



Niobrara Instream Flows Public Informational Meetings

December 8- Chadron
December 9- Valentine
December 10- Butte
December 16- Lincoln

Welcome to the Niobrara Instream Flows Public Informational meetings that we are holding across the state for the next few days and one next week. We will be presenting the same information at each location. Thanks you for taking time out of your busy schedules to come and learn a little about what we have been doing in regards to studying the Niobrara River.



Meeting Agenda

- Introductions
- Overview of Meeting Structure
 - Purpose of Meeting
 - Review of Instream Flows
 - Review Completed Studies
 - Wrap Up

All photos in presentation are courtesy of National Park Service and NE Game and Parks

Want to see the Studies or this Presentation?
Go to: <http://outdoornebraska.org/Niobrara>

I would first like to acknowledge that the photography in this presentation was generously provided by the National Park Service and our photographers at Game and Parks. Our meeting agenda is shown on this screen for your information. If you are interested in seeing the studies we are presenting tonight, or to get a copy of this PowerPoint, you can go to our website and download them. I now would like to introduce and welcome our State Senators, Commissioners, NRD General Managers that are in attendance. Thank you for coming.

Introduction of Staff

- Michelle Stryker-Facilitator
- Michelle Koch- River Characteristics
 - Carey Grell- River Characteristics
 - Kirk Nelson- Recreational Floating
- Craig Wacker-Economic & Social Benefits of River
 - Gene Zuerlein- Fish & Wildlife
 - Frank Albrecht- Fish & Wildlife
- Local Staff

Let me introduce you to the Planning & Programming Team. Each one will stand when I call their name, so you know who they are. I am Michelle Stryker, Division Chief of Planning and Programming and the Facilitator for the evening.

Michelle Koch- Environmental Analyst Supervisor

Carey Grell- Environmental Analyst

Kirk Nelson- Assistant Division Administrator

Craig Wacker- Outdoor Recreation Planner

Gene Zuerlein- Assistant Division Administrator

Frank Albrecht- Assistant Division Administrator

Local Staff (different staff for each meeting) We have local staff represented in case you have other questions regarding Game and Parks. Please stand or wave from where you are.

Chadron: Matt Steffi-Wildlife, Gregg Galbraith-Parks, Rick Holland-Fisheries, Justin Haag-Communications, Office Gregg Hesse-Law Enforcement

Valentine: Tom Krolkowski-Wildlife, Clayton Stalling-Wildlife, Dave Harlan-Parks, Rick Holland-Fisheries, Julie Geiser-Communications, Officer Frank Miller-Law Enforcement

Butte: Tom Welstead-Wildlife, Clayton Stalling-Wildlife, Mark Rettig-Parks, Rick Holland-Fisheries, Jenny Nguyen-Communications, Officer Jonathan Andreasen-Law Enforcement

Lincoln: Scott Taylor-Wildlife, Jim Swenson-Parks, Rick Holland-Fisheries, Jerry Kane-Communications, Officer Travis Shepler-Law Enforcement

Overview of the Meeting Structure

Approximately 45 minutes long for presentation

Going over 6 major studies

Each study will consist of 5-7 minutes of the presentation

We will have a question/answer period after each study. In the essence of time, we will keep that also to 5-7 minutes per study.

Additional time for questions for the presenters or if you have questions for our local staff on anything we will provide break out stations after the presentation for approximately 1 hour

Purpose of Meeting

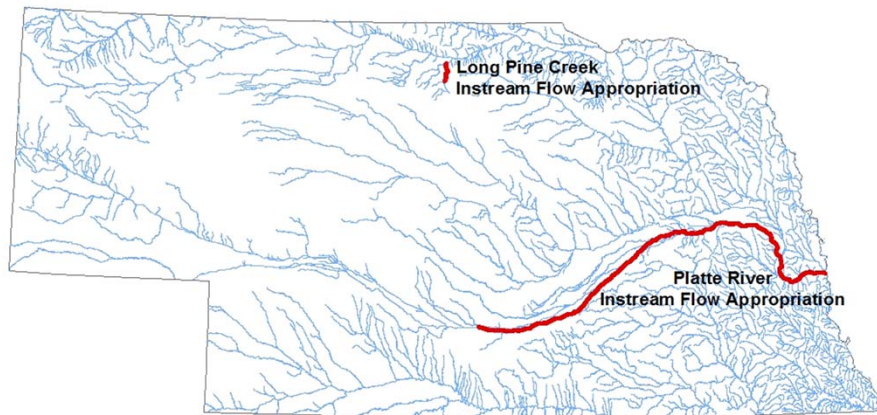
- In 2006, the Board of Commissioners at that time directed staff to look at instream flow recommendations for the Niobrara River.
- NE Game and Parks has undertaken multiple studies on the Niobrara River.
- Studies are complete and it's time to share the results.



Bullet Point 2: For the past 8 years we have been conducting studies and the last one was wrapped up in August of this year.

The Niobrara is a great resource to our state and the studies have shown us the river functions well at this time. There are multiple uses of the water, as the studies will discuss, that are compatible and keep our river functioning in good health. We want to look at how we continue to keep this river functioning like it is.

Review of Instream Flows



An instream flow appropriation keeps a specified amount of flows in the river for a particular purpose, which would include for fish, wildlife and recreation. Instream flow appropriations cannot impact current irrigation; it does not take water out of the stream. Approximately 2% of the fishable rivers/streams in NE are protected by an instream flow. 8 miles of Long Pine Creek (which is a tributary to the Niobrara River) and 277 miles of the Central and Lower Platte River are protected by instream flows.

This map shows what is protected today and our task from 2006 was to determine if Game and Parks should recommend an instream flow appropriation on the Niobrara River. Our first step in this process is to study the river, which we've done for the past 8 years. We hired experts from across the country to do these studies and they provided us with an enormous amount of information. We will share some of that information with you tonight, but if you want more information go to our website. The link to where this information is on our website will be posted again at the end of the presentation.

Niobrara River Studies Completed

- River Characteristics
- Recreational Floating
- Economic & Social Benefits- Instream
- Economic & Social Benefits- Out of Stream
- Fish and Wildlife



As stated before, we completed 6 major studies since 2006. This presentation represents the results of the studies, not the methodology. The methodology is extensive and in the essence of time, we'd be happy to talk to those interested in the methodology of the studies on an individual basis after the presentation concludes. These include (see list on PowerPoint slide).

River Characteristics- The first studies we completed studied the river itself. This included the type of river the Niobrara is, how it functioned in the past and how it functions now.

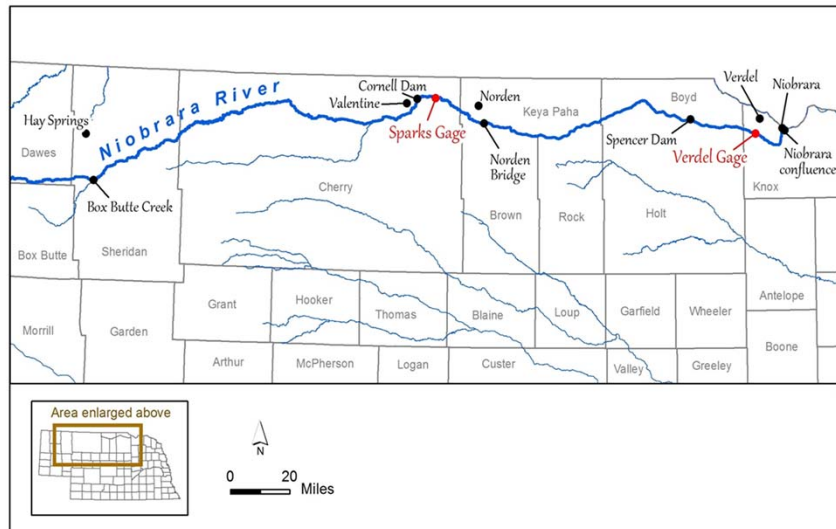
Recreational Floating- The Niobrara is one of the best rivers to canoe, kayak or float in NE. This study outlines the ranges of flows for different experiences on the river based on survey data of users and outfitters along the river. It also discusses what users perceive their experiences to be on the river.

Economic & Social Benefits-Instream- This study provides data on the economic and social benefits of recreational floating and what it means to the local economy within a particular stretch of the river.

Economic & Social Benefits-Out of Stream- Not only did we need to study the benefits of recreational floating, but we also needed to look at agricultural, industrial and municipal water use of the river and the impact of those on the economy.

Fish & Wildlife- Finally, the last study (which was completed in August 2014) looked at the fish & wildlife species along the Niobrara. We are focusing today's presentation on the findings regarding the threatened and endangered species and the needs of these species regarding flows in the river.

Niobrara River Study Area



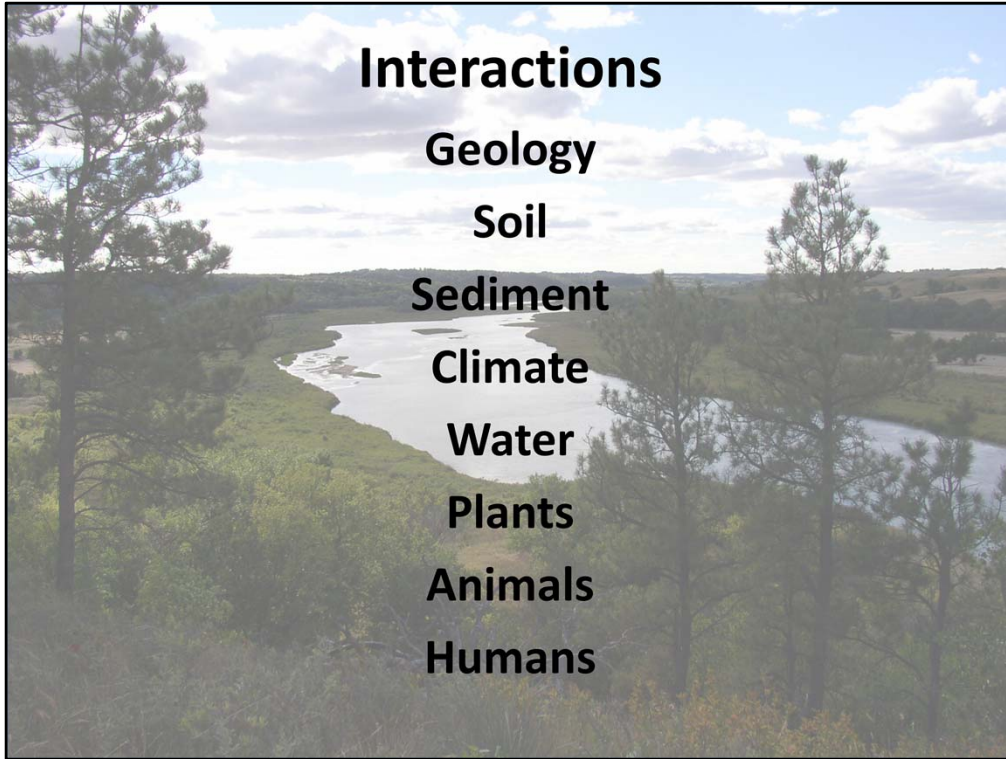
The study area that we will be discussing, for the most part, starts at Box Butte Creek area and goes all the way to the Niobrara confluence. Some studies do discuss specific dam sites and base flow levels off the Sparks and Verdel Gages. Those presenting will go into more detail on this. I will now turn this over to Michelle Koch and Carey Grell to talk about River Characteristics.



Question and answers



Thank you. As Michelle said, I am Michelle Koch, and this is Carey Grell, and we are going to be discussing two studies which examined the characteristics of the Niobrara River.



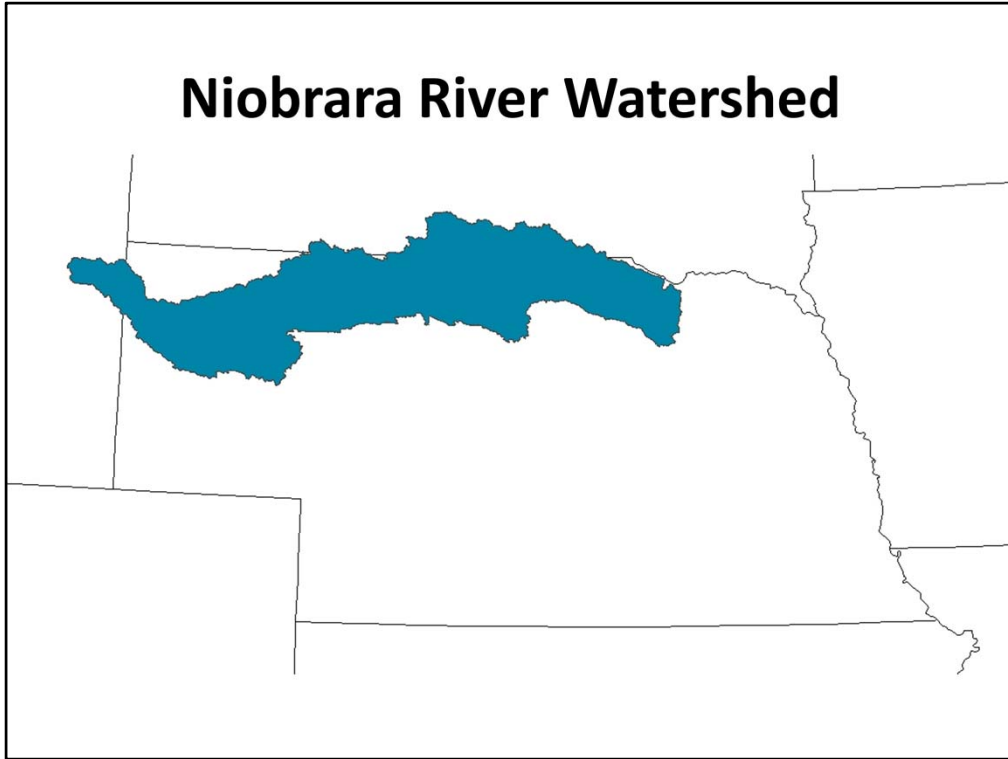
Many factors interact to create the river systems we are familiar with. In order to manage the Niobrara River for multiple purposes, such as recreation, fish and wildlife, agriculture, and hydropower, it is necessary to understand the factors which impact stream flow.

Study #1: Purpose

- Understand influence of human infrastructure on Niobrara River stream flow

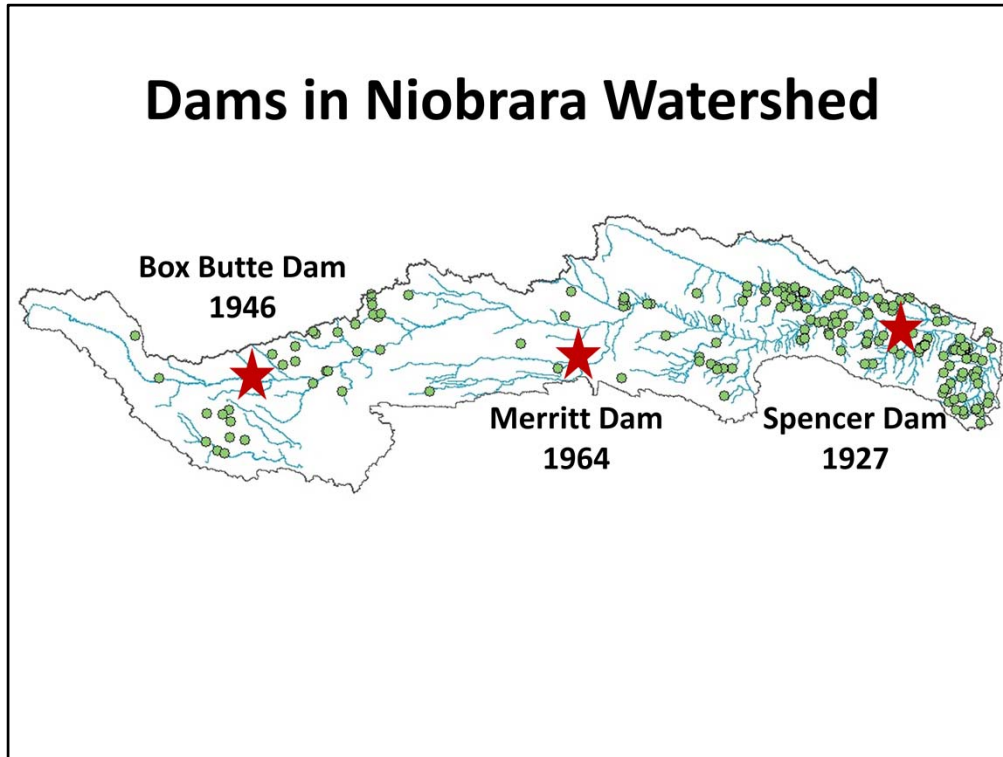


The University of Nebraska Lincoln conducted a study to examine the past and present climate and stream flow of the Niobrara River in order to determine if water development projects on the Niobrara River and its tributaries have impacted stream flow.



For a frame of reference, here is a map of the Niobrara River watershed.

Dams in Niobrara Watershed



There are approximately 190 dams listed in the Department of Natural Resources' database.

In 1927, Spencer Dam was completed for the purpose of hydropower generation. It is still operated today by the Nebraska Public Power District.

The Mirage Flats Project includes Box Butte Dam, which was completed in 1946, and the associated canals and distribution system, which were completed in 1948.

Merritt Dam is operated by the Ainsworth Irrigation District, and was completed in 1964. This was the last major dam constructed in the Niobrara River watershed.

Box Butte Dam, Merritt Dam and the associated distribution systems were constructed for the purpose of irrigation, and together account for 90% of all diversions from the Niobrara River.

Mirage Flats includes Box Butte Dam (1946), Dunlap Diversion Dam, Mirage Flats Canal, and distribution system. Completed in 1948. Developed to irrigate 11,679 acres.

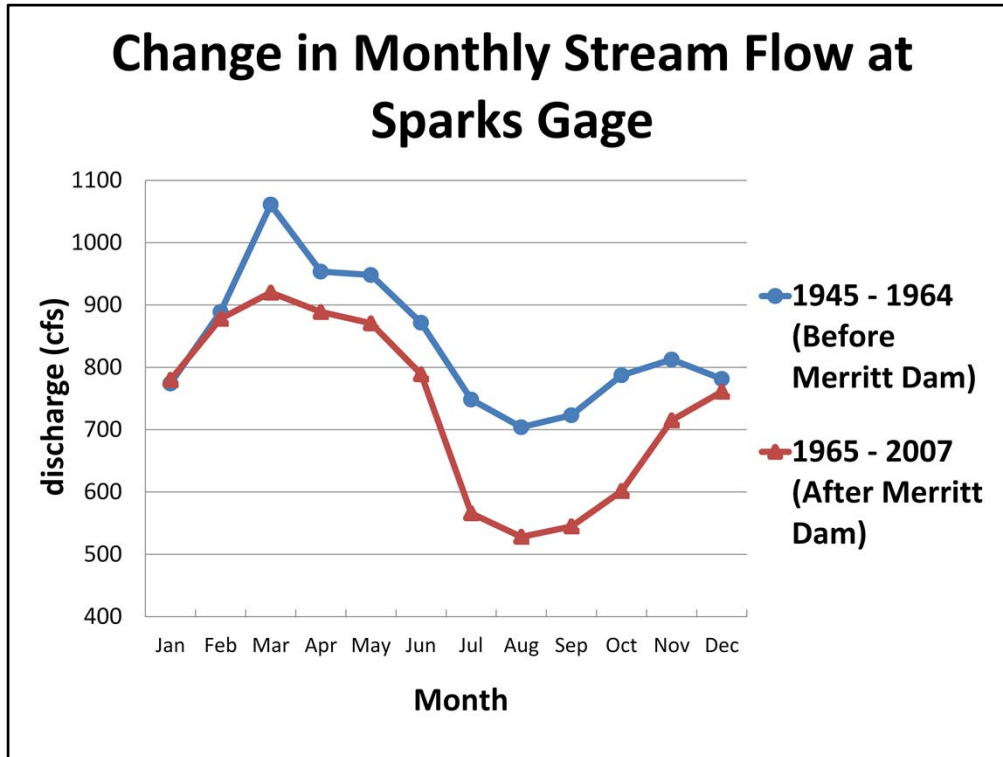
Merritt Dam & Reservoir on Snake River. Includes Ainsworth Canal and operated by the Ainsworth Irrigation District. Dam completed in 1964 and distribution system finished in 1966. Irrigate 34,540 acres.

Comparing Water Data



- No change in average annual precipitation
- Decrease in daily, monthly and annual flows for time periods before and after Merritt Dam was constructed

This study examined climate variables throughout the basin, and determined there was no change in the average annual precipitation between time periods before and after Merritt Dam was constructed. However, when comparing stream flow data at the Sparks and Verdel Gages, there were decreases in daily, monthly, and annual flows before and after Merritt Dam was constructed.

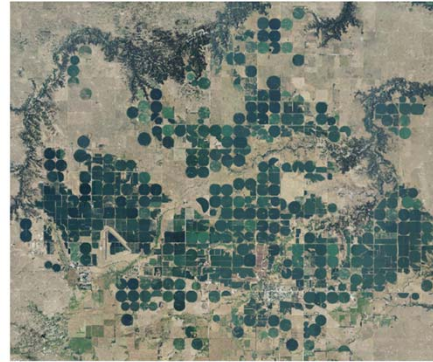


Here is an example of how stream flow has changed before and after construction of Merritt Dam. Prior to completion of Merritt Dam, this was the monthly stream flow at the Sparks Gage. After completion of Merritt Dam, the average monthly stream flow dropped anywhere from 10 – 25%, with the largest decreases occurring during the summer months when water is diverted for irrigation.

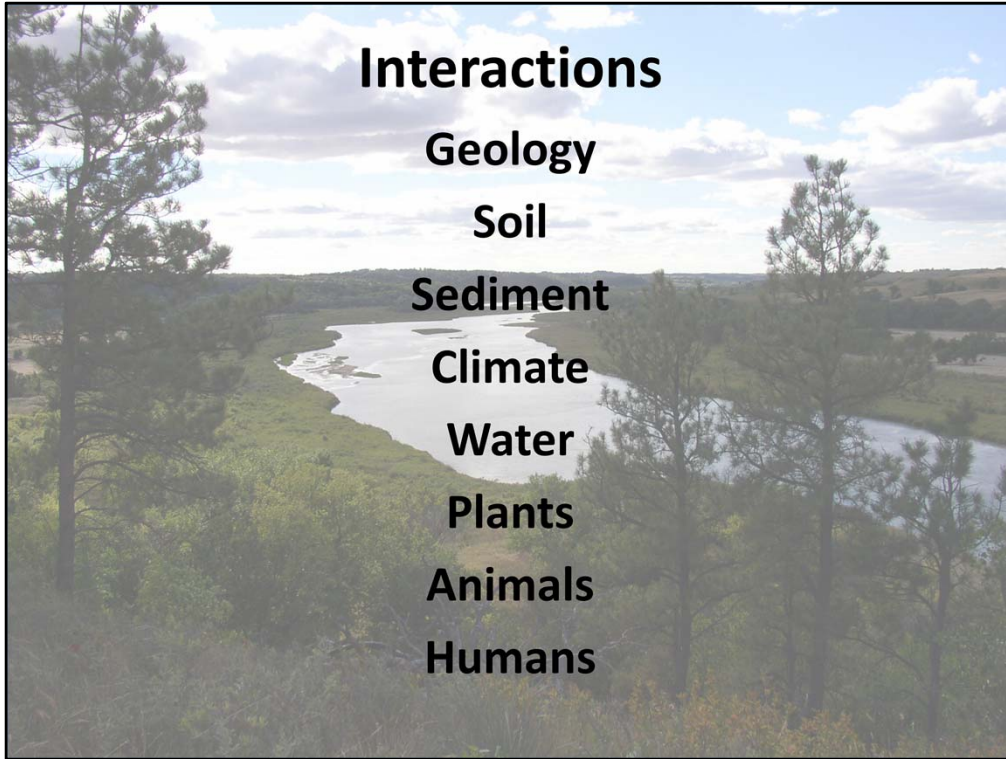
As stated in the previous slide, the amount of precipitation has not changed. So, we can conclude the change in flow is due to water development structures, and not due to changes in the amount of precipitation or drought conditions.

Application

- We must understand human influence on stream flow in order to manage the Niobrara River for multiple benefits and users.



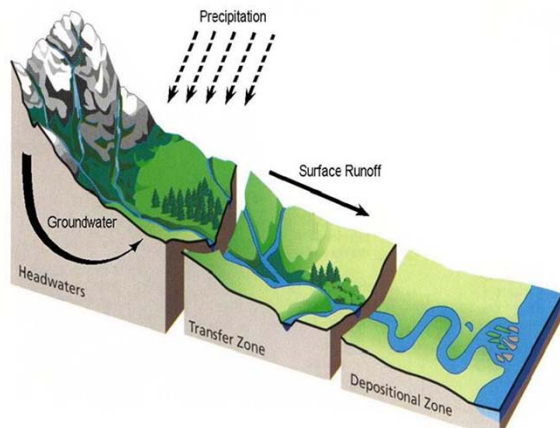
If we want the Niobrara to continue providing its current “services” for fish, wildlife, recreationists, farmers, ranchers, and hydropower generators, we must understand the various factors influencing stream flow. Continued decreases in stream flow could affect how the river functions, which in turn could affect the benefits provided by the river to various types of water users.



As previously stated, there are many factors which affect how the river flows and functions. I have just discussed how man-made structures have impacted river flows. And now, I'm going to hand it over to Carey who is going to discuss how physical characteristics of the river create various types of habitat for aquatic species.

Study #2: Purpose

- Understand connection between physical characteristics and river habitat



Purpose--Thanks Michelle. As was just mentioned, I will be focusing on the study that was done to gain a better understanding of the links between the physical characteristics and ecological characteristics of the Niobrara River. By that I mean that the study looked at how surface water, ground water, precipitation and the landscape interact to form habitat in the river.

River Functions

- Transport water
- Transport sediment
 - 900 cubic feet per second (cfs)



River Functions--The primary purposes of a river are to transport water and sediment. While the river is doing its work to transport water and sediment, it is also creating habitat and other ecosystem services along its way such as nutrient cycling, fisheries, recreation, food production, groundwater recharge, pollution filtering and biodiversity. The study found that, at some time of the year, the Niobrara river needs flows of 900 cubic feet per second to maintain the sediment transport function of the river. This flow rate is mostly achieved during spring runoff events.

--To better understand how the Niobrara river works, the study determined that the river could be divided into 3 different reaches based on what the river channel looked like.

Meandering Bottoms



Meandering Bottoms--The upper section of the river, from the headwaters downstream to just below Box Butte reservoir, the Niobrara river channel is narrow and it meanders across a wide valley. The photos show a view as if you were standing on the river bank, and also an aerial view to give you a sense of what the channel looks like from above.

Canyons and Restricted Bottoms





Canyons and Restricted Bottoms--The middle section of the river, from below Box Butte reservoir downstream to the Norden Chute, the Niobrara river channel is a bit wider, carries more flow, and is mostly confined in a canyon setting where bedrock is found on the bottom of the river channel in many places.

Braided Bottoms



Braided Bottoms--The lower section of the river, from Norden Chute downstream to the confluence with the Missouri river, the Niobrara channel is much wider with a wide valley, and flows over a sand bottom where many sandbars are present in the channel.

Diversity of Habitats & Species

		Water Velocity		
		Slow	Moderate	Swift
Water Depth	Shallow			
	Intermediate			
	Deep			

Diversity of Habitats and Species--In taking a closer look at each of these three different channel reaches, the study found that river flow velocities and flow depths varied in each reach. This is important because aquatic habitat diversity is based on flow velocity and depth.

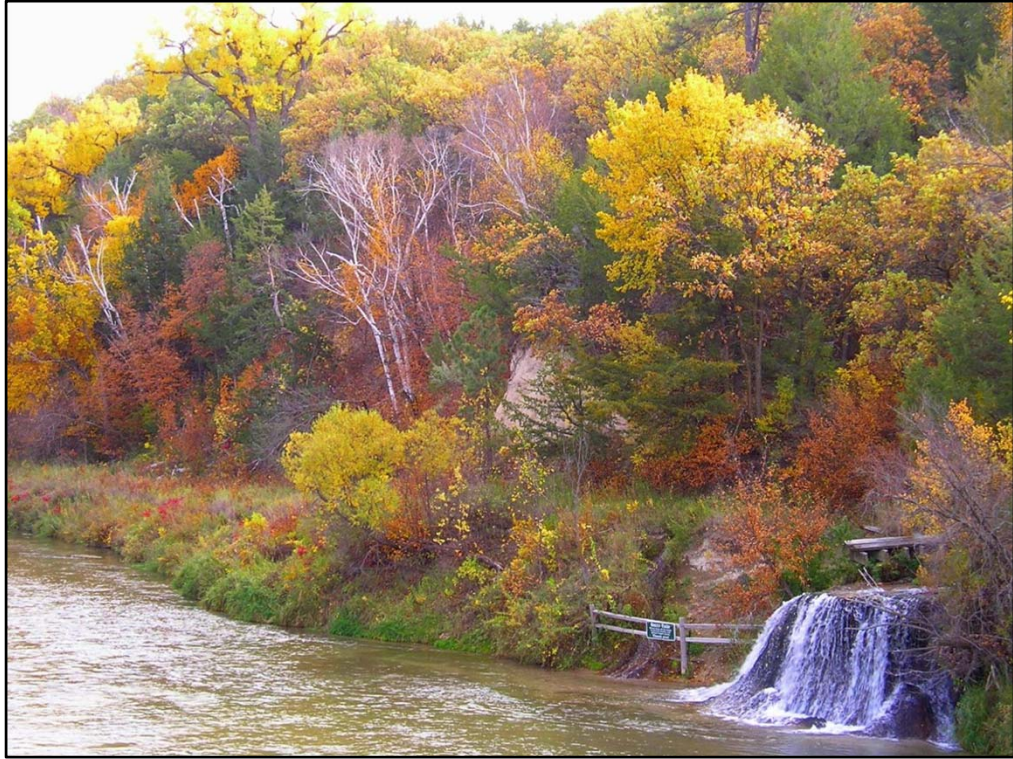
--The study looked at a range of flow velocities from slow to swift, and depths from shallow to deep. The upper reaches of the river channel have shallower depths and slower water which is more suitable for species like shiners, minnows, and chubs. The lowest reaches of the river channel have a greater diversity of habitat types overall, including much deeper water depths and swifter moving water which is more suitable for species like catfish, drum, and sturgeon.

Application

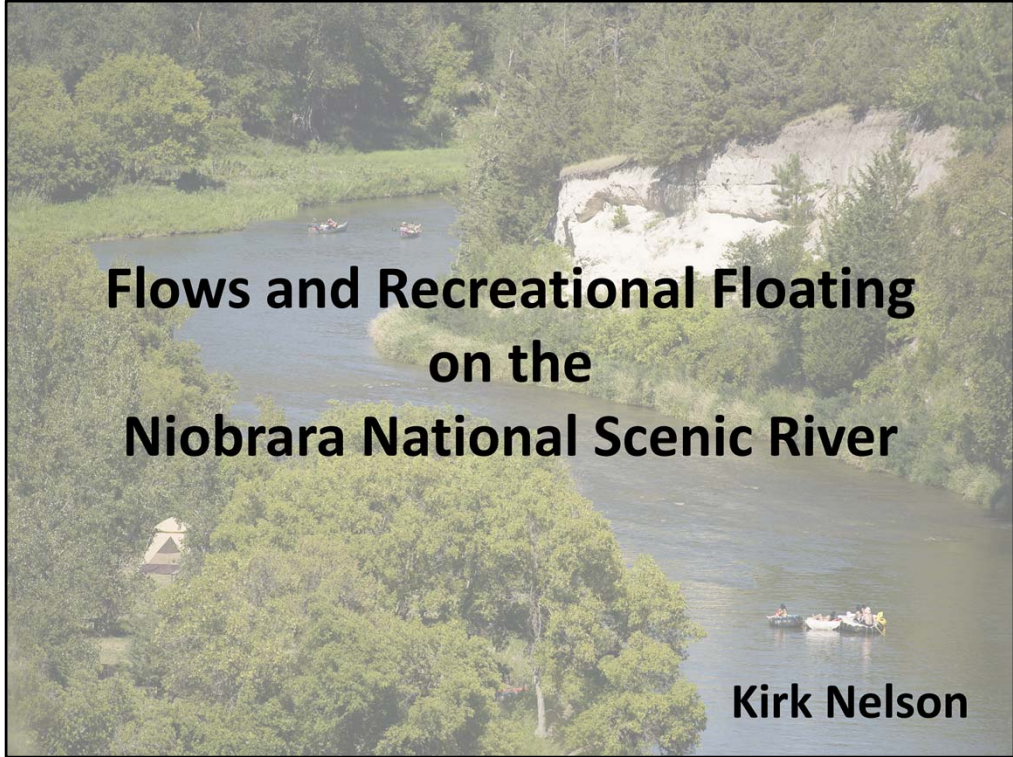
- Different flow depths and velocities create a diversity of habitat, making the Niobrara River system more resilient and creating a wider range of benefits and functions over the long term.



Application--In conclusion, the more variation in flow velocity and depth means there are more diverse habitats available to support a diverse fish community, and a river system with a variety of channel and flow characteristics such as the Niobrara will be more resilient over the long term and continue to provide its many ecosystem services.



Questions and answers



**Flows and Recreational Floating
on the
Niobrara National Scenic River**

Kirk Nelson

Study Goals and Objectives

- One of the goals of the study was to assess relationships between flows & recreation opportunities.
- **Specific Objectives include:**
 - Identify flow-dependent recreation opportunities with a focus on scenic floating in canoes, kayaks, and tubes
 - Describe flow-quality relationships and flow ranges for each type of opportunity



Study Goals and Objectives are mentioned in this slide. These are not all the goals and objectives of this study but only the ones to be addressed in this talk.

Survey Findings

Information from a 2007 National Park Service user survey regarding floating on the Niobrara River from Cornell Dam to the Norden Bridge shows:

- Most Niobrara floaters are from Nebraska, are part of family groups who have little experience on the Niobrara and rudimentary boating skills.
- About 90% rent canoes, kayaks, or tubes from one of 13 outfitters, about 56% use canoes and kayaks and 42% use tubes.
- Annual use ranges from 33,000 to 44,000 people in recent years.
- Nearly 80% of use occurs on Saturdays, 10% on Sundays, and the remaining 10% through the rest of the week. Most use occurs from Memorial Day through Labor Day, although there is some use from early May through October.

These survey findings are from the National Park Service Survey done in 2007.

Fieldwork and Interviews



- Fieldwork was conducted in May 2006 and July 2007, allowing observations at about 440 and 800 cfs (at the USGS Sparks gage).
- An outfitter focus group & phone interviews were conducted in 2007.
- The interview panel included 27 outfitters, agency staff, and experienced users who had taken many trips on the river at different flows.

The authors of this study conducted both fieldwork and Interviews to arrive at their conclusions.

List of Flow-dependent Trip Attributes

- Taken together with information from fieldwork and findings from other flow-recreation studies, the following four attributes appear most relevant for assessing flows for Niobrara floating opportunities.

1. Boatability
2. Safety
3. Aesthetics
4. Rate of Travel



- Interviewees were asked to specify flows that provide boatable conditions and identify acceptable and optimal flow ranges.

The Flow-dependent trip attributes were used to determine a range of flows deemed necessary to accommodate recreational activities on the river.

Flows & Ranges for Recreation Opportunities on Niobrara NSR

Specified flow for floating opportunities	(cfs)	Flow Ranges
Lowest flow that allows use of the river for transportation (minimum boatable flow)	340	319 to 346
Lowest flow that provides an acceptable quality "scenic trip"	460	450 to 500
Lowest flow that provides an optimal quality "scenic trip"	600	550 to 600
Highest flow that provides an optimal quality "scenic trip"	900	750 to 1,000
Highest flow that provides an acceptable quality "scenic trip"	1,200	1,050 to 1,200
Lowest flow that provides optimal whitewater in the three Class II-III rapids	800	740 to 1,000

This table lists the recreational activities and the corresponding flows for each floating opportunity.

In Summary

Based on interview information and supported by fieldwork

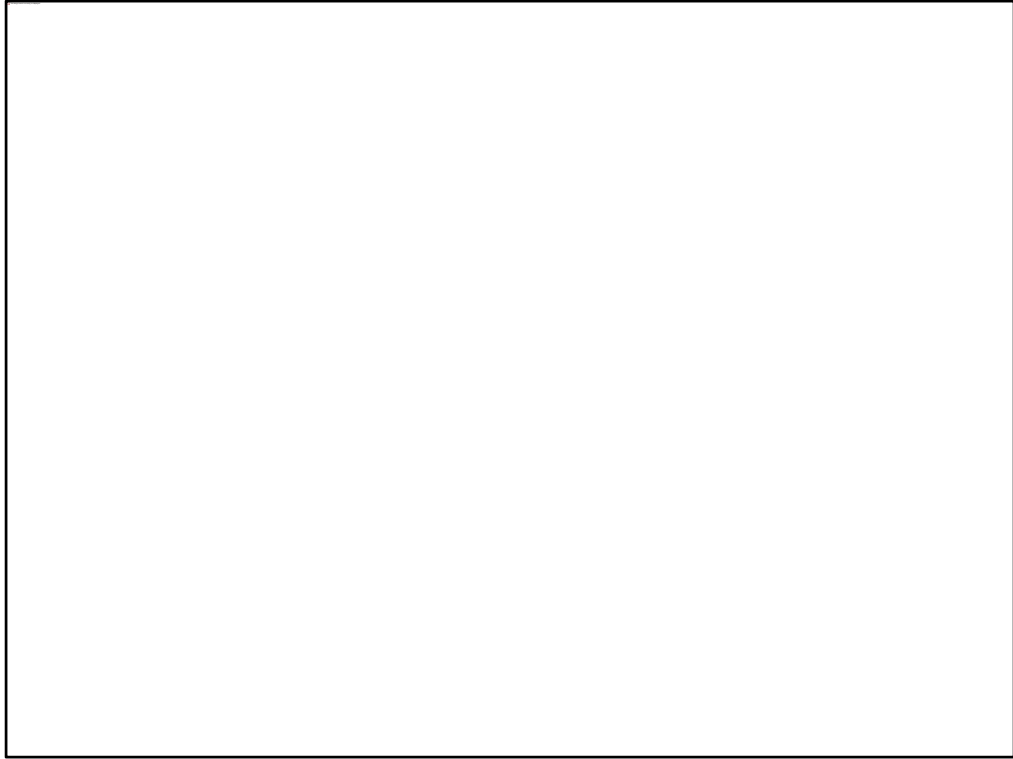
- Flows higher than 460 cfs provide acceptable boating opportunities.
- Flows between 600-900 cfs provide optimal boating opportunities.
- Tubing flows are similar except at the high end of the optimal range.
- Whitewater at the Class II-III rapids becomes optimal above 800 cfs.
- Flows between 340 cfs and 460 cfs are boatable and tubable, but offer lower quality opportunities.
- Flows below 340 cfs (rarely observed in the period of record) are considered “unboatable.”

A summary of the range of flows judged to be necessary to accommodate recreational floating on the river.

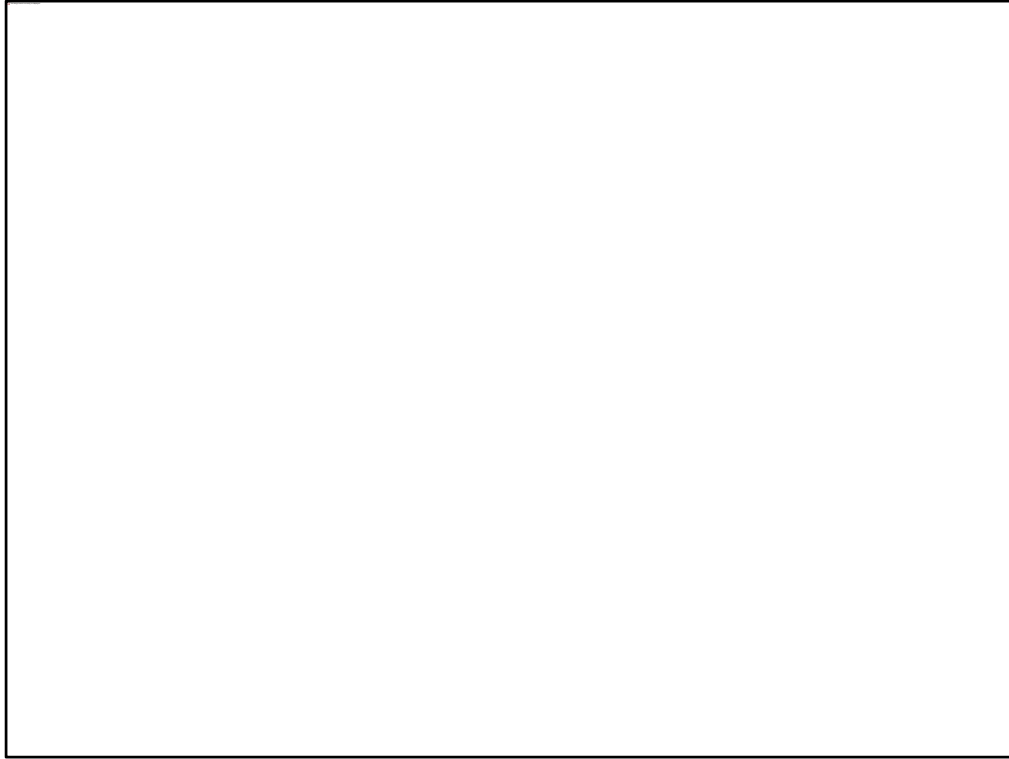
River Flow Scenarios

- The remainder of this study involves the analysis of various factors influenced by wet and dry precipitation years including estimated impacts from past and potential future water development projects on river flows.

Additional information from the study.



Questions and answers



I will be presenting two different economic studies concerning the Niobrara River. The first is Titled "Economic and Social Values of Recreational Floating on the Niobrara River." This study was conducted in 2009.

Use of Niobrara River

- 73% of Nebraskan's are familiar with the Niobrara River.
- 33% have floated it.
- 53% have recreated on it (including floating, camping, and fishing).
- 92% know of friends or family who have recreated on the river.



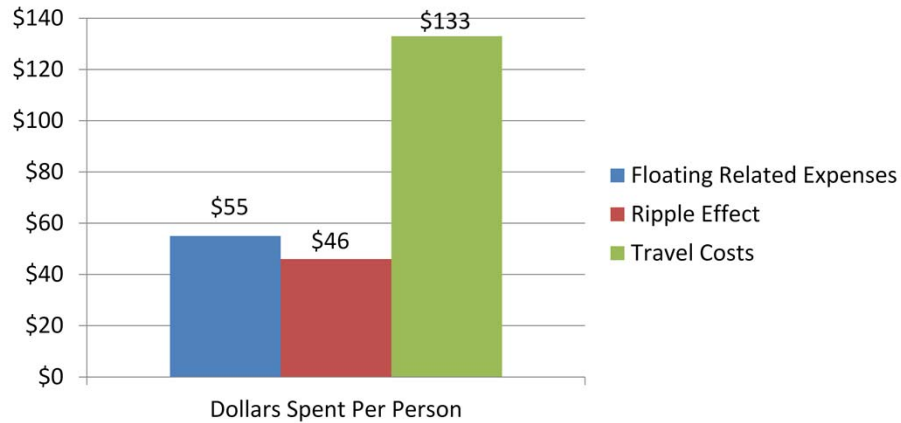
Based off a statewide survey completed by BOSR for NGPC in 2008

Recreational Floating on the Niobrara River

- Floating on the river increased 8.5% per year from 2005 to 2008.
- 73% of the people floating the river are from Nebraska.
- Tubes are by far the most popular device used.
- Typical floaters make 3 trips every 4 years.
- Typical trips last 2 days with 1.3 days floating.
- 98% of floaters camp or stay in local hotels during their trip.
- 87% rent equipment or use shuttle services of local outfitters.
- 33% buy groceries at local stores and 23% eat meals at local restaurants.

The information shown in this slide comes from outfitters and a survey of floaters conducted in 2007 and 2008. From 05-08 there was a 8.5% increase in floaters using the river this growth rate is up from 2.3% from 01 to 05. 73% of floaters are from Nebraska. Tubes are the most popular device by far 75% of floater in 2008 used tubes up from 32% in 2001. This increase in tube usage corresponds to the increased growth rate. Floaters make 3 trips every 4 years telling us this is a yearly event for most people, many of which come in large groups. Typical trips last two days, mostly weekend trips. 98% of floaters camp or stay in local hotels. 87% rent equipment or utilize outfitters for shuttle service. 33% buy groceries locally, and 23% eat at local restaurants.

Economic Values Associated with Floating the River



Total values in 2008 were \$234 per river floating day or \$10.9 million for the year.

The numbers shown on this graph represent the amount of money that is spent locally per person per day. \$55 per person per day is spent on floating related expenses, such as rental equipment, food, and lodging. \$133 per person per day is spent on travel costs, this is calculated by taking the average number of miles traveled multiplied by the federal mileage rate in 2008 of \$0.55. The ripple effect of \$46 per person per day represents the money that locals put back into the local economy because they are paid from the revenue of floaters.

Floaters Perceptions of Water Flows

- 23% of floaters felt low flows were a primary concern/threat.
- 11% were most concerned with litter and water quality issues.
- 35% consider flow levels while planning trips.
- 66% check on flows in advance of a trip.

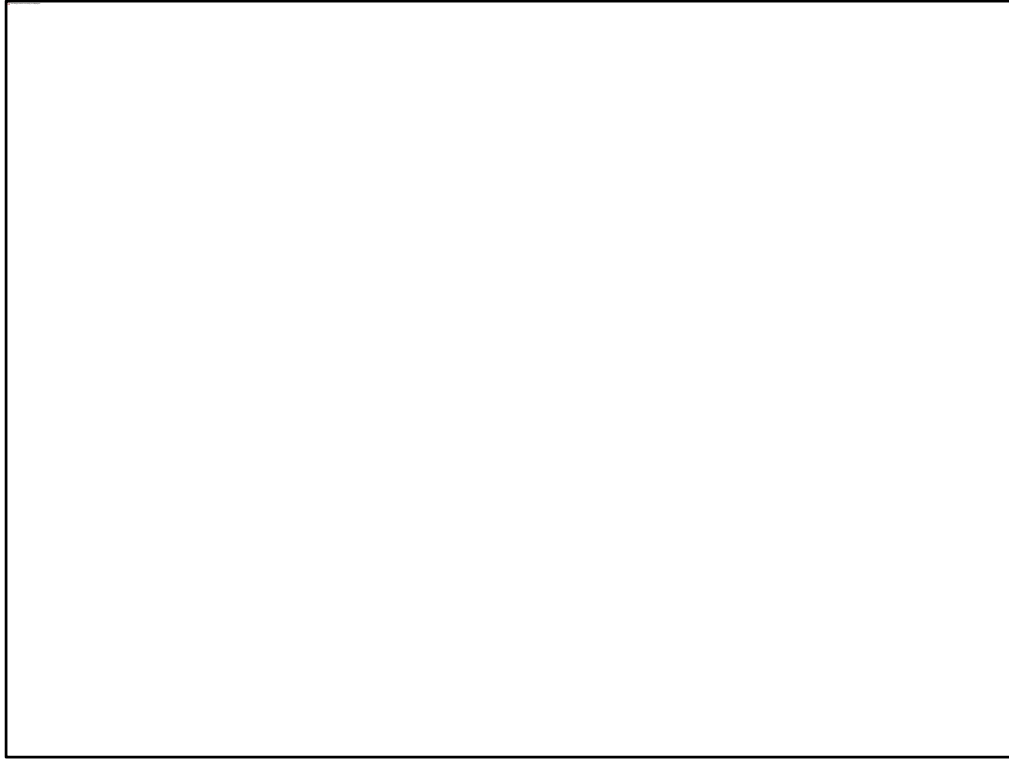
Based off the 07-08 floater surveys, 23% felt low flows were a primary concern/threat to the river. 11% were most concerned with water quality and litter. 35% considered flow levels while planning their trip, and 66% check on flow levels prior to a trip. As information becomes more available such as real time stream gauge data being available on line people are increasing becoming more informed.

Current and Potential Economic Losses Due to Low River Flows

- 4.5% of floaters would not return due to the low flows they experienced.
- That 4.5% loss equates to \$488,446 per year.
- Over the next decade these losses are predicted to range from \$471,000 to \$659,000 per year.



This slide looks at potential losses due to low flows. 4.5% of floaters surveyed said they would not return due to the flow levels they experienced. That loss equates to approximately \$488,446 per year. Over the next decade those losses could be anywhere from \$471,000 to \$659,000 per year depending upon the growth rate we discussed earlier of 8.5% or 2.3%.



Now I will move on to the second study regarding the economics of the area. This study is titled “The Extent and Value of Agricultural, Municipal, and Industrial Water Use in the Niobrara Basin” and it was completed in 2010.

Municipal and Industrial Water Uses

- Drinking Water needs are low and not expected to increase in the future.
- Industrial needs are also low and not expected to increase.
- Hydro-electricity generation at Spencer Dam has a historical water right of 2,035 cfs (1.4 million acre-feet per year) and an average use of 1,207.23 cfs.
- This report estimates the Hydro-electric values to be \$0.48/acre-foot.



Both Municipal and Industrial water usage is relatively low and not expected to increase. This is due to the low population of the Niobrara basin and the distance to large population centers. Hydro-electricity generation at Spencer Dam is valued at \$0.48 per acre foot and therefore is also not a significant economic factor.

Irrigated Agriculture Usage

- 794,500 acres are irrigated in the basin.
- 84% of irrigation is from groundwater.
- Estimated potential for additional irrigated land is 106,000 acres or a 13.3% increase.



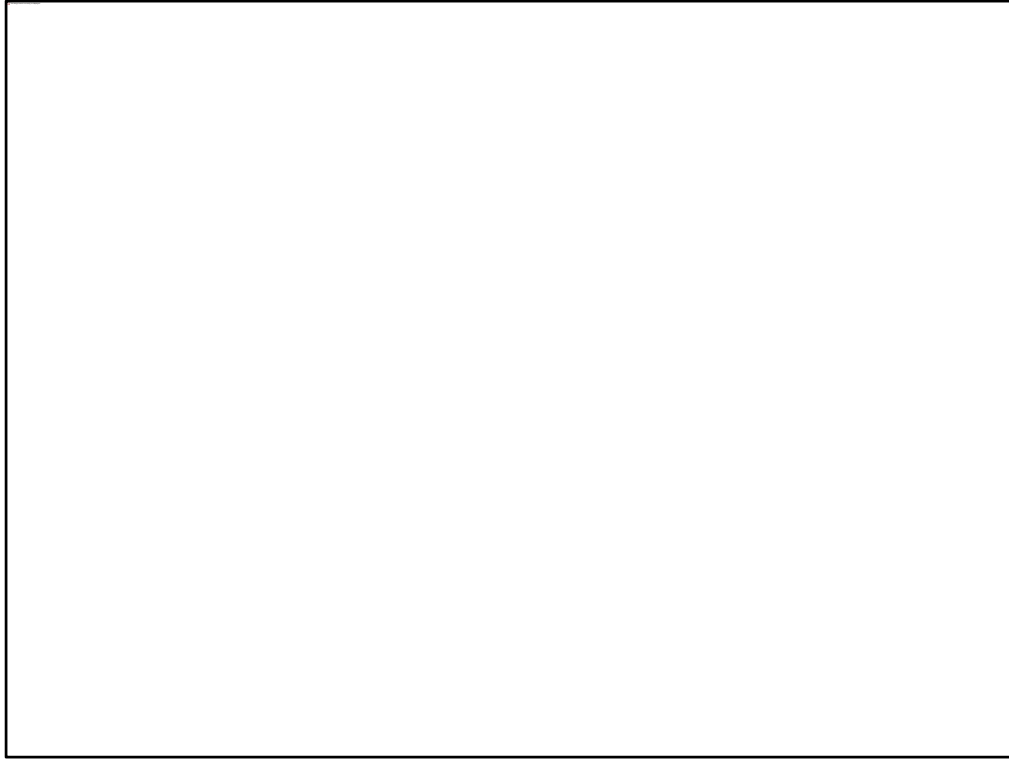
The bulk of the study was devoted to Irrigated Ag usage. In 2008 there were almost 800,000 irrigated acres in the basin, 84% of which came from groundwater sources. Based off a GIS analysis that looked at soil and topographic data the study estimated there to be the potential for an additional 100,000 acres for irrigation roughly a 13% increase.

Economic Value of Irrigation

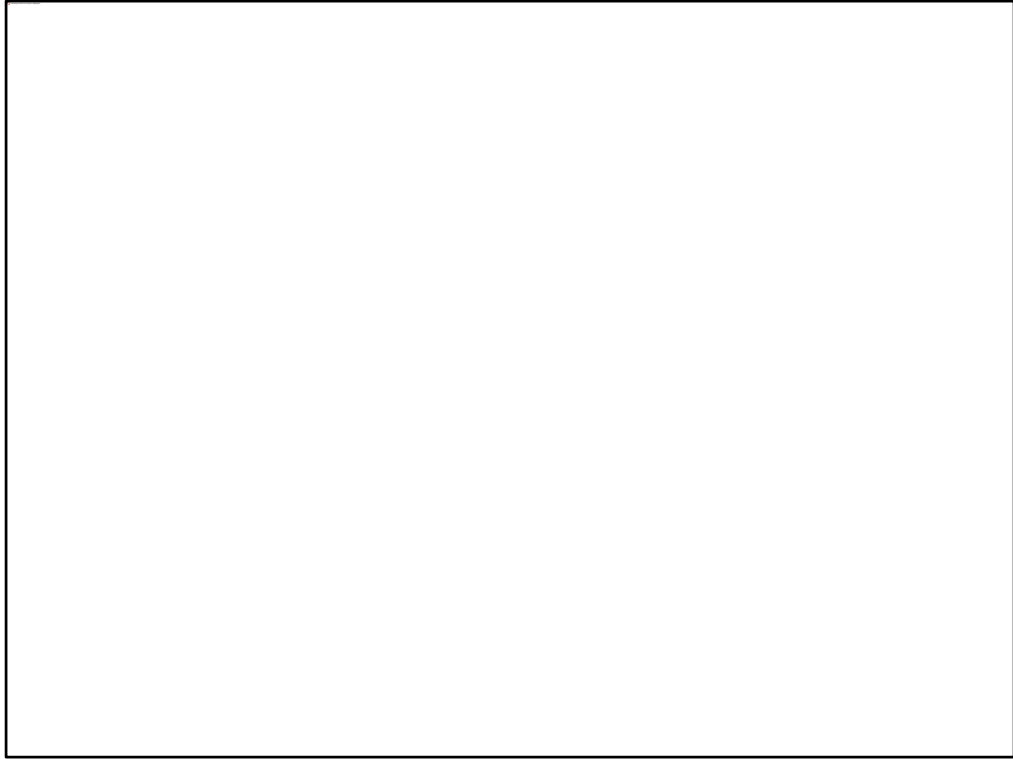
- Price modeling for this study showed irrigation values of \$827/acre.
- Irrigation increased property values by 63% across the region with variances from 51% to 89%.
- When comparing irrigated v. non-irrigated land values, irrigated land added \$44 million of economic value to the basin per year.



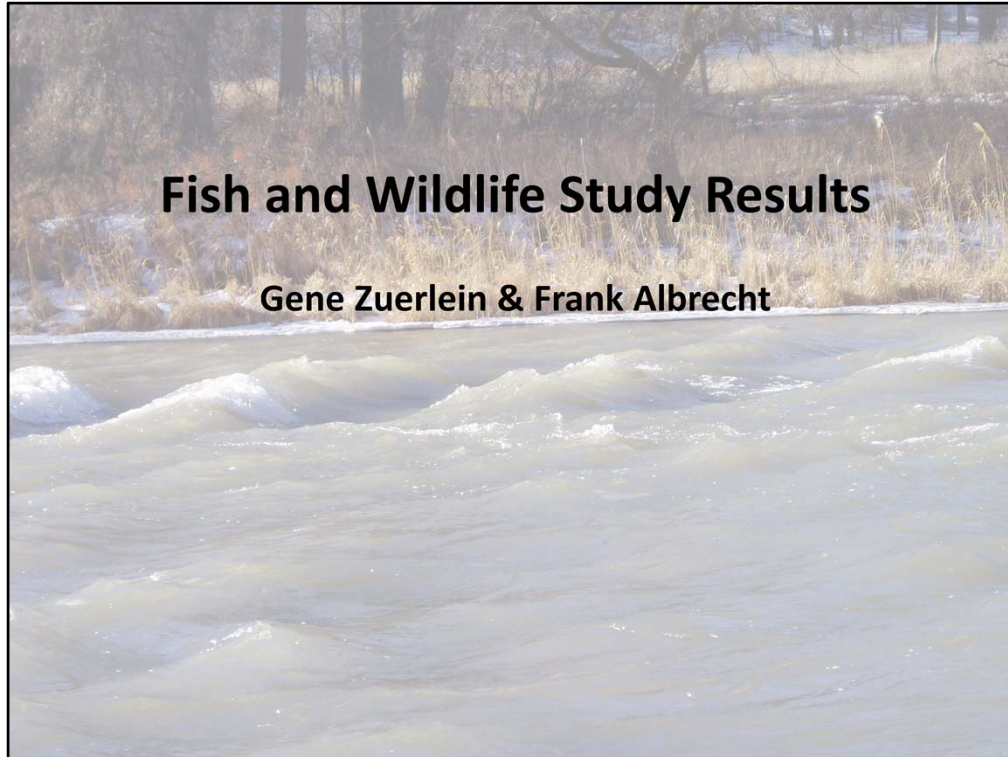
This study estimated the additional value of irrigated land vs non irrigated land to be \$827 per acre. Irrigated property values are 63% higher across the basin with variances between 51% and 89%. When comparing irrigated v. non-irrigated land values, irrigated land added \$44 million of economic value to the basin per year.



In conclusion Irrigation and Recreation have the most significant impact to the local economy of the Niobrara Basin. Another important point to note is that irrigation along the Niobrara river largely comes from groundwater sources, surface water irrigation accounts for only 16% of all irrigation in the basin.



Questions and answers



Instream flow simply means protecting some quantity of water in the Niobrara for a beneficial purpose, such as fish and wildlife. The MesoHABSIM study is just a fancy name for a model that evaluates riverine habitats used by fish and bird species. This study was conducted by expert Piotri Parasiewicz of the Rushing Rivers Institute in Massachusetts and Dr. Mark Pegg, a fishery professor, from the University of Nebraska, Lincoln. Riverine habitats evaluated included:

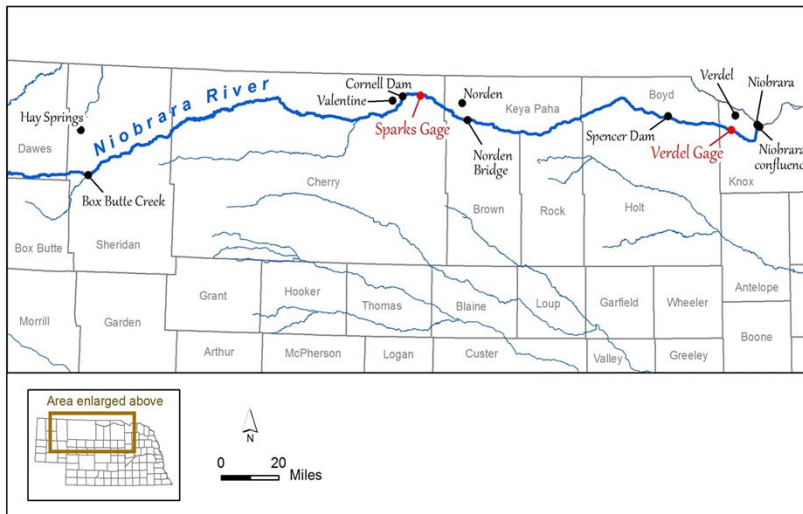
- main channel areas.... (with greater velocities and depths (runs)).
- riffles areas.... (with velocities lower than main channel areas).
- off-channel pools or backwaters.... (near the rivers edge).
- channel margins.... (with low velocity & shallow depths).
- secondary channel margins.... (with low velocity & shallow depths).
- sandbars.

Fish and Wildlife Species on the Niobrara

<u>Fish species included in five riverine habitats types</u>	<u>Species of Special Interest</u>
Bigmouth Shiner	Paddlefish
Red Shiner	Pallid Sturgeon
Plains Topminnow	Shovelnose Sturgeon
Largemouth Bass	Sauger
Fathead Minnow	Adult Channel Catfish
Brook Stickleback	<u>Interior Least Tern</u>
YOY Channel Catfish	<u>Piping Plover</u>
River Carpsucker	<u>Whooping Crane</u>
Emerald Shiner	
Sand Shiner	

Model input includes: 1) capturing fish at high, medium, and low flows and quantifying existing riverine habitat & developing a model of **habitat availability**, 2) identifying & model **available habitat used** by target species under each flow regime, and 3) determining **flows** (magnitude, frequency, duration, timing, and rate of change) **needed to sustain or maintain** the existing fish and wildlife community.

Niobrara Reach with Stream Flow



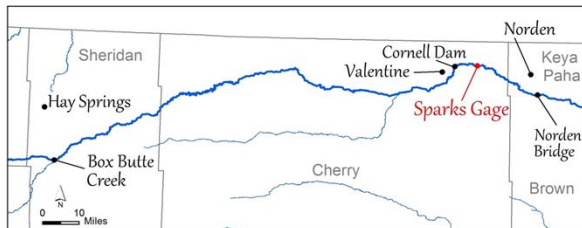
Different segments of the river can have different flows from west to east. For fish and wildlife study purposes, the 310 miles of Niobrara River is broken into two reaches with one significant USGS gage station in each. The upper reach from Box Butte Creek downstream to the Norden Bridge has the Sparks gage as key while the lower reach from Norden Bridge downstream to the confluence has the Verdel gage as key.

1. Fish Community Flows (Sparks gage) **Study Results:**

Purpose: To maintain the fish community

Reach: Box Butte Creek confluence downstream to Norden Bridge (185 miles)
(Sheridan Co. to Brown Co.)

Bioperiod: January 1 - February 28(29), for overwintering late habitat **965 cfs**
 March 1 - May 14, for early spawning habitat **701 cfs**
 May 15 - June 30, for late spawning habitat **701 cfs**
 July 1 - September 30, for summer rearing and growth habitat **665 cfs**
 October 1 - December 31, for overwintering early habitat **894 cfs**



In the upper reach, to maintain the fish community, study results indicate that for 5 timeframes, flows need to be higher in the Jan/Feb time frame, slowly decreasing through summer and September, and then slightly increasing in Oct/Dec as measured at the Sparks gage.

2. Fish Community Flows (Verdel gage)

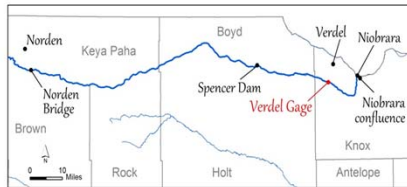
Study Results:

Purpose: To maintain the fish community

Reach: Norden Bridge downstream to Niobrara confluence (125 river miles)
(Brown Co. to Knox Co.)

Bioperiod: January 1 - February 28(29), for overwintering late habitat ... **2,084 cfs**
March 1 - May 14, for early spawning habitat **2,270 cfs**
May 15 - June 30, for late spawning habitat **2,270 cfs**
July 1 - September 30, for summer rearing & growth (1,725)
July 1 - September 30, for rearing and growth habitat (1,806) **1,765 cfs**
avg.

(Includes paddlefish, pallid sturgeon, sauger, adult channel catfish)
October 1 - December 31, for overwintering early habitat **1,969 cfs**



In the lower reach, to maintain the fish community, study results indicate that for 5 time frames, flows in the Jan-Jun time frame should be in the 2,000 -2,300 cfs range, decrease during the Jul/Sept period, and slightly increase to 1,969 cfs in the Oct/Dec time frame. The summer flows for the fish community and fish species of special interest, which includes the endangered pallid sturgeon, are averaged at 1,765 cfs.



Flows to maintain riverine habitat for three bird species of special interest were determined from the study. The lower reach of the river is broad, has a higher volume of water, has sandbars and more braided channels.

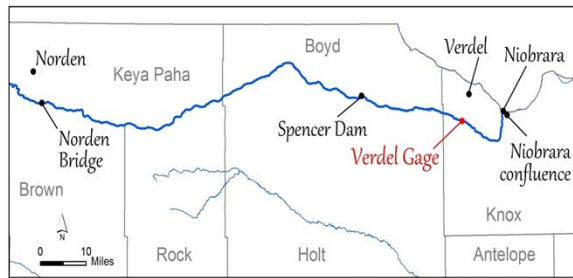
3. Whooping Crane Roosting Flows (Verdel gage)

Study Results:

Purpose: To maintain spring and fall roosting habitat

Reach: Norden Bridge downstream to Niobrara confluence (125 river miles)
(Brown Co. to Knox Co.)

Bioperiod: April 1 - April 30, for spring migration habitat **1,806 cfs**
October 1 - October 31, for fall migration habitat ... **1,714 cfs**



To maintain spring and fall roosting habitat for Whooping Crane in moving water in the lower reach, a flow of 1,806 cfs is needed in April and 1,714 cfs is needed in October. The Whooper uses wide open channels as a defense mechanism ... able to see predators.

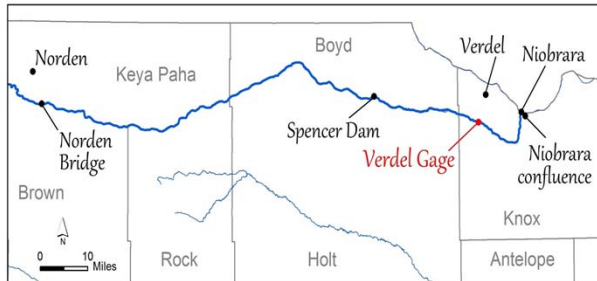
#4. Least Tern Nesting Flows (Verdel gage)

Study Results:

Purpose: To maintain nesting habitat

Reach: Norden Bridge downstream to the Niobrara confluence (125 miles)
(Brown Co. to Knox Co.)

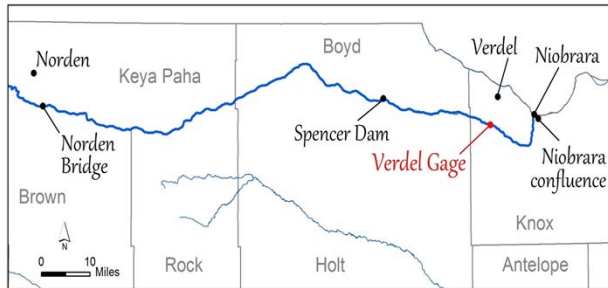
Bioperiod: May 1 – August 31, for nesting habitat**1,818 cfs**



To maintain nesting habitat on sandbars for least tern in the lower reach, a flow of 1,818 cfs is needed May through August. Most are fledged by the end of August.

5. Piping Plover Nesting Flows (Verdel gage)
Study Results:

Purpose: To maintain nesting habitat
Reach: Norden Bridge downstream to the Niobrara confluence (125 miles)
(Brown Co. to Knox Co.)
Bioperiod: May 1 – August 31, for nesting habitat**1,424 cfs**

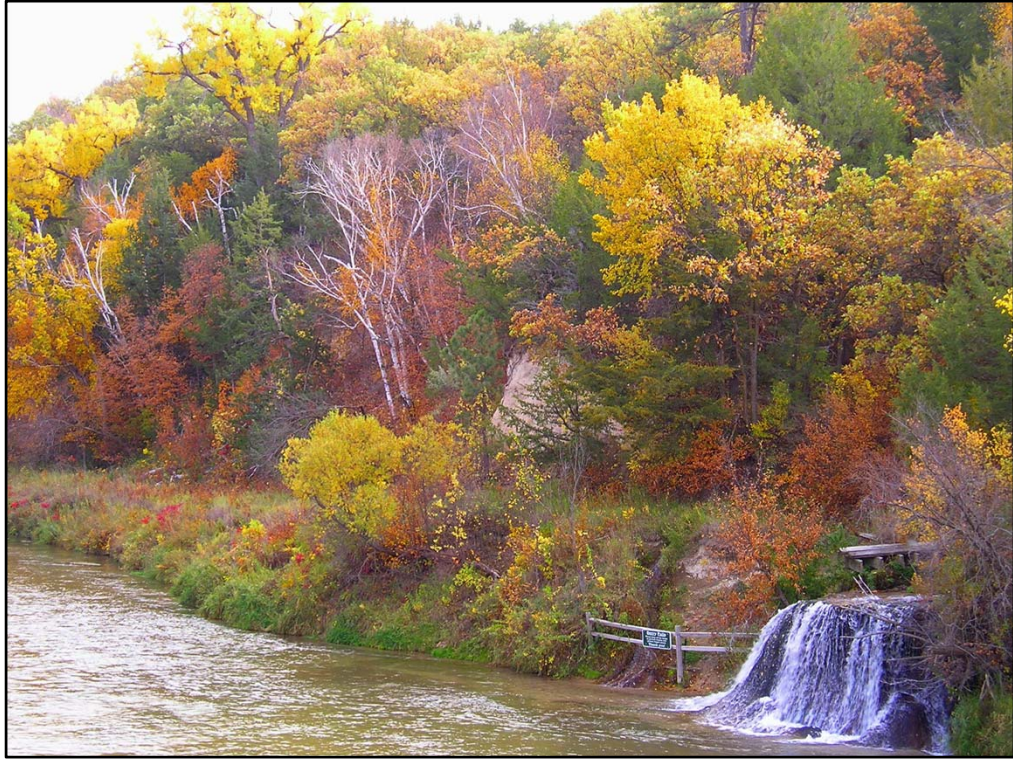


To maintain nesting habitat on sandbars for piping plover in the lower reach, a flow of 1,424 cfs is needed May through August. Slightly different sandbar criteria used in the model is the reason why there are different flow recommendations for the terns and plovers.

Summary

- Fish and wildlife are public trust natural resources important to stakeholders across the state of Nebraska.
- The pallid sturgeon, whooping crane, and least tern are state and federal listed endangered species, the piping plover is a state and federal listed threatened species.
- A healthy river will not only support fish and wildlife, but multiple benefits including groundwater recharge, water quality, recreational floating pursuits, distribution of nutrients relied upon by the entire aquatic food chain, etc.
- The Niobrara River is the gem of northern Nebraska. We can all work together to help protect this tremendous resource.

Overall, fish and wildlife are public trust natural resources which belong to all citizens and future generations. A sustainable healthy river will serve multiple benefits and help grow Nebraska's economy.



Questions and answers

Wrap Up

The studies show that keeping water in the River can benefit...

- The health and diversity of the area
- The local economy
- Habitat for Threatened and Endangered Species
- The aesthetic value of the river

As you can see the Niobrara River provides great benefit to Nebraska and at this time functions very well.

If you have any additional information to add to this that is related to this topic that we should know, please come up after the meeting and talk with us. We will be here for the next hour to hear any other comments in our different break out areas. Our local staff is also here to answer any other concerns or questions you may have.

We appreciate all the questions you came with today. Your comments and questions allow us to look at this topic more broadly and we will incorporate this information into whatever our next steps may be regarding the Niobrara River. Thanks for coming!

Thanks for coming!

To view this PowerPoint or the Studies,
please go to

<http://outdoornebraska.org/Niobrara>

Questions?

Feel free to call Gene Zuerlein at (402) 471-1542

Niobrara River Study Area

