houses where actually very little action was taken upon this measure, the problem being that of a

shortness of funds for natural resources projects such as dredging. Dredging really was not on anyone's list of priorities at that time.

Not wishing to lose a cause we believed in, we decided to attack the problem in a new way. Back in the 65th General Assembly, they appropriated \$100,000 for a dredge study on the Iowa lakes. This study, we have, shows that Lake Manawa is the lake with the greatest need.

At the same time, the legislature also appropriated \$500,000 to be used in dredging of these lakes. That money had not been spent and was just idly sitting there.

The action we then took with the cooperation of leadership in both houses was to include in House File 898 a section which amended the act of the 65th General Assembly by tying down the \$500,000 to make it contingent upon receiving matching Federal funds for dredging.

Iowa's \$500,000, plus the Federal money, will enable Lake Manawa to get started with the needed work. Of course, it will take millions of dollars, but we figured this was seed money and a start in the right direction.

I would like to make it known that without the help of men like Ken Bedwell who supplied the needed energy for this task, the Chamber of Commerce which hosted various functions to inform other officials of our need in southwest Iowa, and the officials of Council Bluffs who supplied their talents to this project, along with the total support of all southwest Iowa elected officials, we couldn't have completed our goal.

Several attempts were made in both houses to eliminate the Federal matching funds provision, but because of our united efforts and firm commitment that we would be able to receive the Federal matching funds, we were able to hang onto our \$500,000.

What we need now is your total effort in helping us to keep our commitment by passing the Federal Manawa dredging bill. Southwest Iowa, I believe is on the move and I think that is proven by your attendance today in sharing our concern.

Thank you.

Senator CLARK. We thank you, very much, and we pledge to both of you that we will do our very best to get this legislation passed as you have successfully done.

Thank you.

We are in receipt of three letters, one from Majority Leader George Kinley of the Iowa Senate, the second from State Senator Louis Culver, and the third from Representative Emil Pavich of the Iowa House. They will be entered at this point in the record.

[The letters follow:]



GEORGE R. KINLEY
STATE SENATOR
POLK COUNTY
STATE HOUSE
DES MOINES, IOWA 50319

HOME ADDRESS
5006 S.W. 18TH STREET
DES MOINES, IOWA 50315

The Senate
STATE OF IOWA
Sixty-Sixth General Assembly
STATE HOUSE
Des Moines, Iowa 50319

SENATE MAJORITY LEADER
COMMITTEES

LABOR AND INDUSTRIAL RELATIONS
RULES AND ADMINISTRATION
STATE GOVERNMENT
WAYS AND MEANS

September 26, 1975

Senator Clark, Cluver and
Members of the Committee

During the 65th General Assembly Iowas' Legislators appropriated \$500,000 for state lake dredging purposes. \$100,000 of this sum was designated to study the many state lakes and to determine which lakes should have priority use of the remaining \$500,000. The study, when completed and presented to the 66th G.A. placed the Western Iowa Lakes of Manawa and Blue at the top of the lake dredging list.

However as the legislature was digesting the study prepared by Economics Research Associates the Conservation Commission was discussing the possibility of transferring the \$500,000 into a non dredging project.

At the insistance of Southwest Iowa Legislators Senator Louis Culver, and Representatives' Craig Walter and Emmel Pavich the Democratic Majority in the Iowa legislature protected the dredging funds by extending the revision clause till June 1979 and provided the monies could only be used where Federal matching Funds were available.

We in the Iowa legislature have taken a positive step forward in providing Funds to reclaim our state lakes. A commitment by the U.S. Congress for current and future matching funds could start a Federal-State partnership toward protecting our natural resources.

Senator George Kinley
Majority Leader of the Senate

ce

LOUIS P. CULVER
 STATE SENATOR
Twenty-Seventh District
 HOME ADDRESS
 Box 27
 DUNLAP, IOWA 51529



The Senate
 STATE OF IOWA
Sixty-Sixth General Assembly
 STATE HOUSE
 Des Moines, Iowa 50319

COMMITTEES

- APPROPRIATIONS
- ENERGY*
- NATURAL RESOURCES
- WAYS AND MEANS
- APPROPRIATIONS,
 SUBCOMMITTEE ON HUMAN RESOURCES
- *RANKING MEMBER

As a member of the 66th Iowa General Assembly it was my pleasure to be active in setting aside \$500,000 for the dredging of Iowas State Lakes. As a legislator from South West Iowa I was naturally interested in seeing these funds used in the Western part of our state.

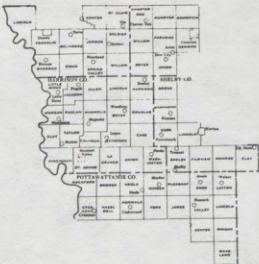
I am especially pleased to see this committee taking an active interest in Western Iowas Lakes

\$500,000 regretablely is only a "small part of the vast sums necessary to clean up all lakes in the state.

That is why the success of a Federal-State pilot project in Western Iowa could provide the motavation necessary to begin a partnership of protecting our Natural Resources.

Louis P. Culver
 State Senator---Dunlap

ce



SENATORIAL DISTRICT 27



EMIL S. PAVICH
STATE REPRESENTATIVE
Ninety-Ninth District

HOME ADDRESS
1706 - 15TH AVENUE
COUNCIL BLUFFS, IOWA 51501
PHONE: XXXXXXXXXXXXXXX

House of Representatives

STATE OF IOWA
Sixty-Sixth General Assembly
STATE HOUSE
Des Moines, Iowa 50319

COMMITTEES

LABOR AND INDUSTRIAL RELATIONS
TRANSPORTATION
WAYS AND MEANS

September 24, 1975

Senator Richard Clark;
Senator John Culver

Statement in Support of Lake Manawa Dredging Project:

I would like to lend my support to the effort to obtain Federal Funds for the dredging of Lake Manawa in Council Bluffs, Iowa.

Lake Manawa is a natural resource that is in short supply in both Southwest Iowa and Southeast Nebraska and as a result literally tens of thousands of people use this lake since this area has a limited number of lake facilities. This Lake has a tremendous historical heritage and in this Bi-Centennial year we should try to preserve and upgrade our historical resources. The Lake Manawa area during its golden years was recreational mecca for many people and this particular place is rich in local lore and history.

The citizens of this area have shown the need for this recreational area by their use and support of its facilities and I certainly hope that the Congress of the United States will appropriate funds to preserve and protect this priceless asset.

State Representative
Emil S. Pavich
Emil S. Pavich
District 99, Iowa

NOT PRINTED OR MAILED AT GOVERNMENT EXPENSE

Senator CLARK. We are going to hear next from a very important witness, from the Iowa Conservation Commission, Don Brazelton.

Don, will you come on up?

I would like to ask the other witnesses who are going to be testifying who submitted their testimony, the people who are going to testify there, I have a list of some 28 witnesses, to please come up and register at the table at my left here.

I see Rob Hubler over there; there are others. I know next on the list, we have the representative from the Nebraska Game and Park Commission, and then Dr. Dugal and Tom Pesek, and others.

All of those people and anyone else whose names we have here to testify, please come on over to the table and register. We are, because of the number of witnesses, limiting the time to 5 minutes in which to testify, so we are sure that everyone gets an opportunity to talk that wishes to.

Don, you proceed in any way you think appropriate.

STATEMENT OF DON BRAZELTON, IOWA CONSERVATION COMMISSION

Mr. BRAZELTON. Thank you, Senator Clark.

This statement will be brief and relate to factual conditions on this subject. Included for record in this hearing are two documents. The first is "A Natural Dredging Evaluation Report"¹ prepared by the staff of the commission, completed in June 1973, and the second is "A Preliminary Study of Dredging Programs, Benefits, Costs and Effects for Eight Iowa Lakes"¹ prepared by Economic Research Associates and completed in December 1974.

The first document provides a brief background on dredging history in the commission and provides a method for analyzing on an economic basis the recreational benefits to be derived from dredging. This report served as the background document for the current commission position on dredging as adopted July 10, 1973.

This position is as follows:

1. Use of the evaluation procedure as the initial step in determining priority of dredging projects with a maximum of 35 cents per weighted potential recreation user day as a guideline for determining projects to be evaluated in detail.

2. The Upper Gar, East Okoboji Lake dredging project be carried out as outlined under the following conditions:

(a) The final analysis shows alternatives to be more expensive than dredging.

(b) That dredging can provide recreational opportunities at a cost less than 35 cents per weighted potential recreation user day.

3. No other lake project evaluated to date should be proposed for dredging.

Subsequent to this position, the Iowa Legislature in the 1974 regular session of the 65th General Assembly, passed chapter 1026, section 3, as follows:

SEC. 3. From funds appropriated by section 1 of this Act, not less than \$500,000 shall be set aside for use for dredging and an additional \$100,000 shall be used to contract for an independent study of the feasibility and economics of dredging all

¹ Retained in Committee files.

lakes especially including Black Hawk Lake, Blue Lake, Silver Lake, and Five Island Lake.

The funds have been set aside and the study has been completed for the legislature through the commission. For entry into the records is the second document. The report provides detailed considerations on eight specific lakes in Iowa including oxbow lakes along the Missouri River, glaciated natural lakes, and artificial lakes.

The commission in its budget have not included any request for State funds for dredging due to the number and magnitude of financial needs having a higher priority than dredging. These include operation and maintenance funding, improvements to existing outdated and outmoded facilities and areas, open space acquisition, completion of existing lake projects and provision of access to State rivers and lakes totaling over \$30 million for 1975-77 and over \$20 million for 1977-79.

Specifically with regard to Lake Manawa, in October 1974, the commission retained a consulting firm to develop a master redevelopment plan for the lake. A number of public meetings have been held during the development of this plan. It is currently in the final stages and will shortly be presented to the commission for approval. The plan is not dependent upon the dredging of Lake Manawa.

It does, however, accommodate the possibility of dredging in terms of land acquisition needs, disposal area requirements, and facility location. Past studies conducted by the commission indicate that due to its location near Omaha, Lake Manawa had the highest nonresident usage of any State recreation area in Iowa.

Endorsement by the commission of a dredging program specifically for Lake Manawa will be reserved until a detailed engineering and environmental study is completed. In any event, the immediate water quality problems associated with Lake Manawa must be rectified before proceeding with any dredging efforts.

The costs associated with correcting the water quality problems may be substantial. Because of the extremely high costs associated with dredging, particularly in terms of recreational benefits derived, it is feared that a Federal program requiring matching funds will jeopardize the other priority needs of the conservation commission in terms of potential appropriations by the State legislature.

The authorization for the Corps of Engineers to carry out dredging on the oxbow lakes of the Missouri River could indeed be of assistance, not only for Lake Manawa, but also for the Winnebago and Snyder Bend area south of Sioux City.

Winnebago Lake received extremely heavy sedimentation due to winter reservoir operations. Excessive reservoir releases caused subsequent ice jams, which resulted in the backup of water, and subsequent sedimentation.

In the case of Snyder Lake, river degradation—lowering of the river bottom—has been accelerated due to the presence of the main stem reservoirs, controlled release rates, and river channelization. It was the commission's intent to develop the Winnebago-Snyder Bend area into a much needed major water-based recreation facility for the region.

To this end, a plan was developed and the project was budgeted. The project has been halted as a result of both sedimentation and

degradation until the Corps of Engineers will accept responsibility for correcting the situation.

In some situations, dredging alone will not resolve the problem due to the fact that the water supply to the lake has been affected by degradation of the river and subsequent lowering of the ground water table.

Many of the oxbow lakes are dependent upon the ground water for their water supply which in turn is directly related to the river levels. Consequently, additional water sources need to be developed for maintenance of lake levels.

An additional factor is that recent news articles have made reference to a dredging cost of \$3.7 million. This figure is not accurate in that it does not encompass all related costs and as contained in the December 1974 dredging study. The cost estimate in that study is \$8.7 million based on 1974 figures.

In summary, the issues related to a dredging program are indeed complex and should not be dealt with on a separate basis or isolated from all the factors that must be considered.

Each lake must be evaluated on its own merits. The State and local governments do not in any manner accept responsibility for the problems affecting these lakes.

In every situation, the responsibility can be directed to the Corps of Engineers in terms of man-attempted manipulation of a natural river, therefore, non-Federal interests should not be required to match the costs of any potential project.

The reservoir development and river channelization of the Missouri River are federally sponsored projects which, without question, have been and continue to be the principal cause of water supply or sedimentation problems associated with the Missouri River oxbow lakes.

In regard to the aspect of the grading of a river, a continuing monitoring and evaluation system should be established to provide verification of the change, the rate of change to the river bottom, and corresponding effects on adjacent lands and waters.

The Federal Government must accept 100 percent responsibility for the corrective measures, not 50 percent.

Senator CULVER. Thank you very much for your statement, Mr. Brazelton. I think it is already apparent from the testimony the committee has entertained this morning that we are talking about dollar figures which are essentially mind-boggling, if we want to be honest about it, in terms of the total State requirements in that area, whether the obligation is assumed by the Federal Government, State government, shared not only in terms of the immediate costs of dredging activity but the long term maintenance and operation responsibilities as well.

Mr. Brazelton, you undoubtedly have had an opportunity to either hear the Corps of Engineers address themselves to this particular proposal or to read their statement.

It is interesting, of course, that what we have here is a contradiction, the extent to which the Corps is saying that this is a project which is a single purpose recreation project unrelated to any Corps work.

In addition, this project has not been subjected to any Federal study as to engineering.

The Corps acknowledges that they probably aren't in a position to make that finding as far as its independence is concerned in the absence of a study or a survey, and admits that they really are not in possession of factual information with regard to subsurface recharge sources or even the flooding aspects from the Missouri River.

You, on the other hand, categorically suggest in your statement that these are federally sponsored projects, man-made alterations of the natural environmental balance, to quote you, "which without question have been and continue to be the principal cause of water supply or sedimentation problems associated with the Missouri River oxbow lakes."

Can you scientifically and objectively document your statement that the river channelization continues to be the principal cause of the river sedimentation problems of oxbow lakes?

Mr. BRAZELTON. In reference to this, the problems that were mentioned in the statement concerning the Snyder-Winnebago areas of last winter are noted.

In reference specifically to Lake Manawa, the Corps statement is correct in that the Missouri River has not transgressed over or deposited any sediment load in Lake Manawa since the construction of the levees.

Senator CULVER. What about the question of subsurface recharge?

Mr. BRAZELTON. This is one area where the commission feels there is a need for intense investigation, the river degradation is noted with several soundings that have been undertaken, by various commission staff members. The lowering of the water table has been noted and further scouring is occurring along the banks and bottom of the river channel.

Senator CULVER. So you are really essentially agreeing with the Corps in terms of this specific location that it is impossible in the absence of a survey aimed at that question to really scientifically with confidence make a judgment on that?

Mr. BRAZELTON. That is correct. There can be many guesses made.

Senator CULVER. Right now you are both guessing?

Mr. BRAZELTON. That is correct.

Senator CULVER. You mentioned problems of Winnebago Lake and Snyder Lake due to winter reservoir operations and I quote from your statement, "due to the presence of the main stem reservoirs, controlled release rates, and river channelization."

Are these problems caused by Corps of Engineers reservoirs and other activities and, if so, what structures or activities in particular would you cite?

Mr. BRAZELTON. The Gavins Point main stem dam is one of the areas that has multiple effects upon the river itself. Once water is held within the reservoir, it clarifies by dropping out its sediment load. Once water is released from the dam, it picks up this sediment load to retain its natural equilibrium and, as a result, a loss of the side banks and bottom through the scouring process occurs.

Senator CULVER. Finally, in terms of the money figures and amounts that you cited in the priority requirements of the Iowa Conservation Commission, this \$9 million figure that we made reference to, essentially \$8.7 when you include the operation, maintenance, and so on, it even goes up further.

Are you suggesting that the bill be amended to require total Federal payment for the entire project? Do you see no way the State can participate in a meaningful way in dredging operations?

Mr. BRAZELTON. That is our recommendation. The aspect of State funding is quite apparent through the previous talks by the area legislators. We feel that the costs, due to the total aspects of the priorities of the conservation commission on a statewide basis, would put dredging at a low position on our priority list.

We have many other projects across the State that are in need of funding presently and within our present budget requirements find that dredging itself would rank very low on this priority list.

Senator CULVER. So you think that it is imperative to establish this Federal nexus of responsibility, as well as legal authority, to assume this obligation if we are going to do something in the oxbow lake area?

Mr. BRAZELTON. This is correct.

Senator CULVER. Senator Clark?

Senator CLARK. Thank you very much. Just two or three questions about the State's responsibility. What percentage of the lakeshore is now owned by the State of Iowa?

Mr. BRAZELTON. Technically, the State owns the entire shoreline to the ordinary high water mark and the public has access rights to the entire shoreline. Access to this shoreline is restricted on approximately 20 percent of the lake by private shoreline cottages.

Senator CLARK. What percentage of that is open to the public at the present time? All of it?

Mr. BRAZELTON. That is correct.

Senator CLARK. While the cost-sharing mandated in the Senate bill, S. 1799, is in line with the Federal Water Project Recreation Act, that particular act, Federal act, does require that non-Federal public bodies bear all the costs of operation and maintenance. Is the State of Iowa willing to incur any part of that responsibility?

Mr. BRAZELTON. Yes; for operation and maintenance.

Senator CLARK. For operation and maintenance of the entire State park area, shoreline?

Mr. BRAZELTON. That is correct.

Senator CLARK. Good.

Public Law 89-72 also requires full consideration of opportunities for fish and wildlife enhancement in any investigation of projects under the act. Has such consideration been given in this particular case?

Mr. BRAZELTON. Yes; in the redevelopment master plans we have taken into consideration the recreational needs of all interested parties, one being fisheries needs. As far as wildlife goes, there has not been historically a great deal of hunting in this area. Under Iowa laws, a State park is classified as a refuge where no hunting is allowed, although waterfowl hunting may legally occur on the water body itself.

Senator CLARK. Last, has the conservation commission made any estimate of how long it will be before dredging of Lake Manawa will be necessary, again, if it is done at this time?

Mr. BRAZELTON. None, other than what has been referred to in the Economic Research Associates study.

Senator CLARK. Thank you very much.

Senator CULVER. Thank you very much. We may also like to have the opportunity, after we review your statement a little more carefully, to submit some additional questions in writing for you to respond to if you would, to round out our hearing record.

Mr. BRAZELTON. Yes; I will.

Senator CULVER. Thank you very much.

[Questions submitted to Mr. Brazelton, responses, and supplemental information follow:]

QUESTIONS SUBMITTED TO MR. BRAZELTON

1. You state that the immediate water quality problems associated with Lake Manawa must be rectified before proceeding with any dredging.

Can you detail for us precisely what the water quality problems of the lake are?

2. You also state that the sole responsibility for the problems of the Oxbow Lakes lies with the Corps of Engineers because of the reservoir development and channelization of the Missouri River. As such, you believe that non-Federal interests should not be required to bear any portion of the costs of projects built to alleviate the problems.

Do you agree with the Corps that no major flooding has deposited sediment in Lake Manawa since the 1952 flood? And that a major reason for the lack of sedimentation since that time has been the construction of Corps levees? Would you not agree that, therefore, certain Corps activities have served to prevent further deterioration of the lake?

3. You testified that about 60 percent of the Manawa shoreline is State owned, and that all of this area is open to the public. Do you anticipate that, should the project be built, all of this 60 percent will remain open to the public, or is there some thought that public access may be limited as provided in S. 1799?



CONSERVATION COMMISSION

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October 31, 1975

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The Honorable John C. Culver
United States Senate
Committee on Public Works
Washington, D. C. 20510


Dear Senator Culver:

Enclosed please find supplemental background information in regard to your Water Resources Subcommittee hearing in Council Bluffs on S. 1799. Information includes: 1971 correspondence concerning damage to the Winnebago-Snyder Complex; a 1974 report entitled 'Missouri River Oxbow Areas' by Gerald Jauron, Waters Section, Iowa Conservation Commission; 1975 correspondence from the Corps of Engineers to Iowa Public Service Company; and 1975 correspondence from the Iowa Conservation Commission to the Missouri River Basin Commission. I have also requested the Missouri Department of Conservation send me a copy of their 1974 report entitled 'Changes in the Channel of Lower Missouri River and Effects on Fish and Wildlife'. I will forward this copy to the Public Works Committee once the document is in my receipt.

In response to your letter of October 22, the following information is provided:

Question 1. The water quality problem in Lake Manawa is a combination and compilation of several factors. These factors include but may not be limited to nutrient levels, surface and subsurface aquatic growth and turbidity. To a recreation user, the cumulative effects of these problems may cause a reduction of enjoyment in his or her recreational experience. This may be due to weed-choked fishing and boating areas, unpleasant odors, aesthetic visual degradation, growth reduction of sight feeding game fish species, and a higher proportion of carp which adds to the turbidity problem.

Question 2a. The Iowa Conservation Commission believes that Corps of Engineers should be financially responsible for problems of Missouri River Oxbow Lakes caused by the Corps' reservoir development and channelization projects.

Outdoor IOWA  a place to enjoy

Question 2b. No major flooding from the Missouri River has deposited sediment in Lake Manawa since the construction of the Council Bluffs levee system and that this Corps construction has helped prevent further deterioration of the lake. The Conservation Commission believes that if similar protection had been afforded other Missouri River Oxbow Lakes the lack of recreational water in western Iowa would have been less critical. Gerald Jauron, Missouri River Supervisor, has provided the following information on Missouri River problems:

High water of April 4, 5, and 6, 1960, resulted in the 50% siltation of Dakota, Omadi, Snyder Monona, Blackburn, Teville, Sandy Point, Tyson Bend and California Bend cutoff oxbows.

River bottom degradation and siltation due to inadequate levee construction, high water and ice and log jams have resulted in the reduction of water at Rabbit Island from 150A to 20A, at Monona from 225A to 25A, at Blackburn from 420A to 125A, at Middle Decatur Bend from 750A to 150A, at Louisville Bend from 960A to 200A, at Tyson Bend from 600A to 20A, at California Bend from 500A to 50A, and various other areas from 50% to 90% silted in.

Meetings in the early 1960's between the staffs of the Conservation Commission, the Corps of Engineers, and Iowa's Congressman Jensen tried to solve some of the problems of Iowa's Missouri River Oxbow Lakes. In 1962, the Iowa Conservation Commission passed a resolution to request the Corps to implement levee design changes which would prohibit siltation of the oxbow cutoffs, but no action was taken by the Corps.

The Conservation Commission is now concerned about the effects that the Missouri River bottom degradation will have upon Lake Manawa as in the other oxbow lakes. The efforts to keep a stable water elevation in the lake through the Mosquito Creek diversion may further add to the water quality problems if greater amounts of water are required in the future. At some point in time, this remedial action may prove to be futile unless river degradation can be halted.

Question 3. With deference to my September 27 testimony, I wish to make a correction. Technically, the entire shoreline of Lake Manawa is owned by Iowa to the ordinary high water mark. Public access is somewhat restricted on approximately 20% of the lake where private cottages are located on the shoreline. This fact does not legally restrict this shoreline for public use, but realistically little public use occurs in this area.

If you require any further information, please feel free to contact my office.

Sincerely,

Don E. Brazelton
Don E. Brazelton
Outdoor Recreation Planner

DEB:rt

May 11, 1971

Colonel Billy Pendergast, District Engineer
U. S. Army Corps of Engineers, Omaha District
Federal Building
Omaha, Nebraska

Dear Colonel Pendergast;

The Conservation Commission at their meeting on May 4, 1971, passed the following motion. A motion was made by Mr. Bixler instructing the Director to request the U. S. Army Corps of Engineers personnel to meet with the Conservation Commission at their regular meeting in Des Moines, on June 1, 1971, relative to the Winnebago Snyder Complex, seconded by Mr. Weinheimer - passed.

This matter pertains to the damage done to the complex when the levee broke at the north end of the Snyder Bend during the high water and the ice breakup this spring. There was an extensive deposit of debris and silt over the complex area which presents a real problem.

Our staff has made an on-the-ground inspection of the area and some questions have arisen as to whether the recreational development of the complex is feasible unless some cleanup action is planned. Will the levee be replaced? Has the Corps of Engineers made an evaluation of the area? These questions and others will need answers.

Normally 11:00 a.m. or 1:00 p.m. are the best times for organizations to appear. We hope either of these times will be satisfactory with your personnel. Should you have any questions, please feel free to call me.

Sincerely yours,

Fred A. Prievert, Director
State Conservation Commission

FAP/JMS/pam
cc: Commissioners

INTER DEPARTMENTAL COMMUNICATION

(PLEASE CONFINE TO ONE SUBJECT)

STATE CONSERVATION COMMISSION - DES MOINES, IOWA

TO Fred A. Prierwert, Director DATE April 28, 1971FROM John M. Stokes, Chief, L & W

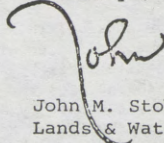
SUBJECT: Item 11 - Agenda

Dear Fred;

Attached is a report from Roy Downing, Supt. of Waters explaining the damage done to the Winnebago-Snyder Complex when the levee broke at the north end of Winnebago. It points up what happens when man tries to tame a river.

Our recommendation is for the Director to request the U. S. Army Corps of Engineers personnel to appear at the June meeting to discuss what will be done as far as clean-up and to determine if the complex still offers recreational development possibilities after this extensive damage. We recommend Commission approval of this recommendation.

As always,

John M. Stokes, Chief
Lands & Waters DivisionJMS/pam
Attachment
cc: Press
Commissioners*File Copy*

INTER DEPARTMENTAL COMMUNICATION

(PLEASE CONFINE TO ONE SUBJECT)

STATE CONSERVATION COMMISSION - DES MOINES, IOWA

TO John M. StokesDATE April 15, 1971FROM Roy L. DowningSUBJECT : Winnebago-Snyder

Yesterday, April 14, I met with Jerry Jauron and made an on-the-site inspection of the damage caused to the Winnebago-Snyder area by the unexpected ice breakup resulting in the ice jam and high water over these areas.

The recreation potential of this area was virtually destroyed. There is acre after acre of debris, including literally hundreds of piles from the Corps' revetment dikes. Where people were water-skiing last year, we now have mounds of dirt extending 3 to 6 feet above the surface of the water. It appears that there was heavy siltation in Snyder Lake, with the majority of the debris going into Winnebago Lake, along with the major deposits of silt. On the shore, there still remain large slabs of ice covered by the tons of silt which they carried into the area.

I could not believe what I saw and I find it impossible to adequately describe the devastation. I hope you will be able to view this personally in the near future.

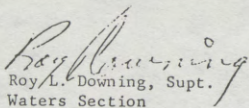
At this time, the cause of this massive ice jam is not clear. The River was and remained frozen with a solid ice cover below this area for several days after this breakup. Some say the breakup was caused by increased discharge from the Corps impoundment upstream; others indicate that it was caused by an increased flow from tributaries upstream and below the Gavins Point impoundment. Perhaps the Corps can give us their views in this regard.

I have asked Jerry to check other recreation areas along the Missouri River to determine their condition and report to this office.

It is suggested that we have a meeting of interested staff to determine our course of action, and at the same time request a meeting with the Corps of Engineers. I personally feel that the Corps should accept some of the responsibility and consider mitigation of general recreation losses to the State of Iowa; and, not only restore the area, but consider providing safeguards to keep this from happening in the future. Due to the channelization by the Corps, we automatically lose the benefits of the wide meandering stream which existed prior to the project and we suffer the losses by situations such as this - and this should not be. If necessary we should arrange a tour for our legislators at both the State and National level and request that Congress give due consideration to our problem.

At the same time, it is quite urgent that a decision be made on the Winnebago-Snyder Recreation Complex project.

Thanks in advance for your consideration of this matter.


Roy L. Downing, Supt.
Waters Section

ne

July 16, 1975

Mr. John Neuberger, Chairman
Missouri River Basin Commission
Suite 403
10050 Regency Circle
Omaha, Nebraska - 68114

Dear John;

The degradation of the Missouri River is a concern to Iowa. Following are a few of the concerns which have been brought to our attention.

1. The Sioux City Marina has expressed river access problems.
2. Many oxbows on the Iowa floodplain are public property. The specific boundaries are unknown, however the water levels maintained in them has prohibited encroachment. We anticipate a lowering of the water levels as a result of this degradation.
3. The effects on future economic as well as recreational developments should be considered in the near future.
4. There are differences in public and private land ownership between adjacent states.

It appears appropriate to discuss these and other issues at the August meeting.

Sincerely,

William C. Brabham
Deputy Director

WCB/pam
cc: Priedwert



DEPARTMENT OF THE ARMY
MISSOURI RIVER DIVISION, CORPS OF ENGINEERS
P. O. BOX 103, DOWNTOWN STATION
OMAHA, NEBRASKA 68101

MRDED-TH

27 February 1975

Mr. Warren S. Kane
Vice President
Iowa Public Service Company
Orpheum Electric Building
Sioux City, Iowa 51101

Dear Mr. Kane:

This letter is pursuant to your 21 February 1975 visit with Messrs. McClendon, Carlson, and Mellema of this office requesting information on future Missouri River flows and degradation trends in the vicinity of your powerplant south of Sioux City, Iowa. As discussed with you, significant changes in the stage discharge relationship at the Sioux City gage have occurred over the past 15-20 years. Unfortunately, the majority of the streamflow data collected at this station does not extend down to the low flows at which you are interested and where you might encounter problems.

It is our understanding from the discussions at the above-referenced meeting that your two existing powerplants and the plant which is under construction have the same intake level and that one of the existing units was inoperable due to inability to pump cooling water during the low river stages of 11-13 January 1975. USGS estimates of discharges during this period ranged from 8,000 to 11,000 cfs even though our releases from Gavins Point Dam were held constant at 17,000 cfs during the period. Therefore, a continuing degradation trend, flow reductions due to ice jams, or the necessity of reducing upstream reservoir releases during future drought periods, could require remedial measures for satisfactory operation of your plants.

The future outlook for streamflows in the Missouri River below Gavins Point is presented in the report on the "Main Stem Reservoir Regulation Studies, Series 1-74," a copy of which was furnished you at the meeting. This exploratory study presents data for 14 different levels of possible upstream water use. Although the length and severity of possible downstream low flow periods vary from study to study, all studies envision the necessity to reduce Gavins Point releases to about 6,000 cfs during future drought periods.

Insofar as degradation trends are concerned, I have included a table, Inclosure 1, showing the stage at the Sioux City gage over the past 12 years for a range of experienced discharges. The values are based on recorded stages and measured flows obtained by the USGS and represent the low side of the envelope of measurements for a given year. This is not the same chart that we showed you which depicted average stages; this chart is also inclosed as Inclosure 5. Actual stage for a given year may vary as much as 2 feet above these values for any given measurement. These gage heights can be converted to MSL by adding 1057.0 feet. The chart shows that the river stages have dropped about 6 feet since 1963 at discharges of 20,000 cfs and about 5 feet at discharges of 30,000 cfs. Although reliable information is sparse at discharges of 10,000 cfs or less, we would expect that stage reductions may have been greater for low discharges. Of significance, however, is an apparent leveling off of the downward trends since 1971 in the 20,000 to 30,000 cfs level. We are not certain if this same trend is true for flows lower than these since no discharges were observed in this range.

In addition to the above, we have evaluated some field data collected in a reach of the river between the Sioux City bridge and the mouth of the Floyd River. Although your intake is not in this reach, the trends observed there may lend some insight into what is happening throughout this general area. Inclosures 2, 3, and 4 show this data.

Inclosure 2 shows the gross cross section area of the channel below a fixed reference elevation for the 1967-74 period. A considerable change in the area below this plane can be noted in the 1967-71 period with little change indicated since 1971. Inclosure 3 shows trends in the channel thalweg and the average depth below the same reference plane, both indicating about a 4-foot drop in the 7-year period.

Inclosure 4 shows historical cross sections at river mile 731.7 and illustrates what is happening to the channel in this area. The outside of the bend (left bank) is progressively scouring deeper, whereas the inside (right bank) is filling in with sediment deposits. This deep channel along the outside of bends is typical and is encouraged to a large degree through the installation of our navigation channel control structures and is necessary for the development of continuous 9' x 300' navigation channel. The deposition along the inside of the bends, however, is not necessarily encouraged, and the levels to which it accumulates are largely related to the sequence of flows and heights of structures existing along the insides of the bends. A long sequence of high flows and corresponding high velocities may keep more of this material in suspension, whereas low flows would have the opposite effect.

Although there are some indications that the lowering trend might be leveling off, the fact that the thalweg continues to lower, forces us to conclude that the stage trend has not bottomed out and new record low stages can be expected. From a construction point of view, we have no plans for major additions or revisions in the structural arrangement or alignment in this reach of the river and should make for a more stable situation. In addition, we have noted a gradual coarsening of the material making up the bed of the stream, which indicates an increased degree of stability; however, this in itself is not considered to be sufficient to inhibit scour at high flows.

In our opinion, the biggest factor influencing the future rate of channel degradation will be the sequence of hydrologic events both above and below the system of main stem dams. Excessive runoff above Gavins Point may necessitate high releases for long periods of time, thus tending to accelerate the scouring action and providing little in the way of replacement sediment. Floods from streams like the Big Sioux and Floyd could have an opposite effect, by providing above normal sediment loads, thus tending to build up the bed levels. Because of the probability of events, however, the former will probably occur on more frequent intervals than the latter; therefore, we would expect a continued lowering of the bed.

The level at which the bed of the stream might stabilize is a matter of conjecture; however, based on data available at this time, additional degradation of 5 feet or more appears to be realistic, and we would certainly recommend that as a minimum your water intake be designed to operate under these conditions. However, because of the large degree of uncertainty in projections of this nature, we would think it to be in your best interest to build a maximum degree of flexibility into the structure, taking into account not only potential lowering of the bed, but possibly means for using water from the upper levels of the flow at times of high flow in order to minimize sediments entering into your system.

The amount of time necessary for a major river system such as the Missouri to respond to major changes in alignment, cross section, slope, and runoff characteristics is measured in tens of years, and what we are experiencing is the result of all of the above factors. We are continuing to monitor the system; and as we gain additional information, we will be in a better position to make projections.

I trust that this information will be of assistance to you. Please contact us if we can be of further assistance.

Sincerely yours,

Kimball C. Hoop
for LLOYD A. DUSCHA
Chief, Engineering Division

5 Incls
as stated

MISSOURI RIVER OXBOW AREAS

This report covers the areas from Sioux City to Hamburg on and adjacent to the Missouri River. The following areas are claimed or owned by the State of Iowa.

Starting in approximately 1930, the Corps of Engineers started to realign the Missouri River so that they could control the erosion and stabilize the banks. In approximately 1955, the Corps of Engineers decided to realign this original design channel, and in doing so created a number of the before-mentioned areas.

The first area that was created by the realignment was Dakota Bend. The new designed channel adjacent to Dakota Bend was completed in October of 1958. Here, the Corps of Engineers moved the original design channel approximately one-half to three-quarters of a mile west and in doing so created an approximate 125-acre body of water which was adjacent to the newly designed channel. This body of water existed in its original form until approximately April of 1960 when high waters on the Missouri River silted approximately three-fourths of the area. It has remained as such until the present time.

The next area which is down the river and connected to Dakota Bend to the south is Omadi Bend. This area consists of approximately 250 acres of land and 60 acres of water which was redesigned by the Corps of Engineers in 1958 and a new canal dug to the east of the original design. This area silted in in the 1960 high water, and an emergency levee was later built by the Corps of Engineers to stop further siltation of the said old riverbed.

The next area down the river is Snyder Bend, which, at the time of being cut off by a new canal which was put into use in 1961, was a 500-acre area consisting of about 400 acres of water. In 1960, and again in 1962, high water caused the silting of approximately 300 acres of this area. The 1960 high water was caused by upstream releases, and the 1962 high water was caused by the ice jam which caused the water to raise up and silt the area. In approximately 1965, the Woodbury County Conservation Board started construction of an access area, camping area, and recreational area on the

north shore of Snyder Bend. Because of erosion of the bed of the Missouri River and the reduction in the water flow, this area has been non-usable in 1973 and 1974 because of insufficient water to flood the area. The Woodbury County Conservation Board development on the north shore of Snyder Bend consists of two boat ramps, concession stand, shelterhouse, latrine, recreational areas, parking lots, camping areas, wells, etc.

The next area down the river is Winnebago Bend which is approximately 1,050 acres in size. The river was placed in its designed channel originally in 1943. It escaped from this designed channel in 1949, and was placed back in its original channel in 1962. At the time of it being placed back in its original channel, the 1,050 acres consisted of approximately 750 acres of water and 300 acres of land. The average depth of this water was approximately six feet. Because of the high water in 1960 and again in 1963 and the breaching of temporary levee in 1972 by high water, ice jam, etc., this water area has been reduced to approximately 150 acres. This 150 acres has a water depth average of approximately two and one-half to three feet. When the emergency levee was broken in the spring of 1972, a great deal of debris from upriver entered the north or the upriver end of Winnebago area proper. This debris is of great concern because it consists of large trees, snags, piling clumps, and other debris that floats in the Missouri River. The Snyder-Winnebago area has been designed to be improved as a recreational complex by the Corps of Engineers and the State of Iowa. Certainly a great deal of cleanup and dredging will have to take place before these silted areas can be used for water recreation.

The next area owned by the State of Iowa is Rabbit Island which at the time of the completion of the new canal in 1962 consisted of approximately 140 acres of water. By high water and ice jams, this 140-acre area has been reduced to approximately 20 acres.

The next area is the Monona Slough downriver (mile post 762) that came into being in June 1957, and since this time the water area has been reduced to approximately 15 acres in size.

Monona Bend in 1957 when the river was moved to its new design channel consisted of approximately 225 acres of water. By bottom erosion of the Missouri River and siltation of the water area, it now only consists of 25 acres of water.

The next area down the river is Blackbird Bend. It was put into the new canal west of the originally-designed channel in 1957. At this time, the water area was approximately 420 acres in size. Because of the high water in 1960 and again in 1962 and again in the early 1970's when it broke the emergency levee at the upper end, this water area has been reduced to approximately 125 acres.

Ivy Island, which is adjacent to Blackbird Bend to the south, consists of 125 acres. The old canal behind Ivy Island which permitted water from Blackbird Bend to enter Tieville Bend has silted up by the high waters in 1960 and 1962 and in the 1970's. Because of this siltation, no water can travel from Blackbird Bend into Tieville Bend. An emergency levee was placed on Tieville Bend to keep the Missouri River water from entering and further siltation in approximately 1964.

Upper Decatur Bend is part of the Tieville complex. In 1960 and again in 1962 before the placing of the emergency levee, this area silted considerable and approximately three-fourths of the original Tieville-Upper Decatur water area was silted in. The emergency levee protecting this area has not been broken or topped since it was put in place. In 1974, the Conservation Commission constructed at this site a boat ramp, parking lots, latrines, etc., both into the Missouri River and into Upper Decatur Lake.

Middle Decatur, downriver from Upper Decatur, was created by a new canal which was put in operation in 1961. At the time of the opening of the new canal, Middle Decatur Lake was approximately 750 to 800 acres in size. Because no attempt was made to save the area prior to the building of the emergency levee in 1964, this water area in Middle Decatur Bend was reduced to about 150 acres. The State Conservation Commission has built an access area to Middle Decatur Lake, and it consists of a boat ramp, latrines, water wells, camping area, etc. This has now been turned over to the

Monona County Conservation Board. Also, besides the area now controlled by the Monona County Conservation Board, the State of Iowa purchased, in 1961, an area at the south end of Middle Decatur Lake, an access area to which a new road was built in the year 1973. Because of the siltation, this south area has never been any more than an access to lower Middle Decatur Lake. Lower Decatur is an area consisting of 100 acres of water and 100 acres of land at the time it was placed in its new design channel in 1962. Since this time, this water area has been silted approximately 90%.

Downriver from Lower Decatur is Louisville Bend. This bend is an Iowa Conservation Commission refuge. At the time of being placed in its new channel in 1964 and 1965, this area was approximately 900 acres of water and 25 acres of land. Because of high water and the failure of the levees to withhold the designed CFS established by the Corps of Engineers, this water area has been reduced in size to the present approximately 200 acres of water. In 1973 and 1974, the Conservation Commission constructed an access, boat ramp, parking area, latrines, etc. to this area. Since the start of the original construction, the outlet to the Missouri River from Louisville Lake has also been silted in caused by breaks in the levee and degradation of the bottom of the Missouri River itself.

The next area on the Missouri River is Deer Island. This area was created as an island in the late 20's and in 1973 and 1974 the Iowa Conservation Commission designed and constructed a boat harbor, boat ramp, latrine, parking area, and a road and because of the lack of water flow in 1974 and supposedly the degradation of the bottom of the Missouri River in the area more work will have to be done to make this boat ramp and harbor workable.

Downriver, Bullard Bend was created by a new canal in 1962. The emergency levee was put in place in 1964, but it was destroyed by high water and the area completely silted. Since the siltation has taken place, the State of Iowa has traded this area to a Nebraska corporation for some timberland adjacent to Louisville Bend.

At Soldier Bend, the river was placed in the new design channel in 1962. At the time of being cut off from said new channels, this area consisted of approximately 450 acres of water. Because of siltation, this water area has been reduced in size to approximately 200 acres.

The Missouri River at Tyson Bend broke out of its design channel in 1945 and created approximately an 1,100-acre body of water. The old design channel was silted and the Missouri River completely flowed through the area. In 1959, the Missouri River was again placed back in its originally-designed channel, and the old oxbow formed because the breakout was then cut off from the designed channel. The water area here at the time was approximately 600 acres. At the present time, this area has been reduced to approximately 20 acres. In 1973 and 1974, the Iowa Conservation Commission constructed an access road, boat ramp, and latrines on the areas so this land area can be used by the public. Because of the lack of water, this ramp will have to be redesigned.

The next area is California Bend. It consisted of approximately 500 acres of water when the river was moved to the new designed canal in 1958. Because of high waters and ice jams, the water in California Bend now covers approximately 50 acres and is of very shallow depth. This area has no public access by land because of the deterioration caused by silting.

Wilson Island. The Iowa Conservation Commission in 1973 and 1974 constructed a boat ramp and parking area adjacent to the old channel to be used by boaters as a slack water area for entrance into the Missouri River proper. Because of the reduced flow and degradation of the bottom, this boat ramp and channel will have to be redesigned.

In 1959, the Conservation Commission took great interest in the new design of the Missouri River which was to be created by the Corps of Engineers. Commission personnel and Commissioners themselves made many trips down the Missouri River to acquaint themselves with the future development of the areas to be cut off by the

Corps of Engineers in redesigning their new channel. Many people of great note made this trip including Mr. and Mrs. Lawrence Rockefeller, Congressmen Holven and Jensen, Governor Erbe when he was Attorney General and later as Governor. Governor Hughes, and in later years Governor Ray also toured the river areas.

The officials of the State of Iowa could see great potential for water-oriented recreational areas along the Missouri River. Their concern was immediately raised because of the way that the Corps of Engineers was stabilizing the banks above and adjacent to these cutoffs. They were greatly alarmed by the lack of protection being placed at the upper end of these cutoffs and immediately contacted the Corps of Engineers about said poor design for the protection and preservation of these oxbows. They were informed it was the intention of the Corps to protect their new design channel from any further erosion and unravelling so they desired that the areas behind these levees be silted in as soon as possible. Much endeavor was made by the Commission and its personnel to have the Corps change this procedure; but to no avail until Congressman Jensen from Iowa was called into the picture and recommended to Colonel Woodbury, then Chief Engineer of the Corps of Engineers in Omaha, that they placed some emergency levees in the upper end of the best oxbows--Omadi, Blackbird, Middle Decatur, Bullard Bend, Snyder, Winnebago, and Tieville. The emergency levees on Omadi, Tieville, and Middle Decatur held. The rest eroded and washed away. No effort was made to replace or repair the ones which were destroyed except at Winnebago.

In 1973 and 1974, because of the low flow of water in the Missouri River plus the possibility of degradation of its bottom, all of its cutoff areas have been reduced to the point that no recreation can take place. If, in the future, these areas ever again attract recreationalists, they will have to be put back in the condition they were in at the time they were cut off by the Corps of Engineers' new designed channel.

Gerald Jauron
July, 1974

CHANGES IN THE CHANNEL OF THE LOWER MISSOURI RIVER

AND EFFECTS ON FISH AND WILDLIFE

BY

JOHN L. FUNK AND JOHN W. ROBINSON

Aquatic Series No. 11

MISSOURI DEPARTMENT OF CONSERVATION

Jefferson City, Missouri

November, 1974

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INTRODUCTION

Radical changes have been impressed upon the surging brown Missouri River in the years since Lewis and Clark threaded their boat up a sprawling river studded with islands and sunken timber. If the explorers of 1804 could return, they would be bewildered in trying to locate any of their river camp sites or landmarks. Much of the danger from caving river banks recorded in their diaries is gone, but to move a keelboat against the swift current of a now-constricted river would be a nightmare of poling and straining at the dreaded *cordelle* (tow rope).

Much of the Missouri's change has been wrought in the present century; it is doubtful even renowned pilots of bygone steamboating days such as Captain Bill Heckman of Hermann could find their way on the river. The "marks" Heckman used are gone. But old river hands would find a deeper channel and less threat of running aground. They might like the "new" river, for many big changes have been made to benefit navigation, though the fish and wildlife that were part of the historical river scene have been greatly diminished by those same changes.

Men have been altering the channel of the Missouri River since the first explorers and fur traders chopped away obstructing snags and tree tops to ease the passage of their keelboats, mackinaws, bullboats, and canoes. "Improvement" of the channel has been a Federal government activity since 1884, first under the Missouri River Commission and, since 1902, under the U.S. Army Corps of Engineers.

This publication was written to document the extent of the changes made in the channel of the Missouri River in the past 90 years, to illustrate the loss of fish and wildlife habitat, and to evaluate these losses in present-day terms.

The Corps of Engineers, Kansas City District, published (undated) a set of maps entitled "75 Years, Comparison of Conditions, Missouri River, Rulo, Nebraska to Mouth, 1879-1954". The publication consisted of an index and 14 maps, each depicting a section of river in the reach referred to in the title. On the individual maps the channel, landmarks, and cultural developments based on surveys made between September 16, 1878 and September 6, 1879 were depicted in red. Superimposed on this in blue were the channel, landmarks and cultural development as they existed in 1954. The set of maps apparently was published to show the Corps' accomplishments in improving the navigability of the river. They also show very graphically what this improvement has cost in lost fish and wildlife habitat.

The superimposed red and blue depictions of the channel show the changes with a certain dramatic force. To measure and evaluate these changes on the original maps, however, becomes hopelessly confusing. Separate tracings were made of the 1879 channel and the 1954 channel, with many extraneous details omitted. These tracings, reduced in scale, are published here. The different measurements from them (Fig. 1) are the basis for most of the statistics given. Information on the changes made since 1954 was obtained by comparing the Corps' hydrographic surveys for 1954 and 1972.

The Kansas City District is responsible for operations on the river from Rulo to the mouth. Since we have worked with this District's publications, we have selected this portion of the River for study. The 55 miles from Rulo to the Missouri-Iowa line, under the jurisdiction of the Omaha District, will not be considered, although similar changes have been made on it.

CHANNEL CHANGES

The Missouri River has been shortened. The distance from Rulo to the mouth was 544 miles in 1879. In 1954 the distance was 514.8 miles; the 1972 hydrographic survey shows Rulo at Mile 498.4. There has been a loss of 45.6 miles of river in the past 93 years, over 8% of the length under consideration, an average of $\frac{1}{2}$ mile per year. The rate of loss apparently has accelerated recently, since 16.4 miles were lost in the 18 years between 1954 and 1972. An average mile of the river in 1954 had a surface area of 138 acres, so over 4,000 acres of water were lost in 75 years by shortening the river. This is equal to more than half the water area of Pomme de Terre Reservoir (7,800 acres). The total loss to straightening has not been computed, since we do not know the average area of a mile of river in 1972.

The total water surface area in the Missouri River in 1879 was 121,739 acres. In 1954 it was 71,151 acres, so the loss was 50,588 acres. This loss was due chiefly to constriction of the channel by the use of various kinds of dikes, but the loss also includes the shortening discussed above, accomplished mainly by cutting off meanders.

To provide a frame of reference for this loss of water area, we may recall that Table Rock Reservoir has a surface area at conservation pool elevation of about 43,000 acres. Lake of the Ozarks about 60,000 acres. Constriction of the channel has continued since 1954. Specific locations where dikes have been lengthened are mentioned in the captions of the individual maps. In the 18-year period, 1954 to 1972, an additional 10,244 acres of water area has been lost. This is a greater surface area than in the Missouri portion of Bull Shoals Reservoir. *Between 1879 and 1972, 60,832 acres of water surface has been lost, 50% of the original surface area of the River.*

Unconnected islands were practically eliminated from the Missouri River between 1879 and 1954. The surface area of islands was reduced from 24,419 acres to 419 acres, a loss of 98%. The number of individual islands was reduced from 161 in 1879 to 18 in 1954. The reduction in the number of islands was accomplished chiefly by building dikes across the portion of the channel (chute, slough) separating the island from the shore, causing the chute or slough to silt full in a relatively short

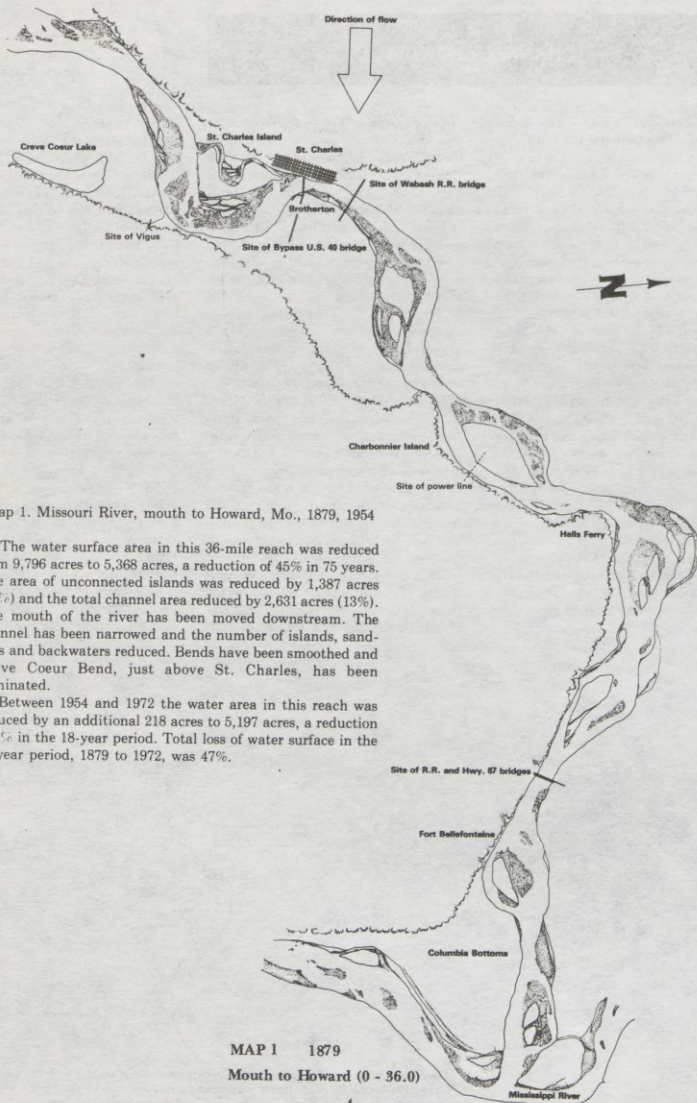
time. The islands, with rich alluvial soil, often provided luxuriant cover for wildlife, but usually were cleared by adjacent landowners and put into cultivation when they became connected to shore.

The chutes or sloughs between the islands and shore, more shallow and with less current than the main channel, provided valuable diversity to the fish habitat, probably serving as nursery and feeding areas for many aquatic species. They provided favored fishing places, sheltered from the hazards of the main channel and offering opportunities to catch a variety of species. *The loss of the islands is a loss to recreational opportunity in both fisheries and wildlife, and a loss to the diversity of the river environment.*

The distance from bank to bank of the Missouri River was reduced in the 75-year period. The total area of the entire channel from bank to bank, including marginal bars, etc., decreased from 250,252 acres in 1879 to 183,857 acres in 1954, a loss of 66,895 acres (27%). This area, lost from the public domain, mostly has been annexed by riparian land owners. Like the islands, much of this land furnished cover for wildlife and was a recreational asset benefiting many people. Much of it now probably is in cultivation to the benefit of a few bottomland farmers.



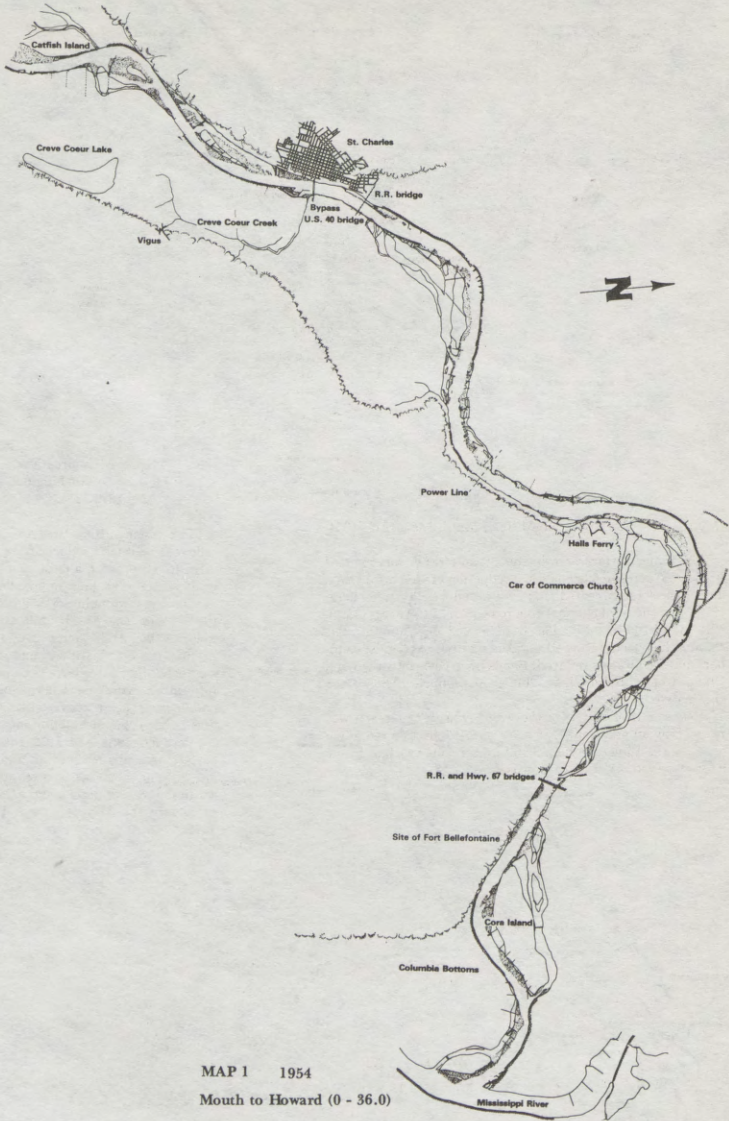
A wandering Missouri River has been made narrower and swifter with the use of wooden pile dikes. The dikes tend to deflect river current toward the center of the channel; silt accumulates behind the dikes, creating new land and a narrowed river.



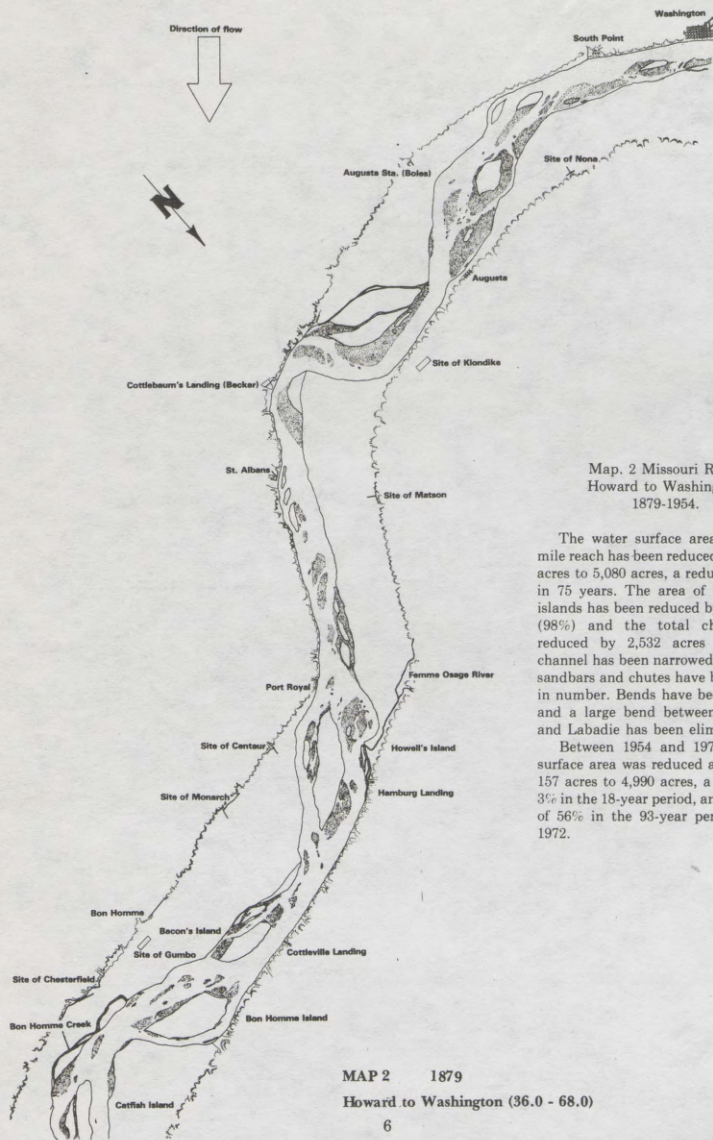
Map 1. Missouri River, mouth to Howard, Mo., 1879, 1954

The water surface area in this 36-mile reach was reduced from 9,796 acres to 5,368 acres, a reduction of 45% in 75 years. The area of unconnected islands was reduced by 1,387 acres (97%) and the total channel area reduced by 2,631 acres (13%). The mouth of the river has been moved downstream. The channel has been narrowed and the number of islands, sandbars and backwaters reduced. Bends have been smoothed and Creve Coeur Bend, just above St. Charles, has been eliminated.

Between 1954 and 1972 the water area in this reach was reduced by an additional 218 acres to 5,197 acres, a reduction of 4% in the 18-year period. Total loss of water surface in the 93-year period, 1879 to 1972, was 47%.



MAP 1 1954
Mouth to Howard (0 - 36.0)

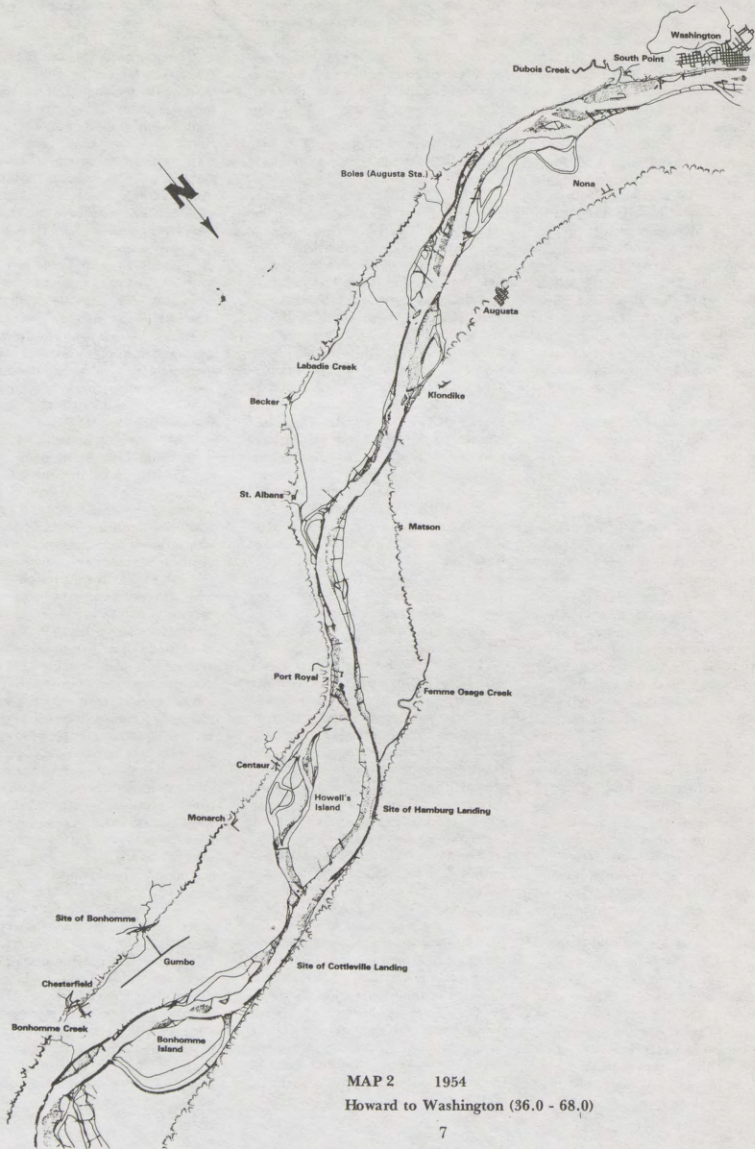


Map. 2 Missouri River,
Howard to Washington,
1879-1954.

The water surface area in this 32-mile reach has been reduced from 11,226 acres to 5,080 acres, a reduction of 55% in 75 years. The area of unconnected islands has been reduced by 3,701 acres (98%) and the total channel area reduced by 2,532 acres (12%). The channel has been narrowed and islands, sandbars and chutes have been reduced in number. Bends have been smoothed and a large bend between St. Albans and Labadie has been eliminated.

Between 1954 and 1972 the water surface area was reduced an additional 157 acres to 4,990 acres, a reduction of 3% in the 18-year period, and a total loss of 56% in the 93-year period, 1879 to 1972.

MAP 2 1879
Howard to Washington (36.0 - 68.0)



How Channel Changes Were Accomplished

Structures employed to restrain and control the Missouri River include revetments, pile dikes and rock dikes, with numerous variations of each to suit local conditions (see illustrations). A revetment is a great mattress woven of willow brush, poles, or lumber, sometimes reinforced with iron rods, constructed in place along an unstable bank and sunk by ballasting it with rock (Fig. 2). The revetment is intended to stabilize the bank and protect it from erosion. Concrete or asphalt revetments are seldom used on the lower Missouri River. Pile dikes may consist of single or multiple rows of clumps of three piles, usually joined by stringers with or without a base mattress of timber and stone (Fig. 3). A pile dike set at an angle with the bank tends to deflect the current toward the center of the channel. Back of it is an area of relatively slack water, so there is a tendency for suspended sediment to settle and for the bottom to be built up.

A rock dike is made of broken stone (Fig. 4). Most of those on the Missouri River have been built by filling in existing pile dikes with rock. Its function is similar to that of a pile dike except that, being less permeable, an eddy is created behind it and accretion of sediment is much more rapid. Detailed descriptions of river control structures and how they accomplish what they are designed to do are given by Manning (1964) and Lindner (1969). Specific methods used on the Missouri River are described by the U.S. Army, Corps of Engineers (Anonymous, 1946 and Bondurant, 1963).

To understand what has happened to the Missouri River we need to review its history and establish a chronology of the attempts to control and manipulate the great stream. The early use by explorers and fur traders has been mentioned. They apparently took the river pretty much as they found it and made little effort to change it.

The first steamboat moved into the Missouri in 1817 and by 1832 the mouth of the Yellowstone had been penetrated.

The next 50 or 60 years may be called the steamboat era. The movement of immigrants to the west, the discovery of gold in Montana, the need for supplies for an army fighting the Indians, as well as the need to get furs, grain and other products to the eastern markets all required the movement of large quantities of people and freight.

In the absence of railroads or adequate roads, the steamboat afforded the most effective transportation. Steamboating was a dangerous business, however; groundings were everyday occurrences, and wrecks were frequent. Snags were one of the most serious hazards. Snagging operations on the Missouri River began as early as 1832 and in 1838 the first snag was removed under an Act of Congress.

Major C. W. Howell made a survey of the Missouri River in 1867. In his report to the Chief of Engineers he described graphically conditions of the river, especially those affecting navigation. Among other things he catalogued the snags he considered hazards. He listed 1,793 between Rulo, Nebraska and the mouth.

Government freight shipped up the River in 1867 totaled 13,957 tons plus 476 mules and horses. Other freight shipped up-river consisted of 164 hogsheds, 97,682 barrels, 1,507 half barrels, 42,246 kegs and casks, 1,324 tons of iron, 16,380 board feet of lumber, 141,627 bushels of oats, 780,882 sacks, boxes, bales, packages or bundles and 62 head of cattle. Freight coming down the river in the same period consisted of 826,627 bushels of grain, 14,765 head of livestock, 7,711 hogsheds, 4,594 barrels, 674 kegs, 11,694 hides, and 76,254 bales, boxes, sacks, packages or bundles. All of this may have amounted to almost one-half million tons of freight (Howell, 1868).

Lt. Col. C. R. Suter in 1881 wrote the first report on the Missouri River which fully recognized the many variables associated with control of the river for navigation. He recommended a combination of bank protection and contraction to maintain a navigable channel (Suter, 1881). Probably largely as a result of this report, the Missouri River Commission was formed and Col. Suter was its first president.

The Missouri River Commission, established by Congress in 1884, consisted of two civilians and three field grade officers of the Corps of Engineers, with a company grade officer as secretary. The president was always the ranking officer of Engineers and he addressed his reports to the Chief of Engineers. The objective of the Commission, as stated by Col. Suter in his second annual report, was: "Improvement of the navigation of the river, which consists essentially in contracting the width of the stream to comparative uniformity and fixing the location and direction of

the channel by protecting all banks exposed to the erosive action of the current" (Suter, 1887).

To accomplish this the Commission developed, largely by trial and error, most of the techniques in use for these purposes today. They first attempted bank stabilization by use of revetments woven of willow brush and ballasted with rock. Often several miles of unstable bank was covered. Results were disappointing. These revetments were weak and tended to wash out, especially from the upstream end. Pile dikes were installed to divert some of the force of the current away from the revetments and stronger revetments were developed. Pile dikes also were used to close off chutes and to compress the channel. A smart young officer developed a heavy revetment arranged in conical fashion which stood up especially well. It was designated a "bankhead", and was used at numerous places on the river.

The Commission believed that its work could best be accomplished by systematic development of whole reaches of the river. Instead, Congress tended to appropriate funds for work in scattered localities; often little money was left for systematic development. By 1902, the railroads were carrying most of the freight and the steamboat era was over. River commerce was greatly reduced (540,000 tons in 1901) and Congress repealed the Act establishing the Commission. In the 18 years of its existence it had spent \$7,150,000 in "continuous, progressive control of the river, contracting it where necessary, giving the channel proper direction and securely holding it in place".

In the 538 miles (1901) of river from Rulo to the mouth about 85 miles were affected to some extent by the structures installed by the Commission. Most of these were in the 45-mile section between Jefferson City and Hermann, where systematic control was attempted. The Commission's snagboat removed 17,676 snags and 69 drift piles. *This degraded the habitat by removing cover and nesting places for fish, especially catfish.* Also, 6,073 trees considered liable to become snags were cut (Stickey, 1909). These doubtless were mature bottomland trees which might be expected to occur in stands of about 50 to the acre, so this was the equivalent of some 120 acres of bottomland forest destroyed. *Many of these doubtless were den trees important to wood ducks, raccoons, and other wildlife.*



Complex revetments and rock rip rap have been used to stabilize river banks and protect them from erosion, work beneficial to commercial navigation but harmful to wildlife and natural values.

The Act of 1902 turned responsibility for the Missouri River directly to the U.S. Army Corps of Engineers. No maintenance was provided between 1902 and 1912, and most of the Commission's structures were washed out.

In 1912, acting on a report prepared in 1908 by Col. Schultz, Congress authorized a 6-ft channel from Kansas City to the mouth of the Missouri River. Much engineering work was done between 1912 and 1917. From 1917 to 1922 appropriations practically ceased, but it can be assumed river structures were maintained. A revival of activity in the period 1922 to 1927 was directed primarily at flood protection. In 1927 the extension of the 6-ft channel to Sioux City, Iowa, was authorized, a comprehensive plan of development was adopted, and engineering activity increased. By 1933 the 6-ft channel project was 95% complete (Fig. 5). It was reported \$68 million had been spent on the channel, yet commercial tonnage carried was less than one-third of that carried on the unimproved River in 1867.

The Rivers and Harbors Act of 1945 provided for a channel 9-ft deep and 300-ft wide from the mouth of the Missouri River to Sioux City, Iowa. The Corps restated Col. Stickney's objectives of "continuous, progressive control of the river, contracting it where necessary, giving the channel proper direction and securely holding it in place" and went on to state, "Under this

definition the river current itself becomes the main agent of construction. Concentrated into one channel, properly controlled and directed by permeable dikes, and fixed in place by revetted banks, the current is relied upon to produce a channel that will maintain itself, with occasional assistance by dredging and snag removal, in a satisfactory condition for navigation throughout the navigation season. Permeable dikes direct and train the current so as to scour out a deep stable channel. They also induce the current to deposit material in portions of the river that are to be abandoned. Revetment fixes satisfactory banks in place. The characteristics which the improved river will have and which insure maintenance of a satisfactory navigation channel have been determined to be as follows:

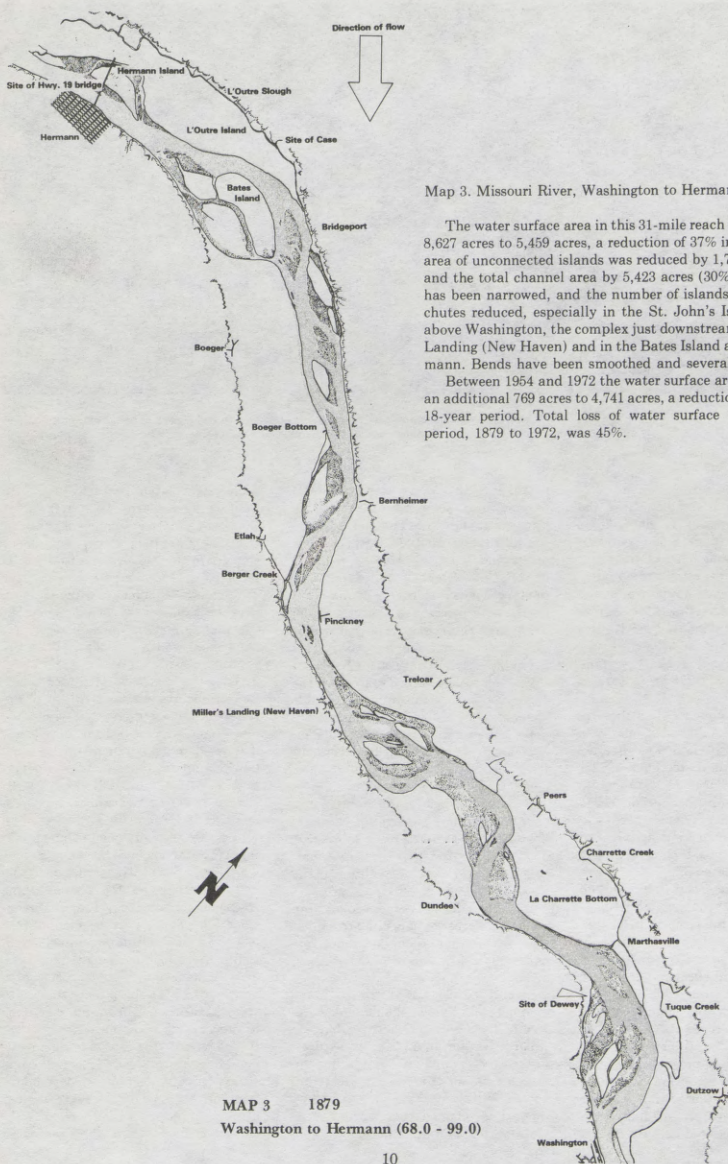
"A. Stabilized banks.—High banks, protected from erosion, confining all the water in a single channel.

"B. A curved trace, consisting generally of a series of bends 3 to 5 miles long, with radius of curvature decreasing from head to foot." (Anonymous, 1946).

Bondurant (1963) emphasized channel stability was the present objective of the Corps on the river but felt "that it was fortunate that the early efforts were geared to navigation requirements, for many of the factors involved in establishing a satisfactory navigation channel have proved to be important considerations in es-

tablishing a stabilized channel." He went on to list specific objectives as: (a) Continuity in treatment of a reach of river as essential, since "significant changes in any one meander loop will be reflected in several adjacent loops." (b) "A smooth alignment without bank irregularities, lunate bends, or other irregular formations is necessary." (c) "Optimum width (of channel) is the maximum which can be maintained without the formation of center bars." Concerning the methods in use to accomplish these purposes, he said: "We now use only rock-filled pile dikes, rock dikes and rock revetment unless some unusual circumstance dictates a deviation therefrom." By 1967 the Missouri River navigation and stabilization project was 98% complete.

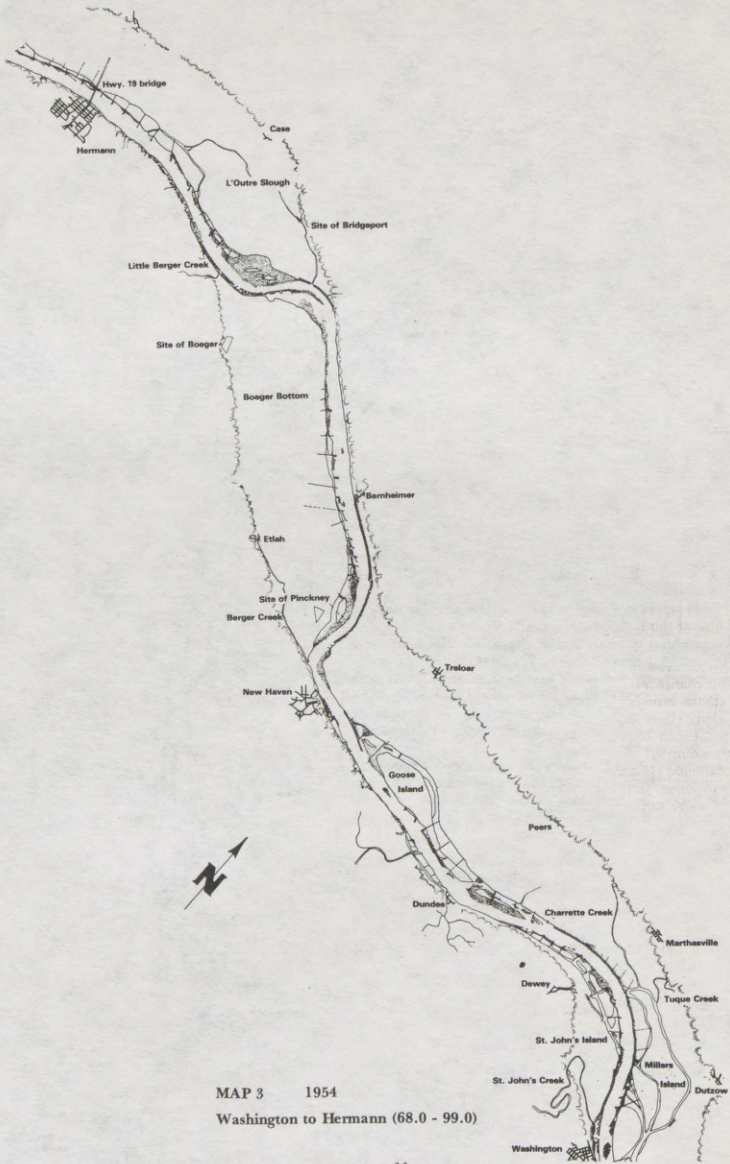
By 1971 the Corps had stopped talking much about navigation. The key word was "stabilization" but the methods advanced for accomplishing this sounded familiar. "Project dimensions are obtained by developing into one fixed channel the numerous small, shallow channels of the natural river. This channel refinement and control is obtained by shaping the flow into smooth, easy bends by means of systems of stone and/or wood pile dikes to direct the flow into the desired alignment; bank line revetment of stone and/or pile structures to protect the concave banks from further erosion once the desired alignment is attained; cutoffs to eliminate both sharp and protracted



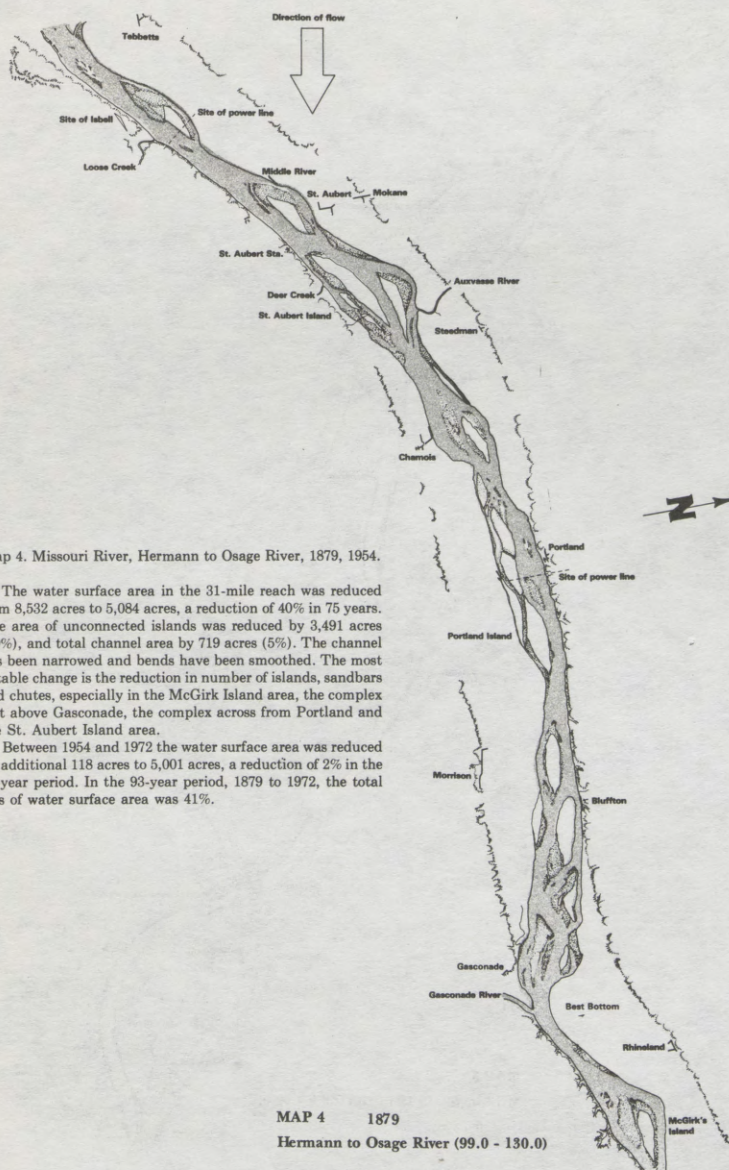
Map 3. Missouri River, Washington to Hermann, 1879, 1954.

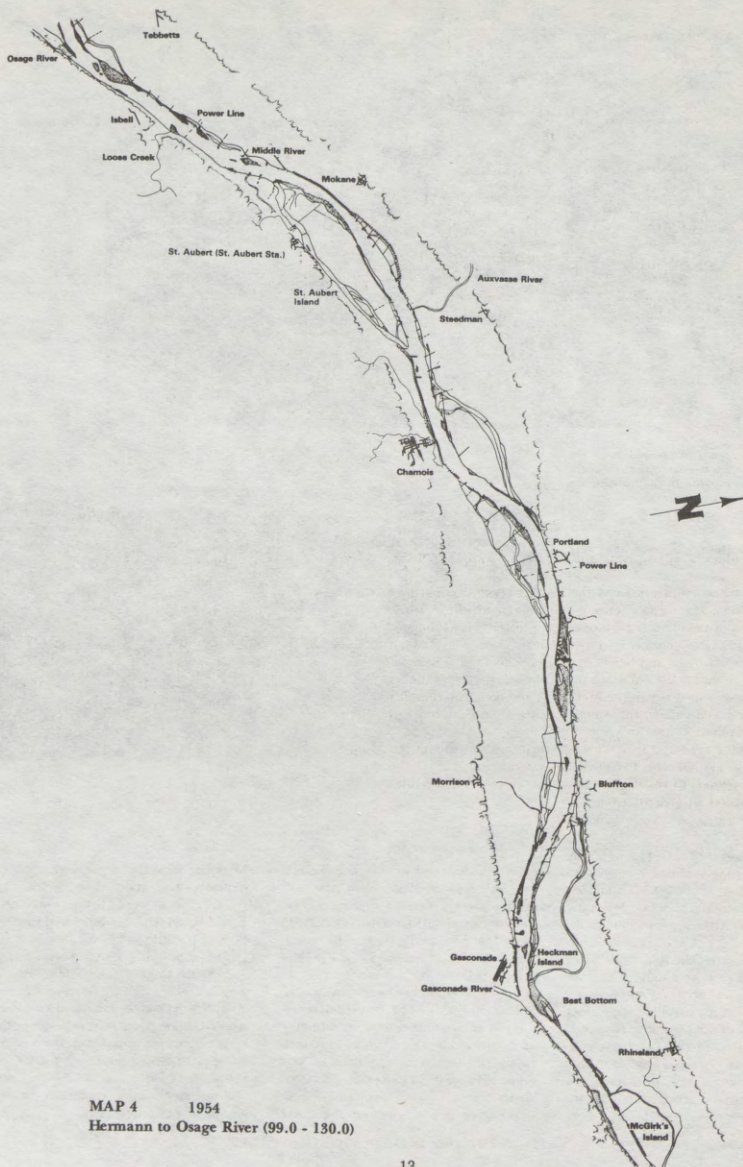
The water surface area in this 31-mile reach decreased from 8,627 acres to 5,459 acres, a reduction of 37% in 75 years. The area of unconnected islands was reduced by 1,719 acres (97%) and the total channel area by 5,423 acres (30%). The channel has been narrowed, and the number of islands, sandbars and chutes reduced, especially in the St. John's Island area just above Washington, the complex just downstream from Miller's Landing (New Haven) and in the Bates Island area below Hermann. Bends have been smoothed and several eliminated.

Between 1954 and 1972 the water surface area was reduced an additional 769 acres to 4,741 acres, a reduction of 14% in the 18-year period. Total loss of water surface in the 93-year period, 1879 to 1972, was 45%.



MAP 3 1954
Washington to Hermann (68.0 - 99.0)





MAP 4 1954
Hermann to Osage River (99.0 - 130.0)



The federal boatyard at the mouth of the Gasconade River was home to much of the floating equipment used in channelizing the Missouri River.

Most Missouri River pile dikes have been filled with rock. The rock-filled dikes are more impermeable to water - an eddy is created behind them and accumulation of sediment occurs more rapidly than behind wooden pile dikes.



bends; chute closure dikes to close minor and diverted channels; and removal of snags and dredging where necessary." (Munger and Wixson, 1972).

Thus, we see that little except poorly coordinated snag removal was done to the River before about 1885. From 1885 to 1900 snag removal was systematic and intensive. Although considerable effort and money were expended in attempts to control the river during this period, no more than about 16% of the reach covered by this study was affected and the structures installed were later lost from lack of maintenance. A second, 5-year period (1912-1917) of active construction was followed by 16 years (1917-1933) when the principal new work was levee construction, but the in-stream structures apparently were

maintained. Active work on the channel was revived in 1933 when the 6-ft channel was extended to Sioux City; work received further impetus in 1945 when the 9-ft channel was authorized. The stage of completeness of the project during this period varied from 77 to 98%, with chief set-backs being the results of floods. The principal structures used continued to be revetments and permeable dikes of piling until about 1960: then replacement of pile dikes with rock dikes began, and continues.

Another factor affecting the lower

Missouri was the construction of six dams on the main stem further upstream. These were Gavins Point near Yankton, South Dakota, closed in 1955; Fort Randall near Wagner, South Dakota, 1953; Big Bend, Fort Thompson, South Dakota, 1964; Oahe, Pierre, South Dakota, 1962; Garrison, Riverdale, North Dakota, 1955; and Fort Peck near Glasgow, Montana, 1940. Since the system has been completed, flows in the lower river have been much reduced in the winter (non-navigation) season and the sediment load, especially in the winter, is noticeably less.

CHANGES IN THE FISHERY

Sixty three species of fish have been collected from the Missouri River (see list). Not included are species collected only in the mouths of tributary streams and thought to be more characteristic of the tributary than the main river. The paucity of records before 1905 reflects the paucity of collections. Most of the species recorded before 1905 were collected near St. Joseph by Meek in 1884 (Jordan and Meek, 1885). The first extensive sampling was done by Fisher in 1945. He made 16 collections from 11 localities between the Iowa line and the mouth. Using hoopnets, a trammel net and seines, he collected 24,664 specimens of 60 species (not all included in our list). Seventy percent of these were minnows and other forage-size fishes. If we consider only the 7,278 fish of species capable of reaching a size to interest fishermen, carp made up 35%, carpsuckers 19%, channel catfish 9%, gizzard shad 9%, buffaloes 6%, bullheads 5%, freshwater drum 5%, mooneyes 4%, centrarchids of all kinds 3% and flathead catfish 2% (Fisher, 1962).

No quantitative information on the sport catch from the Missouri River is available. However, Funk (1969) reported the species composition of the catch of 797 sport fishermen interviewed by conservation agents between 1946 and 1958. Their catch was 45% carp, 21% channel (and blue) catfish, 7% crappies, 7% bullheads, 6% flathead catfish, 6% sturgeons, 6% freshwater drum, and 2% buffaloes.

The commercial fishery of the Missouri River has been monitored periodically by the U.S. Fish Commission (later Bureau of Commercial Fisheries, still later National Marine Fisheries Service), the U.S. Bureau of the Census, and the Missouri Department of Conservation (Smith, 1898; Townsend, 1902; Anonymous, 1911; Sette, 1925; Fiedler, 1933; Fisher, 1947; Anderson and Peterson, 1953; Anderson and Power, 1957; Power, 1962; Lyles, 1967; Robinson, 1971). The quantity of fish reported caught in the Missouri portion of the River (Fig. 6) must be interpreted with some care. There is no assurance that data for the various years are comparable, especially prior to 1945.

The men making the reports usually were much more familiar with marine fisheries of the Atlantic and Pacific coasts than with those of inland rivers. The study on which the 1908 report was based was made for the Bureau of Census, presumably by a fisheries specialist, but his identity and extent of experience with the fisheries of inland rivers are unknown to us. Before 1945 commercial fishermen did not need a license and were not required to report their catch. The data for 1945 and later is based on the fishermen's reported catches. Only a portion reported, however, so the reported catch was expanded proportionally to provide an estimate of the total catch. Earlier data may have been derived from sales to fish markets or from interviews with only the more prominent and active fishermen.

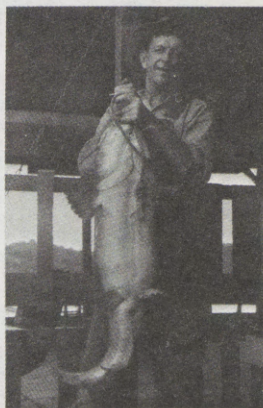
Before 1905

Little information is available on the early fishery in the Missouri River. Early travelers described the scenery, people, hunting, game animals, and the river itself but recorded little of the fish in the river. A few catches of large fish are mentioned but weights and measurements in comprehensible units usually are lacking and frequently the species of fish is in question. Lewis and Clark mentioned a bottomland pond near the mouth of the Nodaway River which they called Pike Pond from the number of these fish they saw in it. Apparently they caught their first catfish (probably a blue catfish) near the mouth of the Platte River in Nebraska. This should not be interpreted as indicating a scarcity of fish in the lower Missouri. There probably was no need to resort to fish for food in the early part of the journey. Later on and further upstream they frequently mentioned the abundance and large size of the catfish. Sergeant Gass spoke of "nine that would together weigh 300 lb." They also spoke of catching "buffalo-fish" in the river. The most notable (and best documented) of the stories of big fish is Captain William L. Heckman's account of the 315-lb channel (blue) catfish caught by a boy named Struttman at McGirk's Island near Morrison in 1866.

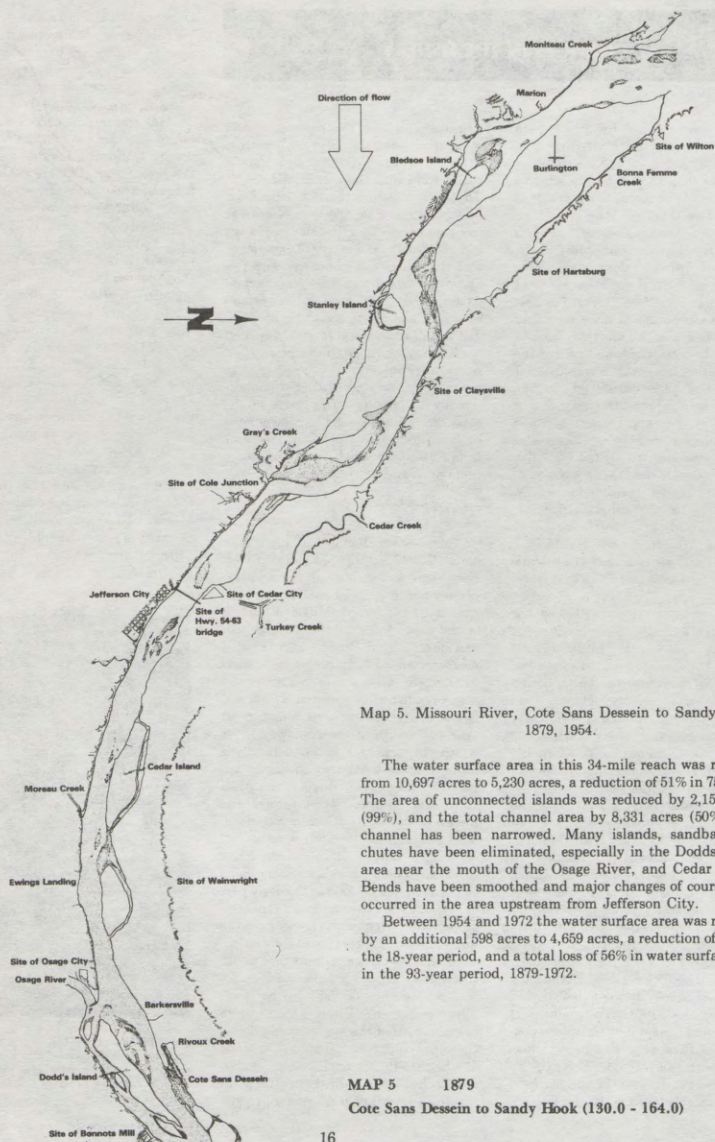
Other of Capt. Heckman's accounts of big fish lack authenticating details. *The general impression from these sketchy early accounts of the fishery is of an immense resource, largely unexploited, and generally taken for granted.*

This impression carries over to the information we have on the commercial fishery before the turn of the century. For 1894, Smith (1898) reported that 143 fishermen fished 37 seines, 26 trammel nets, 368 fyke (hoop) nets and 351 trotlines to catch 569,710 lb of fish. It must be remembered that this probably represents only those fishermen and that part of their catch which went to organized markets. Small operators and locally distributed catches probably were not reported. Townsend (1902) reported on 334 fishermen who fished 48 seines, 11 trammel nets, 541 fyke (hoop) nets and 286 trotlines and caught 711,687 lb of fish in 1899. The limitations of this information probably are similar to those applying to Smith (1898). There were some discrepancies in the reporting of species.

Between 1894 and 1899 the number of commercial fishermen reported on the Missouri River increased by 34%. The quantity of gear fished did not seem to be proportional to the increase in fishermen. The number of seines and



Legendary blue catfish were caught frequently. Reports include one of 315 pounds, another of 242 pounds weighed at Hermann in 1868. Removal of snags to benefit navigation has meant the loss of catfish nest sites.

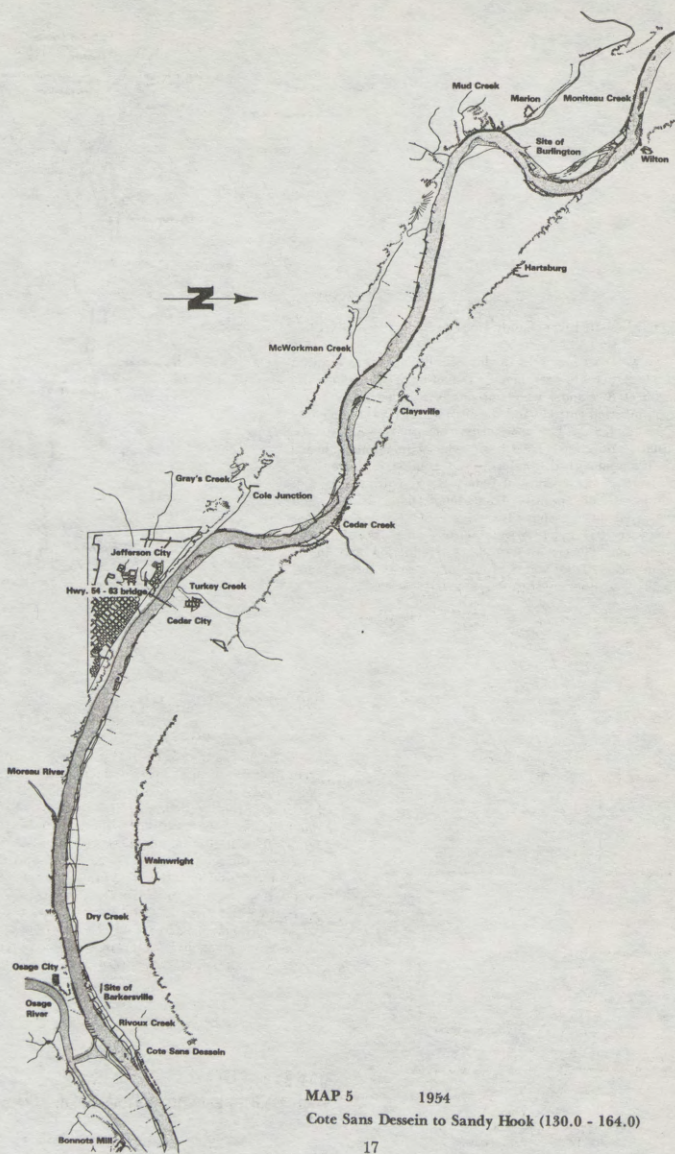


Map 5. Missouri River, Cote Sans Dessein to Sandy Hook, 1879, 1954.

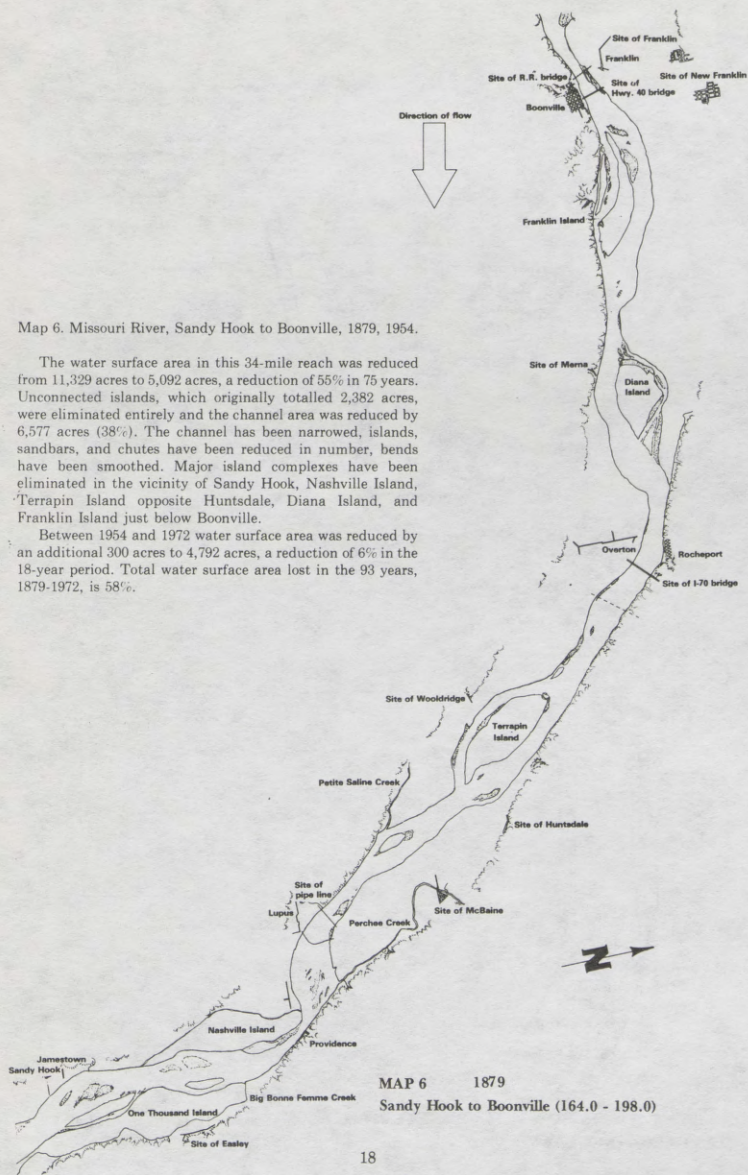
The water surface area in this 34-mile reach was reduced from 10,697 acres to 5,230 acres, a reduction of 51% in 75 years. The area of unconnected islands was reduced by 2,152 acres (99%), and the total channel area by 8,331 acres (50%). The channel has been narrowed. Many islands, sandbars and chutes have been eliminated, especially in the Dodds Island area near the mouth of the Osage River, and Cedar Island. Bends have been smoothed and major changes of course have occurred in the area upstream from Jefferson City.

Between 1954 and 1972 the water surface area was reduced by an additional 598 acres to 4,659 acres, a reduction of 11% in the 18-year period, and a total loss of 56% in water surface area in the 93-year period, 1879-1972.

MAP 5 1879
Cote Sans Dessein to Sandy Hook (130.0 - 164.0)



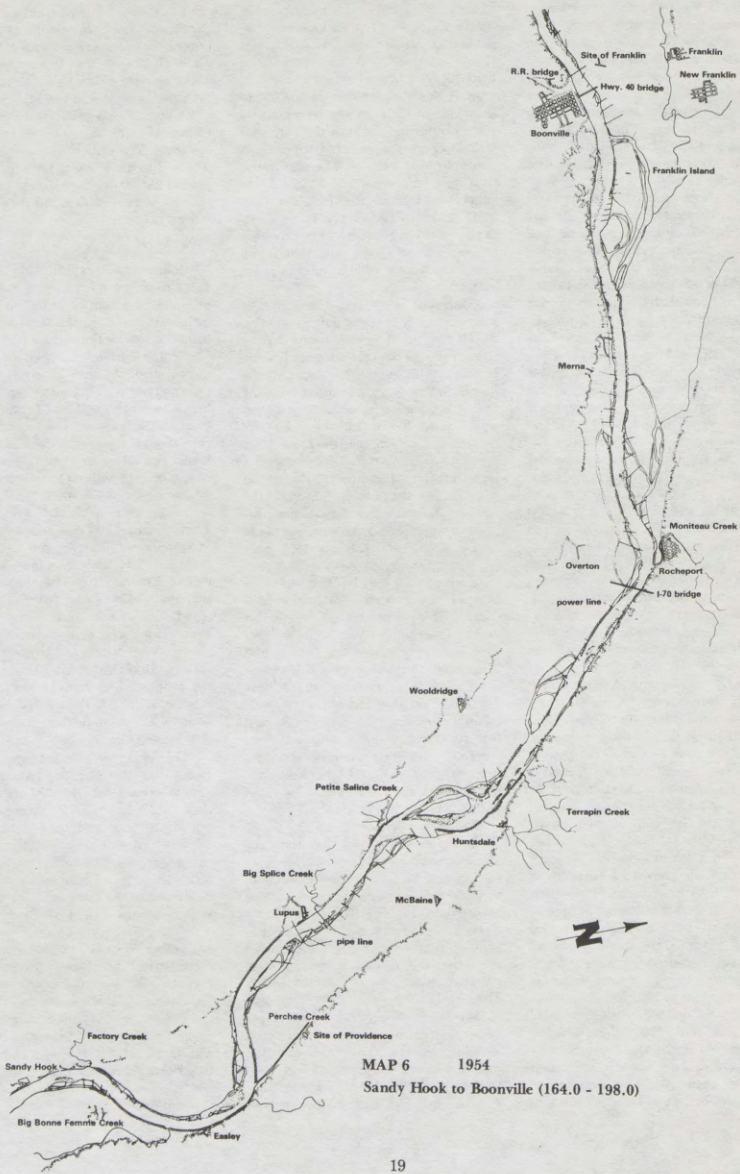
MAP 5 1954
Cote Sans Dessain to Sandy Hook (130.0 - 164.0)



Map 6. Missouri River, Sandy Hook to Boonville, 1879, 1954.

The water surface area in this 34-mile reach was reduced from 11,329 acres to 5,092 acres, a reduction of 55% in 75 years. Unconnected islands, which originally totalled 2,382 acres, were eliminated entirely and the channel area was reduced by 6,577 acres (38%). The channel has been narrowed, islands, sandbars, and chutes have been reduced in number, bends have been smoothed. Major island complexes have been eliminated in the vicinity of Sandy Hook, Nashville Island, Terrapin Island opposite Huntsdale, Diana Island, and Franklin Island just below Boonville.

Between 1954 and 1972 water surface area was reduced by an additional 300 acres to 4,792 acres, a reduction of 6% in the 18-year period. Total water surface area lost in the 93 years, 1879-1972, is 58%.



hoopnets in use increased, the number of trammel nets and trotlines declined. The popularity of seines suggests that sand bars, needed to beach a seine, were prevalent. Trotlines were very popular in the early fishery and sometimes these were very long, with a thousand or more hooks. Part of the difficulty in comparing quantities of gear is due to infrequent reporting on the length of nets and number of hooks on lines.

Catfish were important in the early fishery of the Missouri River. The big fish stories usually referred to catfish, doubtless the blue catfish. In a recent issue of the Kansas City Star, David Dary tells of a 242-lb blue catfish caught in 1868 by two fishermen who weighed it at Hermann. Captain William L. Heckman recounts how Captain John Brown of Becker, Missouri, caught a fish (apparently a blue catfish) at Columbia Bottoms near the mouth of the Missouri which was so large there was no scale available which would weight it. The head alone weighed 38 lb. It is also mentioned that Captain Brown once caught four fish which weighed 500 lb and Captain Heckman says "it was common to catch catfish weighing from 125 to 200 lb" (Heckman, 1950).

Catfish were a substantial part of the recorded catch in 1894, 30%, and 1899, 24% (Fig. 7). The species composition cannot be determined since all catfish were reported together (Smith, 1898, Townsend, 1902). It is likely that this very desirable group of food fish was heavily exploited during this period. The large blue catfish especially probably were heavily fished, although records are not adequate to show this. The catfish doubtless used numerous snags in the river as nest sites, so snag removal to benefit navigation would have been detrimental to them.

Carp, an introduced species, was important in the fish fauna of the Missouri River by 1894, although it was not collected by Meek in 1884. The Missouri Fish Commission opened a hatchery at Forest Park in St. Louis in 1880; carp reared there were distributed to private and public waters, including the Missouri River. Only small fish were distributed in the first few years and it is not surprising that none were found by Meek in the River at St. Joseph in 1884.

The Fish Commission's efforts were very successful. By 1890 doubts were being expressed about the desirability of carp but propagation and distribution continued until 1901, when carp are no longer mentioned in the reports

(Anonymous, 1881 - 1903). Carp made up 12.1% of the reported commercial fisheries catch for 1894, decidedly less than buffalo (26%) (Smith, 1898). Strangely, no carp were reported in 1899. It was at about this time that disillusionment with the species was at its early height and perhaps the carp and buffalo catches were listed together as "buffalo" in this report. The large quantity of buffalo reported (33.1%) lends support to this assumption. The carp quite obviously had succeeded very well in the Missouri River by 1905, probably at the expense of the native buffaloes and carpsuckers which have similar habits.

Sturgeons were important in the early fishery of the Missouri River (Fig. 8). Of the three species native to the river, the lake sturgeon was much the largest and most desired, primarily for its roe, which was made into caviar. At first the smaller shovelnose sturgeon was considered a nuisance by the fishermen. Later the flesh of both species was smoked and commanded a high price as a delicacy. The pallid sturgeon is not distinguished in the records and may never have been especially abundant. Lake sturgeon made up 2% of the total catch in 1894, only 0.3% in 1899. No shovelnose sturgeon were reported in 1894 but they made up 11% of the reported catch in 1899 (Smith, 1898; Townsend, 1902). Similar declines, apparently starting about 1880, are reported for the Illinois and Mississippi rivers (Forbes and Richardson, 1920; Carlander, 1954). This decline is usually attributed to overfishing, stimulated by high prices paid for sturgeon caviar and smoked sturgeon. Habitat changes resulting from snag removal and other engineering work on the river cannot be ruled out as a factor in the decline.

Paddlefish were not sought much until it was discovered that their roe also made acceptable caviar. Then, as the harvest of lake sturgeon declined, the take of paddlefish increased. This occurred on the Mississippi and Illinois rivers as well as on the Missouri. In 1894 paddlefish made up 8% of the catch, in 1899 also 8%, although the quantity reported was greater (Smith, 1899, Townsend, 1902).

Several species considered sport fish were reported in the commercial catch in early records. The take of some species declined (crappies, 5.9% in 1894, 1.2% in 1899; black bass, 0.6% in 1894, 0.2% in 1899). Whether this decline was

due to overfishing, public reaction against commercialization of sporting species or to loss of habitat is not known. It is of interest that it was possible at that time to catch those quantities of bass and crappies in the Missouri River with commercial gear. The catch of pike remained constant (0.3% in 1894, 0.3% in 1899). The walleye (sauger) catch increased (0.3% in 1894, 1.4% in 1899). It seems likely that the increased take was due to increased demand for Missouri River saugers.

1905 to 1944

Commercial exploitation of the fisheries of the inland rivers may have attained its height early in this period. This is suggested for the Mississippi and Illinois rivers by Forbes and Richardson (1920) and Carlander (1954) and it may apply also to the Missouri River. Commercial fishing apparently was lucrative for those willing to work at it. Captain William L. Heckman reports that the Thompson brothers of Dodd's Island started commercial fishing in the winter of 1918 with no knowledge of the business, a small boat, a few hundred feet of trammel net and \$28 in capital. They caught "catfish, buffalo, suckers and redhorse", selling the catfish in Jefferson City and shipping the scale fish to Kansas City. They fished from the mouth of the Osage River to the foot of Mokane Bend and made enough money to purchase a gasboat with a cabin. When a rise in the river forced them to stop fishing after seven weeks, the four brothers had \$1,200 in cash, "quite a bit" of fishing tackle and a good boat to show for their efforts (Heckman, 1950).

The report for 1908 prepared by the Bureau of the Census, (Anonymous, 1911), records data for 237 fishermen: they fished 51 seines, 76 trammel nets, and 1,118 fyke and hoop nets taking 1,303,000 pounds of fish for the highest catch of record. This report, prepared by different personnel, probably was on a different basis from the preceding reports by the U.S. Fish Commission. The harvest from the Osage, Gasconade and other tributary streams was included with the Missouri River in this report but, judging from previous separate reports, the contribution of the tributaries would have been small, probably only a few thousand pounds. The fact that the reported number of fishermen decreased nearly 30% while the reported harvest increased over 80% is of interest.

Sette (1925) for 1922 reported 108 fishermen who operated 11 seines, 52 trammel nets, 223 fyke (hoop) nets and 63 setlines and caught 296,565 lb of fish. For 1931 Fiedler (1933) reported 75 fishermen who fished 7 seines, 43 trammel nets, 330 fyke (hoop) nets and 20 trotlines to catch 169,088 lb of fish. These two reports were prepared by personnel from the same agency that compiled them for 1894 and 1899. Probably the reports were prepared on a similar basis, and they should be fairly comparable. The low level of the fishery in 1931, in the midst of the Great Depression, is rather surprising. One would expect that a handy source of food requiring chiefly the expenditure of a certain amount of effort would be thoroughly utilized. The fact that the catch declined from 1922 levels lends weight to our previous assumption that these statistics were based chiefly on the fish which passed through organized markets. In the Depression there was not much commerce in any kind of produce, but many people who fished for food or local barter may have been overlooked.

In this period the carp came to dominate the fishery of the river (Fig. 7). It made up 53% of the commercial catch in 1908 and remained near this level in most subsequent years. The reported catch of buffaloes declined markedly throughout the period and from the previous period. This, no doubt, was a real decline in abundance, since the buffalo, usually considered more desirable and bringing a higher price than carp, would have been more heavily exploited.

The reported catch of catfish, after having remained fairly stable through 1908, declined substantially in the later part of the period (14% in 1908; 18% in 1922; 9% in 1931). Again, these are fish that bring a premium price, so they probably were exploited as thoroughly as possible, and the decline doubtless was real. Three species of catfish are important in the Missouri River fishery—the channel catfish, the blue catfish and the flathead catfish. However, in the statistics all species were lumped together, so there is no opportunity to analyze species differences. It is probable that the decline in the catch of large blue catfish, suspected to have started in the earlier period, continued. Fisher (1962) in his survey in 1945 took 657 channel catfish of all sizes, 130 flathead catfish and only 11 blue catfish. Fishermen frequently have pictures

of blue catfish caught in past years, which are large by present day standards (apparently 50 or more pounds). A photograph owned by Robert Dallmeyer of Jefferson City shows a man with an enormous catfish. He recalls that the fish weighed 142 pounds and was taken by commercial fisherman John Brunner in the river near Jefferson City probably in the 1920's. Of course, the fact that a picture was taken and kept indicates that such catches were rare. The virtual elimination of snags from the river during this period would not have helped the catfish.

The harvest of sturgeon declined further during this period although the extent of the decline is not clear, due to confused reporting (Fig. 8). The catch of 1908 (6.0% of the total catch) is reported simply as "sturgeon" (Anonymous, 1911) but it is probable that most of these were shovelnose sturgeon, with only a few lake sturgeon. In 1922 Sette (1925) reported lake sturgeon made up 0.9% of the total catch, with no shovelnose reported. This is almost certainly an error; all or most of these probably were really shovelnose sturgeon. In 1931 Fiedler (1933) reported that shovelnose sturgeon made up 1.8% of the total catch; no lake sturgeon were reported.

In the earlier period the catch of paddlefish increased as the sturgeon (especially lake sturgeon) catch declined. In this period the paddlefish catch declined precipitously (2.7%, 1908; 6.5%, 1922; 0.4%, 1931) suggesting that paddlefish, like the sturgeons, had been overexploited. The habitat requirements of sturgeon and of paddlefish are not well enough known to judge whether the physical changes made in the river were harmful to them or not. It is a fact, however, that both paddlefish and sturgeon were common in the unaltered river and that both are rare today.

The commercial harvest of walleyes (saugers), crappies, sunfishes, and black bass from the Missouri River came to an end in this period, mostly toward the later part. This is no doubt in part because commercialization in these species became illegal. *The decline in take had started well before any legal restrictions were imposed, however, and it seems likely that habitat changes, especially the reduction in the number and quality of chutes and backwaters, contributed greatly to the decline.*

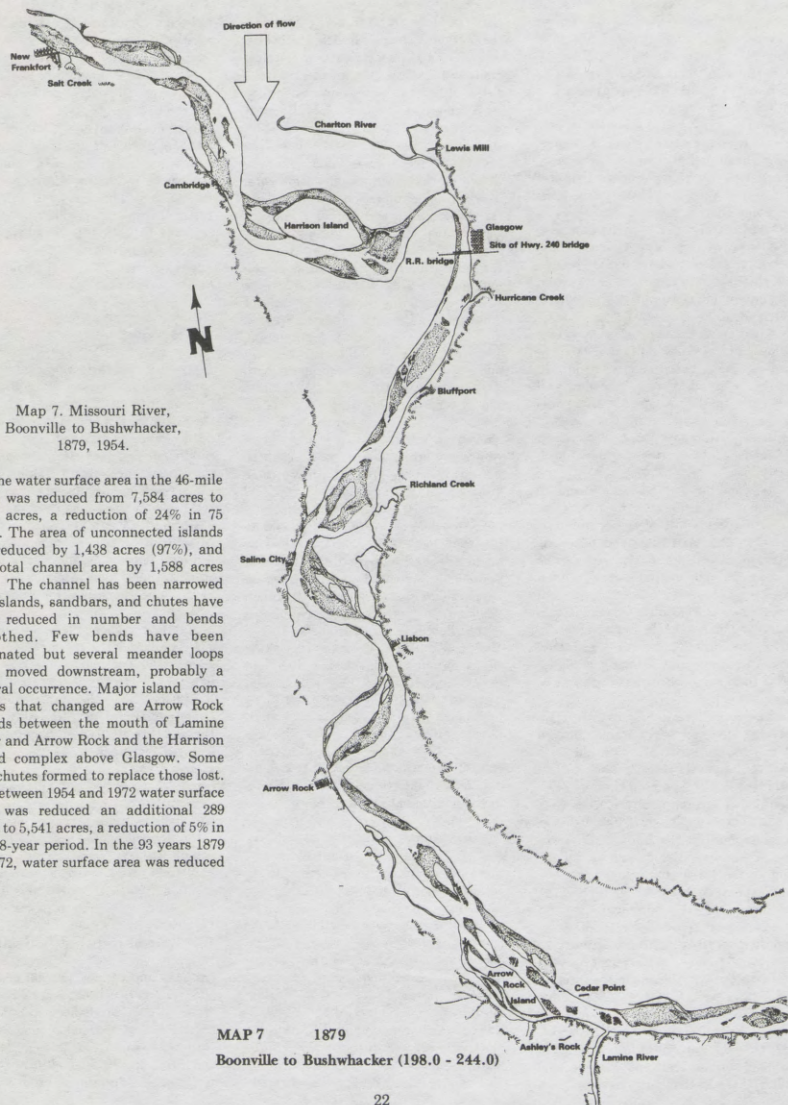
Some further peculiarities of repor-

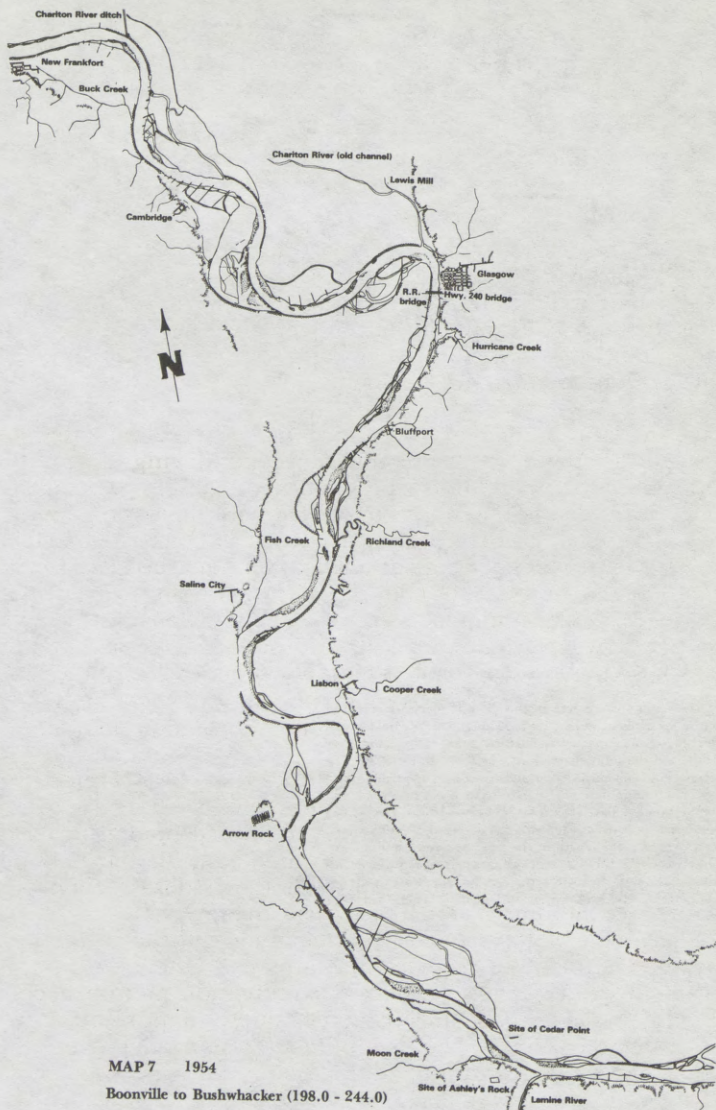
ting require explanation. No freshwater drum were reported caught in 1908, although substantial catches of the species were reported in preceding and succeeding years. In 1908 it was reported that "dogfish" made up 1.5% of the total catch, the only recorded catch for this species in all the reports (Anonymous, 1911). "Dogfish" is a name applied to the bowfin or grindle, which is fairly common in commercial catches in the lower Mississippi River, but seldom appears in the Missouri River. It seems likely that the "dogfish" reported in 1908 were really freshwater drum. Quillback (carpsuckers) appeared first in the 1922 report. In previous reports they had been included with suckers.

1945 to present

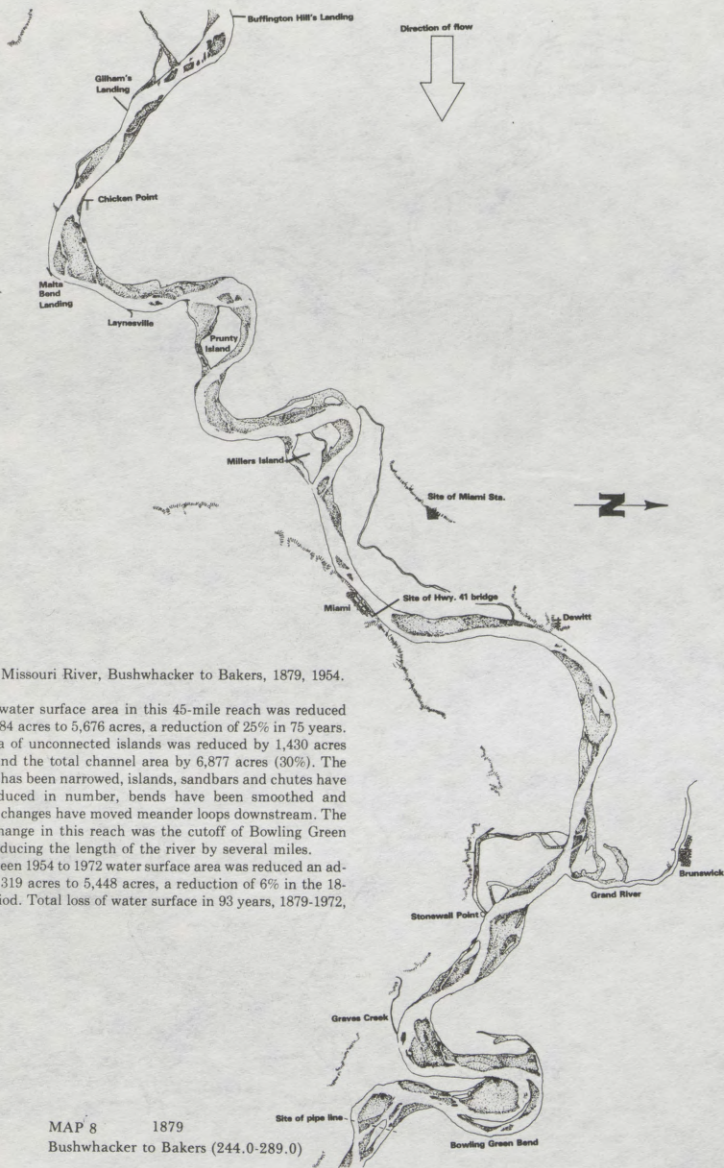
In 1940 the Missouri Conservation Commission required commercial fishermen to buy licenses and to report their catches as a requisite to having the license renewed. The catch reports were tabulated first in 1945 and annually thereafter. The Missouri Department of Conservation's tabulations have been the basis for the Bureau of Commercial Fisheries statistical reports on the Missouri River fishery since 1945. In the interest of saving space the annual statistics for 5-year intervals are shown in the species composition graphs (Fig. 7,8).

In 1945, Fisher (1947) reported that 771 commercial fishermen fished 29 seines, 156 trammel nets, 1,493 hoop nets and 379 trotlines, and took 503,117 lb of fish. This is the highest number of fishermen recorded; it probably reflects the fact that all licensed fishermen were counted, whereas in previous reports some fishermen doubtless were overlooked. In 1950, Anderson and Peterson (1953) reported 652 fishermen who fished 13 seines, 290 trammel nets, 1,732 hoop nets and 232 trotlines and caught 340,600 pounds of fish. In 1955, 515 fishermen with 8 seines, 182 trammel nets, 1,262 hoop nets and 143 trotlines caught 166,400 pounds of fish (Anderson and Power, 1957). In 1960, 401 fishermen fished 1 seine, 119 trammel nets, 1,072 hoop nets, and 112 trotlines and caught 155,300 pounds of fish (Powers, 1962). Lyles (1967) reported that 232 fishermen fished 119 trammel nets, 609 hoop nets, and 98 trotlines to catch 106,000 pounds of fish in 1965. In 1970, Robinson (1971) reported 404 fishermen used 3 seines,





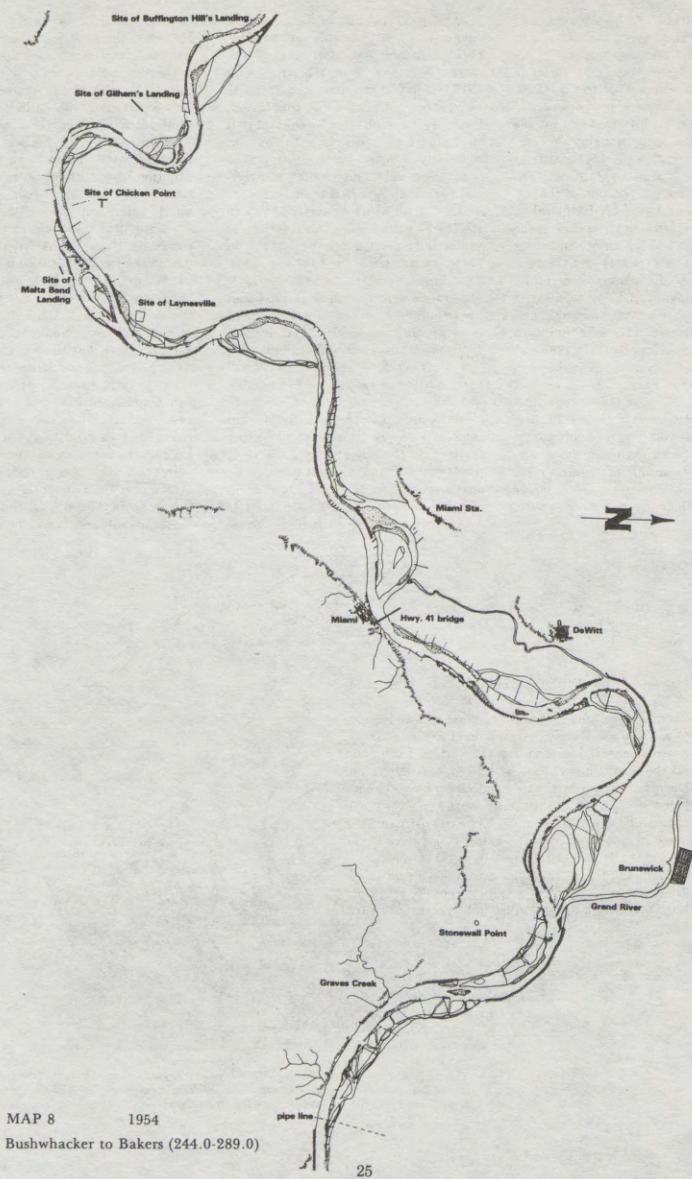
MAP 7 1954
 Boonville to Bushwhacker (198.0 - 244.0)



Map 8. Missouri River, Bushwacker to Bakers, 1879, 1954.

The water surface area in this 45-mile reach was reduced from 7,584 acres to 5,676 acres, a reduction of 25% in 75 years. The area of unconnected islands was reduced by 1,430 acres (94%), and the total channel area by 6,877 acres (30%). The channel has been narrowed, islands, sandbars and chutes have been reduced in number, bends have been smoothed and channel changes have moved meander loops downstream. The major change in this reach was the cutoff of Bowling Green bend, reducing the length of the river by several miles.

Between 1954 to 1972 water surface area was reduced an additional 319 acres to 5,448 acres, a reduction of 6% in the 18-year period. Total loss of water surface in 93 years, 1879-1972, is 28%.



202 trammel nets, 820 hoop nets, and 163 trotlines and caught 254,703 pounds of fish. The increases in 1970 are believed to have been due to more stringent enforcement of the legal requirement that fishermen file reports.

Some of the information in the reports before 1945 probably is comparable with that in the 1945 and later reports, some of it probably is not. The reported species composition of the annual catches probably are comparable. There is no evidence of bias in any of the reports except the few minor instances mentioned. The numbers of fishermen reported to be fishing annually certainly are not comparable. Prior to 1945 it seems likely that records were obtained only on fishermen who sold their fish through organized markets. In 1945 and thereafter all commercial fishermen were required to have a license and all were counted. Many of these caught fish only for home consumption or sold their products locally and so probably would have been overlooked in previous surveys. The number of commercial fishermen doubtless was much larger before 1945 than the published reports indicate.

The total pounds of fish reported caught in a year probably are not comparable before and after 1945. Since more fishermen were reporting after 1945, we might presume the catch to have been larger. This conclusion, however, is complicated by the fact that the reporting requirement was not rigorously enforced before 1970, and in many years only a relative few commercial fishermen reported their catches.

Of the 19 years between 1945 and 1967 for which the information is available, reporting was best (44%) in 1948, poorest (26%) in 1947 and 1963, with a median of 31% in 1958 and 1961. Fishermen were informed in 1968 that the requirement would be enforced and reporting improved (50%). It continued to improve in 1969 (69%) and 1970 (70%). Therefore, the actual total harvest between 1945 and 1967 probably was substantially higher than reported. If we assume that the reported annual catch is a representative sample of the catch of all the fishermen for the year, then the total catch can be estimated by direct proportion (Fig. 6). There is no reason to believe that this assumption is not correct, so the estimated annual

catch probably is fairly accurate. However, these estimates are not comparable with the reported annual catch for earlier years. Since only the part of the catch which was marketed probably was reported in the earlier years, the total catch in these years would have been substantially higher than the reported catch. There is no way of estimating how much, so we can not compare the quantities of fish caught annually before and after 1945.

Since 1945 the trend of the annual commercial catch has been generally downward from 1,724,000 lb in 1947 to 342,000 lb in 1963, a decline of 80% (Fig. 6). These are extremes, but they mark the trend of the catch. *Many factors may effect the commercial catch in a body of water, but the one steady, consistent change in the Missouri River has been the reduction and deterioration of fish habitat resulting from the navigation and stabilization project.* The change to rock dikes has been especially hard on the commercial fishermen. The permeable pile dikes provided places to attach gear and frequently were favored fishing spots. The rock dikes do not have these advantages. Nets anchored near



The decline of commercial fishing in the Missouri River is wedged to reduction and deterioration of fish habitat due to navigation and stabilization projects. The lake sturgeon has almost disappeared and the paddlefish declined drastically.

them may be worn out by chafing against the rock or be buried in silt in a short time.

During this period the three principal species groups (carp, buffaloes, catfishes) dominated the commercial catch from the Missouri River even more completely than in the previous period (90 to 95%) (Fig. 7). Carp made up 60 to 64% each year from 1945 to 1965, but dropped to 39% in 1970. The decrease in carp in 1970 was due to increased proportions of buffaloes (29%) and catfishes (22%) in the catch. Why this has happened, and whether it may be the start of a new trend, remains to be seen.

Carp, buffaloes, and catfishes made up about the same proportion of the catch in the 1945 survey as they did of the commercial catch that year, but relatively more carp and fewer buffaloes were taken in the survey (Fisher, 1962). In the 1967-68 study of catfish populations, carp, buffaloes, and catfishes made up only 80% of the total catch (Ragland and Robinson, 1972). This was due almost entirely to a very restricted take of buffaloes; proportionately more carp and catfishes were taken than in the 1970 commercial catch. This was to be expected because the catfishes were the object of the study and methods used were selective for catfishes.

The catch of sturgeons declined further during this period (Fig. 8). Nearly all of those taken presumably were shovelnose sturgeon. The proportions of paddlefish and freshwater drum in the total commercial catch remained relatively constant, but the decline in total catch meant that the total quantity of each species taken actually declined. The take of sturgeons and paddlefish in 1945 was substantially smaller in the survey than in the commercial catch. In the 1967-68 catfish study, however, the relative proportions of sturgeons, paddlefish and freshwater drum were not greatly different from the 1970 commercial catch.

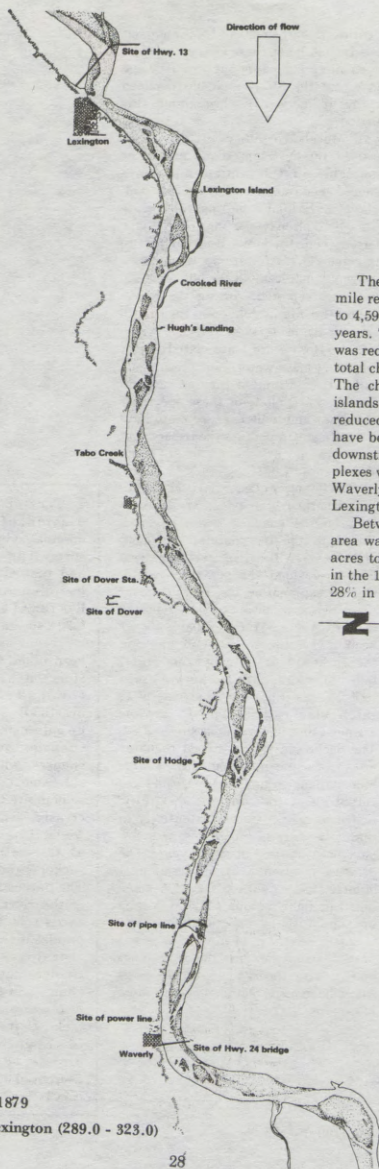
Since 1949 records of the species composition of the commercial catfish catch are available (Fig. 9). These show the proportions of blue catfish in the annual catch to have remained relatively stable, the proportions of flathead catfish to have declined, and the proportion of channel catfish to have increased. The increase of channel catfish coincides rather closely with the increased use of rock dikes. The decline in flathead catfish had started earlier but

continued rather steadily throughout the period. That these changes may be even more serious is suggested by the fact that the total catch has declined rather consistently throughout this period.

Reduced turbidity of the river, caused by upstream dams and most noticeable in the winter, may have caused some changes in the fish populations. Skipjack herring and white bass, both piscivorous, presumably sight feeders and, therefore, best adapted to relatively clear waters, have been collected in recent years but formerly were not reported. Among the forage fishes, the mimic shiner and the spotfin shiner have been taken in recent collections. Both are associated with relatively clear water, and presumably turbidity had limited their spread into the Missouri. None of these species is abundant and none is expected to have a significant impact on the fishery, but their mere presence is of some significance.

The quantity of gear reported fished, per fisherman reporting, sheds some light on the changes which have occurred in the fish habitat and populations (Fig. 10). Hoop nets have been used throughout the period of record, and no explanation can be offered for the wide variation in numbers reported in early years. Trotlines have always been used but many more were used in the earliest years. Anonymous (1911) failed to report on the trotlines in use in 1908. Today they are used chiefly to catch blue catfish, and it can be assumed that this was in use in the past. The decline in trotlines used probably reflects decline in abundance of large blue catfish, which we suggested occurred about the turn of the century. Seines were used rather extensively in the early years of record but very few have been licensed in recent years. The decrease in recent years in the number of large sand bars (necessary to beach a seine) probably accounts for the decline in popularity of this method. More trammel nets have been used in recent years. The greater prevalence of snags and drift in the river in earlier years would have made trammel netting more hazardous.

Thus, it seems that the fish population of the river has been dominated by a few species adapted to survival in the swift, turbid stream and that diversity of the population has declined as habitat has become less varied and diverse. Spectacularly large specimens of blue catfish, lake sturgeon and paddlefish have not been taken for many years. The lake sturgeon has virtually disappeared, the paddlefish has declined drastically and the blue catfish makes up only a small part of the total catch. Crappies, sunfishes, black bass and saugers, which once made up a considerable portion of the catch, now seldom are taken. The exotic carp increased dramatically soon after introduction, apparently at the expense of the native buffaloes and carp-suckers, and has remained dominant. The flathead catfish may be declining in the river at present; the channel catfish is the only major species besides the carp which seems to be increasing in abundance. These changes have paralleled the physical changes in the river and, while proof of a cause and effect relationship is lacking, the circumstantial evidence of a direct relationship between decreased diversity in the habitat and decreased diversity in the fish population is very strong.



Map 9. Missouri River,
Bakers to Lexington,
1879, 1954.

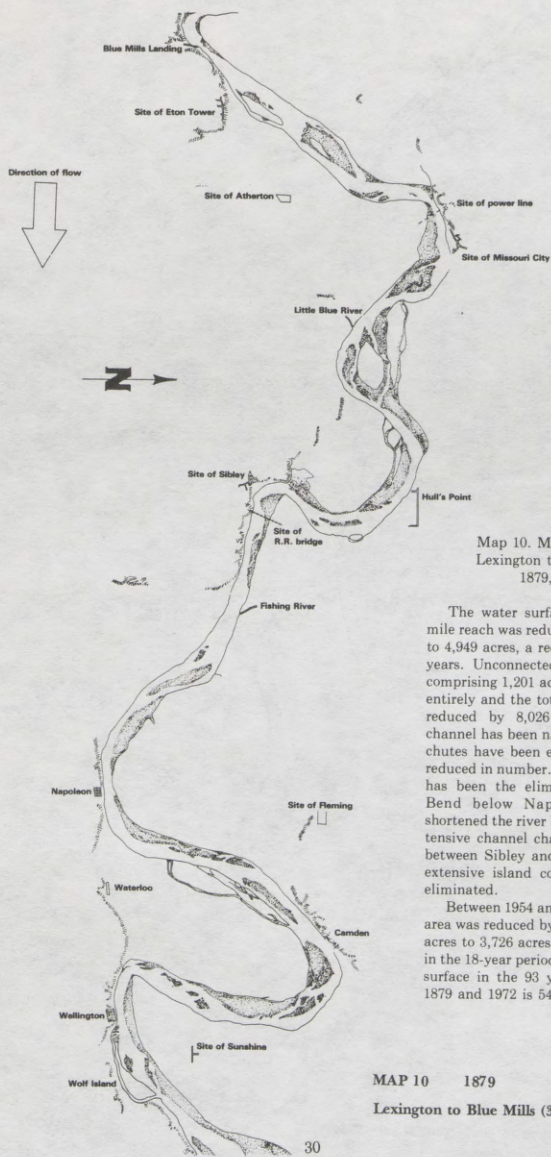
The water surface area in this 34-mile reach was reduced from 5,242 acres to 4,594 acres, a reduction of 12% in 75 years. The area of unconnected islands was reduced by 581 acres (99%), and the total channel area by 2,501 acres (22%). The channel has been narrowed, and islands, sandbars, and chutes have been reduced in number. Channel changes have been less extensive than in nearby downstream reaches. Major island complexes were eliminated in the vicinity of Waverly and Lexington Island below Lexington.

Between 1954 and 1972 water surface area was reduced by an additional 846 acres to 3,752 acres, a reduction of 18% in the 18-year period and a total loss of 28% in 93 years, 1879-1972.

MAP 9 1879
Bakers to Lexington (289.0 - 323.0)



MAP 9 1954
Bakers to Lexington (289.0 - 323.0)

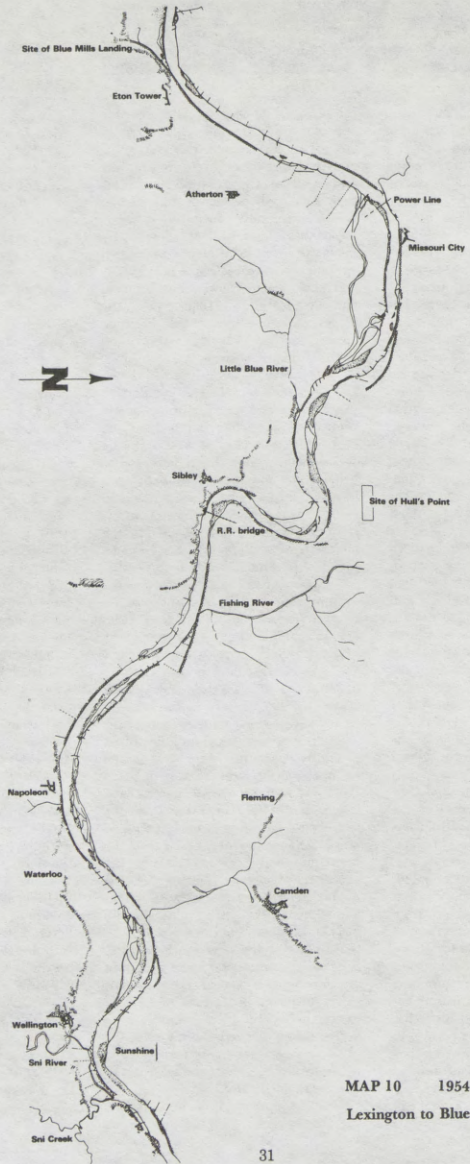


Map 10. Missouri River,
Lexington to Blue Mills,
1879, 1954.

The water surface area in this 35-mile reach was reduced from 8,125 acres to 4,949 acres, a reduction of 39% in 75 years. Unconnected islands, originally comprising 1,201 acres, were eliminated entirely and the total channel area was reduced by 8,026 acres (51%). The channel has been narrowed, islands and chutes have been eliminated, sandbars reduced in number. The greatest change has been the elimination of Camden Bend below Napoleon, which has shortened the river by several miles. Extensive channel changes have occurred between Sibley and Missouri City and extensive island complexes have been eliminated.

Between 1954 and 1972 water surface area was reduced by an additional 1,223 acres to 3,726 acres, a reduction of 25% in the 18-year period. Total loss of water surface in the 93 year period between 1879 and 1972 is 54%.

MAP 10 1879
Lexington to Blue Mills (323.4 - 358.3)



MAP 10 1954
Lexington to Blue Mills (323.4 - 358.3)

CHANGES IN WILDLIFE

Wildlife was very abundant along the Missouri River before the advent of the white man and through the early years of settlement. Bones from Indian sites in Platte and Clay counties dated before 1600 were: deer (90%), raccoon, beaver, bison, elk, dog, red fox, bobcat, bear, fox squirrel, and a few birds (Wedell, 1943). Early travelers had much to say about the abundance of game; all depended on hunting to provide most of their subsistence. The Lewis and Clark expedition killed and consumed 73 deer between May 27 and July 17, 1804, according to the records of Sgt. Ordway. This quantity is not excessive when we recall that the party numbered 45 people. The expedition also reported killing bears, turkeys, wolves, beaver, raccoon, and saw elk, buffalo sign, Carolina parakeets, pelicans, young swans and great quantities of young geese while still in the Missouri portion of the River (Coues, 1965).

The abundance of game changed rapidly as the country was settled. James, narrator of the Long expedition (1819-1820), reported that deer, elk and bison had long been absent in eastern Missouri and that in the area southwest of Franklin "most of the deer and larger animals, as well as the turkeys, have fled from this part of the country, though it is but a few years since they were extremely abundant." He reported that further up the Missouri game was still fairly common. Capt. Wily Martin with three companies of riflemen spent October to August, 1818-1819, on Cow Island, Platte County. They lived off the country as was the custom: "Between two and three thousand deer, besides great numbers of bears, turkeys, etc. had been taken" (from McKinley, 1960).

A weakness of all these records from our standpoint is that there is no way of ascertaining whether the information reported pertains to the river and its immediate margins or to the surrounding country. We believe that in certain instances, as with waterfowl or other water-oriented animals, they pertain to the river. With regard to terrestrial species such as deer, elk, buffalo, and turkeys, the early information obviously pertains to both the river margins and

the surrounding country. At present the Missouri River margins, where not in cultivation, are covered with a luxuriant growth of vegetation. Trees grow rapidly and soon attain a large size. This vegetation provides cover and feeding areas for a variety of wildlife. It seems reasonable to assume that before settlement the entire flood plain was covered with luxuriant vegetation in most places and that such verdure provided food and cover for wildlife, then as now. The biggest difference would be in the much greater quantity of both vegetation and wildlife in earlier times.

Early travelers frequently mentioned Carolina parakeets. Large flocks of the yellow, red and green birds made a beautiful sight when perched on the bare white branches of a stream-side sycamore in winter. There is reason to believe parakeets were dependent upon habitat provided by the bottomland forest. It is reported they fed on the fruit of sycamore trees and roosted in the hollow trunks. Parakeets had become rare by the mid-1880s and were extirpated soon after. The reasons for the disappearance of this beautiful bird are not well understood but the destruction of habitat, including, as suggested by McKinley (1960), the cutting of hollow "bee" trees, may have been a factor.

Swans also were frequently mentioned by the pioneers. It often is unclear whether the trumpeter swan or the whistling swan was meant. Most probably were migrants, but many trumpeters wintered in this latitude and there is evidence some nested here. Lewis and Clark mentioned young swans on a bottomland lake in what is now Buchanan County. Other travelers mention seeing swans during the summer, suggesting nesting. During migration swans were very abundant and apparently quite vulnerable to market hunters. They were scarce by the middle of the nineteenth century. By 1900 the trumpeter swan had been virtually wiped out in the Missouri valley, although it has been saved from extinction (McKinley, 1962). The destruction of favored habitat along the Missouri River was one of many factors which served to reduce the numbers of this magnificent bird.

Turkeys apparently were abundant

on the river margins, according to early accounts, although we tend to associate them with upland hardwood forests. Certainly, turkeys are dependent upon mast-producing trees for food, but pin oaks, pecans, and other mast producers may have been abundant in some of the Missouri bottoms. This would account for the number of turkeys reported by the early travelers on the river. The clearing of the rich bottomland was one of the ways in which turkey habitat was reduced and the species virtually eliminated along the river.

The buffalo (bison), elk and bear which were common along the river in early days declined rather quickly. They were virtually extinct here well before 1900 and they never have recovered. Their extinction probably was due to settlement and excessive hunting (Bennitt and Nagel, 1937, Schwartz and Schwartz, 1959).

Deer continued to be relatively abundant in Missouri River counties until mid-century. Bennitt and Nagel (1937) quote from county histories: One man saw 73 deer (Atchison, 1841), 23 deer killed in one winter (Holt, 1842-43), "unlimited numbers" (Andrew, early 1840's), "trooping over the prairie in droves of 12 to 30 and sometimes 50" (Buchanan), "large numbers", (Clay, 1831); "myriads" (Ray), "shot 5 deer before sunrise" (Lafayette, 1826), three men killed 246 in one hunting season (Saline, 1855), "hundreds of deer killed" (Chariton), Indians killed 2,000 deer (Callaway), 72 deer seen in 6 miles (St. Charles, 1809). They had disappeared from the northern and western counties by 1890 and in 1935 were present in only a few counties in the Ozarks (Bennitt and Nagel, 1937).

The phenomenal increase of deer since 1935 in response to modern game management in Missouri is well known. It is less well known that the largest and most productive deer in the state are those from the river borders of north Missouri (Murphy, 1970). The size of the deer herd in these areas is limited chiefly by the amount of suitable forest cover. River margin bottomland forest provides suitable cover for deer and the destruction of these forests along the Missouri River, especially on former islands, has removed much valuable deer habitat. Seton (1929) gives 20 deer per square mile as the original carrying capacity of deer range in the Mississippi Valley. At this rate, the islands lost on the Missouri River in the past 93 years would have harbored 750 deer capable of

producing a harvestable surplus of 225 animals annually. We know of no way to measure the additional deer habitat lost along the river margins, but it is large and continuing. *The loss of suitable habitat is the principal limit to production of deer along the river.*

Trappers and fur traders led in the exploration of the Missouri River. This suggests the abundance of furbearing animals in the river and its tributaries. The otter was distinctly a river species frequently mentioned by early travelers. Its pelt always brought a good price. The county histories from 1830 to 1880 report otter: "numerous" (Atchison), "present" (Platte), "store bills paid with coon, deer, otter and other skins" (Ray), "present" (Lafayette), "plentiful" (Saline), "abundant" (Montgomery, St. Charles).

The otter population in Missouri was estimated by Bennitt and Nagel (1937) to have been originally as many as one per 19 miles of stream. This would have meant a breeding population of about 30 otters in the stretch of the Missouri River with which we are concerned, using the 1879 length. This is taking into account only the river channel. If the original sloughs, chutes and oxbows were added the length of waterway and therefore the number of otters it could support would be multiplied. Bennitt and Nagel considered the otter virtually extinct in the state in 1935 but thought it could recover. Although given full protection as they recommended, the otter is still rare in Missouri. *The habitat requirements of the species are not well known but its decline in abundance parallels the loss of slough and backwater habitat in the Missouri River.* The otter is piscivorous and a direct relationship between otter populations and fish populations can be assumed.

The beaver is another aquatic furbearer which apparently was abundant in the Missouri River in early historical times. Beaver pelts were the chief lure which induced early trappers to explore the river. The species had been reduced to a few remnants in Missouri by 1915. Introductions from northern states had started an increase in the beaver populations in Ozark streams by 1935 (Bennitt and Nagel, 1937). Downstream migration along the Missouri River helped the species to re-establish itself in the northern agricultural counties. Given complete protection in 1937, beavers increased to the extent that a statewide trapping

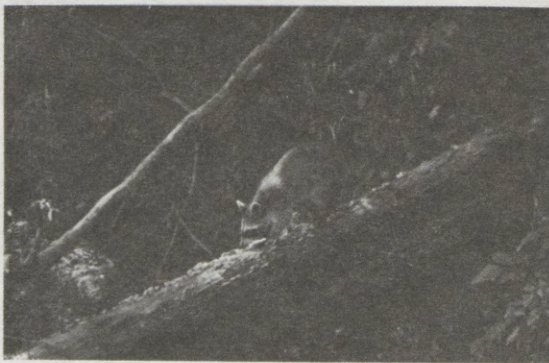
season was authorized in 1956. The harvest reached a modern high in 1962 (Robb, 1970). Importance of the river in the resurgence of this furbearer can not be underestimated. Beavers spread down stream and up tributaries. These naturally established colonies were live-trapped for brood stock to repopulate other portions of the state. There is little doubt that the Missouri River, with its original sloughs and backwaters, would have supported a larger population of beavers than at present and that re-establishment would have occurred sooner and more rapidly under those conditions.

Another common aquatic furbearer, the muskrat, was not mentioned by early travelers on the Missouri River, although it almost certainly was present and probably abundant. Its preferred habitat is marshes and quiet, shallow, weedy waters. The backwaters, sloughs and oxbows associated with the untrammed river would have supported a large population. The lack of attention is probably due to the fact that it was commonplace and its pelts of little commercial value. Bennitt and Nagel (1937) considered the muskrat to be at a very low level statewide in 1935 and decreasing in abundance about 5% annually. They demonstrated an inverse relationship between muskrat populations and the proportion of drained land in an area. Drainage of the associated wetlands, of course, is essentially what has occurred with the channelization of the Missouri River.

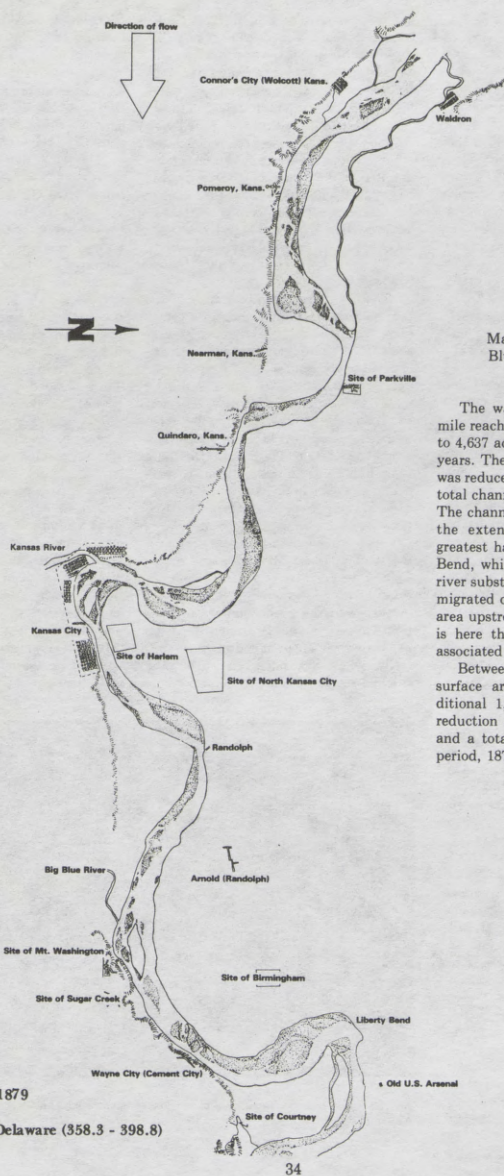
Since 1935, muskrat populations have increased and they are considered abundant in suitable habitat (Sampson, 1970). However there is no indication of an increase in the muskrat population in the Missouri River. *The deep, swift channel devoid of vegetation is not suited to their needs.*

The mink, like the muskrat, was not mentioned by early travelers on the Missouri River but must have been abundant in the marshes and quiet backwaters associated with the river in its natural state. The nocturnal and secretive habits of mink would help to account for the lack of notice by early travelers. Mink pelts have always brought a good price. Bennitt and Nagel (1937) considered the mink population to be at a low level statewide in 1935 and to be decreasing about 5% annually. They showed a positive correlation between mink population density and mileage of permanent stream in an area. The season on mink was closed 1948-49. Harvest of mink increased statewide until 1952; since then competition from ranch-reared mink has increased and served to reduce the harvest of wild mink (Sampson, 1970). Under present conditions, due to the drainage of oxbows and destruction of timber, few mink are found in the Missouri River.

The raccoon was often mentioned by early travelers. This furbearer is not so definitely an aquatic species as are otter, beaver, muskrat and mink, but it feeds along available water courses. Its pelt fluctuates in price but usually is



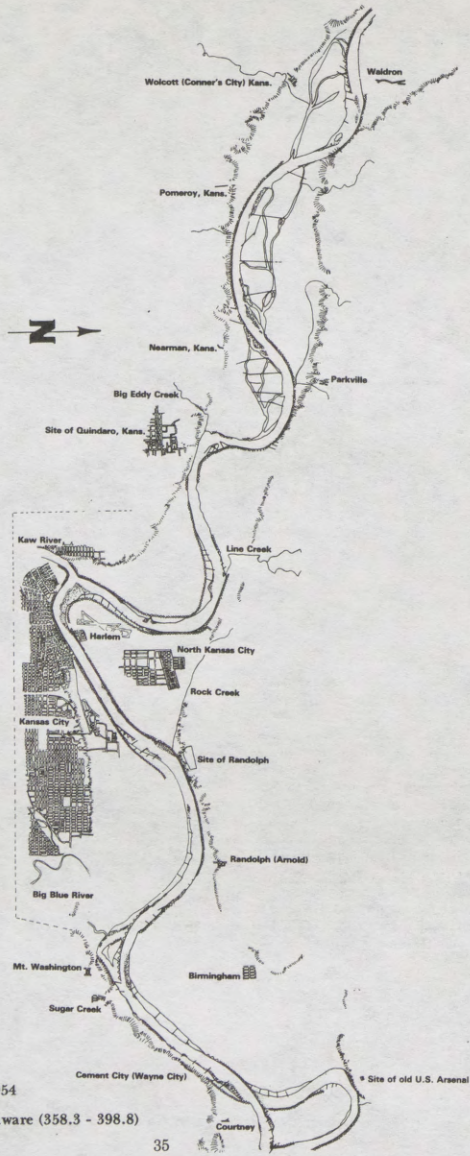
Raccoons and rivers go together, but the loss of backwaters and bottomland forest along the Missouri River has greatly reduced their numbers.



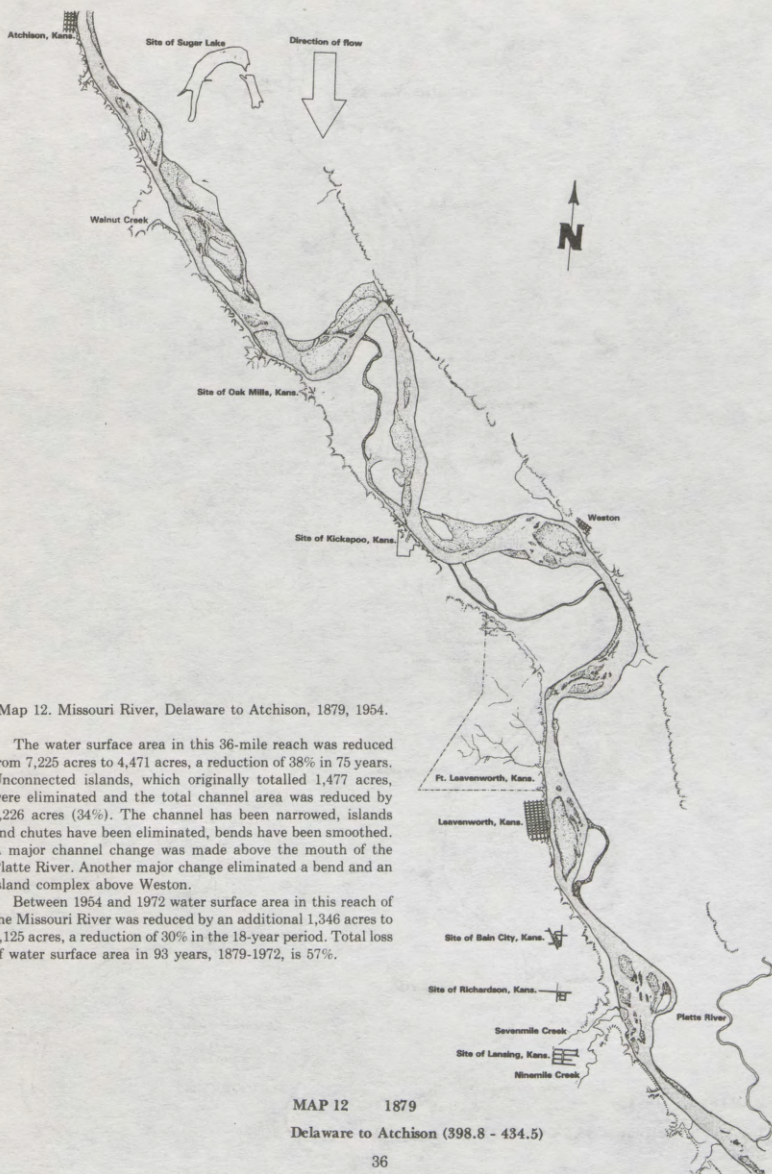
Map 11. Missouri River,
Blue Mills to Delaware,
1879, 1954.

The water surface area of this 41-mile reach was reduced from 8,176 acres to 4,637 acres, a reduction of 43% in 75 years. The area of unconnected islands was reduced by 829 acres (97%), and the total channel area by 3,117 acres (32%). The channel has been narrowed; and of the extensive channel changes, the greatest has been the cutoff of Liberty Bend, which reduced the length of the river substantially. Meander loops have migrated downstream, especially in the area upstream from Kansas City and it is here that most of the islands and associated chutes have been lost.

Between 1954 and 1972, the water surface area was reduced by an additional 1,135 acres to 3,526 acres, a reduction of 24% in the 18-year period and a total loss of 57% in the 93-year period, 1879-1972.



MAP 11 1954
Blue Mills to Delaware (358.3 - 398.8)

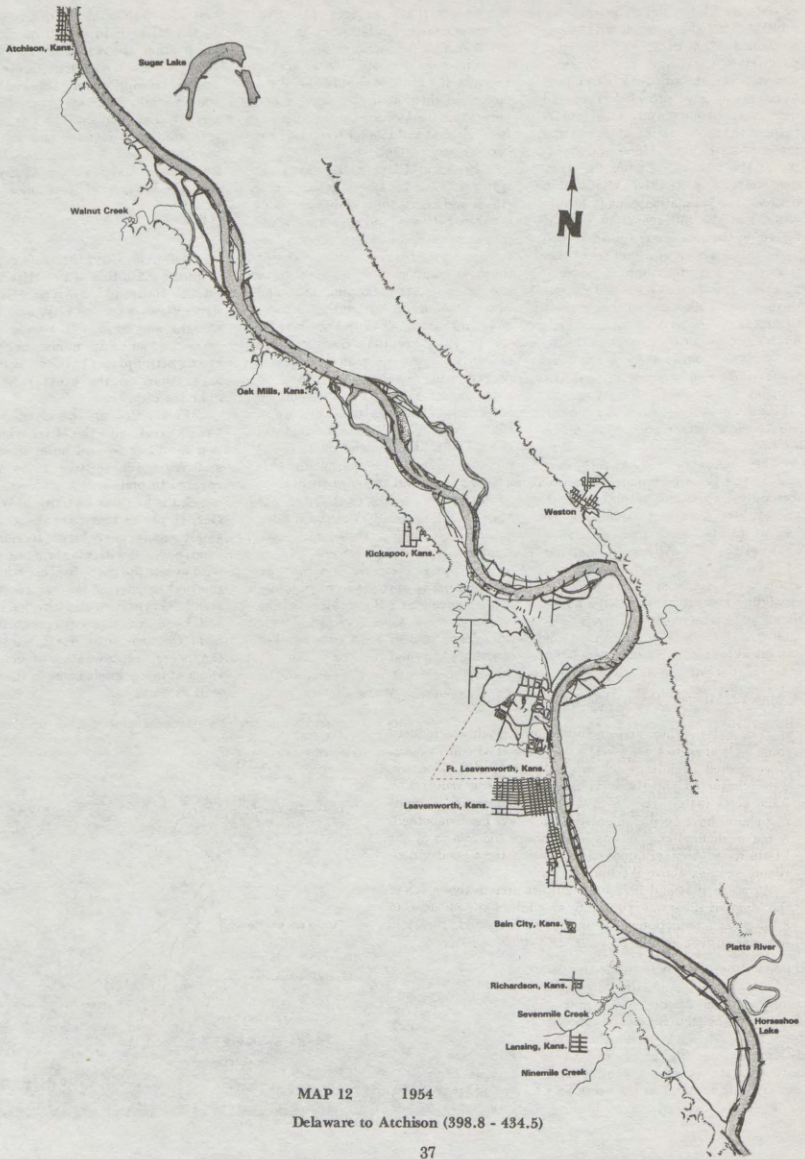


Map 12. Missouri River, Delaware to Atchison, 1879, 1954.

The water surface area in this 36-mile reach was reduced from 7,225 acres to 4,471 acres, a reduction of 38% in 75 years. Unconnected islands, which originally totalled 1,477 acres, were eliminated and the total channel area was reduced by 5,226 acres (34%). The channel has been narrowed, islands and chutes have been eliminated, bends have been smoothed. A major channel change was made above the mouth of the Platte River. Another major change eliminated a bend and an island complex above Weston.

Between 1954 and 1972 water surface area in this reach of the Missouri River was reduced by an additional 1,346 acres to 3,125 acres, a reduction of 30% in the 18-year period. Total loss of water surface area in 93 years, 1879-1972, is 57%.

MAP 12 1879
Delaware to Atchison (398.8 - 434.5)



MAP 12 1954

Delaware to Atchison (398.8 - 434.5)

considered desirable. The raccoon probably was abundant along the unrestrained Missouri River. The quiet backwaters would have been desirable feeding areas, the adjoining bottomland forest would have provided cover and den sites. Bennitt and Nagel (1937) thought the raccoon population was at a low level statewide in 1935 and decreasing at the rate of 5% annually. They demonstrated a positive relationship between the population density of raccoons and the mileage of permanent stream in the area under consideration. They thought that destruction of den trees was a factor limiting raccoon numbers. Populations remained low until the middle 1940's when they started to increase. They have maintained high levels since the 1950's (Sampson, 1970). *The loss of backwaters along the Missouri River and much of the bottomland forest along its margins has substantially decreased raccoon habitat and therefore raccoon populations along the river.*

The abundance of other furbearers and upland game mammals and birds, including opossums, rabbits, quail, and squirrels, has been reduced by the loss of habitat associated with river channelization. Although neither "before" nor "after" figures are available, it is an elementary principle of wildlife management that the abundance of a species is positively correlated with the amount and quality of habitat available to it, and there is no question that wildlife habitat has been lost along the Missouri River.

A body of water as extensive as the Missouri River in Missouri is certain to be important for waterfowl. Most waterfowl which use the river are migratory. They nest and rear their young farther north and winter farther south. They use the river in both spring and fall as a stopover place to rest, feed and recoup strength before resuming their travels. Some of the migrants winter on the river. Their needs differ quantitatively from those of the transients. Still other migrants are summer residents and use the river and adjacent areas for nesting and rearing their young. Their needs are different from either of the other groups.

The abundance of the migratory waterfowl which use the river usually is determined by actions and events far from Missouri, such as weather conditions on nesting grounds in the northern states and Canada, and hunters' kill in states to the north and south. These things have no bearing,

however, on the importance of the river to waterfowl in migration or to those which winter or summer on it. The amount of habitat suitable to special needs of the birds is simply one of the factors in their ability to survive and perpetuate themselves. On the Missouri River habitat suitable for waterfowl has been greatly reduced.

Lewis and Clark noted the great spring migration of swans, geese, ducks, cranes and brants (blue and snow geese) between February and mid-April while they were encamped at St. Louis before starting up the river. They also recorded the great numbers of geese, brant (blue and snow geese), teal, mallards and swans flying southward during October and early November when they were far up in the Dakotas. Beside these migrants, however, many waterfowl nested and raised their young in backwaters, marshes and bottomland lakes associated with the river. Capt. Clark noted on April 13, 1804, while still in St. Louis, "the summer-ducks (wood ducks) raise their young in this neighborhood, and are now here in great numbers." On June 16, on the river near Malta Bend, he noted, "The wood-duck now has its young; these ducks are abundant, and except for one solitary pelican and a few geese, are the only aquatic fowl we have yet seen." By July 1, just above Platte River (Missouri) he recorded, "Saw some geese with their young" and on July 4, "A great number of young swans and geese on a lake--."

An appreciation of the value to the waterfowl hunter of the islands, sand-

bars and chutes which formerly existed on the Missouri River can be obtained by reading the Missouri chapter of *Where to Hunt American Game*. This book was compiled and published by the United States Cartridge Co. in 1898 as a service to sportsmen. The chapter for each state was reviewed and edited by the state game commissioner, so the information should be authentic. Excerpts from the Missouri chapter follow:

"Jefferson City, the state capital, is on the main line of the Missouri & Pacific Railroad . . . The Missouri River flows past the city, and in its sloughs and bayous in season duck, geese, and snipe are numerous. There are no better places in the state to find geese than on the great sand-bars near the city."

"Five miles up the river, where Gray's creek joins the Missouri, there is a sand-bar several miles in length and from one to two miles wide, covered in places with willows, from which the bar gets its name of Willow Bar. In places there are sloughs and small ponds near large sections of sand, covered with plantain and other wild plants the geese feed on, while on the higher part of the bar there are small fields of corn and turnips. Geese can be found there in great flocks from October until April, except in the severe winter weather of January. Duck of many kinds come in there, as well as snipe . . ."

The islands, sandbars and sheltered backwaters which made the Missouri River important to waterfowl have been eliminated. The quiet waters of the river in which geese historically reared their young were destroyed by channelization.



"Opposite Jefferson City is what is locally called the Big Towhead, a long island covered with black willows. In the adjacent sloughs duck can be found in season, and geese frequent the island daily in large numbers. Quail are found there in small coveys. One can reach the island from the Jefferson-street landing in five minutes by boat."

"Four miles below Jefferson City the Moreau flows into the Missouri. This is a wide, deep creek of many miles length, in whose pools teal, sprigtail, and larger duck can be found in season. In the center of the Missouri opposite the mouth of the Moreau there are a number of low bars, where in the milder winter days thousands upon thousands of geese congregate."

"Six miles below the capital, at Ewing's Station on the Missouri Pacific Railroad, is located a division of the Missouri River Commission. A great fleet of dredging and dike-building boats is located there. The officers and engineers are nearly all sportsmen, and an introduction to some of them will secure for the hunter splendid goose, duck or quail shooting nearby. The officers' steamers are constantly plying on the river, and if one can go with them he will find fine shooting."

"Osage City is only three miles from Ewing's. The Osage River joins the Missouri just below. On the islands between the rivers geese and duck are found in large numbers

... ." (Anonymous, 1898). These conditions existed, of course, before extensive changes had been made in the river, although, as noted, the River Commission was at work.

There were few mentions of waterfowl in the sources studied by McKinley (1960). Legislation passed in 1877 made it unlawful for non-residents to market hunt for geese and ducks (among other game species). In the spring of 1882 near St. Joseph a man killed 400 ducks in one day. The first waterfowl season (October 1 to March 31) was enacted in 1895. Other entries tell the retail price of geese, ducks and other game on the markets in St. Louis and other cities. According to Bennitt and Nagel (1937), the peak of market hunting occurred in the period 1874 - 1905. Waterfowl seem to have been common and cheap in the markets, at least during the fall, winter, and spring.

Bennitt and Nagel (1937) were concerned only with resident game and furbearers; they considered all waterfowl to be migratory and so gave very little space to them. They did say, however, that the swans formerly occurring in the state had become extremely rare and that in 1935 the Canada goose and mallard were uncommon residents in summer, but common in winter; that gadwall, bluewinged teal, shovellers and ruddy ducks formerly nested in Missouri to some extent, and that wood ducks still nested in the state in considerable numbers and appeared to be increasing.

According to Brakhage (1970), expanding wood duck populations were reduced by predation from expanding raccoon populations in the 1940's. Wood ducks have become more abundant in recent years but population increases are inhibited by loss of habitat. The great reduction in backwater areas and bottomland timber along the Missouri River is an example of the type of habitat loss which limits this colorful bird. *Without the sheltered backwaters for food production and the natural forest to provide hollows for nests, few wood ducks can survive on the river.*

Mallards of truly wild origin are uncommon summer residents, but birds of semi-domesticated stock are occasionally reported. Many migrant mallards winter on the river when the water remains ice free and some food is available. The number depends on the size of the flyway populations, weather, and water conditions. Few other species are found in the wintering flocks (Brakhage, 1970). The birds feed chiefly on waste grain in cultivated fields. There is no question that before channelization the river could have supported more wintering ducks. Ice jams would have been less prevalent in a less confined channel and much more natural food would have been available in productive backwaters. The migrating ducks also require open water and available food but usually stay only a few days and then press on just ahead of a winter storm. Of course more migrants could be accommodated if more suitable habitat were available, so the Missouri sportsmen suffer.

Today most Canada geese which migrate through the central part of the United States nest on the shores of Hudson Bay. The fact that geese no longer rear their young in the backwaters along the river, as they did in the days of Lewis and Clark, is due to the loss of these backwaters to channelization and

to hunting which reduced the breeding reserve.

Brakhage (1970) reports that small numbers of the resident strain of giant Canada geese have been discovered in recent years and that establishment of resident flocks is being encouraged by the Department of Conservation.

Vaught (1970) believes that few migrant Canada geese wintered in Missouri before 1930. In 1941 fewer than 2,000 stopped here. From 1948 to 1954 approximately 30% of the geese that stopped in Missouri remained for the entire winter. That figure has now increased to 95%. In 1973, the wintering population numbered 170,000. This has been brought about by scientific management and the development of a system of state and federal refuges. Several of these, including Swan Lake National Wildlife Refuge, Fountain Grove Public Hunting Area, Squaw Creek National Wildlife Refuge, August A. Busch Memorial Wildlife Area, and Trimble Wildlife Area, are adjacent to or near the Missouri river. They furnish the quiet open water and readily available food which the wintering geese require. The river still supports a significant population of wintering birds, especially late in the season when feed near the refuges may be in short supply or in unusually severe winters when the refuge lakes may freeze over completely. Although the refuges provide high quality waterfowl habitat, they can replace only a small part of that which has been lost. The river is essential to the geese but the habitat it provides at present is far from satisfactory. *The 60,832 acres of water surface which has been lost on the river, most of which was prime waterfowl habitat, is over 5 times the water area in the five refuges mentioned above. Many more geese could be accommodated if the lost water were still available.*

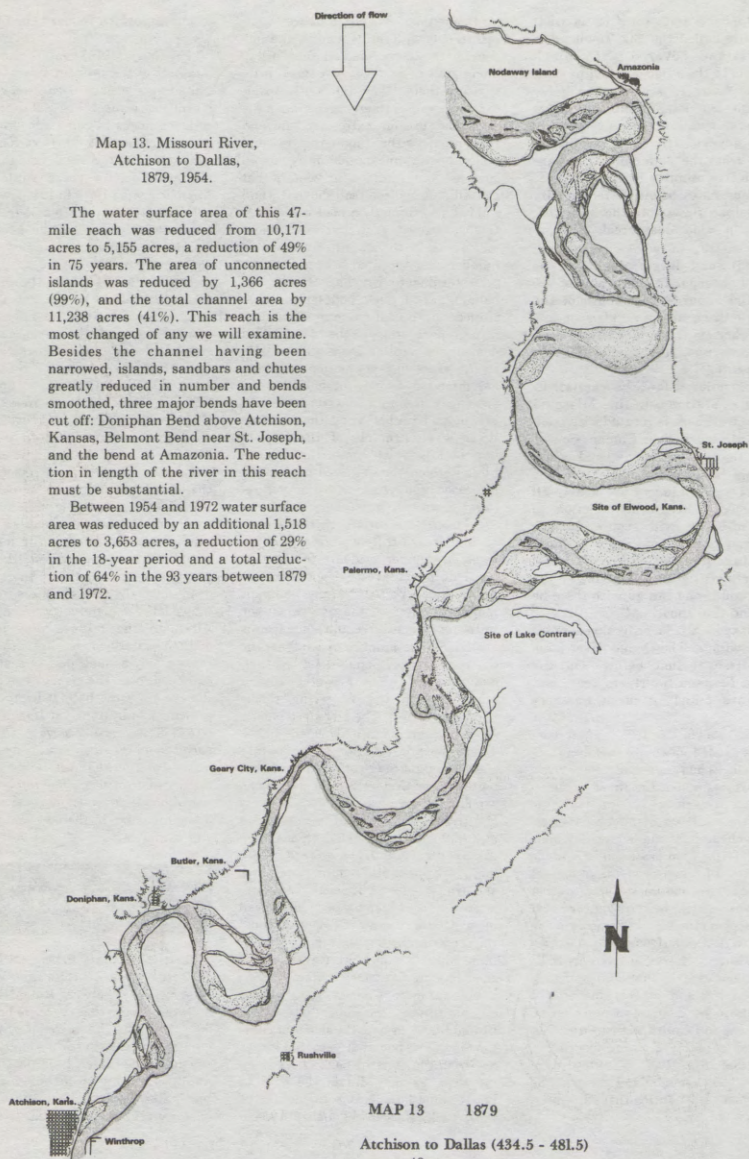
SUMMARY

In the 93 years between 1879 and 1972 the water surface area of the Missouri River between Rulo, Nebraska and the mouth has been reduced by 50%. Islands have been virtually eliminated. The chutes or sloughs which separated the islands from the shore are gone, along with other forms of backwater habitat. The snags which once were abundant in the river have

Map 13. Missouri River,
Atchison to Dallas,
1879, 1954.

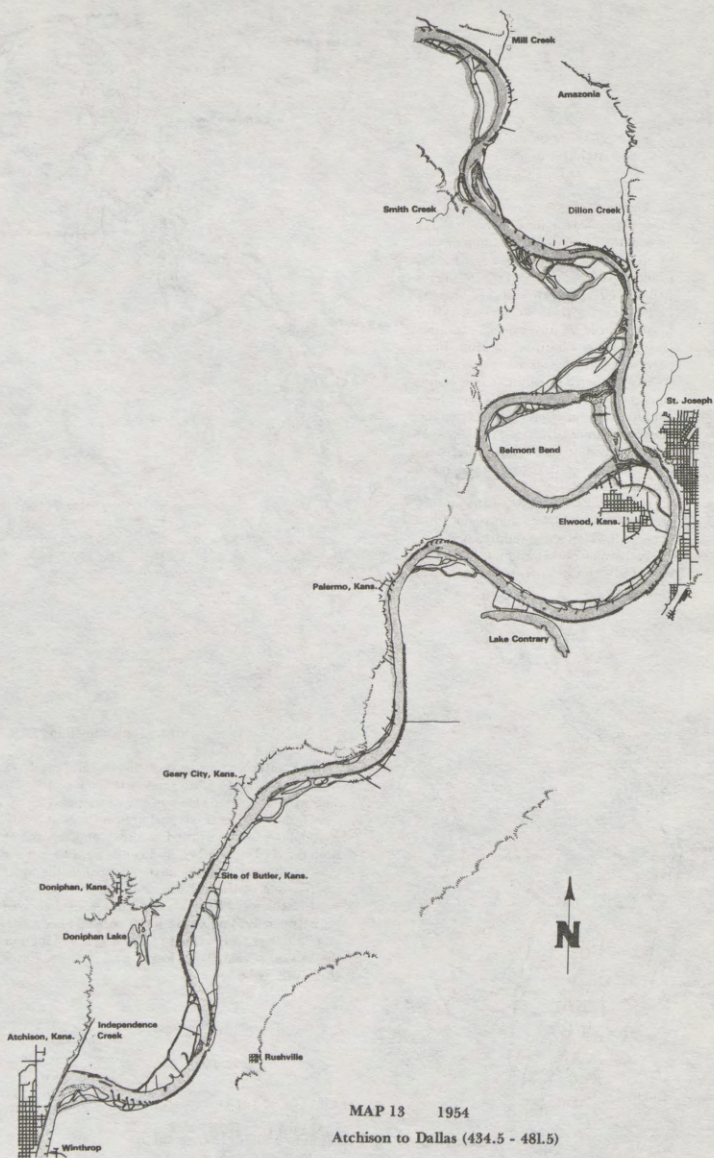
The water surface area of this 47-mile reach was reduced from 10,171 acres to 5,155 acres, a reduction of 49% in 75 years. The area of unconnected islands was reduced by 1,366 acres (99%), and the total channel area by 11,238 acres (41%). This reach is the most changed of any we will examine. Besides the channel having been narrowed, islands, sandbars and chutes greatly reduced in number and bends smoothed, three major bends have been cut off: Doniphan Bend above Atchison, Kansas, Belmont Bend near St. Joseph, and the bend at Amazonia. The reduction in length of the river in this reach must be substantial.

Between 1954 and 1972 water surface area was reduced by an additional 1,518 acres to 3,653 acres, a reduction of 29% in the 18-year period and a total reduction of 64% in the 93 years between 1879 and 1972.

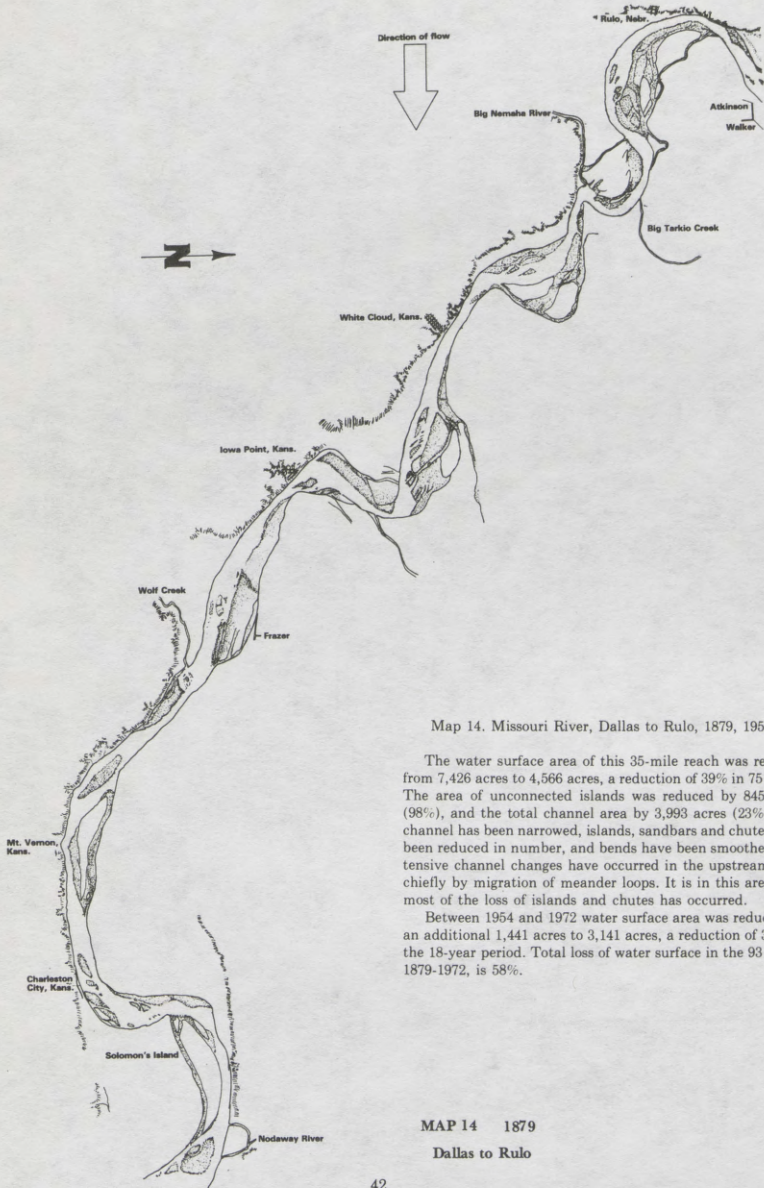


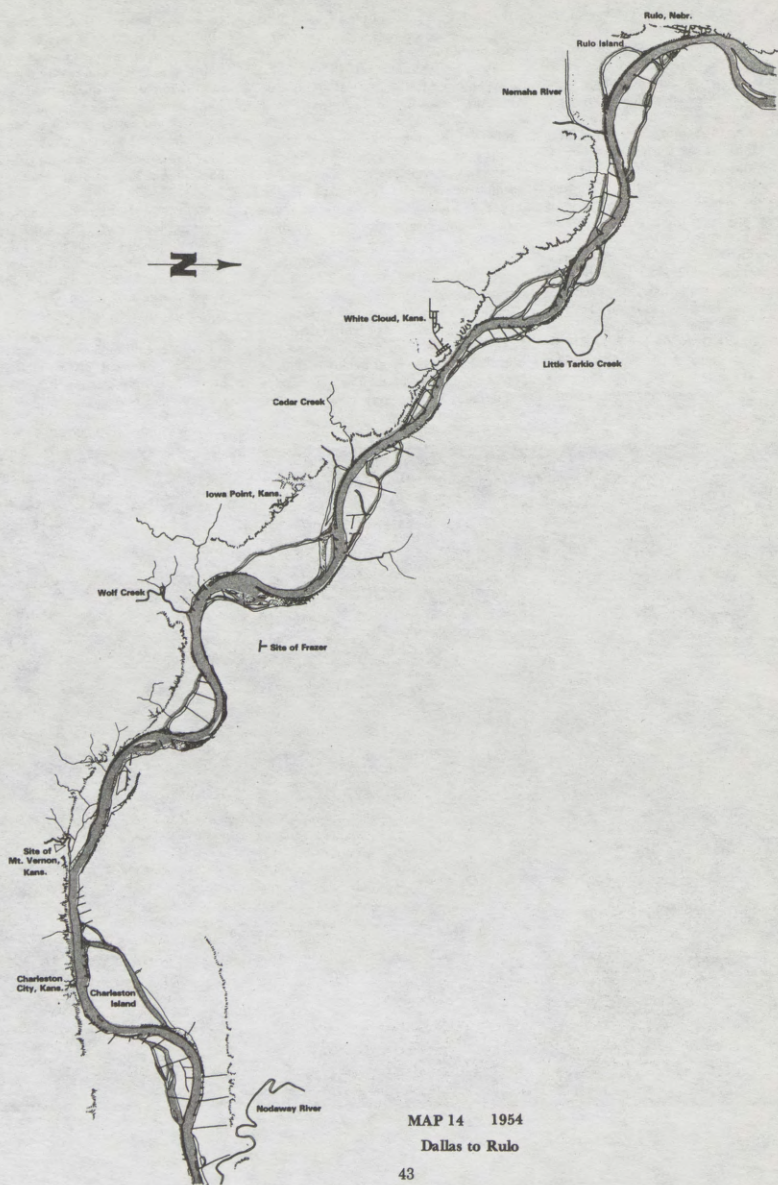
MAP 13 1879

Atchison to Dallas (434.5 - 481.5)
40



MAP 13 1954
Atchison to Dallas (434.5 - 481.5)





MAP 14 1954
Dallas to Rulo

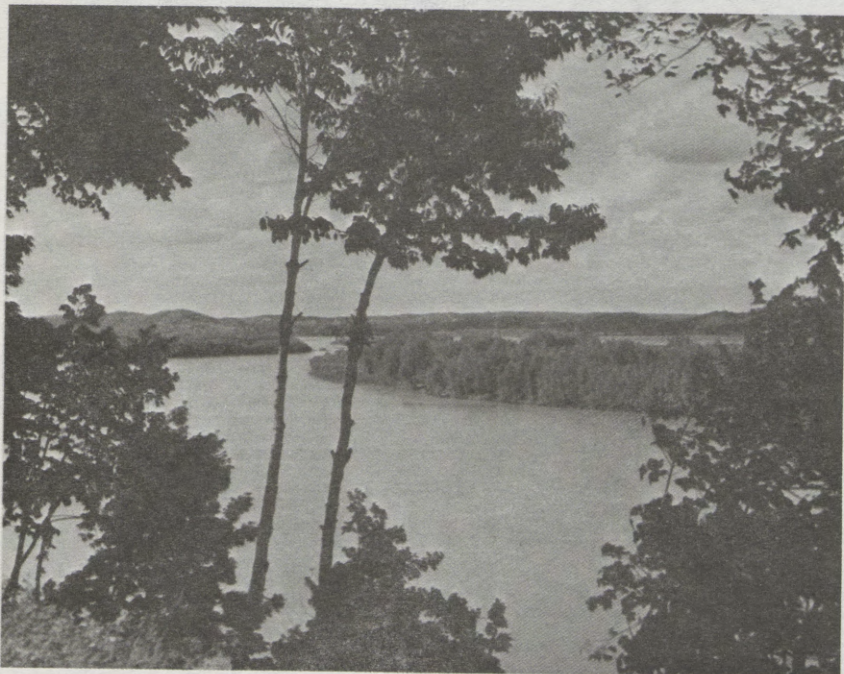
been removed. The full volume of the river's flow is confined within a relatively narrow channel of rather uniform width, with a strong, swift current. This was done to stabilize the river and improve conditions for navigation. It was accomplished by the use of revetments to stabilize banks and wing dikes to direct the current and cut off chutes and sloughs. The pile dikes used originally have been replaced by rock dikes in recent years. Most of this change has been brought about in the past 50 years.

The fishery of the Missouri River, a bountiful resource taken for granted and thoughtlessly exploited, has declined. Quantitative information is not available for the early years, but the commercial harvest declined by 80% in the 16 years between 1947 and 1963. The lake sturgeon is virtually extinct in the river, the paddlefish has been greatly

reduced in abundance and large blue catfish, once commonplace, no longer are being taken. There is some evidence that more channel catfish are being caught but catches of most species, including the exotic carp, have declined. Carp, buffalo and catfish make up the bulk of the commercial catch. Changes in the physical conditions on the river have caused changes in the types of gear which commercial fishermen use, especially a decrease in the use of seines and an increase in the use of trammel nets.

Wildlife, also originally very abundant along the river, was taken for granted and overexploited. Several species are now extinct in this portion of their former range. The whitetailed deer has come back to the state, and is limited along the river chiefly by lack of suitable forest cover. The otter, once abundant, is now very rare along the

river. Muskrats and mink were once abundant but now are rare on the river because of lack of quiet backwater habitat. Migration of beaver down river helped to reestablish the species which had been nearly exterminated in the state but they are not abundant in the river. Raccoons are no longer abundant along the river because of the scarcity of quiet backwaters and mature bottomland forests. Most of the waterfowl which use the river are migrants which need resting places and temporary feeding grounds. Many Canada geese and some mallards which winter on the river need feeding areas for more extended periods. Wood ducks and some Canada geese spend the summer and rear their young on the river. More of all species of waterfowl could have been supported on the unchanneled river, which had much greater area of quiet backwaters, sloughs, and bottomland timber.



ACKNOWLEDGEMENTS

Margaret Ann George and Daniel V. Ragland prepared the tracings of the maps. Terry Baker and Mrs. Betsy Wilhite made the area measurements. Members of the staff of the Division of Wildlife assisted in the preparation of the sections dealing with terrestrial wildlife and waterfowl. Mike Milonski, Dean Murphy, Richard Vaught, John Lewis, and Frank Sampson were es-

pecially helpful. The late Werner Nagel read the manuscript and made valuable suggestions. The work was supported in part with federal aid funds from the National Marine Fisheries Service under Missouri's Commercial Fisheries Project 4-3-R and from the Bureau of Sport Fisheries and Wildlife under Missouri's Dingell-Johnson Project F-1-R.

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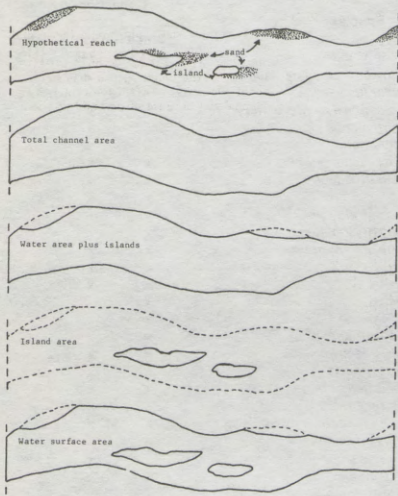
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Fish species known to occur in the Missouri River (after Pflieger, 1971)

FIGURES

Species	Collections made		
	Since 1945	1905- 1945	Before 1905
Chestnut lamprey, <i>Ichthyomyzon castaneus</i>	x	x	
Lake sturgeon, <i>Acipenser fulvescens</i>	x	x	x
Shovelnose sturgeon, <i>Scaphirhynchus platyrhynchus</i>	x	x	
Pallid sturgeon, <i>Scaphirhynchus albus</i>	x	x	x
Paddlefish, <i>Polyodon spathula</i>	x	x	
Shortnose gar, <i>Lepisosteus platostomus</i>	x	x	
Longnose gar, <i>Lepisosteus osseus</i>	x	x	x
Bowfin, <i>Amia calva</i>	x	x	
American eel, <i>Anguilla rostrata</i>	x		
Skipjack herring, <i>Alosa chrysochloris</i>	x		
Gizzard shad, <i>Dorosoma cepedianum</i>	x	x	
Goideye, <i>Hiodon alosoides</i>	x	x	x
Mooneye, <i>Hiodon tergisus</i>		x	
Northern pike, <i>Esox lucius</i>	x		
Carp, <i>Cyprinus carpio</i>	x	x	
Silver chub, <i>Hybopsis storeriana</i>	x	x	
Speckled chub, <i>Hybopsis aestivalis</i>	x	x	
Flathead chub, <i>Hybopsis gracilis</i>	x	x	x
Sturgeon chub, <i>Hybopsis gelida</i>	x	x	
Sicklefin chub, <i>Hybopsis meeki</i>	x	x	x
Suckermouth minnow, <i>Phenacobius mirabilis</i>	x	x	x
Emerald shiner, <i>Notropis atherinoides</i>	x	x	x
Silverband shiner, <i>Notropis shumardi</i>	x	x	
River shiner, <i>Notropis blennioides</i>	x	x	
Bigmouth shiner, <i>Notropis dorsalis</i>	x	x	
Spottfin shiner, <i>Notropis spilopterus</i>	x		
Red shiner, <i>Notropis lutrensis</i>	x	x	x
Sand shiner, <i>Notropis stramineus</i>	x	x	x
Mimic shiner, <i>Notropis volucellus</i>	x		
Ghost shiner, <i>Notropis buchanaani</i>	x	x	
Brassy minnow, <i>Hybognathus hankinsoni</i>	x		
Western silvery minnow, <i>Hybognathus argyritus</i>	x	x	
Plains minnow, <i>Hybognathus placitus</i>	x	x	x
Bluntnose minnow, <i>Pimephales notatus</i>	x	x	
Fathead minnow, <i>Pimephales promelas</i>	x	x	x
Blue sucker, <i>Cycleptus elongatus</i>	x	x	
Bigmouth buffalo, <i>Ictiobus cyprinellus</i>	x	x	x
Black buffalo, <i>Ictiobus niger</i>		x	x
Smallmouth buffalo, <i>Ictiobus bubalus</i>	x	x	x
River carpsucker, <i>Carpiodes carpio</i>	x	x	x
White sucker, <i>Catostomus commersoni</i>	x		
Golden redhorse, <i>Moxostoma erythrurum</i>		x	
Black bullhead, <i>Ictalurus melas</i>		x	x
Yellow bullhead, <i>Ictalurus natalis</i>		x	x
Channel catfish, <i>Ictalurus punctatus</i>	x	x	x
Blue catfish, <i>Ictalurus furcatus</i>	x	x	x
Flathead catfish, <i>Pylodictis olivaris</i>	x	x	x
Burbot, <i>Lota lota</i>	x	x	x
Plains killifish, <i>Fundulus kansae</i>	x	x	
Mosquitofish, <i>Gambusia affinis</i>	x	x	
White bass, <i>Morone chrysops</i>	x		
Largemouth bass, <i>Micropterus salmoides</i>	x	x	x
Green sunfish, <i>Lepomis cyanellus</i>	x	x	x
Orangespotted sunfish, <i>Lepomis humilis</i>	x	x	x
Bluegill, <i>Lepomis macrochirus</i>	x	x	x
Black crappie, <i>Pomoxis nigromaculatus</i>		x	
White crappie, <i>Pomoxis annularis</i>	x	x	x
Walleye, <i>Stizostedion vitreum</i>	x	x	
Sauger, <i>Stizostedion canadense</i>	x	x	x
Logperch, <i>Percina caprodes</i>	x		
Freshwater drum, <i>Aplodinotus grunniens</i>	x	x	x

FIGURE 1



Hypothetical reach of the Missouri River showing kinds of measurements made of the total channel area, water area plus islands, island area, and water surface area. Solid line encloses total area included in each measurement.

Plan (vertical view) and profile (horizontal cross section) of a typical revetment used to stabilize eroding banks of the river.

FIGURE 2

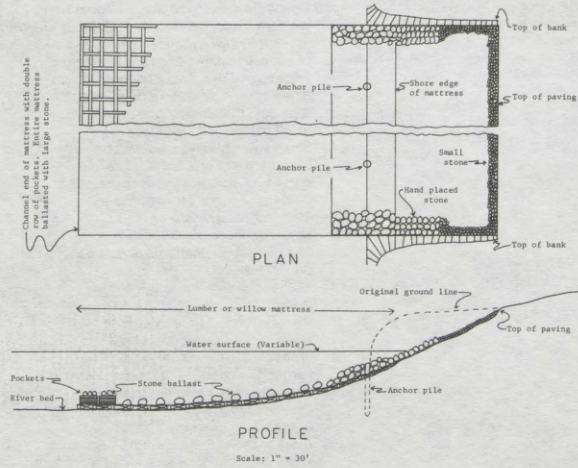
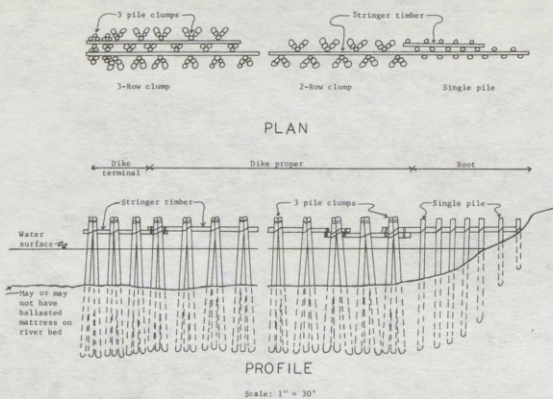


FIGURE 3



Plan (vertical view) and profile (horizontal cross section) of a typical pile dike. When placed so as to extend downstream at an angle with the bank, such a dike tends to divert the current toward the center of the channel and to cause silt to build up behind it.

Section through and profile of a pile dike filled in with rock as most of the dikes on the Missouri River have been. Such a dike serves the same function as a pile dike but, being impermeable, silting behind it is much more rapid.

FIGURE 4

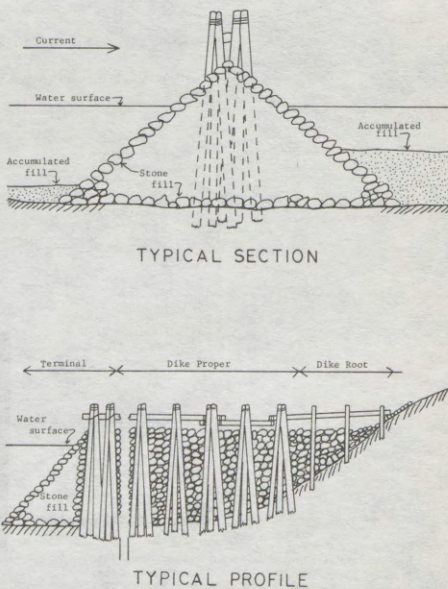
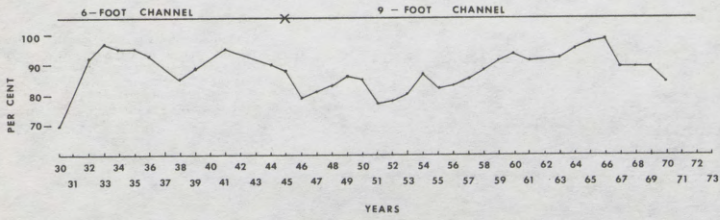
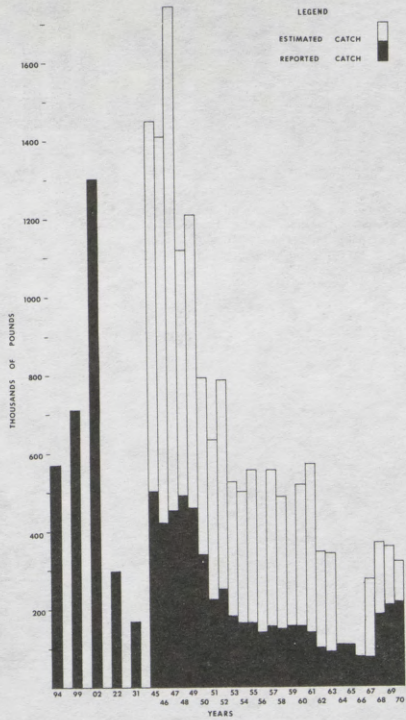


FIGURE 5



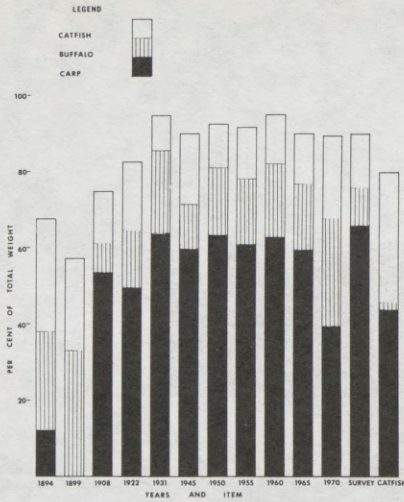
Stage of completion of the Missouri River navigation and stabilization project, 1930 - 1970. (Kansas City District, Corps of Engineers).

FIGURE 6



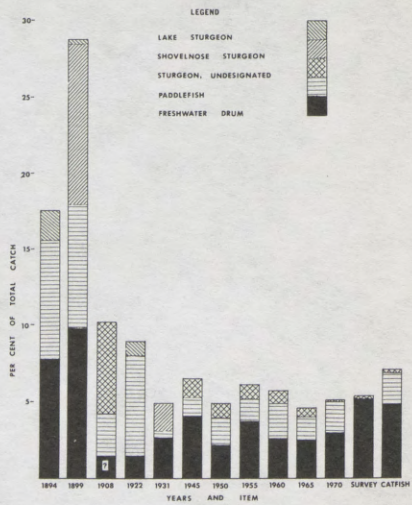
Reported total commercial catch of fish from the Missouri River, 1894, 1899, 1902, 1922, 1931, and the reported catch and estimated total catch, 1945 - 1970.

FIGURE 7



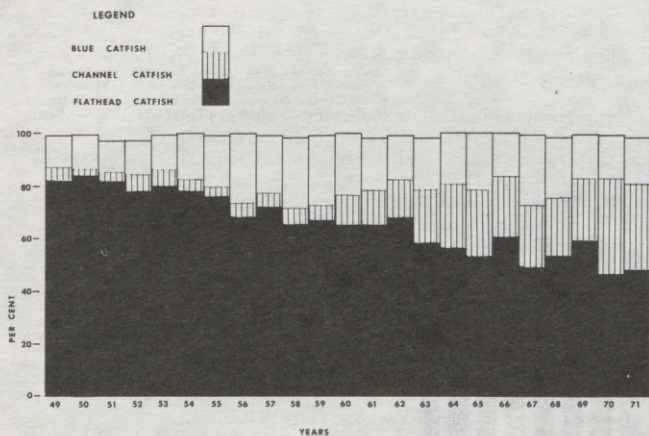
Species composition of the reported commercial catch from the Missouri River in selected years, 1894 - 1970, in Fisher's survey, 1945, and in Ragland and Robinson's catfish study, 1967-68. Percentages of total annual catch which consisted of carp, buffalo and catfish.

FIGURE 8



Species composition of the reported commercial catch from the Missouri River in selected years, 1894 - 1970, in Fisher's survey, 1945, and in Ragland and Robinson's catfish study, 1967-68. Percentage of total annual catch which consisted of sturgeons, paddlefish and freshwater drum. Fish reported as "dogfish" in 1908 are indicated as freshwater drum here (see text).

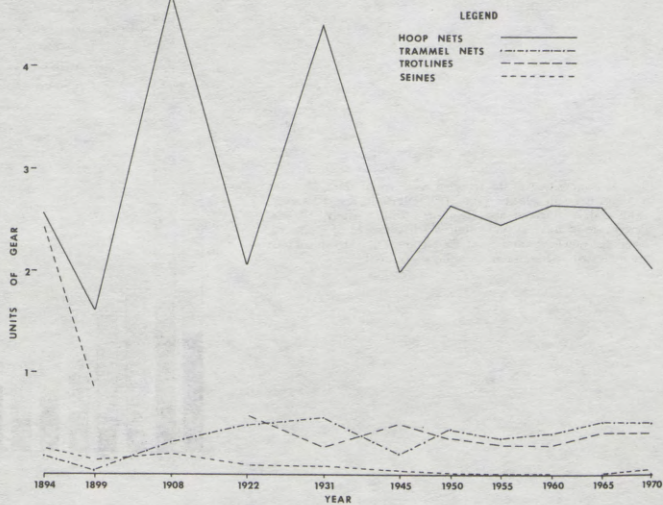
FIGURE 9



Composition of the reported commercial catch from the Missouri River, 1949 - 1971. Percentage of the annual catfish catch which consisted of flathead catfish, blue catfish, and channel catfish.

FIGURE 10

Units of gear per commercial fisherman reported fished in the Missouri River in selected years, 1894 - 1970.



The Aquatic Series is published by the Missouri Department of Conservation to add to the general store of knowledge and to make promptly available to personnel of this Department, related agencies, and other professionals in the field results of original investigations of the aquatic environment of Missouri. It was originally designated the D-J Series. Numbers published to date include:

1. Growth Rates of Missouri Stream Fishes. Charles A. Purkett, Jr. 1958. 46 pp.
2. Evaluation of a Year-round Fishing Season upon an Ozark Smallmouth Bass Stream, Niangua River, Missouri. John L. Funk and George G. Fleener. 1966. 21 pp.
3. A Check-list of the Fishes of Missouri, with Keys for Identification. William L. Pflieger. 1966. 63 pp. Revised Edition. 1968. 64 pp.
4. Some Limnological Characteristics of Six Ozark Streams. Hugh F. Clifford. 1966. 55 pp.
5. Missouri's Fishing Streams. John L. Funk. 1968. 108 pp.
6. Missouri's State-wide General Creel Census. John L. Funk. 1969. 275 pp.
7. Evaluation of Two Stocking Methods for Missouri Farm Ponds. Joe G. Dillard and Max Hamilton. 1969. 17 pp.
8. Missouri Stream Pollution Survey. Frank M. Ryck, Jr. 1974. 38 pp.
9. The Fishery of Big Piney River and the Effects of Stocking Fingerling Smallmouth Bass. George G. Fleener, John L. Funk and Perry E. Robinson. 1974. 32 pp.
10. Water Quality Survey of the Southeast Ozark Mining Area, 1965-1971. Frank M. Ryck, Jr. 1974. 28 pp.
11. Changes in the Channel of the Lower Missouri River and Effects on Fish and Wildlife. John L. Funk and John W. Robinson. 1974. 52 pp.



Senator CULVER. Our next witness is Dr. Merwin D. Dougal, director, Iowa State Water Resources Research Institute at Ames.

It is a great pleasure, Dr. Dougal, to welcome you here today. We appreciate it. If you wish to summarize your statement, we would certainly include the entire statement for the record in the interest of time; whatever your preference might be.

STATEMENT OF DR. MERWIN D. DOUGAL, DIRECTOR, IOWA STATE WATER RESOURCES RESEARCH INSTITUTE, IOWA STATE UNIVERSITY, AMES, IOWA

Mr. DOUGAL. Thank you, Senator Culver, Senator Clark, and Congressman Harkin's representative, ladies and gentlemen.

I will summarize the material we are presenting today because some of it is technical, in a scientific and engineering sense. We do want to note that the Missouri River and the oxbow lakes serve as a unique resource for the residents of western Iowa and eastern Nebraska.

This western border of Iowa is a water deficient area, receiving the smallest amounts of precipitation and having the least stream runoff. Outdoor recreation and fish and wildlife enhancement are the key beneficial user groups concerned with the oxbow lakes.

The main channel of the Missouri River is confined by stabilization works to improve commercial navigation and hold the channel in place. The current frequently is swift and dangerous for pleasure boat use, and offers limited waterfowl habitat. Because of the confinement, that river has deprived us of the previous area that we did have. Therefore, we feel that these oxbow lakes take on a very important role in water resources planning and development. We share the concern of our Iowa congressional delegation in regard to this problem.

I am also serving as vice chairman of the Iowa Natural Resources Council. We have embarked on a framework study for State water planning purposes. This has received additional funding from the Iowa Legislature, and also it is being coordinated with the Federal Water Resources funding we receive through the Federal Water Resources Planning Act and the Water Resources Council.

We have the State agencies participating with us in this expanding water plan effort. We have eight water use categories. I would like to point this out because I think the recreation picture becomes part of a larger scope and thus becomes more important in what has been expressed today by the Federal and State agencies.

These eight categories are: Water supply for both municipal, industrial, regional, rural water supply use; the water quality enhancement picture that we have; flood control, and flood plain management; agricultural use of water; outdoor recreation; fish and wildlife propagation; navigation; and water for energy production.

So we are presently encompassing all of these water uses within the water study program.

I want to certainly point out that the Iowa Conservation Commission is a participating State agency in that water plan effort and that Don Brazelton is working with us.

In speaking from the Iowa State Water Resources Research Institute viewpoint, we certainly want to support the statements that Don

Brazelton has given you. We are coordinating with them and in the water resources field are serving as a research arm for the State agencies of Iowa.

We are including two brief preliminary reports with this statement, the first by Dr. Bachman and a second one by the institute. We are including a third report we feel will be of value, which points out some of the water quality impacts that we have studied on the lakes in Iowa.

These illustrate the water quality problems encountered in these shallow impoundments, resulting in poor transparency and water clarity, and excessive growths of algae and aquatic weeds. Water quality is going to be a key part of any program in the oxbow lakes.

We feel that water quality will be as important as the shallowness and the sedimentation aspect. I think this needs to be clearly pointed out because the low transparency of water clarity, the excessive growth of algae and aquatic weed problems are all important to us, in developing and improving recreation programs.

Dr. Bachman's initial study this year shows the need for reducing the nutrient inflow which leads to excessive growths of algae and other aquatic vegetation. Water quality improvement should be a key part of any management program. Both urban and nonurban runoff problems need to be studied.

We have been able to point out in this research work that water clarity is closely associated with the algal levels in the water. We have also been able to point out that this clarity and algae growth is related to the water depths. The more shallow the impoundments, the more algae growth we have experienced and the lower water quality we have had. Therefore, the operating depth of these shallow impoundments is an important item.

If we move beyond that, we want to state that we are also concerned about the physical relationship between the oxbow lakes and the Missouri River. Dredging may remove any confining silt layers and reinstate a positive seepage connection with water levels in the Missouri River. Any future degradation or lowering of bed of the Missouri River that might be caused by "clear water" scour below the main stem dams could be detrimental to these oxbows. The combined effect of channel lowering and dredging on water levels and depths which can be achieved must be carefully studied. This problem will probably be more severe in the Sioux City area than at Council Bluffs, but should be a study item.

Some of these oxbow lakes may be perched at the present time. Their water levels may be higher than the rivers, but they may be maintained that way because of the siltation of them. If we dredge these out we may accentuate the seepage problem back to the river, and therefore some careful seepage studies must be done as we look at what we might want to do to improve them.

Other long-range aspects need to be included in the proposed action program. These would include the mix of uses to be achieved. Which oxbow lakes should be developed for intensive use recreation, such as occurs at De Soto Bend and Lake Manawa? Which ones should be left for fish and wildlife enhancement? Where can both be tolerated or accommodated?

Presently, we are trying to do both of these at De Soto Bend. These questions must be answered as one looks at the valley's resources and the value of the oxbow lakes to the State of Iowa.

We would urge that Congress include study provisions in the authorization and appropriate funds for such long-range studies as well as for the specified dredging allocations which will be needed. Our ISWRRI research team will continue to assist in solving these water problems, and coordinate with the various local, State, and Federal agencies.

I want to add at this point that when we start looking at recreation, fish and wildlife needs in western Iowa from the State water plan viewpoint we are aware the Missouri River needs to be placed in a special category and the main-channel water area should be discounted as far as its recreational use is concerned.

What we are stating is that it is fairly dangerous for boaters to use the Missouri River. If we remove the Missouri River water area from the inventory, we get to be in a rapidly deficient category quite swiftly. Therefore, the oxbow lakes take on a very important role in this.

We are also aware that it is, roughly speaking, costing at least \$5,000 to \$10,000 an acre to develop a water body if we do it through an artificially constructed impoundment. That is without the cost of the land or the recreational facilities, just to provide water area through a dam and the associated spillway facilities.

Therefore, it would appear to us that we do need to take a look at the oxbow lakes and, as Don Brazelton has pointed out this morning, there are places where it will be less expensive to redevelop an oxbow lake than to try to build a new lake.

This cost balance will have to be worked out. We are giving first priority to the oxbow lakes as a water area resource. We feel, in the long-range future, additional water areas through constructed impoundments would become a second priority. This is what we are trying to work out at the State level. Thank you.

Senator CULVER. I want to thank you for an excellent statement and for some extremely useful enclosures. I would also like to alert you to the real possibility that we may want to come back to you with some more specific questions and perhaps get some written responses for our record.

Mr. DOUGAL. I think it is quite clearly evident that deeper lakes are obviously better than shallow lakes in maintaining high levels of water quality for recreation use.

Senator CULVER. One of the real questions I have is with regard to the degree of coordination your Institute does have into the studies being conducted by the Economic Research Associates.

Mr. DOUGAL. We are serving really as a research arm to that group. They did specifically an engineering study on the dredging possibilities. There was what we felt insufficient water quality input into their studies. However, they weren't specifically asked to do this. In joining forces with the Council Bluffs local task force, we were requested by the Iowa Conservation Commission to add to that report.

So the brief report we have presented here is being given also to the Iowa Conservation Commission. We are providing water quality input which needs to be part of this total study.

Senator CULVER. You also, of course, have been concerned in your study, I gather not all that directly, but certainly have inevitably been sensitive to the particular physical relationship between the oxbow lakes and the Missouri River.

On this last page, I guess it is, of your statement, you make specific reference to that and suggest the combination of effects of channel lowering and dredging on water level depths which can be achieved and must be carefully studied.

At another point in your testimony you suggested that even the deepening by dredging may present unforeseen problems in terms of even greater seepage by way of subsurface recharge, and so on.

Mr. DOUGAL. Yes; I think we want to make sure, especially in the Sioux City area, that we don't dredge the lakes and find out we have the same depths after dredging because we reestablished seepage and the river has degraded, and so the lake level will go down with it even after dredging. It may be better to raise the water levels through ground water pumping if it is a sealed bottom, or pump water in from the Missouri River.

Senator CULVER. I think perhaps one of the most useful things you have done is to indicate the degree of complexity in terms of jurisdictional responsibilities, also in terms of the traditional role of the Corps of Engineers. For example, this would include the particular responsibilities they have as well as shared responsibilities with the various States.

You have suggested and urged strongly in your statement that Congress include study provisions in the authorization and appropriate funds for such long-range studies, as well as for the specified dredging allocations which will be needed.

You really feel that in the absence of that information it is impossible to really responsibly legislate in this area?

Mr. DOUGAL. Yes; I think one way of looking at it, as the Corps has said today, we haven't made certain detailed studies and I think that is probably true. I do think that we have to recognize that the main stem effects which now may progress down through Iowa, through channel degradation, as has been pointed out this morning must remain a Federal responsibility.

So we feel that there is a need for special studies of what is happening below Gavins Point Dam, all the way down past the Iowa border. This needs to be incorporated in anything we do really in the long-range sense with the oxbow lake of western Iowa.

Senator CULVER. I want to thank you again very much, Dr. Dougal, for your statement this morning. We hope we will have some additional questions for you for the record.

[Dr. Dougal's statement with attachments follow:]

STATEMENT OF DR. MERWIN D. DOUGAL, DIRECTOR, IOWA STATE WATER RESOURCES RESEARCH INSTITUTE, IOWA STATE UNIVERSITY, AMES, IOWA

The Missouri River and its oxbow lakes serve as a unique resource for the residents of western Iowa and eastern Nebraska. This western border of Iowa is a water deficient area, receiving the smallest amounts of precipitation and having the least stream runoff. Outdoor recreation and fish and wildlife enhancement are the key beneficial user groups concerned with the oxbow lakes. The main channel of the Missouri River is confined by stabilization works to improve commercial navigation and hold the channel in place. The current frequently is swift and dangerous for pleasure boat use, and offers limited waterfowl habitat. Therefore, the oxbow lakes take on a very

important role in water resources planning and development. We share the concern of our Iowa congressional delegation in regard to this problem.

The Iowa State Water Resources Research Institute has a research group participating in water quality studies of Iowa streams and lakes. Dr. Roger W. Bachman, Professor and Acting Chairman of the Department of Animal Ecology is leading this multi-disciplinary program. We have included Lake Manawa in the sampling program in the 1975 study period. Additional interpretative and evaluation work is being coordinated with the Iowa Conservation Commission, and the Council Bluffs local task force on Lake Manawa.

Two brief preliminary reports are included with this statement, the first by Dr. Bachman and a second one by the Institute. These illustrate the water quality problems encountered in these shallow impoundments, resulting in poor transparency and water clarity, and excessive growths of algae and aquatic weeds. The need for reducing the nutrient inflow which leads to excessive growths of algae and other aquatic vegetation is evident. Water quality improvement should be a key part of any management program. Both urban and nonurban runoff problems need to be studied.

We are also concerned about the physical relationship between the oxbow lakes and the Missouri River. Dredging may remove any confining silt layers and reinstate a positive seepage connection with water levels in the Missouri River. Any further degradation or lowering of bed of the Missouri River (as might be caused by "clear water" scour below the main stem dams) might be detrimental to these oxbows. The combination effect of channel lowering and dredging on water levels and depths which can be achieved must be carefully studied. This problem will probably be more severe in the Sioux City area than at Council Bluffs, but should be a study item.

Other long-range aspects need to be included in the proposed action program. These would include the mix of uses to be achieved. Which oxbow lakes should be developed for intensive use recreation, such as occurs at De Soto Bend and Lake Manawa? Which ones should be left for fish and wildlife enhancement? Where can both be tolerated or accommodated? These questions must be answered as one looks at the valley's resources and value to the State of Iowa. We would urge that Congress include study provisions in the authorization and appropriate funds for such long-range studies as well as for the specified dredging allocations which will be needed. Our ISWRRI research team will continue to assist in solving these water problems, and coordinate with the various local, State and Federal agencies.

Preliminary Report on Water Transparency, Algal Levels,
and Plant Nutrients in Lake Manawa, 1975

Roger W. Bachmann
Department of Animal Ecology
Iowa State University
Ames, IA 50011

Clear water is an important attribute of lakes used for recreational purposes. In May through August of 1975, 16 measurements of water transparency were made in Lake Manawa using a Secchi Disk. This is a white disc that is lowered into the water until it just disappears from view. On the average this happened at a depth of 0.56 meters (1.9 feet). This is a relatively low value for a recreational lake but is not unusual in comparison with other shallow Iowa lakes.

This poor transparency is probably due in large part to the populations of plankton algae found in the lake. The algal populations were sampled on four occasions in July and August, with samples taken at three locations on each date. The quantity of chlorophyll a in the water was taken as a measure of the algal population. The average was 62 mg/m^3 . Previous studies on lakes in Iowa and elsewhere have shown that this level of chlorophyll is associated with Secchi disc transparencies less than 1 meter (Figure 1). Algal levels would have to be reduced below a level of about 10 mg/m^3 before significant improvements in water transparency would be observed.

Previous studies on Iowa lakes have shown a close relationship between the concentration of total phosphorus in lake waters and the concentration of algal pigments in the water in July and August. Lake

Manawa had an average concentration of total phosphorus in July and August of 107 mg/m^3 . For comparison, a sample of 47 Iowa lakes in the summer of 1975 yielded an average of 121 mg/m^3 of total phosphorus, with 27 of those lakes having a value below that in Lake Manawa. The amounts of chlorophyll a in Lake Manawa are consistent with the amount of phosphorus found in the lake (Figure 2). It is reasonable to assume that it will be necessary to reduce the phosphorus levels in the lake before the algal populations can be reduced.

It is recommended that a reduction of the annual inputs of phosphorus to the lake be considered in any major lake improvement program. This might involve activities such as the diversion of urban runoff from the lake, the replacement of septic tank systems with a centralized sewage treatment plant, and special activities in the watershed aimed at keeping feedlot drainage out of the tributaries and reducing soil erosion in the tilled areas. A preliminary study would be necessary to determine if these actions would provide a significant reduction in the phosphorus inputs. Without such a reduction the high algal levels and poor transparency are likely to continue after dredging.

Reference Cited

- Bachmann, R. W., and J. R. Jones. 1974. Phosphorus inputs and algal blooms in lakes. *Iowa State Jour. Res.* 49:155-160.

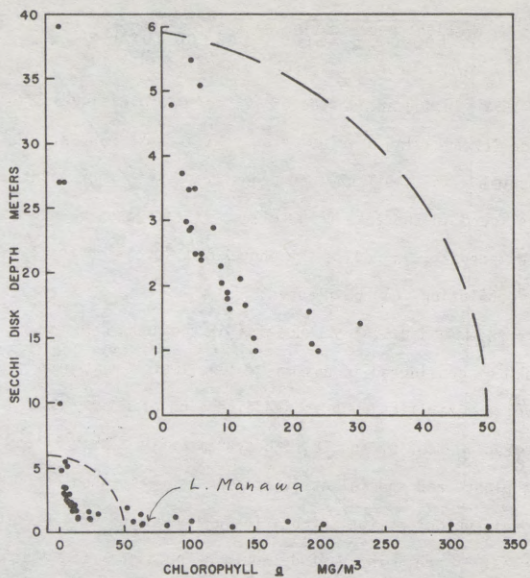


Figure 1. Relationship between mean Secchi disk transparencies for July and August and the mean July-August chlorophyll *a* concentrations for several lakes. (Bachmann and Jones, 1974)

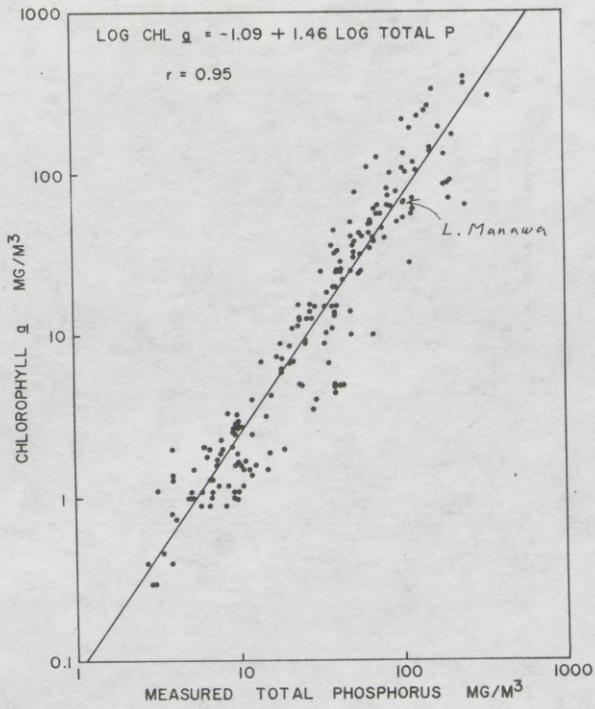


Figure 2. Relationship between July-August chlorophyll a concentrations and levels of total phosphorus for a large sample of lakes.

Lake Manawa
Preliminary Water Quality Study
June 19, 1975

Submitted by Gary K. Speiran
Sanitary Engineering Section
Civil Engineering
Engineering Research Institute
Iowa State University

To: Dr. Merwin D. Dougal, Director
Iowa State Water Resources
Research Institute
Town Engineering Building
Iowa State University
Ames, Iowa 50010

Introduction

The first sampling of Lake Manawa and Mosquito Creek was conducted on June 19, 1975, to give an indication of lake conditions before the July 4th weekend. Scattered showers, some heavy, had occurred in the area for several days preceding the sampling day, although it was not raining the day samples were collected. The rain made Mosquito Creek very muddy and it appeared to be at bankfull flow. There appeared to be little effect on the lake from the rain.

Sampling points were established at three locations. Stations 1S and 1M are surface and mid-depth samples respectively on Lake Manawa. They were both taken at the same location, about the middle of the lake directly off the large point of land that partially divides the lake. Station 2 is on Mosquito Creek near Lake Manawa. This location may be reached by taking U.S. 275 south from I-29. Several hundred yards south of the intersection where U.S. 275 turns south from Iowa 92 is a ramp to the right (west) marked by dead end. The sample was taken where this dead end road crosses Mosquito Creek. Station 3 was reached by taking the Underwood exit west to where that road crosses Mosquito Creek.

Observations

When looking at the two Mosquito Creek stations, a number of parameters appear to be greatly influenced by the rains and the resulting runoff. In most cases that a large difference exists between the two stations, the higher values are for Station 2, the downstream station. Turbidity, total solids, COD, organic nitrogen, total phosphate, and suspended solids are around two to three times the values at Station 2 as Station 3. Values for these parameters at both stations are generally much higher than peak values obtained on the Des Moines River, even at times of high runoff. Most other parameters appear to be in line with what may be expected for an Iowa stream under similar runoff conditions. Little other comparison can be made since this is the first sampling of Mosquito Creek.

Water samples from Mosquito Creek were too dirty to obtain valid values for fecal coliforms, fecal strep, calcium hardness, and total hardness. Problems were also encountered in the dissolved oxygen determinations. For Station 2, sediment resulted in a clouded endpoint. All that can be said is that the endpoint occurred between 8 and 8.5 mg/l. At station 3, the samples were decanted, leaving the sediment behind. In one sample, some sediment was disturbed and was poured with the sample. This sample took .3ml more PAO than the one without sediment. This slightly higher value may indicate that some iodine becomes tied up in the sediment so that this dissolved oxygen value may be slightly incorrect.

Little difference appears to occur between the surface and mid-depth samples on Lake Manawa. Slight settling appears to exist when looking at such parameters as total solids, suspended solids, turbidity, BOD, and COD. No earlier data is available on Lake Manawa. However, a partial comparison can be made with data on the Iowa Great Lakes. Ammonia nitrogen, COD, and total phosphorous values are less than the mean summer values for Lake East Okoboji and Lower Gar Lake for 1971, 1972 and 1973. This would seem to indicate Lake

Manawa may be less eutrophic than either of these lakes. However, ammonia nitrogen, COD, and total phosphorous values are greater for Lake Manawa than Lake West Okoboji while secchi disc depth is less. This would indicate that Lake Manawa is more eutrophic than Lake West Okoboji. However, it should be remembered that this comparison is with mean summer values.

	Lake	Manawa	Mosquito Creek		Units
	Surface 1s	Mid-depth 1m	Downstream 2	Upstream 3	
Time CDT	1145	1145	1230	1420	
Air Temperature	27	27	26	30	deg C.
Water Temperature	24.0	24.0	21.5	23.0	deg C.
Cloud Cover	100	100	100	50	%
pH	8.18	8.20	7.48	7.70	
Carbon Dioxide	1.7	2.2	14.3	10.8	mg/l as CO ₂
Phenol Alkalinity	0	0	0	0	mg/l as CaCO ₃
Total Alkalinity	165	168	176	187	mg/l as CaCO ₃
Dissolved Oxygen	7.5	7.2	8-8.5 ⁽¹⁾	6.9 ⁽¹⁾	mg/l O ₂
Calcium Hardness	80	80	*	*	mg/l as CaCO ₃
Total Hardness	188	189	*	*	mg/l as CaCO ₃
Turbidity	9	11	4000	1517	JTU
Total Solids	257	259	15100	5693	mg/l
Total Organic Carbon	6	6	13	8	mgC/l
COD	27.8	30.3	822	288	mg O ₂ /l
Organic N.	.97	1.04	22.11	9.25	mg N/l
Ammonia N.	.18	.14	.49	.30	mg N/l
Nitrite N.	.01	.01	.01	.01	mg N/l
Nitrate N.	.28	.24	8.43	8.83	mg N/l
Total N	1.44	1.43	31.04	18.39	mg N/l
Total Phosphate	.2	.3	31.6	14.3	mg PO ₄ /l
Ortho Phosphate	.1	.0	.4	.4	mg PO ₄ /l
Chloride	12.0	13.0	9.6	9.6	mg Cl/l
Silica	.7	.5	11.3	12.3	mg SiO ₂ /l
Fecal Coli.	100	47	*	*	no/100 ml
Fecal Strep	140	2200	*	*	no/100 ml
Suspended Solids	27	29	13910	5530	mg/l
Soluble Organic Carbon	4	5	4	4	mgC/l
Specific Conductance	420	421	411	451	µmhos at 25°C
BOD	1.9	2.7	10.8	4.0	mg/l
Chlorophyll a	45.8				
Secchi Disc Depth	1.8				ft

* Sediment caused invalid results.

Limnological Features of Some Northwestern Iowa Lakes¹JOHN R. JONES and ROGER W. BACHMANN²

JONES, JOHN R., and ROGER W. BACHMANN (Department of Animal Ecology, Iowa State University, Ames, Iowa 50010). Limnological Features of Some Northwestern Iowa Lakes. *Proc. Iowa Acad. Sci.* 81(4): 158-163, 1974.

Quantitative information on the morphology, watershed characteristics, water transparency, water chemistry and algal crops of six Iowa lakes is summarized. Lake West Okoboji had less oxygen present in the hypolimnion in 1950-1973 than in 1919-1928, indicating an increase in eutrophication. On the basis of increasing

plant-nutrient concentrations, increasing summer algal standing crops and decreasing water transparency, the lakes can be ranked thus: Lake West Okoboji, Big Spirit Lake, Lake East Okoboji (including Upper Gar and Minnewashta) and Lower Gar Lake. These differences among lakes are related to the ratio of watershed area to lake volume, which controls the impact of annual nutrient inputs from the watersheds.

INDEX DESCRIPTORS: Iowa Lakes, Eutrophication, Water Quality, Limnology.

A water quality study of the Okoboji lakes was conducted from March, 1971, through August, 1973, to document present limnological conditions in each lake and the reasons for the differences in the degree of eutrophication among lakes. Indicators of recent trophic change also were noted.

The lakes are located in northwestern Iowa (Dickinson County), with a portion of the watershed extending into southwestern Minnesota (Jackson County) (Figure 1). The lakes are of glacial origin and are enclosed by morainal topography (Thomas, 1913; Carman, 1915; Tilton, 1916). Radiocarbon dating of lake sediments indicated a late Cary or postglacial age for the basin (Dodd et al., 1968).

Seven major lakes lie within the watershed; they are West Okoboji, Spirit, East Okoboji, Upper Gar, Minnewashta and Lower Gar in Iowa, and Loon in Minnesota. The entire watershed can be subdivided into separate drainage areas for each major lake (Figure 1). The lakes are interconnected, and drainage is southerly from Minnesota to Spirit Lake and over a spillway to Lake East Okoboji. Lakes East Okoboji, West Okoboji, Upper Gar, Minnewashta and Lower Gar have the same water level. The outflow for this drainage system is an ungated spillway on Lower Gar Lake, through which drainage passes to the Missouri River via the Little Sioux River. The region is served by a modern sewage collection and treatment system, which diverts human wastes out of the watershed.

These lakes are eutrophic to various degrees as indicated by the severity of the summer blue-green algal blooms occurring in each lake. Nuisance phytoplankton conditions develop each summer in lakes East Okoboji, Minnewashta, and Upper and Lower Gar. Conditions in Spirit Lake are less severe, depending upon the year, and Lake West Okoboji has localized algal problems of short duration.

The differences in the degree of eutrophication among these lakes are surprising within a lake region with a com-

mon watershed having relatively uniform land-use practices (Table 1). Most of the land within the region is devoted to row-crop agriculture or livestock production; nearly 20% of the watershed is covered by ponds, lakes or marshes.

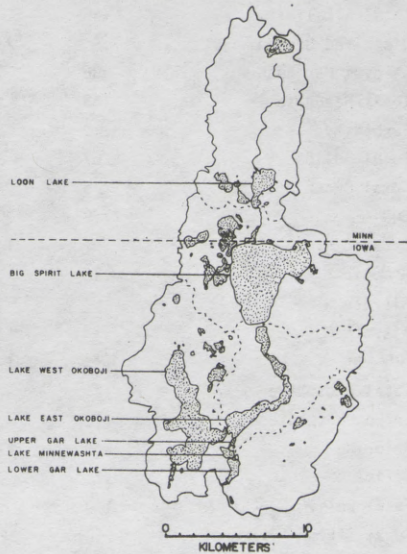


Figure 1. Map of the watershed. Dashed lines indicate watershed boundaries.

¹ Journal Paper No. J-8031 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa. Project 1779. Financed in part by the Iowa Great Lakes Water Quality Control Plan and by a grant from the U.S. Department of the Interior, Office of Water Resources Research, under Public Law 88-379, and made available through the Iowa State Water Resources Research Institute.

² Department of Animal Ecology, Iowa State University, Ames, Iowa 50010.

NORTHWESTERN IOWA LAKES

TABLE 1. BREAKDOWN OF LAND-USE PRACTICES WITHIN INDIVIDUAL LAKE WATERSHEDS AS A PERCENTAGE OF WATERSHED AREA (MAJOR LAKE EXCLUDED)

	West Okoboji	East Okoboji	Big Spirit	Lower Gar
Row Crops	65	74	76	79
Pasture and Grassland	18	13	9	11
Urban (Includes Summer Homes)	11	10	2	1
Marsh	2	1	3	7
Permanent Water	4	-	9	2
Woodland	-	2	1	-

METHODS AND MATERIALS

The watershed area and individual lake watersheds were delineated from U.S.G.S. topographic maps (7.5-minute series).

The following chemical analyses were made on unfiltered lake samples taken within the upper 0.5 m. Ammonia nitrogen concentration was determined by using the direct Nesslerization method. Nitrate nitrogen concentration was determined by using the cadmium reduction method. Prepared reagents for these analyses were purchased from Hach Chemical Co., Ames, Iowa. Total phosphorus was determined by using the procedures of Murphy and Riley (1962) with a persulfate oxidation described by Menzel and Corvin (1965). An Industrial Instruments Conductivity Bridge, Model RC 16B1, was used to measure specific conductance in micromhos/cm at 25 C. Chemical oxygen demand was measured in lake samples by using the dichromate oxidation method (A.P.H.A., 1965), with a one-hour reflux time and 0.025N potassium dichromate and 0.01N ferrous sulfate.

Dissolved oxygen samples were collected and processed by standard procedures (A.P.H.A., 1965). The samples were titrated with 0.025N phenylarsine oxide. Total alkalinity was determined by use of brom cresol green-methyl red indicator and titrating with 0.02N sulfuric acid.

Water transparency was determined by using a 20-cm Secchi disk.

A measured volume of lake water was filtered through a Type A Gelman glass fiber filter for chlorophyll *a* analysis. Chlorophyll concentration was determined by use of the methods of Richards and Thompson (1952) and Yentsch and Menzel (1963). Values were calculated from the equations of Parsons and Strickland (1963).

RESULTS

Morphological and Hydrological Features

Morphological and hydrological characteristics of the lakes are given in Table 2. Lake West Okoboji is the deepest lake and the only one with thermal stratification. Because of its large volume and small watershed, it has the lowest ratio of watershed area to lake volume (m^2/m^3) and longest hydrologic turnover time. The Spirit Lake basin is saucer-shaped, with a large surface area and a moderate mean depth. Lake East Okoboji is long and narrow, composed of several contiguous shallow basins. It has a moderate watershed area and small volume. Lakes Upper Gar and Minnewashta do not have surface watershed drainages separate from Lake East

TABLE 2. TOTAL AREA OF INDIVIDUAL LAKE WATERSHEDS, MORPHOMETRIC CHARACTERISTICS AND RATIOS OF WATERSHED AREAS TO LAKE VOLUMES FOR LAKES WEST OKOBOJI, BIG SPIRIT, EAST OKOBOJI, LOON AND LOWER GAR

	West Okoboji	Big Spirit	East Okoboji	Loon	Lower Gar
Watershed Area (ha)	7,698	9,962	5,903	7,935	4,720
Lake Area (ha)	1,540	2,168	764	291	98
Lake Volume ($1 \times 10^6 m^3$)	184.0	111.9	21.2	4.5	1.1
Mean Depth (m)	11.9	5.2	2.8	1.5	1.1
Ratio of Watershed Area to Lake Volume (m^2/m^3)	0.33	0.69	2.42	16.9	42.0
Turnover Time (Years)	20	5.5	1.2	0.5	0.3

Okoboji; therefore we considered them as a southern expansion of the larger lake. The watershed area:lake volume ratio of these lakes is such that the turnover time is one year. Lower Gar Lake is shallow and receives drainage from a land area 43 times that of the lake surface area. Because of the large watershed area:lake volume ratio, the waters of Lower Gar Lake are more directly influenced by the watershed runoff than those of any other lake in the watershed.

The watershed areas and surface area of lakes East and West Okoboji influence the interchange of water between them. Because the surface outlet for the watershed is on Lower Gar Lake, it is natural to assume that water flows from Lake West Okoboji into Lake East Okoboji. Field observations, however, indicate that the waters of Smith's Bay, West Okoboji (connected to Lake East Okoboji), had characteristics similar to waters of Lake East Okoboji, indicating mixing between these lakes. We collected water samples during the summers of 1971-73 to determine water chemistry characteristics within this interchange (Figure 2).

The mixing pattern between these lakes can be inferred from the specific conductance values (Figure 2), a conservative characteristic of a given water mass. Lake East Okoboji has higher specific conductance values than does Lake West Okoboji. If the outflow was from Lake West Okoboji to Lake East Okoboji, lower conductance values would persist to the interchange (Station 5, Figure 2) and increase into Lake East Okoboji. This was not found; rather, there was a gradient across this connection.

The ratio of watershed area:lake area is greater in Lake East Okoboji (6:1) than in Lake West Okoboji (3.8:1). During periods of rising water levels, Lake East Okoboji would rise at a more rapid rate than Lake West Okoboji (if runoff volumes per unit area were the same in the two watersheds), and water would tend to flow from Lake East Okoboji toward Lake West Okoboji. During periods of falling water levels due to outflows through the Lower Gar Lake outlet, the flow would be in the other direction. During stable water levels, wind action and waves would cause an interchange of water between these lakes.

Water Quality and Trophic Conditions of the Lakes

All the lakes studied are eutrophic or biologically productive, but some lakes are more eutrophic than others. Water quality parameters of the lakes are summarized in Table 3.

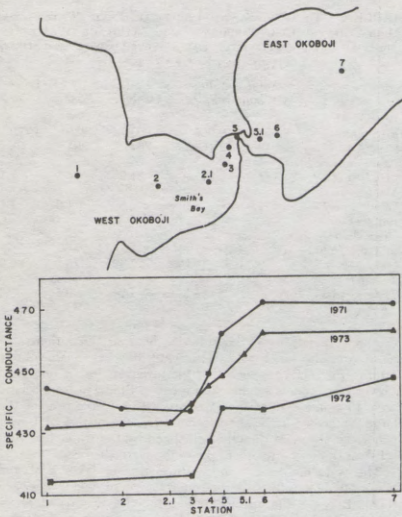


Figure 2. Map of stations along a transect extending from the deep hole of Lake West Okoboji to the open waters of Lake East Okoboji. Also, the distribution of mean specific conductance values across the transect in 1971, 1972 and 1973 is plotted for the respective stations.

The concentrations of nitrogen and phosphorus compounds are indicative of the potential growth of plant materials in these lakes, and chemical oxygen demand and chlorophyll *a* measurements indicate the amount of growth achieved. Secchi disk transparencies are inversely related to chlorophyll *a* concentrations. Each of these lakes has summer algal problems ranging from mild to nuisance conditions, as indicated by the chlorophyll *a* values in Table 3.

TABLE 3. SUMMARY COMPARISON FOR LAKE WEST OKOBOJI, BIG SPIRIT LAKE, LAKE EAST OKOBOJI (INCLUDING UPPER GAR LAKE AND LAKE MINNEWASHITA) AND LOWER GAR LAKE OF MEAN SUMMER VALUES FOR TOTAL PHOSPHORUS, NITRATE NITROGEN, AMMONIA NITROGEN, CHLOROPHYLL *a*, CHEMICAL OXYGEN DEMAND AND SECCHI DISK TRANSPARENCY (1971, 1972, 1973)

	West Okoboji	Big Spirit	East Okoboji	Lower Gar
Total P mg/l	0.033	0.041	0.165	0.222
NO ₃ -N mg/l	0.009	0.017	0.085	0.145
NH ₄ -N mg/l	0.110	0.239	0.468	0.644
Chlorophyll <i>a</i> mg/m ³	4.3	27.5	122.2	226.8
Chemical Oxygen Demand mg/l	20.5	24.9	46.5	56.5
Secchi Disk Transparency (m)	3.2	1.7	0.9	0.4

Thomas (1953) used the difference between winter and summer alkalinity in epilimnion waters as a lake eutrophication index. The greater this difference, the more eutrophic is the lake. From seasonal alkalinity differences, Lake West Okoboji is the least eutrophic lake, with a winter-to-summer difference in alkalinity of less than 10 mg/l. In Spirit Lake, this difference is about 50 mg/l, and lakes East Okoboji and Lower Gar have alkalinity differences from 80-165 mg/l.

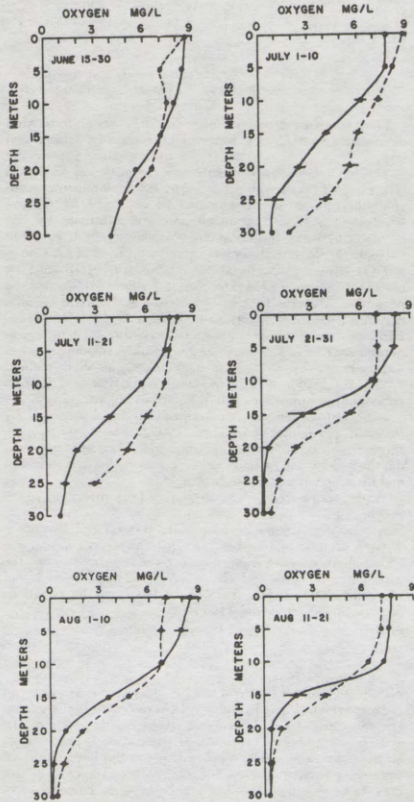


Figure 3. Average dissolved oxygen concentrations at 5-m depth intervals in Lake West Okoboji during June-August, 1919-1928 (dashed line) and 1950-1973 (solid line). Standard-error bars indicate means are significantly different at a given depth.

NORTHWESTERN IOWA LAKES

Hypolimnetic Oxygen Change in Lake West Okoboji

Oxygen data from Lake West Okoboji were examined to determine possible changes that would indicate increased eutrophication (Edmondson, 1966; Bazin and Saunders, 1971). Available oxygen profiles are in separate time periods, 1919-1928 (past data) and 1950-1973 (recent data). The original data from various sources (many unpublished) are given in Bachmann and Jones (1974a). For comparative purposes, summer oxygen profiles were separated into six periods of 10 to 15 days beginning June 15 and ending August 21. Mean oxygen profiles within these periods are plotted in Figure 3. Because of insufficient data oxygen concentrations below 30 m were excluded.

Comparing recent with past oxygen profiles, less oxygen currently is present at various depths below the thermocline (10 m). A t-test was used to determine significant differences between mean past and recent oxygen concentrations from the various profile depths. Corresponding means that differ significantly are indicated by standard-error ranges in Figure 3. In July, recent oxygen concentrations below the thermocline are significantly less than past values at all depths but one (30 m, July 1-10). In August, recent oxygen concentrations at the upper hypolimnetic depths of 15, 20 and 25 m are significantly less than past concentrations. By late summer, oxygen depletion is almost complete at 30 m in both past and recent profiles.

Further t-tests were run of the mean differences between past and recent temperature values for June 15-30 to test the possibility that temperature differences in the early summer may have caused hypolimnetic oxygen differences. These were not significant. It is concluded that increased biological activity in the epilimnion is responsible for the oxygen difference.

The hypothesis that increased algal productivity in the epilimnion is responsible for this change is supported by the finding that epilimnetic oxygen concentrations were greater in 1950-1973 than they were in 1919-1928 (July 21 through August 10). Again, water temperatures could not account for this difference because recent average temperatures for this period are slightly higher (22.9 C) than those measured in 1919-1928 (21.2 C). This difference is statistically significant and would tend to make the recent oxygen concentrations lower, rather than higher, on the basis of solubility laws. Higher rates of photosynthetic oxygen production in the epilimnion in recent years could account for these higher values.

Oxygen deficits (mg/cm^2) were calculated for periods during the summer by determining the oxygen saturation value between the thermocline (10 m) and 30 m from the mean temperature curves for June 15-30, 1923-1928 and 1950-1973. By using saturation values for these temperatures and the volume-depth curve for the lake, the calculated hypolimnetic oxygen content at the onset of saturation was 685,500 kg in 1919-1928 compared with 684,000 kg in 1950-1973. Hypolimnetic oxygen content was then calculated for past and recent mean oxygen profiles within each of the six time blocks between June 15 and August 21. These values were subtracted from their respective initial saturation value and divided by the surface area of the 10-m contour (716 ha) to yield areal oxygen deficit values (mg/cm^2) (Figure 4). Comparing summer oxygen deficits within the six time blocks, initial values are similar, but by July the 1950-1973 deficits are 50% greater than 1919-1928 values. The August oxygen defi-

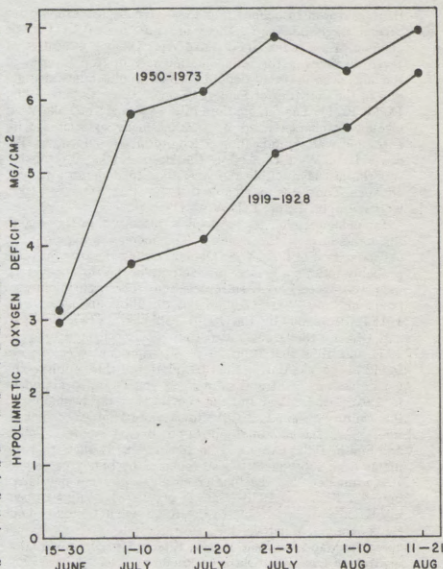


Figure 4. Oxygen deficit values (mg/cm^2) from Lake West Okoboji for periods between June and August, 1919-1928 and 1950-1973.

cit values converge as hypolimnetic oxygen is exhausted, and no further oxygen consumption is possible.

Hypolimnetic oxygen utilization results from decompositional consumption of materials produced within and washed to the lake from its basin. These materials settle into the hypolimnion, resulting in an oxygen deficit. If recent delivery of organic material to Lake West Okoboji is unchanged from the 1919-1928 period, the increased oxygen deficit would result from an increased productivity of the surface waters during the past 50 years. The magnitude of this increased oxygen deficit could be as much as 50%.

DISCUSSION

Cultural eutrophication has had an alarming effect on the limnological conditions of many water bodies in recent years. Many lakes have changed from oligotrophic to eutrophic in a matter of decades. Such a rapid change usually is associated with domestic or industrial effluents. In the lakes studied, sewage presently has a minimal influence on water quality because most areas are sewered and the effluent is transported outside the watershed.

Although the watershed lakes are presently eutrophic,

there is reason to believe that they have been eutrophic for several thousand years. There are no physical or floristic changes in the sediments of Lake West Okoboji indicative of severe changes in the sedimentation rate or trophic level of the lake, even in recent deposits, which would reflect changes due to the activities of man (Stoermer, 1963; Collins, 1968; Dodd, 1971). The diatom flora of the sediment of Lake West Okoboji is characterized by taxa normally associated with eutrophic waters, indicating a long-term eutrophication. Because Lake West Okoboji is the deepest lake, it probably was the last lake within the watershed to undergo a trophic advance. Thus, it is reasonable that the other watershed lakes were eutrophic before Lake West Okoboji.

Limnological changes have taken place within these lakes since the turn of the century. The increased hypolimnetic oxygen deficit in Lake West Okoboji during the past 50 years probably reflects a greater productivity in the surface waters, indicating accelerated eutrophication. The rich molluscan fauna of Lake West Okoboji described by Shimek (1913, 1915a) decreased by the 1930s (Shimek, 1935). Bovbjerg and Ulmer (1960) concluded from snails collected between 1954 and 1959 that from 25 to 40 additional species were found in the lake during the first quarter of this century. The marsh-like emergent and submerged vegetation so abundant in Lake East Okoboji and the Gar lakes at the beginning of this century (Shimek, 1915b; Iowa State Highway Commission, 1917) has almost disappeared. Recent studies (Volker and Smith, 1965; Crum and Bachmann, 1973) show that the plants have subsequently been replaced by blue-green algae. It is estimated that the blue-green algae problem developed between 1920 and 1930 (Cale et al., 1972). Without documentation it is impossible to determine what brought about these changes. Whatever the cause, the rate of change is not comparable to lakes Washington, Erie and Zurich, lakes noteworthy for accelerated eutrophication.

An obvious correlation exists between the algal standing crops in each of the lakes and the ratio of the watershed area to lake volume. This relationship also can be extended to include mean depth (Tables 2 and 3). The lakes can be ranked by decreasing mean depth, increasing ratio of watershed area to lake volume, and increasing algal biomass. This order is Lake West Okoboji, Spirit Lake, Lake East Okoboji (including Upper Gar and Minnewashta) and Lower Gar Lake.

We have shown elsewhere (Jones and Bachmann, in press) that the summer algal crops in these lakes are correlated with the annual phosphorus inputs per unit volume of water. This relationship holds for many other lakes as well (Bachmann and Jones, 1974b). This offers an explanation for differences among the lakes. If phosphorus loss per unit area of watershed is the same for each lake, then the ratio of watershed area to lake volume is directly proportional to the potential annual phosphorus input per unit volume of water. Thus Lake West Okoboji is least eutrophic because of its small watershed and large volume, and Lower Gar Lake is the most eutrophic because of its large watershed and small volume.

ACKNOWLEDGMENTS

Mr. John W. Cory of Spirit Lake arranged for the financial support of this study and brought together the resources of the many organizations, agencies and individuals that contributed to its success as a cooperative effort. Many of the

field data were collected by Messrs. Brian Borofka, Stephen Killus, Keith Schardin, Keith Govto, Terry Schwarzenbach and Randall Maas. Laboratory analyses and data organization were provided by Mrs. Cathy Holste, Mrs. Susan Jones and Miss Rhonda Cetting. Mr. William Higgins mapped the watershed boundaries and inventoried the land-use practices. Dr. David Cox of the ISU Statistical Laboratory provided advice on statistical analyses. Dr. Richard Bovbjerg, Director of the Iowa Lakeside Laboratory, provided laboratory facilities for the project and has provided unpublished oxygen profiles collected by Dr. F. Stromsten from Lake West Okoboji during the 1920s.

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Senator CULVER. Our next witness is Mr. Dale R. Bree, from the Nebraska Game and Parks Commission. It is a pleasure to have you come to the hearing today, Mr. Bree. We look forward to your testimony.

Perhaps you can summarize it. We will give it very careful consideration in the hearing record.

STATEMENT OF DALE R. BREE, NEBRASKA GAME AND PARKS COMMISSION

Mr. BREE. Senator Culver, Senator Clark, ladies and gentlemen.

The statement I read on behalf of my agency today is also a statement of Willard R. Barbee, our director. The purpose of my agency's comments and testimony on S. 1799 is to point out the importance of Lake Manawa and similar recreation resource facilities to Nebraska residents of the Omaha metropolitan area for recreation purposes.

We are not in a position to testify on the economic engineering or environmental feasibility of projects that may be contemplated under S. 1799. Any project must be evaluated on its own merits.

Appended to this letter is a summary of the outdoor needs and deficiencies in the Omaha planning region as set forth in the Nebraska State Comprehensive Outdoor Recreation Plan.

In view of the time element, I will not take time this morning to read the needs that are set forth, but would ask, Senator, that that summary be entered into the record of this hearing with our letter of statement. Thank you.

Senator CLARK. Thank you very much. We appreciate your statement. It will be made a part of the record.

[The material referred to follows:]



Nebraska Game and Parks Commission

2200 North 33rd Street / P.O. Box 30370 / Lincoln, Nebraska 68503

September 26, 1975

Chairman
Senate Public Works Committee
U.S. Senate
Washington D.C., 20515

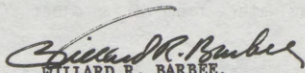
Dear Mr. Chairman:

The purpose of this agency's comments and testimony on S. 1799 is to point out the importance of Lake Manawa and similar recreation resource facilities to Nebraska residents of the Omaha metropolitan area for recreation purposes.

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Appended to this letter is a summary of the outdoor needs and deficiencies in the Omaha planning region as set forth in the State Comprehensive Outdoor Recreation Plan.

Very truly yours,


WILLARD R. BARBEE,
Director

WRB/DRB/mlc
Attach.

Summary of Outdoor Water Recreation Needs and
Deficiencies for the Omaha Area.

The need for water-based recreation facilities in the Omaha-Council Bluffs area has been documented many times, most recently in the Riverfront Development Project study "Recreational Activities and Facilities Needs" and the Nebraska SCORP (State Comprehensive Outdoor Recreation Plan). This latter publication shows Planning Region I (housing one-third of Nebraska's population in Washington, Dodge, Douglas and Sarpy counties) to be more than 12,000 acres deficient in water for power boating and water skiing. Water needed for swimming, fishing, sailing, and canoeing are in addition to this 12,000 acres. The survey showed that over 20 percent of Nebraska's population power boat and nearly 10 percent water ski. Some 13 percent of total power boating demand comes from Region I, an area containing about 3 percent of the water suitable for this type of boating. It is not surprising that over 40 percent of the Region I boaters are forced by crowding to do their boating in other Regions, often traveling considerable distances.

The guideline used to determine power boating space requirements was based on 10 acres per boat, plus another 10 acres if the boat pulls a skier. If all of Region I power boating demand were expressed on Region I waters, there would only be approximately 3.5 acres available per boat, or 2.2 acres per skier.

SCORP projections to 1990 show no improvement, with power boating participation increasing by almost 45 percent and waterskiing increasing by 88 percent. Region I deficiencies in that year will have risen to 9900 acres for power boating and 5500 acres for waterskiing. In calculating the 1990 situation in Region I, an additional 3865 acres were included in supply to account for acres of water to be available in the Papillion Creek Watershed Project. The potential for new boating waters from this project is now undetermined.

"Recreational Activities and Facilities Needs", a study done as part of the Riverfront Development Program by the Center for Applied Urban Research, University of Nebraska at Omaha, shows in its questionnaire analysis that 41 percent of the respondents feel that distance to water is the factor most needing improvement in regard to power boating. Quantity of water was the item listed next as needing improvement, followed by quality and cost. Waterskiing responses were similar, with the majority recommending improvement needed in distance, then quality, quantity and cost. The body contact aspect of water skiing caused quality to rate in importance over quantity as opposed to boating where water quality rated third. Responses for swimming at beaches, canoeing and fishing followed the same pattern, with the distance factor most in need of improvement followed by quantity, quality and cost. There is no doubt that distance to recreation water is of prime concern to recreationists in the RDP area.

A Game and Parks Commission survey done in 1968, "User Survey of Recreation Areas in Nebraska", shows that even 7 years ago Omaha-area people were exerting considerable pressure on the Salt Valley Lakes around Lincoln, which were quite new at the time. Interviews were made on each site during a three month period. Percent of Nebraska visitations from Washington, Douglas and Sarpy counties ran as follows: Conestoga - 5.4; Pawnee - 6.0; Bluestem - 8.2; Stagecoach - 5.8; Wagon Train - 3.9. Branched Oak, the biggest reservoir of the system and closest to Omaha, was not yet open to public use.

Other non-urban, water-oriented recreation areas surveyed in the same study further reflected the influence of recreational desires in the Omaha area. These sites are generally closer to the population centers than are the Salt Valley sites, and show a greater proportion of use by the metro residents. The areas and percent of total visitation made by Washington, Douglas and Sarpy county recreationists were as follows: Louisville SRA - 62; Two Rivers SRA - 72; Memphis SRA - 44; Dead Timber SRA - 24; and Fremont SRA - 26. In the 7 years since this study was done, demands have increased considerably, while facilities in the area have increased only slightly. New refinements and developments have been made on most of these areas, but surface acres of water per person have decreased, as demands increased.

Total shortage of boating and skiing water in Dodge, Douglas, Washington and Sarpy counties totals about 12,000 acres now and is expected to increase to some 15,000 acres by 1990. In light of this deficiency it is most important that existing supplies be maintained and efforts toward new ones accessible to area residents be supported.

Senator CLARK. We are going to hear now from Raymond Pogge, Mayor of Council Bluffs, who has been very interested in this project.

One question before you testify, Mayor, how long have you been a resident of this area?

**STATEMENT OF HON. RAYMOND POGGE, MAYOR, COUNCIL
BLUFFS, IOWA**

Mayor POGGE. Do I have to tell you?

Senator CLARK. Yes.

Mayor POGGE. I have lived in Council Bluffs since 1943, except for 6 years on active duty with the military.

Senator CLARK. One of the things that I hope your testimony will address itself to is one of the controversies here about whether this lake and the silting has anything to do with the Missouri River, if you have lived here during that period and you can speak to that question.

Mayor POGGE. I will be happy to. First of all, I speak on behalf of the city council, which unanimously supports this bill and this project; also the staff of our city.

I speak for the citizens of Council Bluffs in this entire metropolitan area, which I am sure support this project. I want to thank you and Senator Culver for coming. I don't think this city has ever had the honor of two Senators appearing at the same time, and especially conducting a hearing such as this. It is a beautiful day and a great honor for us to have you two here. We appreciate it.

You want to talk as to the general and overall view as to the necessity and feasibility of this project. I know, specifically, it is on the dredging, but we must look on the overall development if we want to really get the full impact of this project.

The Members of Congress should be aware that the city of Council Bluffs has been planning input into the Lake Manawa project over the past 6 or 7 years. That planning effort has been on a cooperative basis with the State of Iowa Conservation Service and Commission, which has jurisdiction over the State parks and recreational areas.

Among the items that we have been jointly planning over the past several years is one, building a new sanitary sewer outfall line from the old primary treatment plant to the new secondary sewage plant, which is just east of here.

This is at the south edge of our city. We purposely designed a 48-inch outfall line with plug taps on the line as it runs through potential Manawa State parkland.

We did this to provide a sanitary sewer service to the Manawa recreation complex and the residents that are in and about the park.

We designed this sewer and water system for Manawa residential area and we have provided long-range plans to include sanitary sewer service and water service for these areas and especially on the south side of the present Lake Manawa.

We have already done most of the preliminary engineering for a complete sanitary sewer facility for all areas of Lake Manawa, as well as the portions of the State that the conservation commission intends to acquire to complete the recreational complex.

We have made preliminary coordinated plans to assume the north portions of the lake for city park and recreational uses if the commis-

sion wishes us to do this. In turn, we have made plans and these engineering plans are completed for sanitary sewer services for that portion which might eventually become city park and recreational uses.

We are developing and have approved a new comprehensive park and recreation plan and open space plan which fully accommodates all of the potential of the Lake Manawa project.

We own 17 acres of riverfront land immediately east of the Indian Creek channel, and on the west side of the Missouri River levee which can be developed and added to the Manawa State Park facilities when funds are available.

This is very close to Long's Landing, a county conservation park now in existence. We developed preliminary plans for sanitary sewer services to serve Lakewood Villa on the west side of the present Manawa State Lake, which has been developed.

Our zoning ordinances in the city of Council Bluffs have rezoned a lot of the property to preserve it for future open space and park uses to assure that Lake Manawa can develop to its full potential in concert with the State Conservation Commission.

When the sanitary sewers are fully developed, there would be no reason for any residential or commercial use having to use septic tanks or other sewer disposal systems.

Water supply is available and these are two very important items.

The dredging of Lake Manawa, therefore, is absolutely essential to complement the commercial and recreational development of our city.

Indeed, we have plans for overnight camping facilities that would complement those that now exist and, particularly, for the interstate highway travelers from both Interstate 80 and Interstate 29. However, without the dredging of Lake Manawa, there is little hope that the full potential of this valuable natural resource can be realized.

I listened with interest, Senator, to your remarks concerning that this is a project which was initiated at the grassroots. I want to emphasize that this metropolitan area and especially this community has done its homework.

We do not come to you to initiate a program. We come to you with a program, planned, organized, ready to go. It is a project which is a desperate necessity. It has the feasibility. We want to work with all groups and all branches of our various governments to make this great and needed improvement. We have done the planning, the engineering; we have already done part of the development.

This is what I think our government officials look for. My brief tenure on the city council shows me that I look to where our money is going and I know you on a national level do.

I think you can look with satisfaction to a community which looks to the Federal Government for a complement, that the community organizes and presents the project and comes to you, and say we need some financial help. That is what we are doing here today. I think you appreciate this.

This must give great satisfaction to you Senators, Representatives, and the Administration, when you can see the Federal funds going into a community that uses them well. I will assure you that these funds will be used to great advantage and to your satisfaction.

To help our community with the State and Federal funds will give this city and this community a tremendous advantage; a tremendous boost.

I would like to just—you said 5 minutes.

Senator CLARK. We will give you a little bit more because I want you to go into this other question.

Mayor POGGE. Let me digress just one moment first. You will be hearing from our Parks and Recreational Director, Les Hicks, and I would like to ask you to take particular concern and interest in his presentation.

Part of his presentation will point out that this would develop better citizenship, a sense of personal responsibility for the wise management of the land and our resources.

This man has been a member of our staff for approximately 5 or 6 months. This man is presenting a program with a sense of responsibility to induce people to also have a sense of responsibility to protect our land. This is the type of people that we have in our community and we are proud of them. I think you will find this very, very encouraging.

Briefly, I want also—I can't just pass up this opportunity for the record—to state the necessity of Federal help. Our total budget in Council Bluffs is approximately \$15½ million. Out of that, we take the waterworks, which is separate; some sewer rental and then our bonds which is approximately \$4.5 million. So our really operating budget is \$11 million.

Our property taxes—I might say we are at our maximum mill levee of 31 mills now is approximately \$4.6 million. Our other revenues amount to a little over \$6 million, which makes up our budget.

Revenue sharing, gentlemen, we have plugged into our operating budget \$698,000. We would like to be able to use this for capital improvements but we cannot do it.

Therefore, our salaries, fringe benefits, and so forth, total about \$6.3 million; our debt retirement for bonds is \$1.3 million. We are building a new public swimming pool, we only have one now, with \$466,000 of revenue-sharing money; our city operation is \$2.8 million, which brings us up to the \$11 million.

None of this, gentlemen, includes the purchase of new equipment or replacement equipment or other capital improvements.

I point this out that we are desperately avoiding deficit spending. We are not broke. We are not bankrupt, but New York City is not the only city with financial problems.

Senators, I would like now to respond to the testimony of Mr. Duscha of the Corps of Engineers.

As was briefly alluded to, this area was part of the Missouri River years ago. Prior to 1952, this area almost yearly was beset with spring floods. The last flood we had and it was a severe one was in 1952, the spring of 1952.

I was not here; I was on active duty with the Navy in the Korean conflict. But Council Bluffs organized a tremendous effort, sand-bagging the river and kept the water from entering into the city. But this area was not protected.

Then after that, the Corps built the levee. After that, they built the dikes and the dams and they have controlled the Missouri River.

I have personal knowledge of this because I handled some lawsuits along the river concerning land which has become contiguous with the Iowa border and there has been considerable cases in our Iowa Supreme Court up from our District Court as to the ownership of these lands.

I was involved in one that went to the supreme court. I am also personally acquainted with the case between Iowa and Nebraska concerning these lands and so forth.

Since 1952, we have not had any floods. Let me say this: just south of here, there are eight gates. These gates now let the water go out of the Missouri River into the river, but the river water cannot backup.

After 1952, the water did not come into this area actually because it was practically down, a lot of silt here from the floods, and so forth. This community with its own funds, I believe, diverted Mosquito Creek into Manawa. We get our water now from Mosquito Creek, which is pretty good water. It doesn't build up the silt. This silt was built up from the floods and from the river prior to 1952.

In 1952 when the big flood came along, the Corps of Engineers opened these eight gates which allowed the water and all the silt and mud to come in.

Regardless of what the Corps says—I have great respect for them; they have been good to us—the condition of Lake Manawa, in my personal opinion, is directly responsible to the river and I think this is a Federal responsibility.

Senator CULVER. I want to thank you, Mr. Mayor, for your statement, for some of the very useful suggestions that you have just made by way of a further review of the relationship, physically, between the river, its channel and its man-made aspects with the lake and which will, of course, give rise to appropriate jurisdictional responsibilities within our governmental structure.

I also would like, Mr. Mayor, in the interest of time perhaps to reserve with you as well the opportunity to perhaps submit some more specific questions, if I might, particularly on the history of some of these flood fighting efforts and their consequences and the way they relate to the lake and the history of the silting that has been experienced in this area.

I would like to submit those on behalf of the committee, to you and perhaps you could respond in writing and we could have them as a part of our record and presentation.

I gather you certainly have no objections to a survey being conducted to substantiate some of these claims and to give them formal credence and perhaps we should think about some competing surveys on this subject.

By that, I mean it is important, I think, that the Corps obviously have that kind of data and information, scientifically, in hand before they are in a position to make any responsible conclusions on that question.

Perhaps it is the kind of thing where we ought to have some independent assessments as well in terms of competitive data and reports upon which to base our recommendations to the Congress in this area.

Mr. POGGE. I have gone to the Corps at various times for information and I am not sure they don't have quite a bit of information right there now.

Senator CULVER. We are certainly going to be assured as a member of this subcommittee and the members of the Senate Public Works Committee will be very thoroughly exploring that with them in the weeks ahead because we know the urgency.

I understand the urgency and timetable we are talking about not only to provide some sort of immediate relief now, but the prospects of preserving this situation for the future.

Senator CLARK. In the interest of time, Mayor, I am just going to ask one question. Mr. Bedwell testified that he thought about 20 percent of the shore of the lake was privately owned and Mr. Brazelton added that he thought about 60 percent was owned by the State.

I don't know whether anyone testified as to the exact nature of those figures. Does the city then own a part of the shoreline or is it all owned by State or private property?

Mr. POGGE. I am sorry I can't answer that. I think the city does own some land, but not very much. It is mostly State.

Senator CLARK. We thank you, very much, for your testimony.

Mr. POGGE. Emmet Ryan follows me. He is much older than I am; he knows a lot more than I do.

Senator CLARK. We will ask him about that. We are deeply honored to have the Mayor of Council Bluffs and now the Chairman of the Pottawattamie County Board of Supervisors because, as we said at the outset, this has been a cooperative effort at every level.

We are very pleased to have you here and to hear your testimony.

STATEMENT OF EMMET RYAN, POTTAWATTAMIE COUNTY BOARD OF SUPERVISORS

Mr. RYAN. It is very nice to have you present here to hear our words on this. We think there is very little that I can say with all the expertise that has been ahead of me and the words of wisdom that have been ahead of me, that I can say to add to this.

But this is a community project. In order for a community to be successful or a businessman or a farmer, he has to have the achievement of the goal he has set. With the good work of Ken Bedwell that has set this goal for us to dredge this lake and the future of it, is well presented in his behalf. We are totally in back of him. We think it should be done.

It is not only for Pottawattamie County or Council Bluffs, this is a community affair. It is bi-State, Nebraska, Omaha, well attended by various people from all areas. We certainly wish that this could be done in the future with your help, of the Senators, Representatives.

That is all I can say. With your good help, I think we can achieve this point.

Senator CLARK. Does the county board of supervisors and the county fully support the legislation and the efforts that are being made here?

Mr. RYAN. We have up to this point. We have been trying to help them as much as we can, although our budget is like everybody else's.

We haven't budgeted anything as far as money is concerned, but we will look to the future. If it is possible, we will try.

Senator CLARK. Thank you, very much.

We are going to hear next from Mr. Lynn. Mr. Lynn is with the Council Bluffs Chamber of Commerce. It is a group, as we said at the outset, that has been very, very supportive of this project and we are very pleased to have you here. You may proceed in any way you think appropriate.

**STATEMENT OF EDWARD R. LYNN, COUNCIL BLUFFS CHAMBER
OF COMMERCE**

Mr. LYNN. Thank you, Senator Clark.

Senator Culver, I am making this statement as Vice President of the Council Bluffs Chamber of Commerce, Riverfront Division, of which the Lake Manawa Task Force is a part.

I represent 530 member businesses in southwest Iowa and 18 volunteers who have given their time to the development of this and other community projects in our area.

Recreational facilities are vital to the future economic development of Council Bluffs, southwest Iowa, and eastern Nebraska. In our efforts to attract new business to Council Bluffs, we have discovered that recreational opportunities such as those offered by Lake Manawa are considered to be among the most important community assets by industry and businesses seeking locations for their plants and offices.

A redeveloped Lake Manawa could accommodate in excess of 1 million persons annually with good water and outdoor recreation. It could attract new businesses to this region and add new dollars to State and city tax coffers. It will bolster our economy.

We consider southwest Iowa to be as lovely as any spot in the Nation. Unfortunately, it does not afford its residents the natural recreation of the Minnesota lakes or the mountains of Colorado.

Provisions need to be made to create suitable facilities and with the help of Congress and the State of Iowa, Lake Manawa can once again be one of the finest recreation areas in the Midwest. The alternative, an urbanized backwater swamp, is unacceptable.

It is our sincere hope that Congress will assist us by approving S. 1799. I can think of no wiser investment it could make in our area, an investment which will reap immeasurable benefits to the economy and to the residents of this bi-State region.

We very much appreciate your interest and your help and your presence here today.

Thank you.

Senator CULVER. Thank you, very much, for your kindness in appearing before the committee. We appreciate your testimony.

Our next witness is Mr. Clarence Shafer, from the city of Omaha and the Omaha-Douglas Civic Center. We are delighted to welcome you, Mr. Shafer.

**STATEMENT OF CLARENCE SHAFER, DIRECTOR, OMAHA PARKS
AND RECREATION**

Mr. Shafer. Thank you, Senator.

I appear here today on behalf of Edward Zorinsky, Mayor of the city of Omaha, and myself as Director of Parks and Recreation. I would like to read to you a statement by the mayor and then I have a couple of remarks that I would like to add to his statement. His statement is as follows:

Gentlemen, I wish to take this opportunity to thank you for the privilege of testifying on behalf of S. 1799, commonly known as the Lake Manawa dredging project.

You may or may not be aware of the fact that water resources, recreation areas in the Omaha-Council Bluffs metropolitan area are grossly inadequate. With 14,000 registered boaters and only a few lakes available, it can be dangerous to indulge in this leisure-time activity. The Missouri River is an alternate recreation area, but the access to this great body of water is inadequate.

The Corps of Engineers, of course, at this time is doing a complete study on this matter, but actual solution to this problem may be years away. I am talking about the building of boat ramps, access to the Missouri River that are safe.

To divert just a little bit from that, in the new ramps that we have built in M. P. Dodge Memorial Park north of the city of Omaha you can go out there on a weekend and find as many as 2,000 cars and buses trying to get in that one place.

The lack of the facilities and the access to water resources leisure time facilities is grossly inadequate in the total area. Lake Manawa has the potential of being one of the finest recreation areas available in the metropolitan area.

However, it is necessary that steps be taken to clean up the lake, deepen the lake, and preserve it for the use of the general public. It seems to me that this is a justifiable use of Federal tax dollars and certainly would be a step forward in the total riverfront development.

It is common knowledge that many citizens of Omaha use Lake Manawa for their recreational boating and in turn many citizens of Iowa use facilities that we have in Omaha. That is as it should be.

Therefore, I wholeheartedly endorse this bill and say to you that all of the citizens in the metropolitan area will benefit.

EDWARD ZORINSKY, Mayor,
City of Omaha.

Senator CULVER. Thank you, very much, Mr. Shafer. We appreciate your appearance and please express our gratitude to the mayor for his statement.

Mr. SHAFER. One other statement I would like to make, one thing in the bill that I am concerned about, and I suppose from being in the profession which I have followed for the last 20 years, it is quite natural to be concerned.

There is a statement in the bill that calls for 20 percent of these lakes; the frontage of these lakes to be preserved for public use. I am concerned over the fact that we have limited this in this bill to 20 percent.

I am not sure that the percentage should be listed because I know it is very easy over a period of years to take a 20 percent factor in one bill and attach it to another bill.

I think of the watershed, flood control, and recreational dams that we are building in Nebraska and Douglas County and such as this. I would hate for this bill to be used as a way to get the frontage taken away from the general use of the public for private use and private access to this lake.

I would ask you to consider and look again at that 20 percent aspect. Is that what we want to say?

Senator CULVER. Mr. Shafer. I think that is an excellent point. It would be helpful to us if you would be good enough to take just a moment someday in the next few days and make that argument on paper, citing some of these examples. Would you do that?

Mr. SHAFER. Yes.

[Mr. Shafer supplied the following:]

CITY OF OMAHA,
Omaha, Nebr., September 29, 1975.

Hon. DICK CLARK,
Agriculture and Forestry Committee, U.S. Senate,
Washington, D.C.

DEAR SENATOR CLARK: On Saturday, September 27, at the hearing on Senate bill 1799, you and Senator Culver asked me to comment on the provision of the bill that would require at least 20 percent of shoreline to be held for public use and access to the lakes rehabilitated under this bill.

My concern is that this may open the door for lakes, built by the Corps of Engineers for flood control or recreation, to return to the place where shorelines may be bought for private use only. My fears may be unfounded, but we must look at this aspect.

I would prefer that a percentage figure not be mentioned, as this gives a target for other projects. Thank you for your concern.

Sincerely,

CLARENCE E. SHAFER, *Director,*
Parks, Recreation and Public Property,
City of Omaha, Nebr.

Senator CULVER. Where you feel that kind of arithmetic and arbitrary limitation is undesirable in terms of the total environmental potential of an area in terms of public value.

One of the things I know that both Senator Clark and I feel about this legislation is that perhaps its most useful purpose at this stage is to serve as a vehicle to bring out some of these kinds of problems and to stimulate the necessary and appropriate directions we must take to shape it into form that is in the public interest and one that has a realistic prospective of bringing about the desired result we all seek.

It has to go a long way yet, through the committees, through the Congress itself and these kinds of suggestions are extremely helpful to us in terms of making it the strongest possible bill and in terms of its attractiveness on the merits.

Mr. SHAFER. Senator Culver, I want to congratulate both you and Senator Clark for the foresight that is in this bill.

I personally feel that we have an obligation as public officials to allow the people within our community to have the opportunity to find those leisure time facilities available to them for the opportunity to live a full life with the feeling that we are accomplishing something.

As you know, our work today, person today, does not find that self-enhancement in the work in which they do. They find the full life in their leisure time pursuits. I think this is a step forward and I congratulate you for your foresightedness.

Senator CULVER. Thank you, very much, Mr. Shafer. We appreciate it.

Our next witness is Mr. Denny Anderson from the city council of Council Bluffs. It is a pleasure to welcome you today before the committee.

STATEMENT OF DENNIS ANDERSON, COUNCILMAN, COUNCIL BLUFFS

Mr. ANDERSON. Thank you, Senator Culver.

My name is Dennis Anderson and I reside at 341 Woodland Dr., Council Bluffs, Iowa. Although I am a member of the city council of Council Bluffs, I speak to you today not as a local elected official, but as a concerned citizen and parent.

I speak today to represent my two school-age children, Christopher, age 10, and Jill, age 5; as well as all the children of our area in regard to the restoration, improvement and preservation of Lake Manawa.

We must be very aware of the great natural resource we enjoy in Lake Manawa and its surrounding open spaces. We must endeavor to restore this resource to its greatest potential as an environmental and recreational facility.

Our children must be afforded the opportunity this lake and others like it have to offer. But we must act now. Our children deserve the opportunity to view our wondrous land at its best and surely if you look closely, you will see the area in which we meet today is indeed worth the efforts and moneys to restore and preserve.

The children must be afforded such an area in which not only to view nature, but also to use in good clean recreational activities such as swimming, fishing, boating, hiking, nature study, picnicking, and just plain relaxing. But unless the lake is dredged to a proper depth and the shoreline stabilized, we may expect only a great place for a mud bath.

So I implore you to think of the children of today and of the future who will be forever grateful for your wisdom and vision in providing for our environmental heritage.

Therefore, on behalf of the children, I wish to express support and encouragement in the passage of the necessary legislation to improve and preserve our Lake Manawa.

Senator CULVER. Thank you, very much, Mr. Anderson. We appreciate your statement.

Mr. Dan Lewis, councilman from Council Bluffs, it is a pleasure to welcome you today.

STATEMENT OF DAN LEWIS ON BEHALF OF DOROTHY L. STROHBEHN, COUNCILWOMAN, COUNCIL BLUFFS

Mr. LEWIS. Thank you.

On behalf of Councilwoman Dorothy Strohbehn who had to leave here a few moments ago, she prepared a letter to each of your offices and that of Thomas Harkin. She says:

Honorable Senators and Congressmen, very simply stated, the dredging of Lake Manawa is extremely important to the future of this entire area. Many homes are built around the lake. Many people use the lake for recreational purposes.

Lake Manawa is enjoyed not only by citizens of Council Bluffs and southwest Iowa, but also by many Nebraska residents. Thus, it is of regional significance. The City of Council Bluffs does not have the resources to dredge the lake.

I, therefore, both as a taxpayer and an elected official, do respectfully request that the necessary funds be appropriated, and that the U.S. Army Corps of Engineers be directed to proceed with this essential project.

DOROTHY L. STROHBEHN,
Councilwoman.

I agree with Dorothy's comments and also would like to include some of my own. Mayor Pogge stated earlier that the problems that we have with the silt in the lake happened probably back in 1952. I do not know. I was still in knee pants then.

Also, at that time, we were coming down here to swim. It wasn't too great back in those day, but even now coming down here and looking at it and having tried to swim, it is even worse.

We need the aid and the help, whether it comes from you and the State, for development of this area. When Council Bluffs sits here within a 500-mile radius of one-sixth of the population of the United States, I don't think this area can be ignored.

We need your help to help us with this area because it is vital, important to our area, to our city as a recreational need.

Thank you.

Senator CULVER. Thank you, very much, and please express our appreciation as well to Mrs. Strohbehn.

Mr. LEWIS. I certainly will.

[A letter from Councilman Ronald E. Cleveland follows:]

THE CITY OF COUNCIL BLUFFS, IOWA,
September 26, 1975.

Hon. DICK CLARK,
*c/o Public Hearing—Lake Manawa,
Water Resources Subcommittee of U.S. Public Works Commission*

DEAR SENATOR CLARK: I am sorry to be unable to attend the meeting on Saturday, September 27, 1975, but due to previous commitments I cannot be present.

I believe the city council has stated their position as one of endorsement of the concept. However, I wanted to express my concern that the dredging and development of Lake Manawa is a vital project to this area.

Sincerely,

RONALD E. CLEVELAND,
Councilman.

Senator CULVER. Our next witness is Mr. James L. Parmelee from the Greater Omaha Chamber of Commerce. It is a pleasure to welcome you here.

STATEMENT OF JAMES L. PARMELEE, GREATER OMAHA CHAMBER OF COMMERCE

Mr. PARMELEE. Senator Clark and Senator Culver, it is a privilege to be here.

My name is James L. Parmelee and I represent the Greater Omaha Chamber of Commerce, appearing in support of Senate bill 1799.

Among the many activities conducted by our chamber is support for the complete development and conservation of water resources. The chamber has a Water Resources Committee of which I am a member.

Water-oriented recreation is not abundant in our region and as a matter of fact, the lack of water for recreation is one of our major deficiencies. This is among the reasons why the Greater Omaha Chamber of Commerce supported authorization and funding for dams and reservoirs in the Papillion Creek Basin. We hope that the people of Council Bluffs and western Iowa will also eventually enjoy the recreational offerings of the several Papio lakes.

Lake Manawa is an important recreation spot to Omaha. A study by the Iowa Conservation Commission shows that 39 percent of visitors to Lake Manawa are Nebraskans. Since our area is so short of water recreation, we certainly endorse this legislation which would authorize the U.S. Army Corps of Engineers to revitalize this lake so that it can be an asset to our region for many years to come.

We realize we are asking Iowa taxpayers to partially pay for a project that Nebraskans can also enjoy, but we are sure there have been and will be opportunities for us to reciprocate.

Assuming the successful advancement of this legislation, we will most certainly urge the support of Senators Carl Curtis and Roman Hruska. I might also add that I have attended many hearings on waterways with the Mississippi Valley Association Water Resources Congress in the past and this is the first one that I have ever had as an outdoor meeting.

Senator CULVER. Thank you for coming. We appreciate your statement.

Our next witness is Mr. Pat Pendergrass, Omaha-Council Bluffs Metropolitan Area Planning Agency. It is a pleasure to welcome you this morning.

**STATEMENT OF PAT PENDERGRASS, OMAHA-COUNCIL BLUFFS
METROPOLITAN AREA PLANNING AGENCY**

Mr. PENDERGRASS. Thank you.

Senator Clark and Senator Culver, since mid-1972, I have been the staff director for the riverfront development programs and what I would like to do very briefly is to put this project in the context of the riverfront development program.

We have just finished a 3-year, \$3.5 million planning program, looking at what the future of this region should be. I might read, with your indulgence, just the objectives of that program. They are:

Replace indiscriminate east-west urban sprawl with planned development which recycles the decaying areas of the central business district; provide a variety of choice of neighborhood types and locations using in-town living; provide a viable economic base and full employment opportunity by attracting desirable and diversified industry to locations near employment centers.

Provide and develop advance skilled training to the unemployed and underemployed; conserve agricultural lands; preserve open space and natural areas and make them accessible to the public; conserve energy by bringing the places where people live and attend school, work, shop and play closer together and by encouraging and facilitating movement by foot, by cycle, and by mass transportation.

Make rural communities viable by balancing the industrial employment base with the available labor force and by gaining adequate housing with suitable amenities and convenient access to the metropolitan corps with its full range of educational, cultural, entertainment facilities, retail outlets, health maintenance and the like.

Provide a high quality of life at a reduced cost by eliminating the causes and burdens of human, physical and economic blight.

As Mayor Pogge mentioned, this is a local plan and program. It was conceived here with a phenomenal amount of public participation. You have seen some of the activists here this morning, like Ken Bedwell. There were over 600 involved in this program, representing the public sector, the private sector, and the concerned citizen.

That process that brought us to this point also has produced a land use plan for this region for the year 2000. That plan is in this synopsis which I will present for the record.

A key element of that plan is Lake Manawa. It was in our first study which was published as a key element. It was in the regional framework of a recreational plan. It was in the Council Bluffs open space plan. It has been a highest priority project with every step of the planning process.

It becomes part of the magnet that, as the mayor said, initiated the program, return to the river; people with money leaving the river caused all sorts of problems.

Getting them back will solve not just the problem of water-based recreation close in for the metropolitan area, but will in a reinforcing way work together with the other planned projects to build the kind of future we would all like to see here. I will submit a more detailed and technical report for the record.

Senator CULVER. Thank you, very much, Mr. Pendergrass, for your statement.

We look forward to any additional information you wish to provide us for the hearing record. I want to commend you for the foresight that is reflected in the kind of futuristic plans that you are involved in.

I happen to be one who feels that is so completely essential if we are going to have any kind of future that is worth living. I know the pioneering work you have been doing in that area in the Omaha-Council Bluffs area planning group.

I just wish to commend you for that general project and you can be assured that we look forward to working closely with you in whatever kind of resolution of this particular problem that we feel possible with regard to the Federal Government's participation.

Mr. PENDERGRASS. Thank you, very much, Senator.

I might add that a new group is being formed of local elected officials from seven counties, to get on with the job of implementing this plan.

Senator CULVER. Thank you.

We are also pleased to welcome Dorothy Buckingham, vice president of the Riverfront Communities Development Foundation. It is a pleasure to have you appear before the committee this morning.

STATEMENT OF DOROTHY BUCKINGHAM, VICE PRESIDENT, RIVERFRONT COMMUNITIES DEVELOPMENT FOUNDATION

Ms. BUCKINGHAM. Thank you, Senator Culver, Senator Clark.

I would like to appear before this committee from several different perspectives. I am a resident of eastern Pottawattamie County, the eastern Pottawattamie County people use Lake Manawa. We have no other water recreation facilities as close as Lake Manawa. So we have a lot of people using this area.

I have also served on the board of supervisors for 8 years and I also support this from that aspect as a former member of the board of supervisors. I am a charter member of the riverfront development program which Mr. Pendergrass has just spoken of.

I am also vice president of the Riverfront Communities Development Foundation of which Mr. Leahy is president and I am supporting it as a member and as vice president of that foundation.

I am a former chairman of the Council Bluffs Riverfront Steering Committee. This committee is very active and we have a riverfront group on this steering committee. We would like to see Lake Manawa become a more viable lake for the whole region.

I am also on the Western Iowa Public Parks Task Force. We have a State park complex program in the State of Iowa. It is the referenced dam area and the State conservation commission is involved in this.

We are looking at our whole western Iowa area as a possible State park complex area and Lake Manawa is a very viable part of this. So I guess I am supporting this in several aspects and I will also submit a more detailed program in letter form to you to put into the record.

I also have another letter here. This comes from the Glenwood Chamber of Commerce:

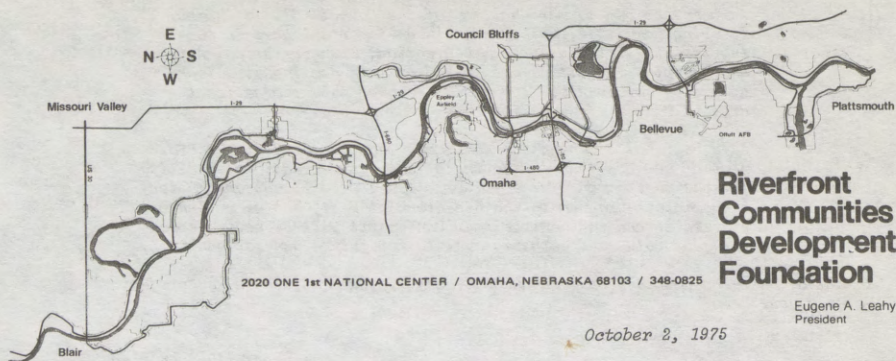
On behalf of the membership of the Glenwood Community Chamber of Commerce, I would like to support this effort to dredge and improve Lake Manawa.

We have a great many boating enthusiasts in our area who I know would enjoy using the lake even more should this project be successfully concluded.

It is signed by Dave Snow who is the Executive Director of the Glenwood Community Chamber of Commerce.

Senator CULVER. Thank you, very much.

[Ms. Buckingham's letter follows:]



Natural Resources Sub Committee
of Public Works
of U. S. Senate

Senator Clark - Senator Culver

I would like to support the dredging bill S-1799 from several perspectives;

1. As a resident of Eastern Pottawattamie County, I feel the passage of this bill and the dredging of Lake Manawa a must. We in Eastern Pottawattamie County have very little access to water and water related activities other than Lake Manawa. It would be doing the citizens a disfavor to ignore the problem that exists on this lake and allow further deterioration.
2. As one who has served 8 years as a Pottawattamie County Supervisor, I feel that an expanding tax base is necessary. If Manawa is allowed to deteriorate, the building that has taken place in the way of new and expensive homes will also deteriorate. Thus an ever lower tax base and a burden on the area as a whole. Whereas if the Lake and Park were to be up graded, more building will take place, land values will rise and the tax base will be expanded.
3. As a Charter Memeber of the Riverfront Development Committee and Vice President of the Riverfront Communities Development Foundation and several of its task forces, I feel the up grading of Lake Manawa and the Park is essential. This is the heart of our Parks program on the Iowa side and a very important part of the over all program. Tourism can be a viable industry in Western Iowa if we can provide the opportunities and areas of interest to get tourists to stop when traveling through. If Lake Manawa is allowed to depreciate, why not the whole area? We cannot let this happen.

GLENN H. L. DIOYT MORRIS F. MILLER THOMAS S. NURNBERGER ED H. SPETMAN, JR. WILLIS A. STRAUSS
ALDEN AUST HAROLD A. BOOTH DOROTHY BUCKINGHAM H. W. CAMPBELL HOWARD C. HANSON, JR.
ROBERT M. HAWORTH ROBERT J. KUTAK

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4. As a member and former Chairman of the Council Bluffs Chamber Steering Committee, Lake Manawa is an important part in wooing industry into our area. Recreation, Transportation, Arts and Shopping Facilities are looked at when new Industry looks at a city for possible location. We need this recreational area.
5. As a Regional Bicentennial Chairman, what better Horizons Project do we have than the saving of a great recreational facility for the population of the future. True, we will not accomplish the complete program in the Bicentennial year, but we will have started it and in the true American spirit will be saving something of value and esthetic quality for future generations.

In all of these capacities, Lake Manawa has been, is, and will be a key project. We need your help.

Respectfully Submitted,

Dorothy Buckingham

Dorothy Buckingham
Vice President Riverfront
Communities Development Foundation
and
Midlands Riverfront Bicentennial
Director

Senator CULVER. Our next witness is Mr. Harold L. Borrick of the Pottawattamie County Conservation Board. It is a pleasure to welcome you here this morning.

**STATEMENT OF HAROLD L. BORRICK, POTTAWATTAMIE COUNTY
CONSERVATION BOARD**

Mr. BORRICK. Thank you, Senator Clark, Senator Culver, ladies and gentlemen. There are some other members here of the committee who I might say a little to.

I am making this statement for the Pottawattamie County Conservation Board and prior to this statement, I would like to—off the record—thank whoever might be responsible for this lovely autumn day on the south shores of Lake Manawa.

Senator CLARK. We are responsible for that. We take credit for it.

Mr. BORRICK. The primary duties of the conservation board are to provide for lands and waters for public use of recreational areas. The board certainly has more than just a passing interest in the waters of Lake Manawa.

There has been much data and will be more data provided to your committee relating to the status of Lake Manawa today and its longer term future. I will not attempt to enlarge on such data. You will have it made available to you. I think without question it all sums up to a matter of establishing need of renovation for the betterment of southwest Iowa as well as the metropolitan area of Omaha.

Gentleman, with this need established and the subsequent cost-benefit ratio being such that renovation can be justified, it then remains to provide for the funding of such renovation.

Costs of suggested work necessary to best utilize Lake Manawa area to serve the public amounts to a considerable sum. For an agency such as our conservation board to fund would be impossible.

Also, such magnitude as to require matching funds from the State conservation commission to proceed with the overall development of the Lake Manawa area is proposed.

The interstate aspect of this facility is such as to qualify it as a justified Federal funding and cooperative program. The State of Iowa has and will continue to spend considerable funds to proceed with the renovation of the area and has to date provided lands needed to proceed with the dredging program proposed and it will assume the maintenance of the area for completion of the development program.

The city of Council Bluffs and our local conservation board will perhaps share in this maintenance.

Gentlemen, we wholly support this legislation for the betterment of the State of Iowa and the State of Nebraska and respectfully request the Congress to enact this legislation so the Secretary of the Army may direct the Corps of Engineers to proceed with this proposed renovation of Lake Manawa.

Thank you, Senators, for having had the privilege to appear.

Senator CLARK. We thank you, very much.

Just one question. Is it fair to say that the county conservation commission fully supports the legislation that has been passed by the State legislature and the pending legislation before the Congress?

Mr. BORRICK. Yes; I think I can state without equivocation on the part of the conservation board that they do support the State and the Federal Government for the betterment of Lake Manawa and well realizing—as I say this being our primary reason, is to provide for lands and water for recreational areas. This is one of our biggest duties. Without question, we support it wholeheartedly.

Senator CLARK. Thank you, very much.

We are going to hear next from Russell Pearson who is here from Onawa. I know he has a particular interest because we visited before about Blue Lake. He is chairman of the Blue Lake Improvement Commission.

Mr. Pearson, because of the wind blowing strongly, I am going to ask you to speak very directly into the microphone, as I am, and loudly so that everyone here can hear you.

**STATEMENT OF RUSSELL PEARSON, CHAIRMAN, BLUE LAKE
IMPROVEMENT COMMISSION, ONAWA, IOWA**

Mr. PEARSON. Thank you, Senator Clark, also Senator Culver.

We appreciate the privilege of attending and being heard at this hearing and I assure you my comments and my remarks will be brief.

The residents of western Iowa in the area surrounding Blue Lake at Lewis and Clark State Park near Onawa are vitally interested in dredging of the oxbow lakes adjacent to the Missouri River and the fact is that we initiated action some 10 years ago on this behalf and have worked with the conservation commission in the State of Iowa to get dredging programs underway.

We also have been active in participation in the passing of legislation in the State for the State funds that are now appropriated.

At the request of the people of our community, the Kiwanis Club has been the sponsoring organization for several years and to give you a brief history of the Blue Lake project, we have in 1971 requested the State conservation commission to ask the Corps of Engineers to make a survey of the silting problem in Blue Lake.

This was completed in that year. So there are studies in regard to Blue Lake that have been made by the Corps of Engineers and at some expense to the Federal Government already. So we have a definite matter of information as to what has happened up there in regard to the flooding of 1952.

In fact, the Corps, in their survey, states that 2,200,000 cubic yards of silt were deposited in Blue Lake directly from the Missouri River in 1952. So there are similarities between Manawa and Blue Lake.

It is this legislation that you men are instituting in Washington, proposing the dredging of oxbow lakes on the Missouri River, we appreciate the fact that we are also being considered in the dredging program.

We want to highly support your activities in this manner and also the conservation commission which has cooperated with us as well.

We heartily support everything you have done. We support the Manawa project here and have nothing but the fullest cooperation to offer in any way we can.

Thank you.

Senator CLARK. We are most appreciative of your statement and your cooperative attitude.

I know you have waited a long time up there. I have been on the lake and know the condition. It is a very similar situation. Much of the problem is created by the same flood. You are badly in need for the same reasons and we want you to know that we strongly support your request. We look forward to working with you on that project.

Thank you.

Senator CLARK. We are going to hear next from Ralph Story of the First National Bank here in Council Bluffs. You may proceed in any way you think appropriate.

STATEMENT OF RALPH STORY, FIRST NATIONAL BANK, COUNCIL BLUFFS

Mr. STORY. Thank you.

I would like to thank the committee for this opportunity to make comments. As an introduction, I would like to say I was born and raised at Lake Manawa and spent the first 34 years of my life here. I have fished, hunted, and trapped over every inch of this lake.

I believe that it is an established fact that thousands of people use this lake each year, almost like an oasis in the desert. I can personally attest to these numbers for as many years as I can remember.

I can also add that a stigma is attached to this lake as being a shallow, dirty, and muddy lake; this charge being made by many of the people who use the lake each year.

Today I am not here as a former resident, but a representative of Dale Ball, President of the First National Bank of Council Bluffs. We are the only financial institution with a facility at the front gate, of Lake Manawa.

Our comment will be from a little different perspective than you probably heard today, that being our analysis and observation of the potential of the area surrounding the lake. We think this area is possibly one of the most unique for what it has to offer and how it is situated in the whole Midwest.

For example, less than one mile from the north end of our lake, Interstate Highway 80, coming from the east and going west, joins Interstate 29, coming from the north, forming almost a funnel which then runs along the east side of where we are sitting with adequate entrances and exits. The recent completion of the widening of the South Omaha Bridge Road also makes this a very excellent road network. The scheduled October opening of the south side viaduct, going from Council Bluffs into Lake Manawa, a complete paved road around the lake, all of this making an outstanding road network for this area.

In the area of recreation within this area, we have a State park with extensive development plans for the future, a city park, a county park, an 18-hole golf course, a game refuge and with this area being bounded on the west and the south by the Missouri River making an unbelievable recreational and nature complex.

Also I might add that there is a very capable gentleman—Mr. Smetana—that lives in Lake Manawa who is at the present time writing a history of the lake and I might add that this lake is very rich in heritage. I would suggest that the committee make this booklet that he is writing a part of this testimony. (See p. 165.)

In the area of housing and commercial establishments, virtually all of the new growth in housing and commercial type establishments has been in this area in and around the Council Bluffs area. This housing would be in the Twin Cities Plaza area, April Village which is a mobile home park, West Lake Village, Lakewood Villa and other scattered developments.

In the area of commercial establishments, there have been approximately 50 wholesale-retail businesses located south of the interstate in the last 5 years and there have been many more inquiries.

There are approximately 150 commercial establishments in all at the present time. Among them, a large marine dealer on the lake, two sporting goods stores, and a large camper dealership.

In the area of schools, the area is served by an excellent school district that had 102 percent pupil increase in the last 10 years.

In the area of utilities, Northwestern Bell Telephone Co. is serving approximately 2,400 residents, with the 366 prefix and they anticipate 250 to 300 household growth per year in this area.

Iowa Power and Light is in the process of a \$200 million-plus expansion project on the Missouri River here which will have a tremendous impact on the actual value of taxable property here.

In closing, we want to say that based on these facts about this area, the dredging of Lake Manawa, which has deteriorated rapidly the last few years, is all that remains to be done to make this an unbelievable recreational area that could help to meet the needs of large numbers of citizens of the Midwest for years to come.

It will have an impact, as far as we are concerned, second only to our urban renewal project. We believe at the First National Bank that this investment will be returned quickly and several times in use, private investment and recreational funds spent.

Thank you.

Senator CULVER. Thank you, very much, Mr. Story, and please express the appreciation of the subcommittee to Mr. Dale Ball.

Mr. STORY. Thank you, very much

[An attachment to Mr. Story's statement follows:]

HISTORY OF LAKE MANAWA

By Frank W. Smetana

Lake Manwa was a result of the flood of the Missouri River on April 9, 1881. At that time one could stand on 8th & Broadway, get in a rowboat and row up to 10th Street in Omaha. From 7th & 5th Ave., looking south, one would see nothing but a vast stretch of water.

General Dodge sent out a cavalry to warn the people in the low lands of the city to gather their belongings and head for the high land. A group of men on horseback were sent to this lower area to help herd the cattle and other livestock to the high land. All one could see were the floating wooden sidewalks, some buildings and much debris. The water was rising at the rate of one foot per hour. This was the greatest disaster that befell this area.

When the river subsided it cut a new channel in the neck of the hairpin turn of the river at that time and in its wake left an oxbow lake.

For a couple of years very few people paid any attention to this body of water but it wasn't long after the flood when the well-to-do people used this lake as their camping grounds. In those days when the people went camping for the summer they brought along their maids, servants, and cooks. The only way to get to the lake area in that period was by horse and carriage.

Mr. Clark of Minneapolis saw this body of water and saw its potential as a good site to build a hotel. In 1887 a hotel was built

which had 24 rooms, ballroom and saloon. Tallykes would bring the young people to this hotel. While the workmen were building the hotel, they thought that the well water in this area had a beneficial effect and this spread pretty fast in the surrounding areas and many people began to frequent the lake area. Whether or not the water had any therapeutic effect is questionable.

The affluent people of Council Bluffs and Omaha built a small clubhouse in 1887. Sailboats were built at the lakefront and eventually regattas were held at the lake and this drew more people to the lake area. The clubhouse was called the Council Bluffs Rowing Association, and this club was only for the wealthy people. Young people were very circumspect and one had to be introduced to a young lady before asking for a dance. If any young lady went out on the veranda too often with her boyfriend, she was looked down upon. If she ventured outside the building for a stroll she committed social suicide. Besides the sailboating they had skull races as well as rowboat racing.

As the traffic increased Mr. Graves of Dubuque, Iowa, built the Manawa Railroad. The locomotive was nothing more than a one truck streetcar with a boiler in it and pulled three short passenger cars. The train would make up on 9th & Broadway and was very busy making a trip to the lake every half hour. In 1888, the M.F. Rohrer, a double decker steamer was launched on the lake. This was named after the mayor of the city and carried about 80 passengers. This boat was used to transport the people to the Manhattan Beach on the south side of the lake from the Manawa Hotel.

Mr. Odell, a real estate man from New York, built the Manhattan Beach and in 1906, a huge kursaal was built on the lake. It was approximately 250 feet long and 60 feet wide. It had a dance floor, restaurant, and locker rooms for the bathers. Also, on the Manhattan Beach was a huge toboggan slide for the bathers. Several restaurants and saloons soon appeared. A horse race track was improvised for a short time just south of the beach.

Since the lake was formed by the river changing its course, the southwestern part of the lake and meander belonged to Sarpy County, Nebraska. The rest of the lake belonged to Pottawattamie County, Iowa. This produced somewhat of a problem and at times a convenience. When the temperance movement was developing, the park decided to stop serving hard liquor. This law was passed by Pottawattamie County. Therefore, whenever a raid was made on the north side of the lake, the concerned people would be warned before the raid and hastily put their kegs of whiskey on barges and by means of steamboats pull them over to the southwestern corner of the lake. The liquor was not in Sarpy County and the mulct law did not affect them. During disasters in the southwestern part of the lake jurisdiction fell under the Sarpy County coroner.

In 1894, a huge pavilion was built on the north shore of the lake. It was 600 feet long, 30 feet wide, and had a boardwalk 900 feet long. It had a restaurant, private dining rooms, soda fountain, saloon and could seat 2200 people.

One of the many attractions was balloon ascensions. Occasionally a balloonist was drowned or killed. They also had spectacular dare-devil divers who would perform nightly. There was a woman who weighed about 200 lbs. and had a bathing suit made out of asbestos and she would drench herself with gasoline, climb to the top of a 40 foot tower, ignite herself and make a spectacular dive. This was quite a sight since she performed her act in the evening.

Just outside the park was the Ben Marks Casino. This had every gambling device of its day. One unusual feature about this casino was that in front of the bar were several trap doors and when a customer had too much to drink and became obnoxious, the bartender would pull a lever which would release the trap door dropping the drunk in the basement cell. When he sobered, the man was released. Similar trap doors were in front of the gaming tables and if a customer tried to cheat the house, the house man would pull the lever and the gambler found himself in a straw-laden cell. Many times that was the last anybody ever heard of him.

In 1905, the Hagenbeck Circus drove their elephants down to the lake for a bath. This was quite a promotional idea and every street car available in both Council Bluffs and Omaha was pressed into service. It is said that between 35 and 40 thousand people were at the lake on that day. And yet, at that time the total population of Council Bluffs was about 25 thousand people.

A theater which featured vaudeville was built. It seated 2200

people. Later on, this was converted to a roller skating rink. At one time there was an opera house.

One of the biggest roller coasters west of Chicago was built in 1906. By this time the street car company owned the north side of the park which was then called the Grand Plaza. This park was considered the Coney Island of the West. So famous was Manawa, that people from Europe came to see it and at one time launched a double decker steamer on the lake. The park had all the features of a carnival and the bandstands featured concerts every night. At one time John Phillips Sousa entertained at Manawa.

The park had a baseball diamond with a grandstand that held 5,000 people. This was the biggest ball park in the middle west. The popular teams of both Council Bluffs and Omaha played at this park every Sunday. In these days baseball was well patronized.

Many organizations used the grounds for their picnics. This picnic area was called Shady Grove. One of the big annual picnics was given by the grocers and butchers of Council Bluffs. This affair was probably one of the biggest picnics of the year. Trains of streetcars were used to bring the picnickers to this haven. In the evening free movies were shown and everybody looked forward to this new type of entertainment.

In 1911, one of the finest ballrooms in the midwest was built on the north shore of the lake. All of the leading jazz bands of the day played at one time or another at this famous ballroom. The crowds attending this ballroom were tremendous.

In about 1924, the bad element entered the picture and the carnival atmosphere dominated the area and the popularity of the park began to decline. At that time, the automobile came into common use and people went elsewhere for their entertainment. The park can once again be a beautiful resort area and with the energy crisis and controlled speed limits, people will patronize their local parks. Therefore, dredging of the lake is something that all people in this area would appreciate and be able to enjoy.

F. W. S. S. S.

Senator CULVER. Our next witness is Mr. John Rodenburg. We are very pleased to welcome you to the hearing this morning, John, and look forward to having the benefit of your thoughts.

STATEMENT OF JOHN RODENBURG, PRIVATE CITIZEN

Mr. RODENBURG. Thank you, Senator Culver.

Ladies and gentlemen, my name is John Rodenburg. I am 14 years old, and we have a house on the other side of the lake. I am very proud of this lake. I have lived on it for a number of years.

I have learned how to ski and taught my brothers and sisters how to ski. Until recently, it has become silted. The water level has lowered.

As you all know, Lake Manawa was formed by a flood many years ago before I was born. My dad, my granddad, told me fish stories and the condition of the lake when they were young.

Since then it has been allowed to deteriorate. The present problem is the depth of the lake. I learned to ski and that is what I do most when I come down here.

As you all know, you get in the water. So I jump in the water. I sink into the mud at least 6 inches everytime I jump in there. I am 5 foot 9. So that means the average depth could be 5 to 6 feet.

In fishing, I do a lot of fishing. I catch carp and I catch catfish. Catfish are becoming pretty rare. There is hardly any game fish. You might catch a bass now and then. But it is not deep enough for them to survive in the winter.

On boating, my dad has a boat. He can hardly drive it on the lake because it is just too shallow. If you look behind the boat the back end of my dad's boat, you can see that it stirs up all the mud in the bottom underneath the boat.

In the winter sports, by the time I am 21, I might be skating on mud. To use the lake, many people come around from Iowa, Nebraska, as far as 50 miles away. It has great camping facilities and great picnic grounds. There are many different kinds of boats that come to the lake, sailboats, motorboats, and all kinds. It is really heavily used.

In fishing again, there is just a few places to catch fish other than the river. The wildlife, there are many migratory birds that come around. Last winter you might have seen the 12 eagles over there on that point. We are afraid that we are going to lose all of those migratory birds if something isn't done.

The solution is we can dredge the lake to improve the recreation, the wildlife and the fishing facilities. What we are asking is for you to appropriate \$500,000 and match the State's funds for at least \$500,000, for the 500,000 people that visit our lake every year, and that is almost less than \$1 a person.

I want to thank you and urge you to support Senate bill 1799.

Senator CULVER. John, before you go, let me just say how very much I appreciate your thinking about this problem so hard and preparing your statement. I have been in Congress 11 years and supposedly have had an opportunity to hear a lot of experts, a lot of committee hearings and I don't think I have ever heard anyone in all of that time that knows more about what they are really talking about than you do.

It is based on your firsthand experience, and I think it tells us a story from a perspective that will be very important and useful to us to have in making the case for legislative help in this area.

I want to commend you for your initiative, your concern and for sharing some of your thoughts with us today.

Thank you.

Our next witness is Mr. Dennis Butler. Mr. Butler?

STATEMENT OF DENNIS BUTLER, YOUTH WORKER, COUNCIL BLUFFS, IOWA

Mr. BUTLER. Thank you, Senator. I don't have a written prepared statement. I was planning to more or less comment on some of the things that people have said in the past, plus I had some other comments.

My capacity at the present time, I am a member, the vice chairman of the extension, Urban Youth Committee in Council Bluffs. I am working with the mayor on developing a commission on youth in the city.

I have been a school teacher. I am a member of the Lake Manawa Task Force and also served in the 65th General Assembly of the Iowa Legislature in which capacity I helped to appropriate the original \$500,000 grant.

However, I am really testifying as a private citizen. I am concerned about the lake. I am concerned about our youth. I am concerned about the programs that we have available around this lake.

Some terrific plans have been developed to utilize this lake in recreational capacities. Many plans have been developed, utilizing those lands around the lake, but unless the lake itself is developed, all of those plans are for naught.

We need to have some good regional recreational activities in this area. We are not talking about just Omaha, Council Bluffs. We are talking about Nebraska, Iowa, South Dakota, Missouri in some respects, people who come that far for the kinds of facilities that will be available and that have been available in the past.

They will be even more available, based on the things that are available in the future. The hinge is all developing this lake and making sure that the recreational needs of the lake itself are fulfilled.

We are not talking about just this lake either, because there are a great many other oxbow lakes. It is more than just developing them because it is historical, too. We will have no more natural oxbow lakes.

The Missouri River has been scoured, channeled. It is all taken care of. There will be no more oxbow lakes created. This is one of the last natural oxbow lakes. De Soto Bend is a man-made oxbow lake. But those have to be maintained if our heritage is to be maintained, if nothing else.

There is a great historical lesson for us to know about that. This is a particular time in the Bicentennial year to take note of that.

If we can get going maybe we can have the lake ready by the Bicentennial in 1976.

There are a great many activities planned for this lake that we really have to work on, for our youth, for ourselves and for our future, and really for everything that we hold dear.

I really hope that those of you in the Congress can see fit to pass this legislation, that we can get what we need. I think the \$500,000 certainly isn't enough.

We ought to be honest, that perhaps the Corps of Engineers ought to think about instead of just getting involved with \$500,000 but really getting involved and doing the job in the oxbow lake that they really need and really create the recreational capacity of these lakes as it needs to be created.

Thank you.

Senator CULVER. Thank you very much, Mr. Butler. We appreciate your statement.

Our next witness is Bruce Steel.

STATEMENT OF BRUCE STEEL

Mr. STEEL. Senator Culver, I want to testify to the quality of fishing and the deterioration of the lake since I have been in this area. I fished every day for the last 35 years, ever since I was big enough to hold a fishing pole pretty near.

I do know lakes, rivers and streams. When I first came here 9 years ago this lake was a fairly decent lake to fish in, but since then the condition of the lake and the fish quality has deteriorated to where it is a little hard to catch fish out here anymore. As far as the boating is concerned, a little 10-horsepower motor you put on this lake will stir up the bottom and cause mud.

The silting of the water, the movement of the water over the fish eggs keep them from hatching so we don't have the regular hatch that we should have.

It is imperative that we have this lake dredged so that we can have the quality of fishing and boating and other recreation that goes along with water.

We appreciate the fact that you got this bill up and are trying to help out southwest Iowa in a recreational manner that we need. We would like to see more of these lakes renovated and fixed up to where they are a real asset to the community.

Senator CULVER. Thank you very much, Mr. Steel.

Would you just elaborate a little bit more about how the stirring up of this silt and mud affects the fish hatch?

Mr. STEEL. The thing is that these boats out here, the lake is so shallow, that when the boats run across the lake, they create the stirring up of the silt in the bottom which came in, I understand, before my time here in 1952 when they had the big flood and all of the silt came into the lake.

The lake used to be deeper. It fluctuated mostly by the river lowering it. But now the lake bottom is above the level of the river and all we have for water is from Mosquito Creek. Due to this, with the shallowness of the water, and the boats running in through it, the silt moves over into the spawning areas, covering up the spawn and the spawn does not hatch because they can't get there to cause the fish eggs to materialize.

Due to the fact of that, we really need the lake dredged to get it so our fish quality can come back and get better fish.

Senator CULVER. I want to thank you very much for taking the initiative to come here, Mr. Steel, and giving us some of your thoughts. We appreciate it.

Mr. STEEL. Thank you very much.
 Senator CULVER. Our next witness is Donna Pillar.

STATEMENT OF DONNA PILLAR, COUNCIL BLUFFS, IOWA

Mrs. PILLAR. Thank you, Senator Culver.

I am Donna Pillar of 209 North Avenue, Council Bluffs. I would like to testify as a private citizen for my two teenaged children: Don, 16, and James, 13. As a mother, I am concerned for the present.

My children have no place for recreational activities. To put it bluntly, Lake Manawa is a mudhole. It is too shallow for shore fishing. Outside of hearing Mr. Rodenburg, because I can compare him to my own son who likes to fish, all young boys do, I think, and old boys, too.

It is so dirty that it has been years and years since I allowed my children to even come down here swimming. Of course, the situation is getting worse year after year.

I feel De Soto Bend is a little bit too far for teenagers to be going by themselves to go swimming. With the gasoline situation, it would be using that much more gas.

I would like to see the lake dredged so it could be made a nice place for my children and the other children of this area to come to.

The longer it goes, the more expensive it will be. Then my children will be left out entirely.

We have an area with possibilities. Let us develop it.

Senator CULVER. Thank you very much.

Our next witness is Floyd Hughes. It is a pleasure to welcome you here, Mr. Hughes. I know you were a friend of my father's and it is a personal pleasure for me to have the opportunity to meet with you today.

STATEMENT OF FLOYD HUGHES, PRIVATE CITIZEN

Mr. HUGHES. Thank you Senator.

My qualifications for being here are somewhat limited. They might include the fact that some 50-odd years ago, 52 years, I believe, I learned to swim about 100 yards from here. In the years that followed I was on that lake many, many hours; many, many years. In the late thirties, I helped organize sailing on this lake.

We wanted to take a brief moment to emphasize the regional nature of sailing. We attract people from Colorado, Nebraska, Kansas, Missouri, Minnesota, South Dakota, Illinois, annually to our sailing activities on this lake.

Many of our sailors are in the general region, but going out quite a little distance. It is important to all of us who are interested in waterfront activities, sailing and boating, that the lake be preserved. It has been a wonderful asset to this community for many, many years. It has had its trials and tribulations, but it is an excellent recreational lake. We must save it.

Thank you very much.

Senator CULVER. Thank you very much, Mr. Hughes.

That completes those who have expressed an interest in testifying this morning at this particular session.

Is there anyone else who did wish an opportunity to speak that we have overlooked? Will you be kind enough to give us your name?

STATEMENT OF BERNE TALLMAN

Mr. TALLMAN. My name is Berne Tallman. My home address is 213 13th Avenue. For about 22 or 23 years I have been a member of the Council Bluffs Boat Club; at present I am the commodore of the club.

I wanted to say that when the Council Bluffs Boat Club was organized and incorporated in 1929 it was started and operated on this lake and continued to do so. We used to have a dock out here, that the club installed and used and, of course, the public used it, too.

But some years ago when the lake dried up practically entirely, we moved our dock out because there was no water for boating here and obtained permission to cross the levee and have done our boating in the Missouri River since.

We have a lot of members who are boat owners and operators that just are a little afraid of boating on the river. Those of us who do boat on the river lose our fear of it, but I guess it is natural to fear something that we don't know about or don't understand.

I know that if the boating was good here, the Council Bluffs Boat Club would be very much interested in having facilities here so that those of us who like to water-ski and other water sports we could do on the lake that we can't do in the river could do so here. We would certainly be much interested in that angle of it.

Other than that, I don't know much about it. I can remember when we had a steamboat here that used to come from about where the country club is now and come across here with passengers. They used to have a lot of entertainment facilities on this side.

I was here when the dock and pier collapsed. You probably don't even remember that. I was just a small child. I have lived here all my life. Lake Manawa has been a pretty important part of the recreational part of our lives.

Senator CULVER. Were you here in 1952 at the time of the flood?

Mr. TALLMAN. Yes.

Senator CULVER. Could you describe the relationship with the river and the lake at that time in terms of what you observed?

Mr. TALLMAN. Yes; when the flood was here, the lake filled up. As any water that comes from the Missouri River, as soon as it stops, it drops its load of silt. When it drained off, the silt stayed. For many years that was what kept the lake level up. They had a channel down here at the southwest part of the lake, that ran over to the river and each year when we used to have the June rise and floods all over this country, that is what kept the water level up. But it also kept the bottom level up too and kept raising it.

Even now, wherever there is—an eddy, like at Long's Landing, where there is a launching ramp, it is a never ending battle to keep that sandbar out of there. Whenever the water slows down, it drops its load of silt and the bar is formed.

Senator CULVER. Does the boat club have any records that have been kept by way of minutes and reports of that period?

Mr. TALLMAN. I am not sure. I can sure look that up.

Senator CULVER. Would you check for us?

Mr. TALLMAN. Yes.

[The following was received from Mr. Tallman:]

COUNCIL BLUFFS, IOWA,
October 16, 1975.

Mr. PAUL CHIMES,
Staff Member, Committee on Public Works,
New Senate Office Building, Washington, D.C.

DEAR MR. CHIMES: I have been unable to locate the records of the Council Bluffs Boat Club for the period in 1952—at the time of the flood. If located later I will forward them to you.

Yours very truly,

B. C. TALLMAN, *Commodore*,
Council Bluffs Boat Club,
213 13th Ave., Council Bluffs, Iowa.

Senator CULVER. Were you able to observe a very measurable difference in terms of the operation of the lake following that major flood experience?

Mr. TALLMAN. Oh, yes; yes. We finally even before we removed our docks from the south side here, we couldn't launch a boat because it went out 110 feet from the shore and the water was only about 12 or 14 inches deep. You can't launch a boat in that shallow water.

Senator CULVER. Thank you very much, Mr. Tallman. We may also have some additional questions. I am sure you can be helpful because you bring a very unique experience and a very great one as to the operation of this lake. We are grateful to you for sharing some of that with us today.

Out next witness is Mr. Les Hicks, Council Bluffs Director of Parks and Recreation.

STATEMENT OF LES HICKS, COUNCIL BLUFFS DIRECTOR OF PARKS AND RECREATION

Mr. HICKS. Thank you, Senator.

It is a pleasure being here. I will make this brief and address my statement to the utilization of the lake facilities and the need for additional facilities to help bring this lake up to par, so we can offer a more complete leisure time program to the citizens of the Council Bluffs area.

I had the pleasure of observing, reviewing some plans presented to me in my office by the State Conservation Department relating to some of the facilities to be developed. In these plans, it talks about a northern part of the lake, including facilities for day camping, additional beach area, and many other related facilities for the handicapped as well as citizens.

The present beach area could be expanded, offering a more elaborate aquatics program, which would include such activities as swim instruction, competitive swimming, diving, synchronized swimming, water shows, water carnivals, and sunbathing.

One of the facilities which was earmarked in this proposal was day camp facilities. The north shore area, which includes the facilities located directly west of the fish and game club, represents an ideal location for day camp programs.

The purpose of the day camp would be to develop more intelligent use about our outdoors by teaching outdoor manners, decreasing vandalism and generally increasing the quality of public use of parks; to develop better citizenship, a sense of personal responsibility for the wise management of land and our resources; to develop an aware-

ness and understanding of nature and the land; develop skills in hunting, fishing, camping and woodcrafts; increase enjoyment in the out-of-doors; and to develop and maintain physical and mental health.

These programs would be easily administered by the Park and Recreation Department for all age groups, including the physically and mentally handicapped and some of the day activities, which we would like to offer would include canoe instructions, nature crafts, recreational swimming, archery, nature study, nature trails, camp education, fishing, fly casting instructions, picnicking, boating and water safety education.

These are only a few of the programs that could be developed and administered if and when this lake is brought up to adequate standards.

Thank you.

Senator CLARK. Mr. Hicks, I think that testimony is among the most valuable that we have had here today because it gives us some potential, some idea of what this area could be used for, not simply in terms of recreation, but in terms of other things as well.

The day camp proposals, and so forth, that you have outlined.

So we are particularly grateful to you for coming by and giving us your testimony.

We have two additional witnesses that we would like to hear from now. First, Mr. Jim Scheer, who is a businessman here, and then we are going to hear from Frank Smetana, who is a private citizen and a resident of Lake Manawa as well.

Mr. Jim Scheer, you proceed in any way you think appropriate.

STATEMENT OF JIM SCHEER, PRIVATE BUSINESSMAN, LAKE MANAWA

Mr. SCHEER. Thank you. Welcome to our community, Senator. I was listening to Mr. Tallman on boating. I have, as a private citizen, fished right out here beyond or before 1952 in 1949. I had a boat here on the lake for that purpose.

I have caught some nice fish out about where that boat just went by. After the flood, I too had my car parked down here on the other side of the bushes and played with my hunting dog on the sand that had been washed in here.

The fishing and the lake was badly hurt. I would like not to speak on that vein this afternoon. I would like to speak as a businessman.

I have been in Council Bluffs for 28 years. I have been in the grocery business in those 28 years in multiple addresses in Council Bluffs. I currently am at the junction of 192 and 275, the entrance to the Manawa area. We have established our own business at the Town and Country Market.

We are very enthused about what the buildup of this community and particularly the lake did for our community.

We are at this time expanding our operation on the faith that this will come about and that this will support what we need in the community. We are currently a supermarket. We need more than this.

We need larger expansion, larger room for our supermarket. I personally am interested in living in the immediate community. I think that as this community grows this is going to become all the more

beautiful and as I look at it this morning, it is a pretty area here at the lake.

We are on a four-lane Interstate exchange or a four-lane highway coming into the entrance of Manawa. We are accessible to over 500,000 people within 30 minutes of right here.

These people need the kind of recreation that this lake can give them. I think we also need to look at energy conservation. We have a number of people and any number of ads tempting us to drive 500 miles north and 500 miles west to fish and to enjoy our free time.

I have spent free weeks enjoying this lake in the past and I would hope that I could do it again. I hope many people would, and I think the 500 miles up and back can be saved in energy by the facilities here on the lake that we can propose to have.

I also am aware of Ken Bedwell's Task Force here, because I believe that this is mighty important and the expanded facilities that we can share south of here on the ground that the conservation commission is securing will have just no end of value to this community.

Environmental groups may oppose some of the Corps of Engineers, but I feel that this is the time that the Corps can really wear the white hat by developing this project, both economically and environmentally sound.

I have every faith that they will do it. I appreciate your giving me the opportunity, Senator, for these few words.

Senator CLARK. We greatly appreciate your attendance here. I simply want to say to you and to the other witnesses that we have had here that I think we have now come to understand the potential and the possibilities of Lake Manawa in recreational facilities and in other ways.

I think the case has been made here. We have been able to show that people in local government at the grassroots, people at the State level, here at the county and city level working with the Federal Government can make this Federal system work. That is what this project is all about. That is what these hearings are all about. We appreciate very much your cooperation in them.

We would like now to hear from the last person who has expressed an interest here in testifying. That is Mr. Frank Smetana, who lives here, and if I remember correctly at a meeting earlier, not far from here, you were in the process of writing a book on this subject.

STATEMENT OF FRANK SMETANA, LAKE MANAWA

Mr. SMETANA. That is right, Senator. There is an awful lot that I could tell about the history of Lake Manawa. In fact, just where we are standing right now, just in front of us would have been a huge carrousel which extended about 250 feet over the lake, 2 stories high and about 60 feet wide.

This held a dance hall and restaurant and they also rented out bathing suits. I wouldn't guess how many thousands of people attended this carrousel. That was just one of the many events. But to give you some idea as to the amount of people that frequented this lake at one time, back there in 1904 the circus brought their elephants down to this lake to take a bath. This was part of a publicity stunt.

At that time, I have this all documented by the streetcar company, between 35,000 and 40,000 people were on this lake. Bear in mind that at that time the population of Council Bluffs was only 25,251 people. There were more people at this lake than in the city.

Every streetcar that was available was pressed into service on that day. The authorities claimed that at that time you couldn't get a wagon between two streetcars. There was one steady stream of streetcars from the bridge clear down to the lake.

We had, I would imagine, that on the average Sunday, somewhere between 25,000 to 35,000 tons of ice used just for keeping beverages cool.

Much has been said about the energy crisis. I would just like to add this one point: That I think that with the speed limit being brought down to 55 miles an hour, and gasoline being at the price it is today, being much higher and there not being any foreseeable end to the energy crisis, I think it is fitting that this park be restored once again.

Let us bear in mind once more that in the early days we had double-decker steamboats on this lake that carried between 80 and 120 passengers. The deepest part of this lake at that time was some 75 feet. The mean depth I guess ran something like 15 feet.

I think that the people of this community and also of Omaha, I think they look forward to Manawa because we are limited to how much money we can spend on gasoline. Therefore, we are going to frequent and patronize the local recreational areas.

One of these days I hope to see this become a reality. I want to thank the Senators for all they have done for us in the past in getting this bill at least reported.

Thank you very much.

Senator CULVER. Thank you very much.

May we ask you a question? When will your publication be available, do you think? That is probably what everybody is asking.

Mr. SMETANA. I have the first manuscript. I am working it over once again. Something new came up. I spoke before the Senate at Des Moines, and I spoke at the Kiwanis clubs, the Optomist clubs, all the older groups of people, at the hotel and at the various churches.

Last week I was at the Grace and the next 2 weeks I will speak before the federally retired employees. I have spoken to thousands of people. They ask the same question, what can be done about the lake. But as far as the book is concerned, I think it will be another 2 years because of the—

Senator CULVER. Could we possibly have available a copy of a speech? Could you give us a little bit more of a written history? Have you done an article, for example, or something that is available that you could submit to us?

Mr. SMETANA. You mean one of the speeches I have given?

Senator CULVER. Yes; that you think would be relevant.

I think if you had it in any form that you would like to submit, we would like to have it.

Mr. SMETANA. OK. You want the history of how this lake was formed in 1881? Are you people aware of how this lake was made?

Senator CULVER. No; not right now. What I would like you to do when you get home, is to put it in some kind of written form so that we could look it over.

Mr. SMETANA. Sure; glad to.

Senator CULVER. Thank you.

(A history of Lake Manawa by Frank Smetana was submitted for the record by a previous witness, Ralph Story, and may be found at p. 165.)

Senator CULVER. That concludes our witnesses today for this hearing.

I certainly wish to thank all of you very much for coming. I wonder if Senator Clark wants to say a word at this time before we finally adjourn the hearing.

Senator CLARK. John, I would simply like to join with you in thanking the people who were here, and saying that we have indeed had a very valuable hearing. We have heard from the Federal Government; we have heard from the State government; we have heard from the city, county; from the commission, and we have heard from a great number of private citizens, from Ken Bedwell and the Task Force people in Omaha, and Nebraska.

I think we have heard all of the people who have a direct and sincere interest in the project.

That is what we came here for. We are particularly delighted that we are able to do it here in this setting, with the lake itself, and properly so.

We are very grateful to you, and I can only say that we are going to do our very best to see this lake dredged and to see this project completed satisfactorily.

Senator CULVER. I want to just thank everyone who has contributed their time and their knowledge to this hearing this morning, and to say that we will keep the hearing record open until October 1 in the event any of you who are here today, or until the last of October, I was advised—October 31—so that if any of you who are here today who would like to have a statement submitted or know of some others who you feel could make a useful contribution to this problem, we would certainly welcome, and the committee would welcome those statements.

Let me just also express our appreciation to those who have spoken today and those of you who have come. I feel it is an important beginning. I think we have learned some things here this morning.

I believe we have learned how much more we yet have to find out. I think that what you can be assured of is that Senator Clark and I will continue to work closely together to try to develop a formula which will bring about a result here that does contribute to the recreational enjoyment of the citizens. The exact way the various government levels will have to participate, the specific approach and how it should be done, I think, must necessarily await some very serious thought and additional consultation with appropriate governmental offices in the Executive as well as with other Members of Congress, in the House and the Senate, who, I feel, very properly can become effective participants in the ultimate solution.

I want to thank all of you here and again to reaffirm what Senator Clark has said, that we are going to devote our efforts and the efforts of our staff to bringing about this worthwhile project into fruition and not only for the benefit of those of you and I who are here today, but much more importantly, for that future generation who

won't have the pleasure and the enjoyment that some of you have testified to here this morning in the past.

Thank you very much.

We will include in the record the numerous communications received relative to this bill.

[The communications follow:]



United States Department of the Interior

NATIONAL PARK SERVICE

MIDWEST REGION
1709 JACKSON STREET
OMAHA, NEBRASKA 68102

IN REPLY REFER TO:

L7621 MWR CL

SEP 18 1975

Honorable Dick Clark
United States Senate
Washington, D. C. 20510

Dear Senator Clark:

Thank you for your September 9, 1975, letter advising us of the scheduled September 27 Senate Public Works Committee Hearing concerning S. 1799--the Lake Manawa Dredging Project to be held at Lake Manawa.

While we fully appreciate the regional impact of the siltation-caused deterioration of recreation opportunities at Lake Marawa, participation in this stage of the project is outside our responsibilities according to the September 2, 1964, Memorandum of Understanding between the Bureau of Outdoor Recreation and the National Park Service. This document states that the Bureau shall be responsible for pre-authorization recreation aspects in Federally sponsored water projects.

We have contacted the Mid-Continent Regional Office of the Bureau of Outdoor Recreation in Denver on the hearing, and we understand that they will be submitting a statement on the project.

We appreciate your advising us of the proposal, and we regret that we are unable to participate at this time.

Sincerely yours,

Merrill D. Beal

Merrill D. Beal
Regional Director



PROGRAMS:

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



September 23, 1975

STATE OF NEBRASKA

NATURAL RESOURCES COMMISSION

Seventh Floor
 Terminal Building
 Lincoln, Nebraska 68508

The Honorable Dick Clark
 United States Senate
 229 Federal Building
 Council Bluffs, Iowa 51501

Dear Senator Clark:

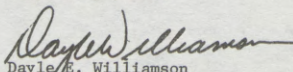
In response to your letter dated September 9, 1975 to Mr. Ted Johnson, we have investigated the Lake Manawa Dredging Project. Our agency looks favorably upon this proposal as Lake Manawa is of great recreational importance to the Omaha metropolitan area. However, we choose to defer formal testimony to the Nebraska Game and Parks Commission which has purview over recreational needs and development for the State of Nebraska. The Game and Parks Commission has indicated it will submit testimony for the public hearing on September 27, 1975.

The Lake Manawa Dredging Project will have no adverse effect on Nebraska's natural resources. We have no criticism of the project; however, we wish to express two concerns brought to our attention.

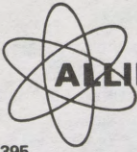
Dr. Robert B. Kaul, University of Nebraska botany professor, has found *Nelumbo* sp., an aquatic macrophyte similar to the water lily, to be abundant in the southeastern and southwestern bays of Lake Manawa. Since he has found this species in only two other localities along the Nebraska reach of the Missouri River, he considers it to be rare in this region. Therefore, he expressed concern that not all of the *Nelumbo* be destroyed during the proposed dredging operation. In addition, we recommend that considerably more than 20 percent of the lake's shorelines be made available for public use wherever possible.

This letter supersedes our earlier intent to submit testimony at the September 27, 1975 public hearing. We would appreciate the opportunity to comment on the Lake Manawa Project when it reaches the review stage.

Very truly yours,


 Dayle E. Williamson
 Executive Secretary

DEW:TFP:cd
 cc: Willard Barbee



**ALLIED COMMUNICATIONS
EQUIPMENT SUPPLY**

BOX 395
COUNCIL BLUFFS, IOWA 51501
Phone: (712) 322-2725
(712) 328-3088

4583 SHARON VALLEY CT.
CHAMBLEE, GEORGIA 30341
Phone: (404) 451-0065

9/22/75

Water Resources Subcommittee of the
U. S. Senate Public Works Committee
Attention: Honorable Dick Clark
227 Federal Building
Council Bluffs, Iowa 51501

RE: S. 1799-the Lake Manawa Dredging Project

Dear Senator Clark:

Since I will be unable to attend the hearing on the above subject project, I am taking this means of letting those concerned know my feelings on this needed work.

Lake Manawa is a valuable recreational asset to the entire area. Every effort should be made to restore its depth by removing the sediment deposits which have been allowed to accumulate for many years.

Sincerely,
ALLIED COMMUNICATIONS EQUIPMENT SUPPLY

Bill L. Barrier,
President

BLE/pmb

ALL OUR EQUIPMENT GUARANTEED

Water Resources Subcommittee of the
U. S. Senate Public Works Committee
Attention: Honorable Dick Clark
227 Federal Building
Council Bluffs, Iowa 51501

RE: S. 1799-the Lake Manawa Dredging Project

Dear Mr. Clark:

Since I will be unable to attend the hearing on the above subject project I am taking this means of letting those concerned know my feelings on this needed work.

Lake Manawa is a valuable asset to the entire area. Every effort should be made to restore its depth by removing the sediment deposits.

Sincerely,

Mr. & Mrs. Jack J. Barrier

Mr. & Mrs. Jack J. Barrier
3527 Avenue C
Council Bluffs, Iowa 51501

October 8th, 1975

Senator Dick Clark
229 Federal Bldg.,
Co. Bluffs, Ia.
51501

Dear Sir:

We heartily support Bill
No. S1799 for dredging Lake Manawa.

It is a much needed
public facility, that will be lost
if nothing is done.

Sincerely,

Maurice Bennett
Mrs. Maurice Bennett

Mr. & Mrs. Maurice Bennett
511 - 3rd Street
Co. Bluffs, Ia. 51501

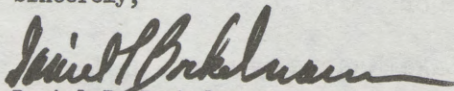
September 22, 1975

The Honorable Dick Clark
Senator from Iowa

I have enjoyed many hours of good sailing on Lake Manawa.

As a former Commodore of the Iowa-Nebraska Sailing Association, I'd like you to know that this is one of the largest, most active and most competitive Snipe fleets in the country, and I urge you to support the dredging of the lake, that it may continue to offer pleasure and challenge to sailors in the mid-west.

Sincerely,



Daniel P. Bockelmann
5941 Elkcrest Drive
Lincoln, NE 68506

September 23, 1975

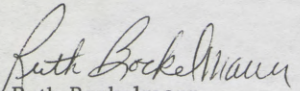
The Honorable Dick Clark
Senator from Iowa

As a sailor, I wish to express my support for the dredging of Lake Manawa.

Since the mid 1960s, my husband and I have sailed a Snipe in competition as members of the Iowa-Nebraska Sailing Association, based on Lake Manawa. From our travels around the midwest to Snipe regattas, we are well aware that the facilities on Lake Manawa are the best in the area.

We would like to see this remain a fact by having the lake dredged to preserve enough depth to handle Snipes.

Sincerely,


Ruth Bockelmann
(Mrs. A. P. Bockelmann)
43 Ginger Cove Road
Valley, Nebraska 68064

Sorry I cannot attend meeting

Sept 14, 1975
21 Tahiyaga Villa
Council Bluffs - Ia

Senator Dick Clarke
U.S. Senator
Wash. D.C.
Council Bluffs - Office
Co Bluffs - Ia

Hon. sir,

In answer to your letter, I wish to thank you, and I appreciate your interest in our lake, Lake Manawa. I am not a native born Iowan. I came from New York City, and when I first came here, which was in 1927, I thought Lake Manawa was a most ideal body of water, but in a sad and deplorable condition, neglected and unnoticed by the state and the local citizens. A most wonderful body of water that should be developed and taken to care of, not only by the state, but by the individual citizens of the area. Lake Manawa is a lake not too large, and not too small. A lake ideal for the average man and his family to enjoy, and use within their monetary means. And be within distances that does not require long traveling time. I, as an individual have tried to better the lake, both by improving its shoreline, as well as trying to sort of beautifying the areas. I used to live here at the lake during summer months, for at least 18 years. During that period men like Keith Rosenberg, who was the developer of Kotalake; with the help of Fred Pledger, Clay Bain, Jim Sidani, and myself, black-topped North Shore Blvd, to on our own, to improve the streets, instead of having a street from mud & ruts & so Etc. When the pumps were put

across the lake, South Boulevard, with the help of two Pholger and others furnished the oil to run the pumps & called the roads to get to & from the pumps. These same men and others like Don Krause, and Tom Smith, went to Des Moines to plead for the tube that is furnishing the water to-day. In my opinion there are springs in the lake, and if it was dredged we would have fresh water in the lake continuously. I mention these people to show the fact the lake needs "help"; has been known for many years. But we have not had the representatives at Des Moines who were interested in the lake. So it was up to the people who were interested to do what they could. But it has never been enough. It takes the state and the Federal government to tackle a job of this size. It is too big for a group of individuals. We did what we could do. It takes people like you, and Senator John Culver, to wake the state and Federal government to a good thing, that is right under their noses. Lake Manawa has a potential that one can only dream about, and that can only come if the state and Federal government do what should be done to develop the lake. The good this lake would do to us, and I mean the state of Iowa too, is almost beyond comprehension, and too numerous to mention here, in this letter.

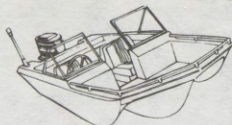
We have more people come to this lake every summer now than all the other lakes put together, even in the poor condition it is in now. What would it be like if the lake was as it should be! Clean, fresh, and dry parks to enjoy. Drives around the shoreline, both on the water & the roads. Home people would take pride in, because the lake is something to be proud of! I could go on and on. But I think you have had enough from me. I'm sure others can say more, as I can. I sincerely hope this has helped to give you some idea of how we feel about Lake Manawa. I mentioned some good points, & know of no bad ones. Lake Manawa is good for all of us!

Sincerely - Respectfully yours - Paul De Bore

CAMPBELL'S MANAWA MARINA

224 Navajo, Council Bluffs, Iowa 51501 / Telephone (712) 366-2284

"Buy'em where you can try'em!"



October 1, 1975

Dear Senator Clark:

We are very much in favor of dredging the Lake Manawa. This body of water should not be left to waste away. Council Bluffs is in great need of a body of water that can benefit all the surrounding communities of recreation and camping. We have alot of ^{with} "low life" around the lake which will not be here if the lake isn't taken care of. I have watched the bald eagles every spring, the ducks in the fall of the year, and people from all over the world enjoy our lake facilities. We also have a business here on the lake we would like to maintain, and the lake is very helpful to our business of selling boats. Please= help to get this bill into operation (S 1799) we would be ever so grateful.

Thank you,

Barbara J. Koestner
Linda Massman
Dave Lange
Bill D Campbell

Campbells Marina
 Barbara J. Koestner
 Dave Lange
 Bill D. Campbell
 Darrel Conway
 Linda Massman
 Jerry Meyerpieter
 Lyle Van Ness

Darrel Conway
Lyle Van Ness
Jerry Meyerpieter

COBALT

MERCURY
 MOTORS

STRAHM

STARCRAFT

BOATS

CARAVELLE

Vernon A. Clausen
 2000 So. 10th St.
 Co. Bluffs Iowa 59501

Dear Senator Dick Clark,

I have been in this fish and game club 12 yrs. the past 6 has been very poor fishing. I do use the camping facilities as I own a camper and it is my hobby. As now to find any fishing very good they travel 100 to 300 miles to Ia. my home state where there is good fishing but it costs more money for gas, with the gas prices and shortages and all.

If the lake is not dredged or have better fishing I doubt if I buy many more fishing licenses, I fully support Bill No. 51799-10070

Yours truly,
 Vernon A. Clausen
 a home owner here for 4 yrs.
 Thank you kindly.

COUNCIL BLUFFS CENTRAL LABOR UNION AFL-CIO

BOX 351
COUNCIL BLUFFS, IOWA
51501



September 28, 1975

United States Senate
Senator Richard C. Clark
Washington, D. C.

Dear Senator Clark,

The Council Bluffs Central Labor Union would like to go on record as being in favor of Senate Bill S. 1799, a project to dredge lakes along the Missouri River.

One of the top priorities of the bill is the dredging of Lake Manawa near Council Bluffs. We feel the improvement of this lake because of its location within the metropolitan area of Council Bluffs and Omaha, will benefit a large number of people that are in need of additional recreational space.

Originally Lake Manawa was spring fed, but due to the flooding of the Missouri River in the past, the springs have been closed off, and the lake has become less and less attractive and self-sufficient.

All one has to do is visit surrounding States to see what the Corps of Engineers has done to improve recreational areas. The lakes along the Missouri River are in dire need of improvement, and the citizens of Iowa are entitled to assistance from the Federal Government on this project.

Sincerely,

R. J. Leuck

R. J. Leuck, President
Council Bluffs C.L.U.
136 Glen Avenue
Council Bluffs, Iowa 51501

Omaha Ne
Oct. 3 - 1975

Senator Dick Clark.
Iowa.

Dear Sir:

We were sorry that we could not attend your meeting on the Lake Manawa project. We are deeply interested as there are many Omaha people who use Lake Manawa for boating, picnicing, etc. as there are not any large lake areas close to Omaha.

We feel it is a valuable recreation area and needs immediate attention as it is getting too shallow for motor boating and too dirty for swimming and skiing.

We appreciate your efforts on behalf of the dredging project and hope you will be successful.

Mr + Mrs Melvin Frame
2907 N. 97 St.
OMAHA NEBR 68134

Harold Gifford, M.D.
8300 Dodge Street
Omaha, Nebraska

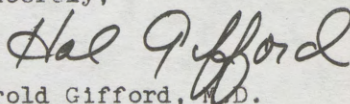
Senator Dick Clark
United States Senate
Washington, D.C. 20510

Dear Sir:

Following the mandates of my family, my wife and I have recently given to the people of this area a substantial piece of property which will be a part of Fontanelle Forest and will be used as a wild-life refuge. This land is immediately across the Missouri River south of Lake Manawa.

If this whole area is to be preserved and developed for environmental purposes in addition to its tremendous recreational capacity, Lake Manawa must be preserved.

Sincerely,

A handwritten signature in cursive script that reads "Hal Gifford". The signature is written in dark ink and is positioned above the typed name.

Harold Gifford, M.D.

PHONE 527-4883
OMAHA PHONE 341-1823

JERRY L. FOY
PRESIDENT

GLENWOOD AUTO SALES, INC.

Buick - Pontiac - Opel - GMC - Sales and Service

205 SHARP STREET

GLENWOOD, IOWA 51534

9-16-75

Dick Clark,
U. S. Senate
Washington D.C.

Dear Dick:

I am terribly sorry to report that I will be unable to attend the September 27th meeting regarding Lake Manawa. However, for what it's worth, I am greatly in favor of the Lake Manawa ~~dredging~~ dredging. The lake is getting dangerous for water skiers and boaters due to its shallow condition.

Thank you for your interest in this project.
Sincerely, Jerry L. Foy.

115 Skyridge Drive
Avoca, Iowa 51521

September 24, 1975

The Honorable Dick Clark
United States Senate
Washington, D.C. 20510

The Honorable Dick Clark,

The Nishna Valley Conservation Club discussed your proposed bill SF 1799 at its last meeting. Since the club is made up of members from the Avoca, Hancock, and Oakland areas, there is a lot of interest in the proposed Lake Manawa dredging. The club is composed of fifty two members of which several are family units. The club members are behind your proposed bill one hundred per cent. They would like to see the Lake Manawa area improved for its fishing resources, boating resources, public recreation, wildlife habitat, seasonal waterfowl resting area, and in a limited way-hunting.

Keep up the good work. The club also wants no further gun legislation of any kind. Punish the criminal, not the legitimate sportsman.

Respectfully yours,

William Hardisty

William Hardisty
Secretary-treasurer
Nishna Valley Conservation Club



LINCOLN CLINIC, P.C.

LOCATED AT:

3145 D STREET
LINCOLN, NEBRASKA

MAILING ADDRESS:

BOX B1009
LINCOLN, NEB. 68501

TELEPHONE (402) 475-4511

September 22, 1975

Senator Dick Clark
U.S. Senate
Washington, D.C.

Dear Senator Clark:

I understand that Lake Manawa at Council Bluffs is gradually deteriorating to the point where something must be done to save it. As I understand it, the lake is silting in and becoming shallower and shallower. I have raced sailboats on Lake Manawa for nearly twenty years. This explains why we have had so much trouble running aground.

The lake has certainly been one of the prime recreational areas in this region for many years. You will note that I live in Lincoln, Nebraska. This required me to commute sixty miles every Sunday to Lake Manawa to race sailboats. This may give you some idea as to the importance of the lake as a recreational facility. Every July sailors would come from other states to race in the annual regatta at Lake Manawa.

It would certainly be a shame if this lake were left to die. I certainly think that dredging the lake to preserve it's recreation potential would be highly advantageous to the region.

Yours very truly,

Harold R. Horn, M. D.

HRH/jw

Sir,

Co. Bluff's La.,
Oct. 9, 1970

We wish to express our support for bill S 1799 for the dredging of beautiful Lake Manawa. We feel this would be a terrible loss - if the lake is allowed to deteriorate further. We sincerely hope you will support this bill.

m & ms w m milburn

October 10, 1975

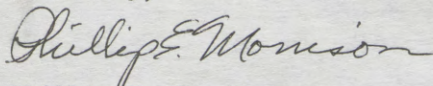
To: Senator Dick Clark

Subject: Bill No. S1799

As a citizen of Council Bluffs, Ia. and a user of Lake Manawa, I would like to express my support of Bill No. S1799. Lake Manawa is a source of recreation for my family, and of many of my freimd's families.

My family and I appreciate your efforts in regards to Lake Manawa. It is an area badly needed by the families of Southwest Iowa. Again, we appreciate your support, and we ask that you continue to support this most important project.

Sincerely,



Phillip E. Morrison
232 Park Ave.
Council Bluffs, Ia.
51501

OMAHA CHILDRENS CLINIC

Infants, Children and Adolescents

3925 DEWEY AVENUE

OMAHA, NEBRASKA 68105

JOSEPH R. ELLISON, M. D.
DONALD T. GLOW, M. D.
BYRON E. CRESSY, M. D.
PETER W. BICKERS, M. D.

September 19, 1975

TELEPHONE:
348-0460

Senator Dick Clark
Cannon House Office Bldg.
Room 404
Washington, D. C. 43254

Re: Water Resources Subcommittee, U.S. Senate Public
Works--S. 1799--Lake Manawa Dredging Project.

Dear Senator Clark:

I wish to voice my strong support for the dredging of Lake Manawa. Having been a sailor and a motor boat user of the lake for the past 18 years, both for my family and as a Scoutmaster for 7 years of Troop #370 in Omaha, Nebraska, it would be a tragedy to lose this excellent body of water, which is in such close proximity to an urban area population of some 500,000 people. The lake is rapidly becoming dangerous, as it is so shallow that if a water skier is not aware of the water limitations, he can result in rather serious bodily harm. If he is a sailor and he should happen to capsize, his boat can sustain rather severe damage due to the shallowness of the lake, the deepness of the mud bed, and the problems with the mast and damage to the hull. Having just two years ago sustained damage of over \$500.00 to my snipe sailing boat, I can speak with real feeling concerning this.

In the past, the lake has been widely used by large numbers of people. I've noticed in the past two years, the utilization of the lake has fallen markedly because of these very items that I have just alluded to.

I would like to be recorded as being very strongly in favor of proceeding with this project, as it will benefit vast numbers of people, both from a recreational standpoint, from a fishing standpoint, and from a monetary standpoint for those who give supportive services to boats, fishing, and water recreation. In addition, it is a lovely setting

Senator Dick Clark
Washington, D. C.

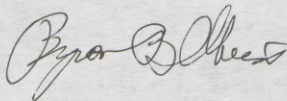
Re: Lake Manawa
Dredging Project

Continued. . .

with the Nebraska bluffs in the background across the Missouri River, and it would be a shame to lose this picturesque spot, which is so near to an urban area where there are so few available.

Thank you for your kind consideration. I am sorry I will not be able to attend the public hearing, as I will be out of town at a medical meeting on Saturday, September 27.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Byron B. Oberst".

Byron B. Oberst, M.D.

BBO:bbs

JOS. H. SPEARING, M. D.
609 COURT STREET
HARLAN, IOWA
51537

Senator Dick Clark
United States Senate
Washington D.C. 20510

Dear Sir:

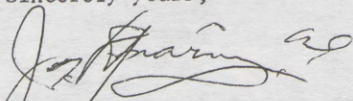
For several years my family and I have been going to Lake Manawa for most of our recreation. I like to sail and have been a member of the sailing club at Lake Manawa for nearly twenty years. It is one of the largest lakes in this area and one of the few suitable for sailing. I seriously feel it should ^{have} and will continue to need a very high priority of preserving.

The proxemity of the lake to us in southwest Iowa makes it very important. It's continued usability is of much concern to us. There are other lakes around that are smaller but none of this size that can be used for so many different recreational activities.

One of the main advantages of Lake Manawa is to me as a doctor (M.D.,-family physican) is the recreational opportunity it gives me and still lets me be somewhat close to my practice to be able to get back home for my obstetrical cases and in other ways keeping moderately close to my practice. Now that we are particulary concerned in trying to interest new doctors in small town practices; being able to point to a "fairly-near" recreational area is decidedly helpful. This (talking point) is a particular advantage and interest to a doctor with a family.

Please help preserve our Lake Manawa.

Sincerely yours,



Jos. H. Spearing M.D. Family Physican
Harlan, Iowa

js

September 30, 1975

Hon. Dick Clark
229 Federal Building
Council Bluffs, Iowa

Dear Senator Clark:

I was unable to attend the meeting held last Saturday, September 27, on the dredging of Lake Manawa because of illness. However, I do want you to know that as the owner of ten pieces of property in the Manawa area, I am most concerned that the lake be dredged together with the fact that I have been a businessman in the Council Bluffs area for 31 years and know how much good the dredging of Manawa would do towards bolstering the economy of the area.

I receive the letters from your office on a regular basis and enjoy them very much. They keep us in tune with what is going on in Washington.

Yours very truly,

Calvin A. Spencer
Calvin A. Spencer

CAS:hc

16 Pickard Lane
Lake Manawa
Council Bluffs, IA 51501

UNION PACIFIC CORPORATION
PROPERTY TAX DEPARTMENTK. W. TEAGUE
General Manager of Property Taxes

September 19, 1975

1416 DODGE STREET
OMAHA, NEBRASKA 68179IN REPLY PLEASE REFER TO
NO. 59AIR MAILPERSONALHonorable Dick Clark
United States Senate
Washington, D.C. 20510

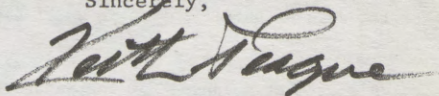
Dear Senator Clark:

Referring to your letter of September 15 relative to the Lake Manawa Dredging Project and the hearings to be held on same at Lake Manawa scheduled from 10:00 a.m. to 2:00 p.m. on September 27.

Of course I am very interested in the future of Lake Manawa and realize that it has served Council Bluffs and the adjoining area for many years as a major recreational area. From a personal standpoint, I have used the Lake for at least 30 years myself so I can attest to the value of it for recreational purposes. I can also see the rapid deterioration of the Lake and the necessity of the dredging project.

I will not be available on Saturday, September 27, for the hearings; however this letter can serve as my written testimony of support for the need for the work as outlined in senate bill S. 1799.

Sincerely,

CC - Rob Hubler)
Susie Walch) With copy of letter

THE NEED FOR INCREASED WATER BASED RECREATION: THE LAKE MANAWA CASE *

By

Ralph H. Todd, Ph.D.
Director, Center for Applied Urban Research
University of Nebraska at Omaha

Introduction

It is difficult to discuss the need of dredging Lake Manawa without considering what impact it is likely to have, not only on the immediate area but on the region it serves. Empirical studies, surveys and inventories of Lake Manawa and other Ox Bow lakes indicate that as a class of lakes they are generally over used. The excessive use has caused degradation and decline in water quality. The dredging of these lakes will contribute markedly to their quality and stimulate additional recreation use. Generally, decisions as to whether to dredge and which lakes should be dredged first need to be based on the extent of need in the area and the region. To do this it is necessary to have an inventory of all bodies of water which serve recreation purposes and to understand the needs of the population to be served.

Regional Participation in Water Based Recreation

A 1974 study of the demand for recreation activities and facilities in the Missouri Riverfront Development Project Area (a six-county region comprised of Douglas, Sarpy, and Washington Counties in Nebraska and Mills, Harrison, and Pottawattamie Counties in Iowa) provided estimates and projections of participation in water based recreation activities.¹ The six-county region supplied 4,414 acres of recreation water for participants in water based recreation (boating, floating rivers, canoeing, sailing, fishing, beach swimming, and water skiing) and residents spent an estimated total of 5.3 million days participating in these activities. By 1990 it was projected that the days of participation in water based recreation would increase to

* A statement prepared for the Senate Public Works Committee Hearing concerning S. 1799--The Lake Manawa Dredging Project.

¹Ralph H. Todd, et. al., Recreation Activities and Facilities Needs, (Omaha, Nebraska: Center for Applied Urban Research, June 1975).

6.8 million. To maintain the 1974 user pressure level, an additional 1,400 acres of water is needed by 1990.

The study further provided recommendations for priority areas of recreation improvement. Those areas of highest priority for improvement programs were those with greatest supply deficiencies (1974) and with greatest projected demand increases over time. ~~Three~~ ^{Three} recreational improvement programs with highest priority in terms of both deficiencies and projected demand were beach swimming, fishing, and camping at developed campgrounds.

1975 Recreation Survey.

A Center for Applied Urban Research survey of 506 persons in the Omaha-Council Bluffs area was conducted from September 17 through September 20, 1975 to determine area resident's use of, and attitudes toward, Lake Manawa and other water based recreation areas.² Of the 506 respondents, 158 (31 percent) indicated that they participated in river or lake recreation activities during the summer of 1975, and 74 percent of these stated that they would participate more often if better facilities at the rivers and lakes in the vicinity were offered. Based on 1973 estimates of the population for the Omaha SMSA (582,300)³ approximately 180,500 participated in river or lake recreation activities during the summer of 1975. However, 133,000 of these indicated they would participate more if the facilities were better.

Forty-seven percent of those who did not participate in river or lake recreation activities during the summer of 1975 indicated they would participate if the facilities were improved. On the basis of the 1973 population this represents about 188,000 people. Combined with those who did participate, a total of 321,000 people would either begin to participate or participate more often in river and lake recreation activities if better facilities were provided.

Of those who responded that they participated in river and lake recreation in the summer of 1975, about one-third said that they went to Lake Manawa at least once during the summer, and 44 percent of those who did not go to Lake Manawa but did participate in river and lake recreation indicated they would use Lake Manawa if improved facilities were made available.

²The detailed results of the 1975 survey are found in Table I.

³U. S. Department of Commerce, Bureau of the Census, Population Estimates and Projections Series P-25, No. 537.

A final question concerning improvements needed for Lake Manawa to encourage more participation was directed to those who indicated they used Lake Manawa or would use Lake Manawa if improvements were made. These persons were asked to choose one of the following improvements which they thought would encourage them to make use of, or greater use of, the lake: (1) improve the play areas and public facilities, (2) clean the lake and improve swimming and beach areas, (3) improve fishing, and (4) zone to control boating. A large majority (82 percent) thought a cleaner lake with improved swimming and beach areas was the most important needed improvement. Eight percent recommended improved fishing, six percent recommended zoning to control boating, and four percent recommended improving play areas and public facilities.

The statistics gathered from the survey reinforce the notion advanced in the 1974 recreation study that there is a substantial untapped demand for water based recreation activities in the region. This in conjunction with anticipated growths in income and population make it imperative that work begin on improving existing resources and adding to the stock of resources where possible. Lake Manawa is an excellent starting point. With proper improvements--specifically a cleaner body of water and better swimming areas--use of the lake could potentially double within a year and increase even more as the population base of the region expands. Certainly the evidence is substantial enough to suggest that a supply deficiency currently exists and that improvements in Lake Manawa would contribute to the alleviation of the deficiency.

Economic Base of the Immediate Area.

The dredging of Lake Manawa will not only contribute to the increase in intensity of lake use but will also have positive results on property values and the general level of the economy of the "Manawa-Twin City" area.⁴

A 1973 study of housing and community development in the Nebraska-Iowa Riverfront Development Project Area rated the "Manawa-Twin City" subarea as a declining subarea.⁵ Of the 27 subareas defined for the study, the "Manawa-Twin City" subarea was one of ten in which more than 20 percent of the

⁴A description of the area is given in Appendix A, Housing Subarea 23.

⁵See Map 1.

people interviewed were dissatisfied with their housing conditions and location. Fifty-three percent rated the condition of housing and general appearance of their neighborhood as "fair" or "poor." This evidence would suggest that the area should be viewed as one in need of economic uplift; something recreation program improvement through dredging of Lake Manawa would help to provide.

Water based recreation improvements can result not only in turning around declines in property values but over a period of years substantially increasing sale values. It can be expected that dredging and improving the recreation character of the Lake will attract new residents and the associated economic services and retail activities to further change the nature, image and values of the area.

TABLE I
 RECREATION SURVEY ON THE USE OF LAKE MANAWA
 IN OMAHA-COUNCIL BLUFFS
 SEPTEMBER 17-20, 1975

Questions	No. of Respondents	Response	
		Yes	No
		(Percent)	
1. Did you take part in any river or lake recreation this past summer?	506	31	69
2. (For Participants) If there were better facilities, would you go more often?	158	74	26
3. (For Non-Participants) If there were better facilities at the lakes and rivers, would you go boating, swimming, waterskiing or fishing?	348	47	53
4. (For Participants) How many times did you go to Lake Manawa?			
None	107	68	(NA)
1-5 times	35	22	(NA)
6-10 times	7	4	(NA)
11-20 times	4	3	(NA)
21-50 times	3	2	(NA)
Over 50 times	2	1	(NA)
5. (For those who did not go to Lake Manawa) If there were better facilities at the lake, would you use the lake?	107	44	56
6. (For those who went to Lake Manawa once or more this past summer) Which one of the following improvements would you recommend in order for you to make (use of) (greater use of) the lake?			
(a) Improve the play areas and public facilities	4	4	(NA)
(b) Clean the lake and improve swimming & beach areas	80	82	(NA)
(c) Improve fishing	8	8	(NA)
(d) Zone to control boating	6	6	(NA)

(NA) = Not applicable

Housing Subarea 23: Manawa-Twin City

As the name implies, the two primary areas of residential occupancy in this subarea are around the area of Manawa and the subdivision of Twin City Plaza. The population of this subarea is of extremely low density with extensive unoccupied tracts of land. Essentially all of the land is floodplain, often with severe water and sewerage problems. Large numbers of mobile homes also set this subarea apart from others.

Despite the large increases in newer housing in the decade of the 1960s, people have been moving out of the Manawa-Twin City area in the 1970s. The area has very little elderly and minority population. Education rates for high school completion are about at the RDP level but only 14.9 percent of the adult population has completed college. White-collar occupations are not typical of Manawa-Twin City as only 35.2 percent of the labor force is employed in these pursuits. Family and individual incomes are lower than the RDP.

The almost rural-like character of Manawa-Twin City is evidenced by a housing density rate almost that of the overall RDP rate. There are virtually no multi-family housing units as the single-family rate of 98.1 percent is the highest in the RDP. Vacancy rates exceed the RDP average at 7.1 percent and rival some inner city areas in Omaha. Consistent with low income values, the value of housing is also below the RDP average at \$13,166.

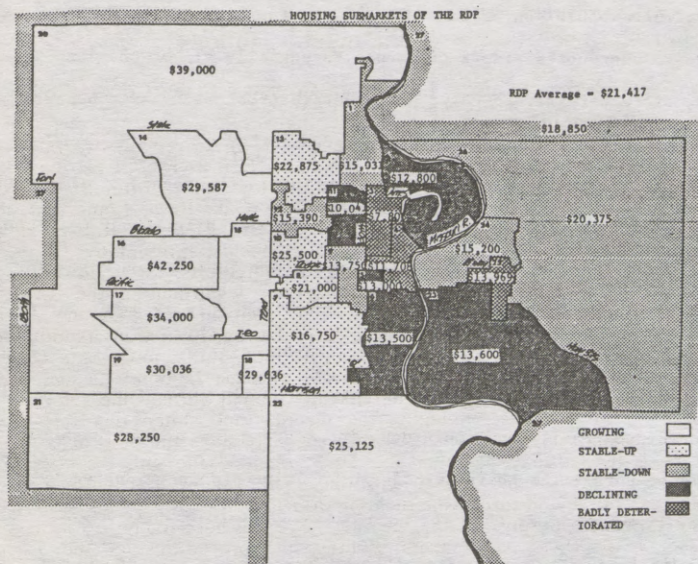
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	% of RDP Popul.	'60-'70 Pop. Inct.	'70-'73 Pop. Inct.	Percent Elderly	Percent Minority	Percent Married	% Families Female Head	% High Sch. Graduates	% College Graduates
#23	1.0	NA	-1.6	3.8	1.2	73.3	7.2	78.1	14.9
RDP	100.0	+1.7	+1.8	9.3	6.9	62.3	9.7	79.2	23.6

	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Lab. Force Part. Rate	% Working Inside SMSA	% White-Collar	% Unemployed	Mean Family Income	Mean Unrel. Indiv. Income	% Income Below Pov.
#23	60.5	98.4	35.2	4.3	9,795	3,719	9.5
RDP	59.0	92.7	51.2	2.9	11,351	3,918	10.7

	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
	Hous. Units Per Sq. Ft.	% Single-Family	% Owner-Occupied	% Built Last 10 Yrs	% In Some House	% of Units Vacant	% Lacking Plumbing	% With No Automobile	Mean Value of Housing (\$)	Mean Gross Rent (\$)
#23	71	98.1	83.3	57.9	37.6	7.1	3.6	5.6	13,166	110
RDP	63	74.5	63.9	27.6	49.7	5.3	3.8	14.9	14,708	113

Source: Ralph H. Todd, et al., Housing and Community Development in the Nebraska-Iowa Riverfront Development Project Area, 1973, (Omaha, Nebraska: Center for Applied Urban Research, December, 1973).

Map I



Source: Ralph H. Todd, et al., Housing and Community Development in the Nebraska-Iowa Riverfront Development Project Area, 1973, (Omaha, Nebraska: Center for Applied Urban Research, December, 1973).

Senator CULVER. The hearing of this subcommittee of the U.S. Public Works Committee will now stand adjourned until the call of the Chair.

[Whereupon, at 1:20 p.m., the subcommittee recessed, to reconvene subject to the call of the Chair.]

[Subsequent to this hearing, a meeting was held which included the Corps of Engineers, the Lake Manawa Task Force, and other interested parties. The minutes of the meeting follow:]

LAKE MANAWA DREDGING PROJECT, LAKESHORE COUNTRY CLUB, COUNCIL BLUFFS, IOWA, OCTOBER 21, 1975

Present: Col. Tucker, representing Col. John Glenn, U.S. Army Corps of Engineers; Fred Prierwert, Director, Iowa Conservation Commission; Ken Bedwell, Chairman, Lake Manawa Task Force; Ray Pogge, Mayor, Council Bluffs, Iowa; Jim Griffin, State Senator from Council Bluffs; Cal Hultman, State Senator, Red Oak, Iowa; Louis P. Culver, State Senator, Dunlap; Frank Crabbe, State Representative, Denison; Rob L. Hubler, Field Representative, Senator Dick Clark; Donna Slater, Field Representative, Representative Tom Harkin; Don Harman, City Manager, Council Bluffs, Iowa; Edward Lynn, Vice President, Council Bluffs Chamber of Commerce, Chairman of the Riverfront Division; Pat Pendergrass, Riverfront Division, Metropolitan Area Planning Agency; G. F. Schnepf, Iowa Conservation Commission; Jerry Jauron, Iowa Conservation Commission; Kathryn Schlott, Chamber of Commerce, Council Bluffs, Iowa; Skip O'Keefe, private citizen; Mr. and Mrs. Paul DiBone, private citizens; Lamond Larsen, private citizen; Fred Parsons, KFAB Radio; Glen Fahrenkrug, Council Bluffs Nonpareil.

Mayor Pogge welcomed those attending the meeting and stated that this project is one of the most important for Council Bluffs, especially since the Southside Viaduct will be dedicated on Saturday, October 25, 1975, opening the entire south end to the downtown area. Mayor Pogge then introduced Ken Bedwell, Chairman of the Lake Manawa Task Force and turned the meeting over to him.

Mr. Bedwell stated the purpose of the meeting, "We are here today to reach agreement on some of the divisions of responsibilities and procedures for the dredging of Lake Manawa. We will be asking a few outside questions, and we will be requesting information as to who will be involved, to what extent they will be involved, and a time schedule, assuming Senate Bill 1799 is passed into law."

Mr. Bedwell then began the questions compiled by the Task Force:

Question 1. Considering the testimony given by Don Brazelton of the Iowa Conservation Commission Staff at the public hearing, does the ICC feel obligated to carry out the express intent of the Iowa Legislature which is to dredge Iowa lakes.

Mr. Prierwert: "We presented to the Legislature a total capital budget. At the same time it was presented, we were given some money to do a study at the direction of the Legislature, and that study was taken back to them. There were no dredging funds requested in our asking. There were capitals of one sort or another, but they didn't include dredging, and we held off on anything in dredging until the study was done. Obviously, we will follow any mandate set by the Iowa Legislature."

It was reiterated that the study was completed and that the Iowa Legislature received it in about March or April of this year.

Mr. Bedwell: "We also understand that if S 1799 passes, it would be a law and that Iowa would be responsible for 50% of the cost shared. Are the ICC and the Iowa Legislators that are present intending to match these funds on a cost share basis."

Mr. Prierwert: "If S 1799 passes in that form or is attached to the Omnibus Bill (which is probably where it will go), we will certainly call it to the Joint Subcommittee's attention and then, hopefully, any funding they would give it would be in the separate appropriations bill."

Senator Culver: "A couple of bills have passed setting aside matching funds for purposes such as this. About one-half million dollars is in that fund. It is just sitting there in that account waiting for passage of S 1799."

Senator Griffin: "The three of us here had only one vote each. We can't guarantee what the other legislators will do. I think that the legislators that are here are dedicated to the cause. I think one of the questions relates to the fact that 'Will Iowa be in a position for 100% contribution?' I don't think that is ever possible. I think that our priorities are too great to say that we could get 100% state funding. So, obviously, if said file 1799 passes in Congress and enters into the budget where it is hypothetically 50% state and federal funding, I can't help but think the Iowa legislature would be receptive to the idea."

Question 2. Are we correct in assuming that the Corps of Engineers will accept the responsibility of this project as stated in § 1799 if Congress so directs?

Col. Tucker: "Yes, sir."

Question 3. Will the ICC and the Iowa Legislature accept the Corp's involvement?

Mr. Prierwert: "We would welcome it. I think Jim (Griffin) already touched on that subject. It won't fly without some other help, and that seems the logical entry from our viewpoint."

Senator Culver: "The State bill was passed, and the only way we got it through the Senate and the House was matching funds. Some were not too happy that we were going to start dredging lakes, but they did commit themselves. There were few objectors in either house."

Question 4. Does the Iowa Legislature plan to pursue continuing funds for the dredging of Lake Manawa?

Mr. Bedwell: "I think this question has already been answered. As Jim said, that at least the people that are here are in favor of it and, consequently, you can't tell how everybody in the state is going to vote."

Representative Crabbe: "One thing I want to point out to you is that this \$500,000 also includes other lakes. It could go to any lake and before we go too far along the line, I am sure that some of you here know that the lake that I am particularly interested in is the lake in my district, Blue Lake. I want to make the statement now that I am very much in favor of dredging Manawa down here, because I know what it means to the people, and I think more of the people would. But whatever we do, I would still carry the ball for Blue Lake."

Mr. Prierwert: "Frank, § 1799 initially addressed itself to one lake, and the committee said no. They wanted it for the Ox Bow Lakes, and the gentleman from Senator Culver's office pointed that out."

Senator Culver: "I think to clear the air just a bit, the Ox Bow Lakes as I recall, and I'll stand to be corrected, in 1799, the Ox Bow Lakes could be Ox Bow Lakes in Nebraska. Maybe somebody in Nebraska would have it and would match an Ox Bow Lake there."

Senator Griffin: "I think for the record, Ken, it ought to be shown the question was asked about continued support. The continued support is going to be there as long as we can get guys like Louie Culver, Frank Crabbe, Cal Hultman, Macleroy, Laverne Schroeder, obviously, and Craig and Emil, what I am trying to do is to reach out and pick up regional support. We can't just tell Frank Crabbe 'well to heck with Blue Lake' so our continued support depends on what practical politics and arrangements we can get so, obviously, what I am saying is that we have to put our political package together rather competently and we have been able to do that in the past, and I see no reason why we can't do it in the future."

Frank Crabbe: "It is my judgment that as far as the House is concerned, we will have no trouble getting the Bill's support. I have already talked to the House of Representatives, and they are very much in favor of dredging the Lake."

Question 5. Considering there is no passage of § 1799, are there other avenues to be taken for federal assistance?

Mr. Prierwert: "Well, I can think of a couple, but they're not of magnitude to really be of very much help, and they are all committed funds, nothing of a magnitude that we are interested in."

Senator Griffin: "I can't even think of an alternative to federal funding or state funding. One alternative would be Park User Fees, and that is only a drop in the bucket to what we're talking about. Park user fees are popular in the border areas that we represent. You get further into the state, and your legislators will say, 'well, thanks, but we don't want to charge our friends on a Sunday afternoon.' We have an inner-state/border-area philosophy disagreement, but I think that Park User Fees will be here soon."

Mr. Prierwert: "But again of a magnitude with an anticipated income of \$300,000 a year's fee, well, I mean if the ticket was \$3, we figure that each dollar would generate about \$100,000. Now that study is old but, even if you added half to it, it would take quite a while to get the money required."

Question 6. Suppose there are no federal monies, what amount of support can we expect from the state level?

Mr. Bedwell: "I think that has been pretty well answered that everybody has one vote and, consequently, however they vote, that's the way the ball is going to roll."

Representative Crabbe: "We have a lot of representatives that have their own pet projects on lake dredging and so forth. You get over east and you have quite a few and most of those over there are supported by the majority party of the House. I was told last year that we had no chance of getting any money at all, however,

this coming session, beginning January 12th, we do have a chance providing there is matching money. These fellows, and I happen to know because I have been with some of them in the eastern part of the state, are going to put up quite a stand for dredging monies this year and with a \$250,000,000 surplus and the publicity we have been getting in the paper and what is going to happen to that \$250,000,000, especially the article that was in the paper this morning, the reoccurring costs each time, there is no reoccurring cost on this. You dredge Lake Manawa and that's it. We dredged Storm lake, and there were no reoccurring costs on that. This is money that could be put to the dredging of these lakes without any reoccurring expenses and, if the Legislature isn't smart enough to know what reoccurring expenses are going to cost them all the time, they should read it in the paper."

Mr. Prievert: "I'd agree, Frank, there were comments that what we were going to do, we were going to do with one-shot deals and that's it, be it dredging or whatever, like building the new agriculture building, that's a one-shot deal."

Senator Culver: "My own comment, and this has been stressed before, the half million dollars come from the 65th Legislature, plus \$100,000 for the study and, going back to Legislature, I worked it hard, and they said, 'if you can find the matching funds, we have pretty good intent to come up with the matching funds which we're talking about it in S 1799.'"

Question 7. Specifically, what financial needs have the higher priority than dredging to the Iowa Conservation Commission's staff, as stated in their Congressional testimony?

Mr. Prievert: "As I said, we put together a package of the state needs without dredging in it, because this instrument was built prior to this subject coming up in the study in the \$500,000. And there are needs scattered across the state maintaining older parks and bringing them up to snuff in all shades and grades. That document is available for anyone that wants it. Legislature accepted it and funded about \$3.7 million for some of the top priority items, and that was most recently, and that's why I mentioned earlier that I think dredging will be handled as a separate entity from our capitals. I don't anticipate that it is in the same bill. There are a lot of demands on the department for limited funds, let me put it that way. We had \$31,000,000 down in capitals that needed to be done, and we got \$3.7 million, so that will give you some idea of the magnitude."

Mayor Pogge: "To clarify this, is it your understanding then that you will continue to keep the dredging separate from the maintenance of your department?"

Mr. Prievert: "Separate from other capitals, not from maintenance."

Representative Crabbe: "I'll go back through the history of this a little bit. The Bill in the 65th General Assembly was sponsored by twelve of us, I think there were twelve of us. We took in Blue Lake, Black Hawk, and Silver lake, and the next morning, the vote by which it passed was contested, we had to go over it again and again it passed quite handily. Then we went to the Senate, and they turned us down. It came back to the House, and we insisted on our Bill. Then it went to a conference committee, and the Conference Committee came out with this \$500,000 to be left in the fund for dredging, plus \$100,000 to do the survey, so I am only giving that history to show that it was a separate bill at that time. As Jim says, we all just have one vote, but I can't see anything under dredging that would be a separate bill each time."

Senator Griffin: "From a priority standpoint, I think there is being more pressure generated across all areas for dredging. As to the economics and feasibility, I think this is going to come to be a more higher priority item. Are we going to build a new lake or spend the money to maintain our old ones. I believe dredging is being pushed closer to the top each year. I think you might see the time when dredging of existing lakes might be the number one priority item."

Mayor Pogge: "Do you agree with this, Fred?"

Mr. Prievert: "Well, you can see that it's coming up, because as Louie said the legislature put in the study money which has never been done before so, obviously, there was interest or they wouldn't have directed us to do the study; so, as he is speaking from the legislative standpoint, I would have to agree."

Mayor Pogge: "Are you pursuing dredging because the Legislature says so or because the staff thinks it is important?"

Senator Griffin: "I think the Legislators are responding to the constituents, because we have lakes that need some maintenance. Manawa, Blue Lake, Black Hawk Lakes are just in western Iowa, I think the decision has to be made: get yourself a new lake or let your old lake dry up."

Mayor Pogge: "Well, I still don't have the answer. Is the staff behind this or not?"

Mr. Prievert: "Well, the engineering study shows the feasibility of dredging Manawa. Now, some of the others, they go down, well, it's on a scale. I think Jim is saying

some of these are lower on the scale and they wouldn't fly today. But, sometime in the future, they may in fact fly. I don't know. If I look at the study today that the legislature directed us to have done, it says that Manawa is feasible and the others are not. It is just that simple."

Senator Griffin: "But to get to the question, which is before us, which is still unanswered, on a balance and all things being equal, does the ICC staff recommend dredging?"

Mr. Priewert: "Not as a general thing, no. In a specific sense, yes; but, in the general sense, no."

Mayor Pogge: "In other words, if the Legislature recommends dredging, fine; but the staff isn't going to go to the Legislature and ask them to put in for dredging?"

Mr. Priewert: "No, we're going to wait and see because he has already mentioned 50% cost-sharing, and the Col. mentioned earlier about not doing anything until they find out about it, because we can't match until S 1799 goes through in some form; and, if it does, certainly, we're going to go back to the Legislature and say 'hey, this passed and these are the costs involved and its 50% and that's the way they are.'"

At this point, Senator Cal Hultman, from Red Oak, arrived. Mayor Pogge introduced him.

Ken Bedwell: "I think, primarily, what the Mayor is referring to is that all the Commission meetings I have attended down there, I come back to the Executive Committee, and I've been more or less telling them 'Now look, if we want something done, we're going to have to influence the staff that this has got to be done, otherwise, it's going to be tough to get to the Commission.'"

Mr. Priewert: "I don't think you're going to have to because this is in the federal ball park at this time. Louie said it, Jim said it, that matching is required to make it go, so the feds have to move on S 1799 if we want it to go. The ball is in their court, not ours, that's the way I view it."

Senator Culver: "My other comment regarding that—we have a clause in this Legislature passed Bill that these funds cannot be touched until 1979, except for dredging, unless the Legislature takes ahold of it, so the Conservation Commission won't touch that until 1979. What I'm saying is it has a deadline of 1979. I hope we can be assured that something will happen to S 1799 before 1979."

Question 7A. Will dredging be at the expense of other conservation programs?

Mr. Bedwell: "I feel that that question as been answered by the fact that dredging will be out of separate funds."

Senator Hultman: "The only comment that I would make is that I sit on the committee for appropriations, and there has always been a general trend that, more this year than it has been in the past, by giving the Conservation Commission a dollar amount for capital improvements . . . I would put my 2 cents in—I think it should come under separate appropriation. Excuse me, Mr. Priewert, but, if we state that the Conservation Commission shall, then they will."

It was reiterated that before Senator Hultman arrived it had been stated that dredging will be out of separate capital funds, not as a line item in the Conservation Commission budget.

Mayor Pogge: "Is this because the Conservation Commission has taken up a position against dredging?"

Senator Hultman: "No, I think it's not. I think we got concerned about this, well, it's been coming up for years and years, with the Upper Gar situation . . . I think when it comes right down to it, the Conservation Commission has always said 'no, we don't want to dredge.' Three years ago, we said 'to heck with it. We may want to doubt their word so let's have a feasibility study,' which I'm sure you've all seen, and Lake Manawa came out on top. Based on that, I think that the Legislature has always been hesitant to put money into dredging when the recommendation from the only source said, 'no, don't do it,' but I think now that we have another source that says it is feasible and here's how to do it and here's the pay back ratio; with that new light, I'll think you'll find that the Legislature would not be hesitant if there is the money to come out in favor of dredging."

Question 7B. Are we correct in assuming that there will be money for dredging above and beyond the Conservation Commission budget?

Mr. Bedwell: "I think this has been answered."

Question 8. According to the ICC testimony that park redevelopment "is not dependent upon dredging of Lake Manawa," the question we have is: Why, then, is the ICC willing to spend money on water oriented recreational facilities when, according to the ERA study, the undredged lake has a life expectancy of only 20 years.

Mr. Prierwert: "First of all, Manawa is one of the highest use areas in the State. There are demands for it in the shape it is in now, and some fuzzy degree of expectation, we had to have some land to put the spoils. These things have to be done, or you'll never get it dredged. The first thing you have to have is the land."

Question 9. Could ICC monies budgeted for park redevelopment, be diverted to dredging?

Mr. Prierwert: "No. If it were in the normal capital improvement budget, if they gave us a blank check, it would still delineate what it could and could not be used for in the broad sense. If they give us a lump, it would still have to include the word 'dredging.' Normally, the monies are delineated by area, so much for park maintenance capitals, and they won't say which park, so much for open space, etc. The money is earmarked in a sense, so it depends on how they write the Bill, and that question is moot anyway, because they have all said it is going to be a separate entity."

Senator Hultman: "One thing I think you should bring out here, also, is that some of your money is under a trust fund."

Mayor Pogge: "Well then if Lake Manawa was so high in the study, why can't we get some money for capital improvements?"

Mr. Prierwert: "Well, we are. We have a new redevelopment plan on the books right now, don't we, Jerry? We have to get the cost estimates, and then we're going back to the Legislature in January with the request."

Question 10. Are we correct in assuming that approximately 87% of Lake Manawa shoreline is for use by the general public?

Mr. Jauron: "It is not less than 85%."

Question 11. On September 27, 1975, at the Senate Public Works Committee Hearing on Bill S 1799, the Corps of Engineers testified, "The project is a single-purpose recreational project unrelated to Corps work. In addition, this project has not been the subject of any federal study as to its engineering, economic or environmental feasibility and justification." Wasn't any of this work done in the recent metro Study?

Col. Tucker: "The purpose of the Metro Study was not to perform detailed economic studies or engineering studies on any particular problem which that study addressed. The study itself was very broad in scope, and it was performed at the request of Congress as a service to the Metropolitan area of Omaha and Council Bluffs. its primary purpose was to identify problems and to inventory (in the case of recreation) existing resources to indicate the shortfalls of recreational opportunities, and it does recognize Lake Manawa as an important portion of the recreational inventory in the Council Bluffs-Omaha area. For that reason, I think that you might appreciate from a money standpoint that engineering and design costs on this specific project for construction were anywhere from 6% to 15%. The cost of performing detailed economic and engineering studies on every problem we ran into would have totaled to an astronomical bill, and I don't think Congress would have accepted it. For that reason, it was not investigated in detail."

Senator Hultman: "I'd like to ask a question if I may, Colonel. Was McCook Lake that was dredged that was . . ."

Col. Tucker: "Yes, sir."

Senator Hultman: "What's the difference between Lake Manawa and that . . . Lake . . . and Taboo Lake in Dubuque?"

Col. Tucker: "There is none. That's a pretty good question. The Congress directed it. The Corps of Engineers did object to that; they indicated that that was not properly in their purview as far as their mission was concerned. It was definitely a precedent."

Question 12. Assuming that the Iowa Legislature directs the ICC to participate and appropriates the necessary money and the Congress directs the Corps of Engineers to participate, what must be done and in what order?

Mr. Prierwert: "It could depend upon how the Bill is written and what they tell the Corps to direct in the line of studies to get ready for it. If it was directed that the Corps do all of the studies, they would; if not, then I suppose we will be in concert with them and, hopefully, assist on the water quality study or whatever it is they don't do."

Col. Tucker then passed out a pamphlet which explained the procedure the Corps uses when issued a directive by Congress. He explained:

Col. Tucker: "The first step has been completed, the people of Iowa have recognized the problem and have gone to their Congressional delegations which has resulted in the Bill being introduced into Congress. Step No. 2 is that the Congress authorizes the Corps to undertake its study. This is usually done by resolution, and we get money to do a study which leads up to a recommendation to Congress on whether it is feasible or not feasible and whether it is justified to spend the money and that

occurs over in Block 18, where you will note it says 'project authorization.' Now, in this case, I'm not sure whether that is going to occur contiguously with Block 2 or not, but it really doesn't make too much difference as far as the process is concerned. You will see that leading up to Step 18, are about 18 steps which include a number of public hearings, development of alternatives, presentation of alternatives to public meetings and integration of public interest into those alternatives. Basically, it is Step 8 where you have to fish or cut bait. At that time, the Corps of Engineers will have developed the preferred alternative and will present it to the public meeting, modify it as required, prepare a feasibility study after they have had the public response, forward it on up the chain to the Office of the Chief Engineer and on up to OMB and the Congress. You might ask how much time does all this take. If, for example S. 1799 is passed in this session of the Legislature and, if, another assumption, it is passed with another appropriation, then planning could begin in the fiscal year '77, which begins October 1, 1976. So, if everything went very well, you might begin construction in the fiscal year 1978, but I doubt that very much because there appears to be an environmental impact statement which is required, as well as the design work which is involved, and all that takes about a year. The environmental impact statement is the governing factor. It must go through a whole series of processes, go to the Council for Environmental Quality and that usually takes about a year, if there aren't any hitches or any objections or any lawsuits, so I would say it is unlikely that construction could occur much before fiscal year 1979, which begins October 1, 1978. Probably, construction, at this stage of the game, I would have to guess would be about a year, depending on what the construction of Lake Manawa would entail. I think by reading the Bill you can see that it's pretty open ended, so we're not sure, we might end up with a stage project, depending on the capability of the federal government and the state to fund it. That, basically, is the process that the Corps of Engineers would go through in order to perform this project."

Senator Hultman: "What happens if the State, as a part of their cost share, goes ahead and does the dredging studies, all the engineering work, the environmental impact statement, and the Congressional mandate says that you accept that?"

Col. Tucker: "If the Congress tells us to do that. The Corps of Engineers would not recommend it. In that case, we would merely become a construction engineer."

Senator Hultman: "And that would speed up the process."

Col. Tucker: "It might. But the local entity, whoever did this, would still have to abide by all the requirements of EPA, and I don't believe that anyone else could get an environmental impact statement through unless Congress directed them to accept it, so it all boils down to about one year no matter how fast we worked it."

Senator Culver: "What would an environmental impact statement on Manawa have to contain since it's just dredging the lake?"

Col. Tucker: "Well, there is the question of water quality, and I think the study that you pointed out shows a number of problems in sewage treatment in the area, and there are some concerns about disturbance of wild life during construction, and after, disposition of the spoil from the dredge, and disposition of the drainage of that spoil. The environmental and engineering study would probably turn up a number of problems associated with environmental considerations."

Senator Hultman: "In your experience, have any of these environmental considerations ever stopped dredging?"

Col. Tucker: "Oh, yes, sir. The Corps of Engineers does a lot of dredging, and we must conform to the rules and regulations that are required by other Federal agencies. The problem is usually where to place the spoil which doesn't seem to be a problem here, but I would not be so optimistic as to say we have no problems. Once the project appears to be moving and going, you will be surprised at the number of . . . that come out of the woodwork from an environmental standpoint. I will comment on it by saying I don't think it will be quite as simple as it seems although we do have a great deal of local support for it; but when it gets down to the wire, there will always be someone come forward, and their demands must be satisfied."

Question 13. Could we have an outline of the Corps involvement?

Mr. Bedwell: "This has already been answered."

Question 14. Is there a possibility of the Corps and the ICC each doing some of the studies?

Mr. Bedwell: "This has been answered also."

Question 15. We question the ICC statement that water quality problems must be corrected before dredging, why not concurrent with dredging?

Mr. Bedwell: "This has already been answered by talking with the Commission. They could be solved concurrent with dredging."

Question 16. On the subject of water quality, study and corrective measures that must be undertaken, who has to do it and when?

Mr. Bedwell: "This has been answered."

Question 17. Which, if any, of the studies already completed could be used by the Corps in the dredging of Manawa?

Col. Tucker: "We would use any and all information in studies which had been done previously. We would perform our own study and, if necessary, verify the facts and figures, but any information that is available is welcome. We would use everything we could get. We are not in the business of duplicating effort."

Mr. Prewert: "Let me explain that the Corps warned us not to do anything on a cost-share basis until it is authorized, anything we did prior to passage of S. 1799 could not be used as matching at this time."

Question 18. Would the Corps and the ICC figure on cost-sharing the estimated associated cost of dredging?

Mr. Bedwell: "We have been having differences in the overall costs and so forth with reference to dredging. According to the ERA study, actual dredging, which consists of 2.1 million cubic yards, is estimated to cost \$3.7 million dollars. The estimated associated costs which are right in line with dredging or have to be done in connection with dredging is \$4,874,000. Shoreline stabilization in the ERA study is estimated at \$150,000. Primarily, we are talking about an overall estimated cost of 8.7 million dollars. Back to the question, does the Corps and the ICC figure on cost sharing in the estimated associated cost of dredging, these total approximately \$5,000,000. Again, I would probably say that this would be a reflection on primarily if S. 1799 passes as is, is that correct?"

Col. Tucker: "You are correct sir."

Mr. Prewert: "Other agencies, such as the Department of Environmental Quality, when it came to water quality or sewers, could become involved. They have some responsibilities in that area. If the Corps states that they will match on all costs, then the Legislature will probably be thinking of matching on all; but, if the Corps says they will only match on parts, the Legislature will probably be thinking of only matching on those parts. That's been said before. We agree that the initial Bill is broad-based, and we will have to see how the funding comes out of it."

Question 19. Could the land or the lake at Manawa be used as some of the non-federal cost sharing?

Col. Tucker: "Again, yes it could be. It would depend on how the Bill was written. I wouldn't want to answer either 'yes' or 'no' on that one until I see how the Bill comes out."

Mr. Prewert: "But under normal circumstances, portions of it could be. That's the normal way of doing business."

Question 20. With passage of S. 1799, is the Corps in charge of the full dredging project and shoreline stabilization, or what part are they in charge of?

Col. Tucker: "It depends on the Bill. If Congress told us to do it, we would be in charge of the project. We would do the design, the studies, etc."

Question 21. Upon passage of this Bill S. 1799, what would be the involvement of the ICC?

Col. Tucker: "I would like to qualify that. At this time, the concept of sponsorship comes up. I would not presume to second guess the State in designation of the sponsor, but I would assume it would be the ICC."

Mr. Prewert: "Yes, it would."

Col. Tucker: "In Block 21 of the pamphlet I passed out, you will notice that there must be a local interest guarantee to fulfill the obligations required by law; for any project, we need a local sponsor. It could be anyone, either in the State or the City; however, prior to this time, we would like to know who the sponsor will be and would like to have a letter of intent so that we can coordinate with them."

Question 22.

Mr. Bedwell: "This question is rather far-fetched. We have talked about time schedule of studies, how long will it be until we can expect the money for this dredging project and, also, how long until we dredge Lake Manawa? Col. Tucker, could you please give us those approximate dates again, supposing everything is expedited?"

Col. Tucker: "Assuming everything moves along smoothly, construction will probably begin sometime in fiscal year, 1979, which begins 1 October 1978. We have to realize that the language in the Bill says more things than just dredging. This might go on for a couple of years depending on what is included in the work—bank protection, development of additional recreational facilities, other structures that might become apparent, maintaining water quality—you can't do all those things in just one year."

Question 23. After we see a dredge in Lake Manawa, how long will it be before they pull it back out with a completed job?

Mr. Bedwell: "Col. Tucker anticipates one year, am I correct?"

Col. Tucker: ". . . we would let the contract on a competitive bid, and I think it would be complete within a year, yes."

Question 24. After the dredging is satisfactorily completed, will the Corps be responsible for any maintenance or operation responsibilities?

Col. Tucker: "No, sir."

Question 25. What will be the life expectancy of the Lake in years after completion of the dredging?

Col. Tucker: "I don't know."

Mr. Prierwert: "I don't know, either; but I would say that after completion of the dredging, we would have to meet with persons such as soil engineers, etc., to determine this. We can't give a clear answer at this time. In any case, we would, of course, try to maximize the life of the lake."

Mr. Pogge: "Am I correct in saying that the study showed that siltation has not been increasing too much in the last few years?"

Mr. Prierwert: "Correct."

Mr. Pogge: "I think this has been one of the finest meetings, Ken, that we've had, and we have asked some very pertinent questions, and we have examined the staff of the ICC to solidify their position and know exactly where we stand. On behalf of the City staff, the Council and the City Chamber of Commerce, it is really a remarkable thing that you came and gave us your time here. This Lake means far more to this area than any of us can imagine. So many people use Lake Manawa, and it is really an asset to our community. When we have people come to town to look at our City for development, one of the first places we show them is Lake Manawa. They are very impressed by it. We feel that the people who are supplying the money to government have the right to have their needs met—not in give-away programs—but their recreational needs. The cities now days are really strapped, budget wise, and we just can't afford to do much in the way of improving recreation facilities such as this one. So, on behalf of the City and the surrounding area, I can't thank you enough for being here and having this fine dialogue. We are grateful that the legislators are trying to obtain money for purposes such as these."

Item 26. These are the things that we tried to resolve at the meeting today:

Mr. Bedwell: (1) "The ICC and Iowa legislative support of state and federal cost-sharing in the dredging of Lake Manawa. The Iowa Conservation Commission feels that if we can get a 100% federal funding, then that is what they are after, but I feel in my own mind that, as Fred said, they are ready, willing and so forth, to welcome the Corps of Engineers to become involved in this project." (2) "The Corps under Congressional direction will participate in the dredging. I think we have gotten this accomplished. Am I correct in saying that if Congress directs it, the Corps will act?"

Col. Tucker: "Yes, sir."

Mr. Bedwell: (3) "The Corps and ICC agreement on division of responsibilities and procedures requesting studies be done as soon as possible. I think we've gotten this accomplished." (4) "Support of all parties for early passage of S. 1799. As Fred said, the most important thing now is the water quality study and passage of S. 1799." (5) "Concurrence that the Minutes of this meeting be included in the Congressional Record as supplemental information. Are there any objections? Let the record show that there were no objections."