Instream Flow Implementation in Nebraska

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STATE OF NEBRASKA
GAME AND PARKS COMMISSION
FISHERIES DIVISION
WILDLIFE DIVISION

Federal Aid in Sport Fish and Wildlife Restoration
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Performance Report
Study 1
Instream Flow Implementation in Nebraska

December 1, 2008 through November 30, 2009

Foreword

Upon completion of the segment report (FW-19R-14), which ran from June 1, 1999 through May 31, 2000, it was decided to transform this project into technical assistance because of the many faceted aspects surrounding the ways and means to protect instream flows / flow regimes important to fish and wildlife resources, and ultimately the citizens who appreciate and enjoy these resources. While site specific instream flows are very beneficial , prudent, and necessary, the knowledge base of rivers and the processes necessary to sustain them has increased tremendously over the past decade or two. Numerous scientific publications and river studies have yielded the fact that natural river systems can and should be allowed to repair and maintain themselves in providing healthy and diverse aquatic communities. What we as a society have done in the past is attempt to control rivers at all costs. This has led to a false sense of security by many, institutionalizing of certain programs, especially federal programs that call for repetitive federal bailout of anthropomorphic encroachments onto floodplains and river channels. Many have unknowingly placed themselves in harms way because they have this false sense of security including the fact that they believe the federal government will come to their rescue when mother nature follows its natural hydrologic rhythm/pattern.

As a result of this past mentality, five hydrologic components of a river's flow regime are often over looked, besides the occasional one hundred year flood. These components are magnitude, frequency, duration, timing, and rate of change. River ecosystems can be damaged and degraded by a multitude of human actions. Changing the natural flow regime is one of the most devastating ways and causes of declining health in rivers. The natural variability of river flows is responsible for creating a wide range of habitat types and ecosystem processes that maintain the natural biological diversity of aquatic and riparian species dependent upon them. A major consequence of this cycle of natural variability is that all species find favorable conditions for their life cycle needs at certain times. Like wise, it prevents any one species from dominating.

In addition to the flow regime (hydrology) of a stream or river, four other important components must be considered in prescribing recommended flow conditions for riverine ecology. Along with hydrology, these other components include geomorphology, biology, water quality, and connectivity (Annear et al. 2002 and 2004). Geomorphology considerations include evaluation of flows necessary to maintain the dynamic nature of an alluvial channel. Geomorphology factors of primary importance are discharge, sediment supply, sediment size, channel width, depth, velocity, slope, and roughness of channel materials. Biological considerations include the range of species that can be affected in the river, riparian zone, and floodplain in preparing instream flow prescriptions. Some of the important biological factors to consider include hydraulic habitats, life history cues for spawning, feeding, migration patterns, and other needs. Water quality is often affected by the amount of stream flows. These can include water temperature, dissolved oxygen, and concentration of pollutants. Connectivity is about the movement, exchange, and pathways for organisms, energy and matter through riverine systems. Connectivity in a healthy river ecosystem is linear (upstream-downstream), lateral (overbank and floodplain), vertical (hyporheic zone of the stream bed), and temporal (timing and duration of connections to backwaters, wetlands, floodplain) to meet life cycle needs of riverine species. Linear connectivity is often fragmented by dams and other barriers that impede or prevent movement of fish. Lateral connectivity between a river and floodplain habitats is sometimes

fragmented by flood control levees. Temporal fragmentation is usually caused by human induced flow management for industrial, agricultural, or municipal water supply uses. Changes in stream water quality can also lead to fragmentation of habitats, such as changes in water temperature from dam discharges or industrial sites, or discharge of contaminants.

Alternation of the natural flow regime results in numerous physical, chemical, and biological changes detrimental to an entire river ecosystem in the long term as well as the environmental services provided by healthy streams. Current river management practices often consider only one or two important imperiled species and how little water can be left in the river for their needs. While it is important to look after their needs, we must not lose sight of the fact that the whole river ecosystem is important to sustaining the most important landscape feature in any watershed, its rivers and steams.

The United States has passed through four eras of public land and resource management (Dombeck et al. 1997). They are (1) settlement and development of the original public domain (1789-1834); (2) the public land stewardship era with the resource conservation ethic beginning with Theodore roosevelt's presidency in the early 1900s; (3) World War II and subsequent national growth (1941-1962); and (4) the era of environmental laws (1962-1990). From these historical happenings, a new fifth era of watershed restoration and collaborative stewardship is emerging across the United States.

Postel and Richter (2003) reported that the World Commission on Dams developed a New Policy Framework for Large Dams. Among the framework was the recommendation to "Sustain Rivers and Livelihoods". This recognizes that rivers, watersheds, and aquatic ecosystems are the biological engines of the planet. They are the basis for life and the livelihoods of local communities. A significant portion of society is also coming to the realization that human welfare is intimately associated with the health of the ecosystems around them and that by protecting rivers we also protect ourselves.

Cover photo: Surface water diversion on the Niobrara River in the Nenzel to Anderson Wildlife Management Area reach during August 2007. Photo by Gene Zuerlein.

PERFORMANCE REPORT

STATE: Nebraska **GRANT NUMBER:** FW-19-T-21

GRANT TYPE: Technical

GRANT TITLE: Instream Flow Implementation in Nebraska

PERIOD COVERED: 1 December 2008 through 30 November 2009

STUDY TITLE AND OBJECTIVES:

Study I. Instream Flow Implementation in Nebraska

The overall objectives of this project are to protect and enhance fish and aquatic wildlife resources in Nebraska's flowing waters by: 1) coordinating and providing aquatic technical assistance to governmental, individual, and private entities regarding existing and future development project impacts on fish and wildlife resources, and 2) coordinating planning recommendations and advocating protection of instream flows and related habitat quality for public trust natural resources.

1. Objective I-1. The objective is to coordinate and provide aquatic technical assistance to governmental, individual, and private entities regarding existing and future development project impacts on fish and wildlife resources.

   a. Activity:

   1. Platte River Recovery Implementation Program (PRRIP). Originally, this Cooperative Agreement (CA) was signed by the governors of Nebraska, Wyoming, Colorado, and the US Department of Interior (USDI) Secretary on July 1, 1997 to see if agreement on a voluntary, cooperative, phased, basin-wide recovery effort could be reached for piping plover, interior least tern, whooping crane, and pallid sturgeon. As part of the Cooperative Agreement, a Governance Committee (GC) was formed to lead the negotiation process. The GC consisted of representatives of the three basin states; the Bureau of Reclamation; the Fish and Wildlife Service; water users from each of the basin states; and environmental groups. The work of the GC concluded in early 2006 with a Final Program Document containing direction for all key elements necessary to implement a program to manage land and water resources to provide benefits for four "target species" on the river in Nebraska; the endangered whooping crane, interior least tern, pallid sturgeon, and the threatened piping plover. A study to test the ability of program water to affect lower Platte River flows was originally set up to be part of the Integrated Monitoring and Research plan throughout calendar year (CY) 2002 but was postponed, possibly until 2007 or later. Target flows for the central Platte River have been identified by the US Fish and Wildlife Service (USDI, USBR,USFWS 2006). There are two categories of target flows. One category is "**species flows**" designed to benefit particular listed species. Target flows for the fish community of the central Platte River reach are included. This category of species target flows is presented in Table 1. The other category of target flows are "**pulse flows**"

designed to provide or restore in-channel geomorphological functions. This category of pulse target flows is presented in Table 2.

Table 1. **Species flows** in cfs at **Grand Island** to sustain the species and their habitat.

Period	Wet year*	Normal year*	Dry year*
January 1 - January 31	1,000	1,000	600
Febuary 1 - March 22	1,800	1,800	1,200
March 23 - May 10	2,400	2,400	1,700
May 11 - September 15	1,200	1,200	800
September 16 - September 30	1,000	1,000	600
October 1 - November 15	2,400	1,800	1,300
November 16 - December 31	1,000	1,000	600
* Wet years defined as the wettest 33 percent, dry years are the driest 25 percent, and normal years are all others			

Source: USDI, USBR, USFWS. 2006. Platte River Recovery Implementation Program, Final Environmental Impact Statement, Table 3-3 on page 3-10.

Table 1 (continued). Key benefits of **species flows** for the timeframes identified above.

Period	Key Biological Benefits of Species Flows
January 1 – January 31	Promote winter survival of native fish community and aquatic insects. Provide foraging habitat for bald eagles and raptors.
February 1 – March 22	Provide migrating waterfowl and other bird species with suitable migration habitat at a time when other nearby wetland habitats may be frozen. Form and move ice which scours vegetation and shapes the channel.
March 23 – May 10	Provide whooping crane night roosting habitat. Provide channel habitat for water dependent organisms, including spawning fish, mussels, and migratory waterfowl, wading birds and shorebirds.
May 11 – September 15	Provide shorebird nests with a degree of protection from terrestrial predators. Protect native fish communities from losses due to high water temperatures.
Sept. 16 – September 30	Maintain and prevent loss of native fish community and promote survival of fish young-of-year.
October 1 – November 15	Provide fall migration and roosting habitat for migratory bird species, including the whooping crane. Maintain aquatic life (e.g. promote growth of young-of-year fish).
November 16 – December 31	Maintain habitats necessary to support fish communities. Provide bald eagle feeding habitat.

Table 2. Annual pulse flow targets in cfs at **Grand Island** to keep the river connected to the floodplain and maintain hydrology of adjacent wet meadows.

Exceedance Probability (Recurrence Interval)	**Recommended flow in cfs**	**Notes**
75% (3 of 4 years)	3,100 to 3,600 (Feb-March)	30 day duration for Feb - March
	3,000 (May - June)	7 to 30 day duration for May - June
	3,400 (May - June)	10 year running mean of 30 - consecutive day exceedance
100 percent (all years)	2,000 to 2,500 (February - March)	30 day duration for February - March

Source: USDI, USBR, USFWS. 2006. Platte River Recovery Implementation Program, Final Environmental Impact Statement, Table 3-5 on page 3-11. Together the **species flows** and **annual pulse flows** constitute the **"Program Target Flows".**

These target flows are greater than instream flow appropriations currently held by the Central Platte Natural Resource District (CPNRD) and the NGPC (Appendix A**,** Table 1-3). Target flows labeled as **pulse flows** are considered vital to rejuvenate riverine processes and functions which sustain river geomorphology and consequently, the habitat diversity needed for species dependent upon the river for their survival. In addition to annual pulse flows, **peak flows** in excess of annual pulse flows are recommended on a periodic basis as follows (Table 3).

Table 3. **Peak flow** targets for Grand Island for habitat recovery purposes.

Exceedance probability (recurrence interval)	**Recommended flows (cfs)**	**Notes**
20 percent (1 in 5 years)	16,000(February – June)	5 - day duration At least 50 percent of these flows should occur between May 20 – June 20 May – June preferred for habitat benefits February – June for channel maintenance
40 percent (2 in 5 years)	12,000 (February – June)	5 - day duration
10 year running average of 5 –consecutive day exceedance	8,300 to 10,800 (February – June)	

Source: USDI, USBR, USBR, USFWS. 2006. Platte River Recovery Implementation Program, Final Environmental Impact Statement, Table 3-6 on page 3-12.

During 2006, Environmental Services staff participated in meetings with the USFWS concerning a draft Fish & Wildlife Coordination Act Report about the proposed 3-state CA program. A draft report was reviewed and appropriate comments provided. Subsequently, the US Department of the Interior (US Fish Wildlife Service and Bureau of Reclamation) issued a Final Environmental Impact Statement on the proposed 3-state program during April 2006. The purpose: to analyze and disclose the environmental consequences of the first 13 years increment of the Platte River Recovery Implementation Program. Although the river is actually short 417,000 acre-feet of water overall, during the first increment, attempts will be directed at replacing 130,000 to 150,000 acre-feet of water. Nebraska's responsibility of the proposed program is part of Lake McConaughy's storage known as the "Environmental Account" (EA) that is required under a FERC license. The EA is described later in this document. See Appendix B for a list of high priority streams and rivers in need of instream flow protection in Nebraska. Official requests for surface water appropriation projects which would have diverted South Platte and Platte river water prior to the Nebraska Game and Parks Commission becoming involved with a Platte River instream flow application are illustrated in Appendix C. Appendix D contains flow recommendations for streams and rivers using the Tennant method.

A May 23rd and 24th , 2008 weather event (Table 4) along the Platte River dumped six to seven inches of rain between Lexington and Chapman, Nebraska. This welcome event actually occurred during the preferred USFWS channel maintenance pulse flow date time

frame and exceeded discharge and volume targets, but it did not have the duration recommended in Table 3. Nevertheless, this event could serve as a fair representation of the maximum pulse flow that might be achieved by the PRRIP during the first thirteen year increment. It might provide an indication of the programs ability to influence channel morphology and in-channel sandbars via pulse flows under existing river conditions and in the absence of larger scale sediment augmentation and flow consolidation actions. This pulse flow resulted in river flows showing up as far downstream as the Highway 81 bridge south of Columbus, Nebraska.

Table 4. **Pulse** flow target and a 2008 natural high flow event discharge & volume comparison at Overton, Kearney and Grand Island gages.

Source	**Flow dates**	**Three day minimum discharge (cfs)**	**Three day maximum discharge (cfs)**	**Three day mean discharge (cfs)**	**Three day flow volume (ac-ft)**
Pulse flow target	N/A	5,000	5,000	5,000	29,752
Overton gage	May 24-26	3,710	11,200	7,597	45,205
Kearney gage	May 25-27	6,110	13,400	9,667	57,522
Grand Island gage	May 26-28	6,270	12,900	10,533	62,675

Source: Platte River Recovery Implementation Program. 2008. Data analysis summary report for May 2008 natural high flow event. Prepared for the Governance Committee of the Platte River Recovery Implementation Program by the Executive Director's Office. 24 pp.

During the current timeframe (1 Dec.08-30 Nov.09) work also focused on reviewing some of the central Platte River science studies being developed for the first 13 year increment as well as helping shape a meeting of adaptive management practioners called the Collaborative Adaptive Management Network (CAMNet). This meeting took place during March 2009 in Kearney, Nebraska with emphasis on the Platte River. Learning how to collaborate and conduct adaptive management experiments is crucial to the learning process and future resource management decisions. Learning from others who are involved in ecosystem recovery processes in other parts of the country is also important so that sustainability can be achieved in a reasonable and prudent timeframe.

2. Nebraska CA New Depletions Committee (NDC).
The NDC is a committee of Nebraska stakeholders concerned with Platte River water rights, groundwater uses, and stream flows. It met monthly for nearly four years (prior to 2005) to develop a Nebraska plan to prevent future surface and ground water depletions to surface water appropriations including NGPC's instream appropriations and USFWS target flows for listed species in the Platte River. This committee is composed of managers from seven Natural Resource Districts (NRDs), two public electric power and irrigation districts, a ground water user organization, a representative of a municipality, NDNR staff, and Fisheries Division staff from the NGPC. This effort was part of Nebraska's endeavor to develop its water management plan as part of the three state Cooperative Agreement

(CA) program with Colorado and Wyoming, and the USDI . The success of this effort will depend on developing rules and regulations that provide regulatory mechanisms for NRDs to regulate future ground water wells, and the Nebraska Department of Natural Resources (NDNR) ability to regulate surface water appropriations to prevent future depletions to target flows for instream flow appropriations as well as target flows for listed species. During 2003, the NDC suspended nearly all activity, due to efforts by the Governor appointed Nebraska Water Policy Task Force (NWPTF) to develop recommendations for changes to Nebraska water laws. Many of the people serving on the NDC were appointed by the Governor to serve on the NWPTF. Environmental Services Section staff participated in two 2004 NDNR meetings and the final recommendations of the NWPTF to amend Nebraska water laws during the 2004 legislative session. Activities of the NWPTF continued to be monitored by Environmental Service Section staff. During the 2009 work segment, limited effort was expended on this activity.

During the current time frame (1 Dec.08 to 30 Nov. 09) the Central Platte NRD submited a Nebraska Environmental Trust grant application entitled *Platte Basin Habitat Enhancement Plan* for $ 6 million dollars over three years. The grant would be used to acquire irrigated acres to retire surface water or ground water wells along the river in order to increase river flows in the central Platte River. As previously stated, the first 13 years of the implementation phase is geared towards reducing shortages of water to the current **target flows** of the Central Platte River by an average of 130,000 -150,000 acre feet of water per year. The Nebraska Environmental Trust approved $ 1,275,000 for 2009, $ 725,000 for 2010 and $ 1,000,000 for 2011 for a total of $ 3,000,000. The Central Platte NRD has implemented a Water Banking System and time will tell if progress is being made.

3. <u>The Cooperative Hydrology Study (COHYST) Committee.</u>
This committee consists of a coalition of natural resource districts, irrigation and power districts, Nebraska Department of Natural Resources (NDNR), and the NGPC that operate under an Interlocal Cooperative Agreement. The COHYST sponsors are guiding and funding development of a broad based ground water model for the Platte River Basin west of Columbus to the Nebraska borders with Colorado and Wyoming. NGPC continues to help fund this effort and an Environmental Service Section staff member has served on the COHYST committee. Presently, Frank Albrecht and Keith Koupal serve on the committee. Nebraska's New Depletions Committee (NDC) under the Cooperative Agreement will utilize the output of the completed COHYST model to finalize recommendations for the Nebraska New Depletions program for the State of Nebraska. The objective of COHYST is evaluating effects of ground water pumping on Platte River flows, including impacts to NGPC's instream flow appropriations and target flow for endangered species. It is also expected to be a tool for the development of integrated water management plans (IMPs) of surface water and groundwater supplies by NRDs and the NDNR. During 2005, the COHYST groundwater model documentation was independently peer reviewed by Eagle Resources P.A. from Raleigh, N. Carolina. The peer review provided recommendations for improving the model and the model documentation. COHYST is planning to implement most of the recommendations over the next three years. To meet responsibilities to achieve the objectives in the CA, Nebraska will eventually be required to utilize changes in some of Nebraska's water laws to do

integrated management of groundwater and surface water that will control new groundwater and surface water depletions and potentially allow the legal transfer of water through leasing from users of surface and groundwater to meet target flows for the central Platte (Aiken (2002, see Appendix E). During the 2006 and 2007 timeframe, some modeling was conducted to assess the obligations on Platte River improvements. See Appendix F for ways to implement instream flow protection in prior appropriation systems. During the 2009 timeframe, NGPC staff Keith Koupal and Tim McCoy participated in working with data bases needed to run modeling scenarios. Because of the complexities of ground water modeling, it takes a long time to generate output with the computers in hand. Efforts are underway to acquire new computers to cut down on processing time and thus be able to answer questions in a more timely manner. Having a functional groundwater model with reasonable acceptance and accuracy is important for management purposes because 71,600 aditional acres of irrigation were allowed along the Platte River between July 1997 and 2005. The State of Nebraska has agreed to make up the water depletions to the central Platte from July 1997 to the start of the Platte River Recovery Implementation Program.This is a sizable quantity of water and it may take a combination of avenues to achieve it.

4. Integrated Management Plans (IMP's) Activities . Areas of the following Platte River NRDs were designated overappropriated and fully appropriated after passage of LB 962 in 2004: North Platte, South Platte, Twin Platte, Tri-Basin, and Central Platte. (Schneider 2010). The IMPs of the North Platte NRD, South Platte NRD, Twin Platte NRD, Tri-Basin, and Central Platte NRD were adopted on August 13, 2009. NGPC staff (Darrol Eichner, TJ Walker, and Al Hanson) were involved with IMPs on the Platte system and Ben Rutten was initially involved with the Middle Niobrara NRD for the Niobrara River. To date, IMPs have been approved for the North Platte, South Platte, Twin Platte, Tri-Basin, Central Platte, Upper Republican, Middle Republican, Lower Republican, and Upper Niobrara-White NRDs (Table 5).

   In a January 25, 2008 Department of Natural Resources Order of Final Determination that a portion of the Lower Niobrara River Basin was **fully** appropriated, four NRDs (Middle Niobrara, Lower Niobrara, Upper Elkhorn, Upper Loup) and one individual challenged the Order on the basis of being arbitary and capricious, or contrary to law, and therefore invalid in whole or in part. Upon due process, and as a result of analysis of the hearing and case record, the Director of NDNR upheld his January 25, 2008 Order that a portion of the Lower Niobrara River Basin was fully appropriated (Dunnigan 2009, Appendix J). Because the NRDs are appealing this December 17th, 2009 Order, an IMP will not be initiated until the appeal process is finished, perhaps as long as two years.

Table 5. Fully and overappropriated (OA) hydrologically connected surface water and groundwater and integrated management plan (IMP) status by NRD as of April 19, 2010.

Basin	**NRD**	**Determination**	**IMP Effective Date**
Republican	Upper Republican	7/16/2004	6/2/2005 & 1/1/2008 (revised)
	Middle Republican	7/16/2004	1/18/2005 & 1/1/2008 (revised)
	Lower Republican	7/16/2004	6/24/2005 & 1/1/2008 (revised)
Niobrara	Upper Niobrara White	11/3/2004	6/17/2009
	Middle Niobrara	1/25/2008	
	Lower Niobrara	1/25/2008	
	Upper Elkhorn	1/25/2008	
	Upper Loup	1/25/2008	
Platte	South Platte	9/30/2004 & 9/15/2004 (OA Basin)	6/20/2008 & 9/14/2009 (revised)
	North Platte	7/16/2004 & 9/15/2004 (OA Basin)	9/14/2009 (DNR)
	Twin Platte	9/30/2004 & 9/15/2004 (OA Basin)	9/14/2009 (DNR)
	Central Platte	9/30/2004 & 9/15/2004 (OA Basin)	9/14/2009 (DNR)
	Tri-Basin	4/21/2006	9/14/2009 (DNR)
	Platte Basin-Wide Plan	7/16/2004	9/11/2009 (DNR)
	Upper Big Blue	4/21/2006*	

* The fully appropriated portion of the Upper Big Blue NRD is hydrologically connected to the Platte Basin. Source: Amy Ostdiek and Steve Gaul, Nebraska Department Natural Resources.

5. Economic Study of Nebraska Natural Resources.
During 2005, NGPC initiated a proposal that included a coalition of private groups, state agencies, and political leaders to plan and fund a study of economic values of Nebraska's natural resource amenities (Although not funded via this federal aid project, it has implications for keeping instream flows in streams and rivers). A Request For Proposal (RFP) was developed and distributed for the purpose of soliciting proposals from qualified consultants for the study. ECONorthwest of Eugene, Oregon responded with a proposal that was accepted and the study was initiated in September, 2005. The final report "*Natural-Resource Amenities and Nebraska's Economy: Current Connections, Challenges, and Possibilities*" was completed in August 2006 (Niemi et al. 2006). Focus areas of the study included the Valentine area with Niobrara River resources, Missouri River amenities of the Omaha area and Ponca State Park, Middle Platte River wildlife amenities of central Nebraska, Pine Ridge-White River Region amenities, Ponca State Park area and wetlands, and Lake McConaughy. This effort was chaired by the Fisheries Division Administrator, Environmental Service Section Staff assisted in this endeavor. For another example of economic responses to protection of ecosystems, see Niemi (2002). More and more, the benefits of keeping streams and rivers healthy with adequate flows to provide ecosystem goods and services and generate economic activities is being realized. In addition during 2009, the start of the updating of the Principles and Standards was initiated by the Council on Environmental Quality. During 2010/11 the value of ecosystem goods and services will become embedded as National objectives in the Principles and Standards.

6. Lake McConaughy Environmental Account (EA).
One of the Federal Energy Regulatory Commission's (FERC) conditions for the Central Nebraska Public Power and Irrigation District (CNPPID) and Nebraska Public Power District (NPPD) hydro-power licenses involves a block of storage water called an Environmental Account (EA) in Lake McConaughy (10 % of the legally storable inflow into Lake McConaughy between October 1 and the end of April the following year, up to 100,000 acre-feet of water) can be released as needed to augment flows in the central Platte River for habitats needed by federally listed species, including fish and aquatic invertebrates used as food. Such releases also benefit many other species using the river. The USFWS office, located in Grand Island, provides a staff person to be the EA manager to make the day to day decisions on how much water should be released from the Lake McConaughy EA to help meet target flows for listed species in the central Platte River. The EA manager meets twice annually with an advisory group called the Environmental Account Committee (EAC) which provides advice on the annual operating plan for the EA. The EAC has biological representatives from two power and irrigation districts, the Audubon Society, the Platte River Whooping Crane Maintenance Trust, Bureau of Reclamation, NDNR, and the NGPC. A Fisheries Division staff person from the Environmentral Services Section is the NGPC representative on the EAC.

During 2001, approximately 90,000 acre feet of EA storage water was available, 74,000 of which was released to augment flows in the central Platte River reach. Most EA releases went to improve low summer flows for fish habitat in the river. On October 1, 2001 there was 27,343 acre-feet left to carry over into 2002. Over the winter season an additional

46,557 acre-feet was added to the EA from inflows to give a total of 72,268 acre-feet in the account. However, some is lost to evaporation during storage and the transportation process. During 2002, a total of 42,843 acre-feet was released for the Platte River. Subsequently, there was 26,302 acre-feet of water available as carryover in the EA of Lake McConaughy for use during 2003. The EA accrued 38,857 acre-feet during the October 1, 2002 to May 1, 2003 non-irrigation season. This accrual combined with unused EA carry over from 2002, minus evaporation/seepage losses, resulted in a total EA volume of 58,787 acre feet at the start of the WaterYear 2003 irrigation season (May 1 to Sept. 30), slightly less than the 64,000 acre feet predicted. No EA releases were made during 2003, 2004, and 2005 nor are any planned for in 2006. The EA account reached about 107,000 acre-feet of water on May 1, 2005. The USFWS EA Manager decided to save the water in the EA to carry over into 2006, but may not activate the EA during 2006. The USFWS did not implement tentative plans to augment May or June 2005 flows for up to 3 days with a pulse flow of 3,000-4,000 cfs at Grand Island to assist with reducing vegetation encroachment in the active channel of the river. This plan is being delayed until some North Platte River channel capacity conveyance problems are resolved and an adequate monitoring plan can be implemented to document the benefits of the pulse flow releases. Never-the-less, two meeting were held during 2006 to discuss options, but no releases were planned. As of September 30, 2006 the EA had accrued a total of 114,182 acre-feet of storage to carryover into 2007. During 2007 serious consideration to a spring augmentation /release was curtailed because of technical matters related to the delivery of water through the system. During 2008, no EA water was released from Lake McConaughy, but a local rain event on May 23rd and 24th resulted in substantial flows in the central Platte as previously discussed.

During April 2009, the USFWS in coordination with the PRRIP and several key partners, implemented an initial "flow routing test" to prepare for future short duration high flow releases. The test involved releasing Environmental Account (EA) water stored in Lake McConaughy in coordination with other reservoir releases and re-regulation of water by Nebraska Public Power District (NPPD) and Central Nebraska Public Power and Irrigation District (CNPPID) to increase elevated river flows in the central Platte River at Overton, Nebraska (PRRIP and USFWS 2009). Specific objectives were identified and evaluated regarding getting water through the confluated system downstream to the central Platte. The test took place from April 9th through April 19th. About 22,000 acre-feet of EA water was released over 8 days. Approximately 16,500 acre-feet was routed down the North Platte River, with the remaining 5,500 acre-feet routed through NPPD's canal system and returned to the South Platte River channel above CNPPID's Supply Canal Diversion Dam. The important aspect of this test was that different organizations were collaborating and assessing key factors to preparation for spring pulse flows in future years. As of December 2009, there was 107,775 acre-feet of water in the EA account.

7. The Lower Platte River Pallid Sturgeon and Sturgeon Chub Task Force (PS Task Force). The PS Task Force provided funding assistance for research in 1999 in order to provide NGPC with information to develop a flow regime for establishing and maintaining habitats necessary for pallid sturgeon and sturgeon chub in the lower Platte River. The PS Task Force was comprised of 15 state and local government subdivisions that operated under an Inter-local Cooperative Agreement and have pooled financial resources to fund

a five year study by Dr. Ed Peters from the University of Nebraska which was initiated in 2000. The fourth year of the 5-year project received funding support from the State Wildlife Grant program which is administered by the NGPC. The final year of the project received funding from the State Wildlife Grant as well as the Nebraska Environmental Trust Fund. The NGPC is a funding partner and chairs (Assistant Director) the PS Task Force. In January 2003 and in July 2004, the PS Task Force met to receive updates on research progress and administration of new surface water appropriations in the basin. The summer meeting was held at Aksarben Aquarium near Gretna, Nebraska. Several presentations were given by federal and state biologists (USGS, USACOE, USFWS, NGPC) on Missouri River and pallid sturgeon research in the basin. A short field trip on the lower Platte River was guided by Dr. Ed Peters to demonstrate sampling methods. During 2005, the PS Task Force held meetings in January (Lincoln), April (Columbus), August (Columbus), and October (Ord). Environmental Service Section members continued serving on this group and its subcommittees. In this segment the Task Force approved subcommittee recommendations for a professional peer review of Dr. Peters draft report; received the draft report along with a presentation of the findings of Dr. Peters in April; in August rejected the draft report as written and directed it to be amended by deleting some chapters and some conclusions and recommendations. At the last 2005 meeting the PS Task Force agreed to a contract with Dr. Peters for redrafting the report (Parham et al. 2005); and extended the PS Task Force Interlocal Agreement until October 2007. <u>During 2006, the PS Task Force met to make plans for disposition of the final report and voted to officially end the task force in October 2007.</u> Dr. Ed Peters completed the final report entitled "Pallid sturgeon and sturgeon chub in the lower Platte River 2000-2004" (Peters and Parham 2007) for the PS Task Force which was accepted at a June 23rd, 2006 meeting. This report has been printed and CDs produced for distribution to PS Task Force members. The PS Task Force members were also advised that the NGPC planned to fund a publication of the full and complete research in a NGPC Technical Series report (See item 8).

8. <u>NGPC Technical Series Report-Lower Platte River Sturgeon Research Report</u>
In May 2006, NGPC contracted with Dr. Ed Peters to prepare his full Platte River sturgeon research report entitled *" Ecology and Management of Sturgeon in the Lower Platte River, Nebraska"* for publishing in the NGPC Technical Series. Completion was planned for October 2007 and for the most part a preliminary report (Peters and Parham *in press*) was finished. It contains recommendations for instream flow requirements for sturgeon species in the lower Platte River. Two important components will be the lower <u>Platte River Habitat Availability Model and the lower Platte River Connectivity Model</u>. An educational article presenting an overview of instream flows in Nebraska was also published during August 2007 in a statewide monthly newspaper called Prairie Fire. The title of the article was: *Remember our rivers! An overview of instream flows in Nebraska* (Zuerlein 2007). During late 2007, editorial work on the draft Nebraska Technical Series 18 report continued and in February 2008 the final was published by the NGPC and distributed. Because of Nebraska's restrictive instream flow law and the need to protect what is left of the natural spring varability in the Platte below Columbus, geomorphological river features such as sandbars and sufficient water depth for sturgeon to make a spawning run upstream need to be protected (Parham 2008). Not only will these flows help listed species but many other riverine sport and prey species as well. Information from the above reports will be used

extensively to support continued protection of instream flows in the lower Platte.

9. Merritt Reservoir
During 2005, the AID withdrew its application for a title transfer of Bureau of Reclamation (BR) lands associated with Merritt Dam on the Snake River and water delivery system to the irrigated lands. This action then initiated an application for renewal of water service contracts. The Snake River is a south bank tributary of the Niobrara River in Cherry County. The Bureau of Reclamation initiated meetings with AID officials and NGPC staff will be involved in a federal environmental assessment (EA) of the multiple resources involving Meritt Reservoir, the downstream cold water fishery of the Snake River (tributary to the Niobrara River), and the multiple resources values of the Niobrara River below the confluence of the Snake River during the process. The 75 mile reach of the Niobrara River from Valentine downstream to the Highway 137 is a federally designated Scenic River reach (Within it, 30 miles from Valentine down stream to the Norden Bridge is a premier canoeing and floating stretch) that passes through a federal wildlife refuge, state wildlife and state park areas, and is the most popular canoeing river in Nebraska. NGPC will seek ways to improve instream flows for brown and rainbow trout in the lower reach of the Snake River downstream of Merrit Dam. During 2006, the Bureau Reclamation successfully negotiated a contract for water service with the Ainsworth Irrigation District. This contract calls for a "minimum pool elevation" and an allocation of 2,000 acre-feet of storage for managed releases to the Snake River downstream of the dam for cold-water fishery enhancements. The release of water for trout resources in the Snake River will be at the request of NGPC and coordinated with the Bureau of Reclamation. The Bureau also agreed to conduct a flow/water temperature modeling effort to help provide NGPC with guidance for river releases. Agreements of this type are good for trout management purposes in the lower Snake and could be used to meet legal requirements for instream flow protection in the future, possibly even summer flows for recreational floating in the Niobrara National Scenic River reach.

b. Significant Deviations: None

c. Recommendations: Consider contracting for needed services when appropriate.

d. Cost: Budgeted $ 43,600 Actual: $ 62,085

2. Objective I-2. The objective is to coordinate planning recommendations and advocate protection of instream flows and related habitat quality for public trust natural resources.

   a. Activity:
   Nebraska is blessed with a wealth of water, both surface and ground. During the 1800s and 1900s development of these resources was extensive. However, protection of flow for instream uses and purposes is only just beginning because of the environmental laws passed in the 1970s and the fact that we are coming to grips with the realization that for sustainability of our quality of life, healthy ecosystems are vital. Managing water conjunctively is increasingly being focused on. A 1998 Report of the Western Water Policy Review Advisory Commission entitled: *Water in the West* stated that federal objectives have shifted from maximizing water development to promoting sustainable use (WWPRAC 1998). Not only this, but increasing the usable supply of water as well as making efficient use of the available supply, from controlling rivers to restoring their natural functions and processes where possible, from concerns about quantity to concerns about quality as well. The Chapter 6 Findings and Recommendations of the above report are especially helpful in delineating hard facts, principles of water management; and recommendations on integrating river basins and watershed governance, meeting obligations to tribes, resource management and restoration, management of water and water facilities, protecting productive agriculture communities, improving decision making and reducing conflict. In summary, the winds of change on how we view and manage water resources are starting to blow again.

   Changing the magnitude, frequency, timing, duration, and rate of change of a river has ecological responses which are described by Poff et al. (1997). On May 15, 2001 while the Administration of the NGPC was conducting a Fisheries Division staff meeting in Lincoln, the topic of instream flows emerged. Discussion of the merits of this endeavor were elaborated upon, especially the value of the recently obtained NGPC instream flows to the USFWS target flows being advocated in the Platte River Cooperative Agreement. When Director Amack was asked which river or stream was going to be selected for instream flow work next, he immediately stated that staff should "Pick One" and start the process. See Appendix B for a list of high priority streams and rivers in Nebraska.

   In November 2005, at the request of Director Rex Amack, the internal Instream Flow Coordination and Review Committee (IFCRC) met to discuss instream flow issues and the potential for new initiatives on Nebraska streams and rivers. The Director opened the meeting and informed the group that the Nebraska Game and Parks Commission fully supports the existing agency instream flow appropriations and current statutes. A legislative proposal from natural resource districts and other water development interests to seek 2006 amendments to instream statutes that would seriously weaken current and future instream protection for fish, wildlife, and recreation was discussed. Also discussed were other streams and rivers where instream flow initiatives could be started. Future instream flow initiatives would be a factor in determinations of fully appropriated status of other river basins. The IFCRC drafted a recommendation for future direction of instream flow efforts for the NGPC Director. Due to continued state budget shortfalls for the Nebraska Department of Natural

Resources**,** the NGPC entered into a joint funding agreement with the U.S. Geological Survey to help fund one-quarter of the annual cost of operating the North Bend streamflow gaging station (October 1, 2002 to September 30, 2004). This gage is one of the Platte River gages used by the NDNR to protect instream flows held by the NGPC on the lower river.

Drought. Due to a severe drought in the mid-west and the Platte River Basin in particular, portions of the North Platte, South Platte, and Platte River proper in Nebraska went dry during 2002. Portions of the Platte also went dry during 2003, 2004, 2005, 2006 and 2007. Like floods, droughts are at the other end of the natural event spectrum, but anthromorphic devlopments across the landscape often exasperate river conditions during times of drought.

Nebraska's surface water laws are governed by the "First in Time is First in Right" doctrine while ground water is governed by "Correlative Rights or Share and Share Alike". Surface water appropriations are administered and regulated by the Nebraska Department of Natural Resources (NDNR 2002a). Ground water wells are administered and regulated primarily by local (i.e. river basin) NRDs. During 2002, a surface water appropriator who owns land along Pumpkin Creek filed suit in the District Court of Morrill County against the Nebraska Department of Natural Resources (*Spear T. Ranch, Inc., plaintiff v. Nebraska Department of Natural Resources, defendant*) for not protecting his surface water appropriation from ground water irrigators in the Pumpkin Creek Basin. During 2003, the same surface Pumpkin Creek appropriator also filed suit against the groundwater irrigators upstream of his land for interfering with his surface water supply and sought damages. The District Court ruled that it did not have jurisdiction to settle the case and the complaint would have to be taken to the local NRD. This decision was appealed to the Nebraska Supreme Court (2005, Appendix G) which ruled in 2005 the Spear T. Ranch could sue groundwater pumpers. The catch was that the individual surface water appropriator would have the burden of proof to prove that groundwater pumping was responsible even though well development materalized well after surface water appropriations were granted. The Pumpkin Creek parties settled out of court and no comprehensive legislation was enacted because of it (Hendee 2009). In Nebraska, there are over 8,000 surface water appropriations which divert surface water from streams and rivers and well over 104,000 irrigation wells pumping ground water. The lag effect of ground water pumping in hydrologically connected areas for streams and rivers is yet to be felt and undoubtedly, many challenges lie ahead to protect our streams and rivers because of the extensive development and lack of comprehensive protection for instream flows.

Federal and state listed threatened and endangered species are another avenue to seek protection of flow regimes conducive to protecting riverine habitats, particularly on an interstate or watershed basis. When this occurs, state water laws often have to be modified.

Nebraska Water Policy Task Force (NWPTF).
During 2001, the Nebraska Legislature passed Resolution 166 which established a NWPTF with 49 representatives from various stakeholder groups, including two

representing recreation interests and two representing environmental interests, but no representative from the Nebraska Game and Parks Commission. Specifically, the NWPTF was mandated to: 1) Review the Laws 1996, LB108 (Groundwater Management Act), to determine what, if any, changes are needed to adequately address Nebraska's conjunctive use management issues; 2) evaluate the utility of allowing temporary water transfers and if deemed useful, to draft legislation and procedures for authorizing and implementing a temporary water transfer law; 3) evaluate the utility of authorizing additional types of permanent water transfers and, if deemed useful, develop draft legislation and procedures for authorizing and implementing additional types of permanent water transfers; 4) reach a determination as to the usefulness of water leasing or transfers and develop a potential water banking system that would facilitate the temporary or permanent transfer of water uses; and 5) reach a determination as to what other ways, if any, inequities between surface water users and ground water users need to be addressed and identify potential actions the state could take to address any such inequities.

The NWPTF convened in mid-2002 and met quarterly until December 2003 to prepare recommended changes in water policy and water law to better address various conflicts between surface water users and groundwater users. An Executive Committee of the NWPTF met monthly during this period, and various subcommittees were formed to assist with various issues. Environmental Service Section staff attended nearly all NWPTF, and Executive Committee meetings and most Surface Water Subcommittee meetings to provide information and recommendations that would benefit fisheries, wildlife and outdoor recreational interests, especially instream flow appropriations for fish and wildlife. The final report of the NWPTF was completed in December 2003 and contained recommended changes to the Nebraska Groundwater Management Act and Surface Water Statutes. Subsequently LB 962 was formulated and passed during the Legislative Session on April 13, 2004. The NWPTF continued meeting on various water law issues during 2005 to review various recommended amendments to Nebraska water law. Of major interest to the NWPTF was getting adequate funding for NDNR and natural resource districts to deal with overcoming depletions in the Republican and Platte River basins. Another proposal of major interest to NGPC is one that would put a much lower flow cap (Exceedence Level of 80 rather than current 20) on existing and future instream appropriations. Environmental Service Section staff evaluated this potential threat to instream flow protection in Nebraska. In addition, section staff are participating with the Assistant Director in meetings with a subcommittee of NWPTF members to resolve issues of concern on the lower Platte. What flow regime is needed to geomorphically maintain natural habitat diversity and recreational attributes which might prove useful in Integrated Management Plans (IMPs) are contained in Appendix D. Aspects of LB 962 include provisions for the following points:

■ Provides a proactive approach for the NDNR to evaluate river reaches to determine if they are fully appropriated. A finding that a stream is fully appropriated will initiate a temporary moratorium (Stay) on new groundwater wells, new surface water appropriations, and expansion of irrigated acres, and provide time to complete studies, develop integrated management plans (IMPs) in coordination with the local NRD, and provides for a dispute resolution process. To date, *Annual Evaluation of Availability of*

Hydrologically Connected Water Supplies reports have been issued for 2006, 2007, 2008, and 2009 (see NDNR web site http://dnr.ne.gov). Generally, the NDNR goes through an administrative process where the annual basin report specifies a preliminary determination in December. Then, three public meeting are conducted and a final determination made as to whether or not a basin is fully appropriated.

■ Provides that groundwater use can be regulated to protect all impacted surface water rights (including instream flow rights).

■ Provides that NDNR can issue temporary and permanent permits that either change the location for surface water use or change the type of permit to another type, through an approved lease agreement up to 30 years. No permanent transfers of surface or groundwater use is permitted if the change is to a different preference of water use, for example an agriculture use is changed to an industrial or domestic use of water.

■ Provides that the consumptive part of a surface water appropriation (e.g. change from irrigation) can be leased for a different purpose (e.g. instream flow, wetland enhancement, municipal, industrial) for up to 30 years.

■ Allows NRD's to grant approval to transfer groundwater from overlying land to other locations for other beneficial uses including environmental purposes. Extends the period of allowable non-use of surface water appropriations from 3 years to 5 years before such rights can be cancelled.

■ Extends the period of non-use with excusable reasons (e.g. Conservation Reserve Enhancement Program enrollment) from 10 years to 15 years.

■ Extends the period from 10 years to up to 30 years (possibly longer) of non-use before cancellation of surface water right when water is unavailable, and if the basin is over appropriated and an IMP is expected to restore surface water use.

Many of these recommendations could be useful for the State of Nebraska if it completes development of a program for meeting USFWS target flows for habitats supporting listed species in the central Platte River reach. Passage of LB 962 during 2004 resulted in a major re-evaluation effort in the upper Platte River Basin. Portions of the Platte River Basin near Elm Creek to the Wyoming/Colorado border were declared over appropriated. The NRDs in this over-appropiated area of the basin and the NDNR have initiated a basin-wide stakeholder group to develop a basin-wide IMP to improve water supplies sufficient to return that part of the basin to fully-appropriated status. Most of the remainder of the basin west of Columbus, Nebraska to near Elm Creek is considered fully appropriated. As a result, five natural resource districts within this portion of the Platte Basin west of Columbus have issued moratoriums on new wells and new irrigated acres. These NRDs in collaboration with the NDNR and other stakeholders have initiated efforts to develop IMPs for the Platte River Basin west of Columbus. The Nebraska Game and Parks Commission is a stakeholder in Platte River water issues. The agency has instream flow appropriations for fish and wildlife resources, a state fish hatchery dependent mostly on surface water, numerous state

recreation areas and wildlife management areas along the river and associated lakes and reservoirs in the basin. Fisheries Division Environmental Service Section staff initiated actions to involve District fishery staff in collaborating with NRDs and NDNR in this process. In over-appropriated areas of the basin, efforts are directed at improving conditions to a fully-appropriated condition. Such efforts would help restore some depletions to instream flow appropriations on the Platte River.

LB 962 and actions by the Nebraska Department of Natural Resources also resulted in other river reaches and river basins being declared fully-appropriated, thus triggering temporary moratoriums on new irrigation well development and new irrigated acres pending development of integrated management plans (IMPs) by natural resource districts in those basins. The basins affected by these actions are the Republican River Basin, the Niobrara-White River basins, and the Platte River from Elm Creek to Columbus, Nebraska. Fishery staff in those areas have also been involved in providing technical assistance. The Lower Loup NRD noted it was close to being declared fully appropriated by the NDNR. Therefore it voluntarily initiated a moratorium on new wells, and requested a moratorium on new surface water permits, and initiated actions to develop an IMP for its part of the Lower Loup Basin. Note: considering that only 2 % of Nebraska's fishable stream and river miles have instream flow protection to date, one shortfall of LB 962 is that there is no mandatory requirement when developing an Integrated Management Plan to plan and provide for base flows or instream flows for fish, wildlife, or recreation or the numerous other ecosystem amenities rivers and streams provide. The result could very well mean that the State of Nebraska and political subdivisions (NRDs) will have to raise taxes to purchase back what was public trust water, similar to what is happening in the Republican and Platte River Basins. The State of Nebraska has agreed to make up for depletions to the Platte River which occurred since July 1997 as part of their contribution to the Platte River Cooperative Agreement (now Platte River Recovery Implementation Program).

Neuman (2000) did a pretty thorough job of reviewing the present status of instream flow protection in the Western United States. The title of her scientific paper is: "*Implementing Instream Flow Protections In Prior Appropriation Systems: Continuing Challenges"* (Appendix G). She also delineates ways to protect instream flow values using the public trust doctrine, state wild and scenic river legislation, federal reserved water rights, the Endangered Species Act, the Clean Water Act, and conversion of senior consumptive rights to instream flows. Other authors (Silk et al. 2000) have advocated consideration of upside-down instream flow water rights. Under this conceptual framework, a certain level of water development is specified and then the remaining flows in a river or stream are protected. Conventionally, instream flows protect up to a certain amount of flow, but if there is any unappropriated flow left, it is subject to development/further appropriation. Interstate compacts are another way to help ensure river water flows downstream by apportioning flows between states. Nebraska was in litigation proceedings against Wyoming over North Platte River flows since 1986 and the Kansas v. Nebraska and Colorado over Republican River flows since 1998. Both have now been settled. See Issue 1 (NDNR 2000) and Issue 2 (NDNR 2001) of the Nebraska Department of Natural Resources's newsletter. On November 13, 2001 the U.S. Supreme Court approved the settlement of the lawsuit between

Nebraska and Wyoming over administration of waters in the North Platte River (NDNR 2002b, Issue 8). This decision favored Nebraska interests by placing new restrictions on ground water use and development in Wyoming that affect Nebraska's apportionment of Platte River flows. In May of 2003 the U.S. Supreme Court approved a settlement of the Republican River Compact dispute (Kansas vs Nebraska, Colorado). The key points of the settlement ruling are: 1) Waives and forever bars past claims of damages to Kansas; 2) Counts depletions from evaporation of all small impoundments (15 acre-feet or more) and all groundwater use that is determined to deplete stream flow as part of a states consumptive use, but also gives Nebraska credit for any water imported into the Republican Basin from surface water projects on the Platte River; 3) Provides Nebraska with more flexability in water accounting by applying 5-year running stream flow averages during normal water years and 2 to 3-year averages in water short years for measuring compliance with compact agreement flows.

It is expected that Nebraska should be able to maintain most, if not all, of its existing uses in normal years. In water short years, which occur 25-33% of the time, Nebraska will have to reduce consumptive use to stay in compliance with the compact. A significant portion of the new Compact implementation responsibilities will fall to the Republican River Basin NRDs. The Upper, Middle, and Lower Republican NRDs have already implemented moratoriums on new wells and in conjunction with the NDNR have completed the first integrated surface and ground water management plans in Nebraska (available on NDNR web site www.dnr.ne.gov). However, at the present time, there is a lingering dispute between Kansas and Nebraska over provisions of the Republican River Compact dwelling on Kansas assertion that Nebraska has over used its allotment of Republican River water. During 2008 both parties were under going mandatory arbitration. If no solution can be found, Kansas has threatened to go to the U.S. Supreme Court. LB 701 was passed to allow local NRDs in the Republican Basin to assess additional property taxes to support purchase of water to satisfy compact requirements, but local property owners sued the State of Nebraska based on the contention that they should not be singled out to help meet a state responsibility. The litigation case is scheduled to reach the Nebraska Supreme Court.

Missouri River Flow Activities/Bi-model Spring Pulses.

The USACOE recently completed a National Environmental Protection Act (NEPA) process regarding the Master Manual (USACOE 2004). This process was an effort to bring balance to the system which was being principally managed for past dominant commercial uses such as navigation. Future uses associated with quality of life economic growth will increasingly rely upon changes needed to enhance the physical, biological, and chemical components of the ecosystem. Eventually this will lead to restoration of a more natural flow regime beneficial to piping plover, interior least tern, pallid sturgeon and other associated riverine species. Although some are highlighted species, the entire system is in need of a revamped water management scenario which would be beneficial to all species dependent upon the ecosystem. On November 8th, 2001 agency testimony was provided to the USACOE at a public meeting in Nebraska City regarding an appropriate flow regime alternative which would benefit fish and wildlife species on the Missouri River. An important point to note here is that for the most part Tribal and Indian Water Rights have not been quantified for the 28 Tribes

residing within the Missouri River Basin. Eventually Tribal Water Rights will have a bearing on management of the flow regime for the Missouri River. Note: During the summer of 2002, the National Research Council (NRC 2002) released it's scientific report regarding the poor condition of the Missouri River ecosystem. Among its many statements were the following:

> ***"Degradation of the Missouri River ecosystem will continue unless some portion of the hydrologic and geomorphic processes that sustained the preregulation Missouri River and floodplain ecosystem are restored-including flow pulses that emulate the natural hydrograph, and cut-and-fill alluviation associated with river meandering. The ecosystem also faces the prospect of irreversible extinction of species." (pg 3 last paragraph)***

On November 7, 2002 American Rivers, the National Wildlife Federation, the North Dakota Wildlife Federation, the South Dakota Wildlife Federation, the Nebraska Wildlife Federation, the Iowa Wildlife Federation, and the Kansas Wildlife Federation filed a 60-day Notice of Intent to sue the USACE and USFWS for violations of the Endangered Species Act, the Flood Control Act, and the Administrative Procedure Act based on past operations, and the 2002-2003 Draft Annual Operating Plan.

Although the USACE was poised to issue a Record of Decision (ROD) for revision of the Master Manual (including a new life giving flow regime change) in time to meet a March 2003 deadline, political intervention at the highest level in the United States resulted in termination of this process in the short term. As a consequence of this intervention, in July the USACE issued a new Biological Assessment (BA)(USACE 2003a) because they believed there were components of the USFWS 2000 Biological Opinion (over 500 scientific references and peer reviewed) that were not reasonable and prudent. In November 2003, in response to the new BA, a different team of USFWS scientists started formal Section 7 consultation and were empowered to write an Amendment to the 2000 Biological Opinion (B.O.)(USFWS 2003b). On December 16, 2003 the USFWS issued their formal opinion under Section 7 of the ESA (USFWS 2003c). This Amendment to the 2000 Biological Opinion was relatively quick in coming because the USACE accepted almost all of the Reasonable and Prudent Alternative (RPA) from the 2000 Biological Opinion. The Amendment decision included addressing system sedimentation issues, particularly on the upper end of Lewis and Clark Lake. Although jeopardy for the least terns and piping plovers was not found this time around, a jeopardy opinion was found for the pallid sturgeon. New elements to the Reasonable and Prudent Alternative for pallid sturgeon included a default flow regime out of Gavins Point Dam that would achieve a bimodel spring pulse and a lower summer flow, specifically at or below 25,000 cfs out of Gavins Point Dam. Although a default flow regime was accepted as necessary (Appendix H), there was latitude to tweak it if basin stakeholders could come together and fashion a more acceptable spring rise as a starting point. Two years were allowed for re-evaluation, but it must be in the 2006 USACE Annual Operating Plan (AOP). The Record Of Decision (ROD) regarding the Missouri River Master Water Control Manual Review and Update was completed and effective when BG William T. Grisoli signed it on 19 March 2004.

In the litigation process (*American Rivers et al., plaintiffs v. United States Army Corps of Engineers, et al., defendants*), on July 12, 2003 the United States District Court for the District of Columbia (2003) issued a preliminary injunction requiring the USACE to undertake specific actions to modify its management of the Missouri River to avoid irreparable harm to three species protected by the Endangered Species Act. The injunction sought by the Plaintiffs was an effort to enforce flow modification provisions of the 2000 comprehensive Biological Opinion issued by the USFWS regarding the Master Manual. These flow modifications were confirmed as necessary by the National Academy of Science, all of the basin fish and wildlife management agencies, and a separate independent panel of scientists. Specifically, the 2000 Biological Opinion required the USACE to reduce flows from Gavins Point Dam to 21,000 cfs by July 15th, 2003, hold this flow until August 15th, and then increase flows to no more than 25,000 cfs until September 1st. The USACE's 2003 Annual Operating Plan sought to avoid these flows. Because of legal maneuvering, implementation of the lower flows was delayed until August 12, 2003. On that date, river flows were reduced to 21,000 cfs for three days. This is the first time in almost 50 years that summer flows were reduced to this level. This pattern of lower summer flows used to be the norm. Although it lasted only three days, it did demonstrate that environmental friendly flows were possible. Because of this litigation and the 2003 Amendment to the 2000 Biological Opinion, the USACOE was on notice from the United States District Court for the District of Minnesota, Case No. 03-MD-1555 (PAM), to formulate a Record of Decision (ROD) on the Master Manual by March 19th, 2004. The Division Engineer, BG Grisoli, signed the ROD on this very date.

During 2005 the U.S. Institute for Environmental Conflict Resolution, a part of the Morris K. Udall Foundation, an independent federal agency of the Executive Branch of the United States Government was hired by the Corps of Engineers and Fish and Wildlife Service to conduct a collaborative effort to develop a spring rise/pulse for the Missouri River between basin stakeholders and the federal government. The U.S. Institute subsequently advertised for a "Request for a Statement of Interest, Availability, Qualifications, and Cost Quotations". In concert with basin stakeholders, four consultant firms were interviewed and the firm CDR Associates from Colorado was contracted with to conduct the process of working with all parties to develop 1) a spring pulse for 2006 as well as 2) a comprehensive Missouri River Recovery Implementation Committee (MRRIC). In order to accomplish the first action, a bi-modal spring pulse had to be formulated in order to be placed in the October 2005-2006 draft AOP. Although numerous committees were formed and meetings conducted, a consensus bi-modal spring pulse was not achieved. However, the following components:

- start date of first rise
- peak date of first rise
- end date of first rise
- magnitude of first rise
- duration of first rise
- rate of change of ascending limb of first rise
- rate of change of descending limb of first rise
- magnitude of flow between rises

- start date of second rise
- peak date of second rise
- end date of second rise
- magnitude of second rise
- duration of second rise
- rate of change of ascending limb of second rise, and
- rate of change of descending limb of second rise

along with the biological rationale (pallid sturgeon spawning que) and criteria under which a March and May spring pulse will be provided, enabled the USACE and USFWS to formulate criteria for a bi-modal spring pulse for the October 2005-2006 AOP. After public meetings in fall 2005, provided there is at least 36.5 MAF of water in system storage in the mainstem reservoirs before each pulse, the first planned spring pulse in over 50 years for fish and wildlife resources was implemented. Mimicking mother nature will also help many other fish and wildlife species dependent upon the river to meet their life cycle needs. The planned spring pulse was monitored (USACE 2006). Adaptive management will allow it to be changed when it is deemed prudent to benefit the species. For additional information on restoring ecological integrity to the Missouri River, see Galat and Lipkin (2002), and Palmer et al. (2005). During 2007, mainstem storage was inadequate for releasing a spring pulse out of Gavins Point Dam, however mother nature provided a spring pulse via flooding out of the Jim and Big Sioux rivers, both of which empty into the 59 mile reach of Missouri below Gavins Point Dam. Monitoring of fish populations documented that two female pallid sturgeon spawned in the Missouri River adjacent to Nebraska. Based on late fall 2008 AOP modeling assessments, adequate system storage is anticipated to allow a March and May spring pulse in 2009 (Table 6).

Table 6. Record of bi-model spring rise events on the Missouri River.

Year	**March Pulse conducted**	**May Pulse conducted**	**Remark**
2006	No	**Yes**	First ever planned spring rise in over 50 years out of Gavins Point Dam
2007	No	No	No planned pulse release from Gavins Point Dam, but the Jim and Big Sioux rivers flooded in the 59 mile reach
2008	**Yes**	No	System storage was above the preclude level
2009	No	Yes	Adequate water in system for first time, March pulse postponed due to flood threat and fear in Missouri from heavy rains. May pulse conducted on May 18 and 19
2010	Planned	Planned	Adequate water stored in system

The Instream Flow Council (IFC).

Following completion and publication of the 2004 book entitled*: Instream Flows for Riverine Resource Stewardship Revised Edition* (Annear et al. 2004), the IFC proposed a new book featuring case histories of river instream flow projects that utilized

important elements described in the previous book. The International Association of Fish and Wildlife Agencies (IAFWA) approved a multi-state federal aid grant to the IFC for this new book entitled: *Case Studies and Guidebook for Conducting Instream Flows for Riverine Resource Stewardship.* During the 2006 segment, a preliminary draft of the Platte River case history was completed after being reviewed and edited. Work on this project continued through 2007 and into 2008 with the Platte being show cased at the IFC conference (Flow 2008) on October 7-9, 2008 in San Antonio, Texas. Publication of the case history book was completion in 2008 (Locke et. al. 2008). At the Flow 2008 conference in San Antonio, Larry Hutchinson and Gene Zuerlein were on hand to display and converse with attendees regarding a poster presentation entitled: *Nebraska's Niobrara River Instream Flow Initiative: A Multidisciplinary Approach* (Hutchinson et al. 2008). In 2009, the Platte River Case Study was made known to people and organizations interested in the Platte River.

The Niobrara River Initiative.

During May 2006, The Nebraska Game and Parks Commission passed a major resolution directing staff to proceed with instream flow activities in order to provide the Commission recommendations to protect the Niobrara River. Planning commenced and this federal aid project was also renewed for a six year period to accommodate NGPC staff time and activities. In addition a Nebraska Environmental Trust Grant (NET) was obtained to assist with certain contract activities for select studies, public outreach efforts, and some equipment needs. During 2007, getting organized and planning followed the process recommended in the 2004 publication by IFC. Agency teams developed to address the many requirements for an instream appropriation included an overall Core Team, an Internal Support Team, a Public Outreach Team, a Partnership Team, a Science Team, and a Legal Advisory Team. The Nebraska Game and Parks Commission (NGPC) initiated contracts for four studies using the NET grant for science based information/data collection and evaluations. These four NET contracted studies are outlined as follows:

■ Niobrara Basin Water Budget (Hydrology) and Bibliography of Reports (University of Nebraska).

This project was initiated June 15, 2007 with two components. The first was a detailed database for river flow, precipitation, water diversions, and river development records. Data from stream flow gages, including discontinued gages have been compiled and preliminary statistical analyses for each gage was undertaken. All weather stations within the basin boundaries were identified and daily precipitation records compiled. This work will allow us to ascertain the quantity of water to meet the 20% rule in state statute for instream flows. The second component was a basin regional bibliography targeting literature providing information on the physical (e.g., hydrology, geology), biotic (e.g., vegetation, terrestrial, aquatic), recreational (e.g., canoeing, camping, tourism), and archeological and anthropological resources within the basin. A total of 565 articles, reports, and books have been compiled and indexed by key word topics. This report was completed in 2008 (Pegg 2008). During early 2008, a preliminary draft hydrologic report was also reviewed and returned to the hydrologist. It was subsequently completed in fall 2008 (Istaubulluoglu 2008). During 2009, effort was directed at analyzing the vast amount of information contained within the report.

■ Niobrara River Recreational Flow Study (Confluence Research and Consulting)
This project was initiated June 21, 2007 and scheduled for completion by March 2008. The goal of this study was to assess relationships between recreational canoeing, kayaking and tubing and other flow dependent recreation opportunities on the Niobrara National Scenic River. The consultants completed a field trip reconnaissance of the canoeing reaches of the Niobrara and met with outfitters during the week of July 16-20, 2007. Staff and other consultants participated in the field trip. The consultants interviewed outfitters and river users individually to help assess flow characteristics of the 75 mile Niobrara River Scenic River Reach. Findings will help the Nebraska Game and Parks Commission (NGPC) and National Park Service identify river flows for river recreational floating, and develop a state instream flow application to protect these recreational opportunities. Adequate flows for floating are part of the natural hydrograph important to sustain fish and wildlife resources on this river. During 2008, this study was completed (Whittaker and Shelby 2008) but off shoots of it in terms of outreach products are still being pursued. During October 2008, the Niobrara River was featured in state newspapers. The first article was entitled: *Scenic rivers' profile raised, Efforts to highlight Missouri and Niobrara in national system* (OWH 2008b) and the second was: *Niobrara teems with wildness, The river winds through six ecosystems, giving floaters glorious views of pine forests and tallgrass prairies* (OWH 2008c). During 2009 staff time was spent throughly ascertaining the data in this report in order to recommend instream flows for recreational management purposes.

■ Hydraulic Geometry and Macro-scale Habitats of the Niobrara River (USGS Water Science Center, Lincoln)
This project with USGS was initiated under contract on August 15, 2007 with a projected completion date of June 30, 2009. It represents the first phase of an overall study that will address fish and wildlife habitat and recreational variables and geomorphic flow relationships between these values. Studies during the projected time-line provide for staged completion of a pilot study on the Scenic River reach by September 30, 2008 with a final completion date of June 30, 2009. NGPC staff assisted with some cross-section flow velocity and depth profiling at selected river sites for this USGS project. The title of this final report is: *Geomorphic Segmentation, Hydraulic Geometry, and Hydraulic Microhabitats of the Niobrara River, Nebraska-Methods and Initial Results* (Alexander et al. 2009).

■ Recreation Users Survey and Socio-economic studies of the National Scenic River Reach (Nebraska Game & Parks Commission)
This project was initiated June 30, 2007. A temporary employee was hired and was utilized to contact floaters at access areas within the primary canoeing use reach of the Niobrara River. A short survey questionnaire was used to determine floater activities. A number of Niobrara River Outfitters also provided and collected completed survey cards from their customers. The questionnaire also sought permission to send the user a more detailed follow up survey in late 2007. The distribution, collection of completed user survey cards and much of the data entry was completed by September 30, 2007. Information collected from the survey cards and a 2008 follow-up questionnaire helped document use and provide data for a socio-economic analysis and

report needed for an instream flow application for recreational floating. Following initial discussions, the NGPC contracted with a University of Nebraska-Omaha economist (Dr. Steven Schultz) to develop and conduct the additional 2008 survey materials including field contacts with river recreationists and others and prepare a final report on socio-economic values of receational floating on the National Niobrara Scenic River reach. The final report (Phase I) was completed during June 2009 (Shultz 2009).

As part of a 2007 outreach and education effort, NGPC staff met with representatives of a number of organizations including the Lower Niobrara NRD (Feb 07), I & E Division (April 07); canoe outfitters (Jun 07); Upper-Middle-Lower Niobrara NRDs, NDNR, and other partners (Aug 07); Niobrara Partners (Nov 07), as well as collaborative efforts with the Niobrara Council to organize a October 18, 2007 meeting with landowners within the Niobrara Scenic River corridor to provide information and answer questions about the Niobrara instream flow project. On May 24, 2007, the NGPC also passed a formal Resolution endorsing and supporting moratoriums on new groundwater and surface water uses in the Niobrara River Basin and sent it to the Director, Nebraska Department Natural Resources. Due to Nebraska Public Power District's (NPPD) formal complaint that its senior water right appropriations to generate hydro power at Spencer Dam were not being met, the NDNR (2007) reached a preliminary conclusion on October 16th, 2007 that the Lower Niobrara River upstream of Spencer Dam was fully appropriated. After due process involving three public information and three public hearings, on January 25th, 2008 the NDNR issued a final determination concluding that the portion of the lower Niobrara Basin between Mirage Flats diversion dam and the Spencer Hydropower Plant is fully appropriated (NDNR 2008a, Appendix J). Obviously, the first question through staff minds was whether or not NGPC could indeed obtain an instream appropriation under such fully appropriated conditions. A letter from the director of NGPC to the director of NDNR and subsequently a response helped clarify and assure us that it was possible because Nebraska Statute §46-714(n) allows new surface water uses for which a variance has been granted for good cause and NDNR Regulation 457 N.A.C. 23.001.01 allows a surface water variance for non-consumptive use (NDNR 2008b). Outreach activities during 2008 included partnership meetings and planning that included findings on the recreational floating study, socio-economic study plan, and a riverine fishery study planning effort. During 2009 much effort was put forth to develop a video of the Niobrara.

☐ Fish and Wildlife resources of the Niobrara River

During 2008, planning was initiated to consider natural resources dependent upon the flow regime of the river in contemplation of future work needs. A review of the literature noted in the bibliography above is part of the first consideration to discovery what is known about these resources, but additional studies are adding to the base information which will be utilized. Dietsch (2008) published USGS Fact Sheet 2007-3098 entitled: *Water quality and fish community data for the Niobrara National Scenic River, Nebraska, 2003-05*. On March 4th, 2008 a Science Team meeting was held in Hardin Hall at the University of Nebraska to determine the types of studies which will be needed to seek instream flows on the Niobrara River. Flow dependency and species

discussion included fish, birds, herps (reptiles and amphibians), aquatic macroinvertebrates and macrophytes, riparian/terrestrial, as well as sturgeon fish species below Spencer Dam. This planning continued into October and December meetings when tentative agreements were agreed to by the NGPC and National Park Service to help fund and participate in fish sampling at selected geomorphical macrohabitat sites along the river during May through October 2009.

Other Niobrara River Studies Initiated and/or Continued in 2009:
Economics of Out-of Stream Niobrara Water. NGPC contracted with the University of Nebraska – Omaha (UNO) for a Phase II research project titled "Estimating the Current and Potential Economic Values of Out-of-Stream Water Uses in the Niobrara Basin." This project will summarize and evaluate current and potential value of water used for both hydro-electric production and agro-industrial uses. The economic value of alternative out-of-stream uses of water will be an important to developing instream flow applications for public trust resources of the river. This project will involve NET grant funding and a report is expected by May 2010.

Niobrara Seepage Study. During the July-September 2009 it was decided that information on groundwater contributions to the Niobrara River would be helpful additional information to help augment understanding of the base-flow hydrology of the river. The study reach was determined to be from the Dunlap Diversion Dam downstream to the confluence with the Missouri River. Seepage study meetings were held with USGS, NPS, NDNR and USFWS to plan and cost-share funding and in-kind assistance for a hydrology base-flow study. The field data collection was completed in November 2009 and a USGS final report is due by June 2010. This will involve some cost-share funding from NGPCs NET grant.

Niobrara Fishery Inventory. The cooperative Niobrara fish inventory study with Greg Wanner of the U.S. Fish and Wildlife Service (USFWS) and NGPC fishery staff was carried out during 2009. The field data collection was completed in October and a final report from Greg Wanner is to be prepared by June 2010. NGPC Fish Management and Fishery Research staff participated in this study that included use of electrofishing gear and hoop-nets. Funding for this project came from the USFWS, NPS, NPPD, and the NGPC and its NET grant in part.

Fish, Wildlife, Habitat & Environmental Flow Study- UNL, School of Natural Resources. In April 2009 the NGPC hosted a stakeholders workshop in Lincoln for Dr. Piotr Parasiewicz of the Rushing Rivers Institute to describe a method commonly known as “MesoHABSIM” for evaluating fishery flows in streams. Subsequently NGPC contracted with Dr. Mark Pegg of the School of Natural Resources at UNL to conduct a project titled “Developing Environmental Flows in the Niobrara River for Fish and Wildlife.” The 2.5 year research project was initiated in July 2009 with objectives being:

1 – To quantify existing habitats and develop a model of habitat availability related to flow in the Niobrara River.

2 – To identify and model available habitat used by target species, life-stages, and/or guilds in the Niobrara River over a range of flows.

3 – To recommend flows needed (e.g., magnitude, frequency, duration, timing, and rate of change of flows) in the Niobrara River to sustain the existing fish and wildlife community composition (presence/absence) and structure (abundance).

Dr. Pegg will use a graduate student and be assisted by Dr. Parasiewicz of Rushing Rivers Institute using MesoHABSIM methodology. The project was initiated 1 July 2009 and will go through 30 June 2012. A preliminary reconnaissance of the Niobrara River and a review of other data collections was completed during 2009 by Dr. Pegg and Dr. Parasiewicz. Preliminary plans include a progress workshop for a stakeholders outreach meeting in Lincoln during March 2010. This study will be entirely funded under FW-19-T-21.

Public Outreach Friends of Niobrara (FON) video project. In August 2009 NGPC contracted with FON to produce a video to be completed by June 2010. NGPC has allocated $20,000 for this production. The contract contains various provisions for NGPC oversight on script and content related to Niobrara and instream flow studies. NGPC met with FON officers and videographer and reviewed video examples and partial scripts several times earlier this year. Funding for this project will be under the NET grant.

Late in 2009, Fishery staff began evaluating reports on hydrology, geomorphology, recreational floating, and socio-economics of recreational uses for instream flow recommendations to sustain canoeing, kayaking and tubing. This process will continue in 2010.

The Lower Platte River

When the Nebraska Game and Parks Commission was planning and applying for fish community instream flow appropriations during the 1990s, information was lacking on natural hydrograph flows needed by shovelnose and pallid sturgeon as well as least terns and piping plovers. Consequently, all inclusive flows for their life cycle needs were not sought. Since then, the importance of the natural hydrograph necessary to sustain the geomorphological features for these three species has been determined (Parham 2007). After many years of water development and diversion of river flows, the varability of the remaining hydrograph during spring months must be protected in order to create sandbar habitat needed by terns and plovers to nest upon as well as provide suitable depth for river connectivity to que sturgeon to migrate upstream and spawn in the Platte River and then descend to the Missouri River. This element of the natural hydrogaph is also important to many other species of fish and wildlife. The Nebraska Non-Game and Endangered Species Conservation Act (NNESC) could very well be utilized via a biological opinion to protect the remaining flows in the Lower Platte because it would allow protection of higher flows of the natural hydrograph which could not be obtained under the limitations of the existing instream flow law/process. During 2008 numerous meetings were held within and without NGPC and NDNR to discern the proper process to evaluate future surface water

appropriations for diversions on the Lower Platte and the Loup and Elkhorn tributaries. If future water development occurs, it most likely will entail water off sets in some form or another because there has been heavy surface and ground water development already. *A Rivers 101 – Processes and Concepts* white paper (Zuerlein 2008) was developed upon request and distributed to a working group of state and NRD personnel with emphasis on the ecological purposes of base, pulse, and flood flows as defined by (Richter et al. 2006). In the December 2007 NDNR basin report issued for 2008, the lower Platte River was not declared fully appropriated, but the likelihood that it may increased because of the continuous development pressures for surface and ground water. During 2009 staff from the NGPC continued to refine the high flows needed to protect what is left of the hydrograph natural varability. Another sturgeon study on the lower Platte is also providing additional data on this resource.

Nebraska Unicameral Activities

During 2006, Larry Hutchinson and Gene Zuerlein worked with Professor Sandra B. Zeller (University of Nebraska Law College) to formulate a review of Nebraska Instream Flow Legislation. Part of this effort was educational in that the purpose was to help educate new State Senators about the status of current instream flow laws. The product of this effort was submitted in Memorandum (Re: Nebraska Unicameral Memo on Instream Flow Legislation) and used in a briefing document prepared for all State Senators for the 2007 Legislative Session (Appendix I). During the 2008 Legislative session, LR 291 was passed and two public hearings (August 20, 2008 in Alliance and November 20, 2008 in Lincoln) were conducted by the Legislature's Natural Resource Committee. The purpose, to examine the application process for obtaining an instream flow right by either a natural resource district or the Game and Parks Commission. Interest in this topic by the Natural Resource Committee indicates that there could be legislative proposals during the 2009 legislative session to amend Nebraska Water Law that will impede the ability to get instream flow appropriations on the Niobrara River. At the Alliance meeting Nebraska's instream flow law was critized (OWH 2008a).

During 2009, LB 438 was introduced. This bill as initially written would undermine existing instream flow legislation. It was opposed by the Director of the Department of Natural Resources, among others, because it would affect transfers of water all over the Platte River and be counter productive to LB 962 passed in 2004.

b. Significant Deviations: During 2009, fish and wildlife studies using the MesHABSIM methodology with a contractor and the University of Nebraska was formalized and started in order not to under spend this project in the future. This official time frame for this study is 1 July 2009 through 30 June 2012.

c. Recommendations: Use contract to develop envoronmental flows in the Niobrara River for fish and wildlife resources starting on 1 July 2009 and going through 30 June 2012.

d. Cost: Budgeted $ 431,300 Actual $ 174,227

Total costs: Budgeted $ 474,900 Actual $ 236,312

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APPENDIX A

Table 1, 2, and 3 illustrating instream flows appropriated for the central and lower Platte River reaches. Table 4 illustrating instream flows appropriated for Long Pine Creek which were up for review during 2004 and which were subsequently re-approved.

Table 1. Platte River **instream flows** in cubic feet per second **appropriated** by the Department of Natural Resources **to the Central Platte Natural Resources District** on September 23, 1994[1,2] (effective priority date of July 25, 1990) by purpose, segment, time period, and gage location.

				Central Platte River reach		
Application and flow requested by time period	**Purpose**	**River segment**	**Time period**	**Overton gage**	**Odessa & Grand Island gages**	**Duncan gage**
A-17004 a 500 cfs b 600 cfs c 500 cfs	Maintain fish and macroinvertebrates as food for terns and plovers	J-2 mouth downstream to Columbus	Jan 1- Jun 23 Jun 24 - Aug 22 Aug 23 - Dec 31	500 600 500	500 600 500	500 600 500
A-17005 a 750 cfs b 750 cfs	Maintain fish and waterfowl as food for bald eagles	J-2 wasteway gate to mouth	Jan 1- Feb 25 Dec 10 - Dec 31	Both **dismissed** because the segment is a canal		
A-17006 a 1,100 cfs b 1,100 cfs	Maintain fish and waterfowl as food for bald eagles	J-2 mouth downstream to Elm Creek	Jan 1- Feb 25 Dec 10 - Dec 31	**denied** **denied**		
A-17007a 1,100 cfs	Initiate biological activity(invetebrates) in wet meadows	J-2 mouth downstream to Chapman	Feb 15- Feb 28	**denied**		
A-17007 b 1,100 cfs c 1,100 cfs	Maintain staging and roosting habitat for sandhill cranes	J-2 mouth downstream to Chapman	Mar 1 - Mar 31 Oct 1- Oct 11	1,100 1,100	1,100 1,100	
A-17008 a 1,300 cfs b 1,500 cfs c 1,500 cfs	Maintain staging and roosting stopover habitat for whooping and sandhill cranes	J-2 mouth downstream to Grand Island	Apr 1- Apr 14 Apr 15 - May 3 Oct 12 - Nov 10	1,300 1,500 1,500	1,300 1,500 1,500	
A-17009 1,100 cfs	Maintain staging and roosting habitat for sandhill cranes	Grand Island downstream to Chapman	Apr 1- Apr 14		1,100 G. Island gage only	

Nebraska Revised § 46-2,112 requires NDNR to review instream flow appropriations every 15 years from the date they were granted (September 23, 1994). In 2009, NDNR called for a review of the above appropriations by publishing in several newspapers for three consequetive weeks (June 17 through July 8, 2009) and posting the review on DNR and CPNRD websites. Interested parties were given until August 27, 2009 to present evidence relevant to the review or request a hearing. Two letters of support for the instream flow appropriations were received (CPNRD August 6 and NGPC August 19). No other evidence was presented. Brian Dunnigan, Director of NDNR, subsequently issued an October 5, 2009 Order stating these appropriations continue to be benefical, are in the public interest, and should contiue in effect with no modifications.

Superscript notes:
1 = Nebraska Supreme Court. 1994. Opinion of the Supreme Court of Nebraska. Central Platte NRD v. State of Wyoming. March 25, 1994.
2 = Nebraska Department Water Resources (now Nebraska Department Natural Resources). 1994. Director Order dated September 23 in the Matter of instream flow Applications A-17004 through A-17009.

Table 2. Platte River **instream flows** in cubic feet per second **appropriated** by the Department of Natural Resources **to the NGPC** on June 26th, 1998 (effective priority date of November 30th, 1993) by purpose, segment, time period, and gage location (does not include previous instream appropriations granted to the CPNRD for the central Platte River reach). (Corrected for superscript notations)

				Central Platte River reach [1]		*Lower Platte River reach*	
Application and flow requested by time period	**Purpose**	**River segment**	**Time period**	**Odessa & Grand Island gages**	**Duncan gage**	**North Bend gage**	**Louisville gage**
A-17329 1,000 cfs Jan-Dec	Fish community	Kearney Canal diversion downstream to Loup Power return at Columbus	Jun 1-Jun 23 Jun 24-Jul 31 Aug 1- Aug 22 Aug 23-Aug 31	500 400 200[2] 300[2]	500 400 300 400		
A-17330 1,800 cfs Jan-Dec	Fish community	Loup Power Canal return downstream to confluence with Elkhorn River	Entire year			1,800	
A-17331 3,700 cfs Jan-Dec	Fish community	Elkhorn River downstream to mouth of Platte River	January Feb-Jul 31 August September Oct 1-Dec 31				3,100[2] 3,700 3,500[2] 3,200[2] 3,700
A-17332 2,400 cfs Apr 1-May 10 and Oct 1-Nov 10	Whooping crane roost habitat	Kearney Canal diversion downstream to U.S. Hwy 281 bridge at Grand Island	Apr 1- Apr 14 May 4 -May 10 Oct 1- Oct 11	50 1,350 1,350			
A-17333 Feb 2,700 cfs Mar 3,200 cfs Apr 2,800 cfs May-Jun 5,900 cfs	Wet meadow habitat	J-2 return downstream to Chapman, just east of Grand Island	February March April May June	**denied** **denied** **denied** **denied** **denied**			

The above instream flows will be up for review in 2013.

Superscript notes:
1 = Central Platte River reach instream flows granted to the NGPC are in addition to previous instream appropriations granted to the CPNRD.
2 = NDNR reduced the instream flow request because it exceeded the 20 percent exceedence flow limit set by statute.

Table 3. **Total instream flows** in cubic feet per second granted **for the <u>central and lower</u> Platte River when <u>CPNRD appropriations</u>** (effective priority date of July 25, 1990) **<u>are combined</u> with <u>NGPC appropriations</u>** (effective priority date of November 30, 1993) by time period and gage location. (Corrected for gage locations and superscripts)

	Central Platte River reach			*Lower Platte River reach*	
Time Period	**Overton gage [1]**	**Odessa & Grand Island gages**	**Duncan gage**	**North Bend gage [3]**	**Louisville gage [3]**
January	500	500 [1]	500 [1]	1,800	3,100[10]
February	500	500 [1]	500 [1]	1,800	3,700
March	1,100	1,100 [1]	500 [1]	1,800	3,700
April 1 - 14 April 15 - 30	1,300 1,500	1,350 [2] 1,500 [1]	500 [1] 500 [1]	1,800 1,800	3,700 3,700
May 1 - 3 May 4 - 10 May 11 - 31	1,500 500 500	1,500 [1] 1,350 [3] 500 [1]	500 [1] 500 [1] 500 [1]	1,800 1,800 1,800	3,700 3,700 3,700
June 1 - 23 June 24 - 30	500 600	1,000 [4] 1,000 [5]	1,000 [4] 1,000 [5]	1,800 1,800	3,700 3,700
July 1 - 31	600	1,000 [5]	1,000 [5]	1,800	3,700
August 1 - 22 August 23 - 31	600 500	800 [6, 10] 800 [7, 10]	900 [8, 10] 900 [9, 10]	1,800 1,800	3,500 [10] 3,500 [10]
September	500	500 [1]	500 [1]	1,800	3,200 [10]
October 1 - 11 October 12 - 31	1,100 1,500	1,350 [3] 1,500 [1]	500 [1] 500 [1]	1,800 1,800	3,700 3,700
November 1 - 10 November 11 - 30	1,500 500	1,500 [1] 500 [1]	500 [1] 500 [1]	1,800 1,800	3,700 3,700
December	500	500 [1]	500 [1]	1,800	3,700
Annual Mean Discharge (and period of record)	at Overton 1,664 (1942-2000) at Odessa 1,539 (1942-1991)	at Kearney 2,259 (1983-2000) at G. Island 1,658 (1942-2000)	at Duncan 1,883 (1942-2000)	at N. Bend 4,687 (1949-2000)	at Louisville 7,158 (1953-2000)

Superscript notes:

1 = CPNRD
2 = NGPC (50 cfs) plus CPNRD (1,300 cfs)
3 = NGPC
4 = NGPC (500 cfs) plus CPNRD (500 cfs)
5 = NGPC (400 cfs) plus CPNRD (600 cfs)
6 = NGPC (200 cfs) plus CPNRD (600 cfs)
7 = NGPC (300 cfs) plus CPNRD (500 cfs)
8 = NGPC (300cfs) plus CPNRD (600 cfs)
9 = NGPC (400 cfs) plus CPNRD (500 cfs)
10 = NDWR (NDNR) reduced the instream flow request because it exceeded the 20 percent exceedence flow limit set by statute.

Table 3 (with purposes specified). **Total instream flows** in **cubic feet per second** granted **for the <u>central and lower</u> Platte River when <u>CPNRD appropriations</u>** (effective priority date of July 25, 1990) **<u>are combined</u> with <u>NGPC appropriations</u>** (effective priority date of November 30, 1993) by time period and gage location. (Corrected for gage locations and superscripts)

	Central Platte River reach			*Lower Platte River reach*	
Time Period	**Overton gage [1]**	**Odessa & Grand Island gages**	**Duncan gage**	**North Bend gage [3]**	**Louisville gage [3]**
January	500 Fish & macro for t & p	500 [1] Fish & macro for t & p	500 [1] Fish & macro for t & p	1,800 **Fish community**	3,100[10] **Fish community**
February	500 Fish & macro for t & p	500 [1] Fish & macro for t & p	500 [1] Fish & macro for t & p	1,800 **Fish community**	3,700 **Fish community**
March	1,100 Sandhill crane habitat	1,100 [1] Sandhill crane habitat	500 [1] Fish & macro for t & p	1,800 **Fish community**	3,700 **Fish community**
April 1 - 14 April 15 - 30	1,300 WC & Sandhill habitat 1,500 WC & Sandhill habitat	1,350 [2] **WC** & Sandhill habitat 1,500 [1] WC & Sandhill habitat	500 [1] Fish & macro for t & p 500 [1] Fish & macro for t & p	1,800 **Fish community** 1,800 **Fish community**	3,700 **Fish community** 3,700 **Fish community**
May 1 - 3 May 4 - 10 May 11 - 31	1,500 WC & Sandhill habitat 500 Fish & macro for t & p 500 Fish & macro for t & p	1,500 [1] WC & Sandhill habitat 1,350 [3] **Whooping Crane habitat** 500 [1] Fish & macro for t & p	500 [1] Fish & macro for t & p 500 [1] Fish & macro for t & p 500 [1] Fish & macro for t& p	1,800 **Fish community** 1,800 **Fish community** 1,800 **Fish community**	3,700 **Fish community** 3,700 **Fish community** 3,700 **Fish community**
June 1 - 23 June 24 - 30	500 Fish & macro for t & p 600 Fish & macro for t & p	1,000 [4] **Fish comm** & t & p 1,000 [5] **Fish comm** & t & p	1,000 [4] **Fish comm** & terns & plovers 1,000 [5] **Fish comm** & terns & plovers	1,800 **Fish community** 1,800 **Fish community**	3,700 **Fish community** 3,700 **Fish community**
July 1 - 31	600 Fish & macro for t & p	1,000 [5] **Fish comm** & t & p	1,000 [5] **Fish comm** & tern & plover	1,800 **Fish community**	3,700 **Fish community**
August 1 - 22 August 23 - 31	600 Fish & macro for t & p 500 Fish & macro for t & p	800 [6, 10] **Fish comm** & t & p 800 [7, 10] **Fish comm** & t & p	900 [8, 10] **Fish comm** & terns & plovers 900 [9, 10] **Fish comm** & terns & plovers	1,800 **Fish community** 1,800 **Fish community**	3,500[10] **Fish community** 3,500 [10] **Fish community**
September	500 Fish & macro for t & p	500 [1] Fish & macro for t & p	500 [1] Fish & macro for t & p	1,800 **Fish community**	3,200 [10] **Fish community**
October 1 - 11 October 12 -31	1,100 Sandhill crane habitat 1,500 WC & Sandhill habitat	1,350 [3] **W Crane habitat** 1,500 [1] Whooping Crane habitat	500 [1] Fish & macro for t & p 500 [1] Fish & macro for t & p	1,800 **Fish community** 1,800 **Fish community**	3,700 **Fish community** 3,700 **Fish community**
Nov 1 - 10 Nov 11 - 30	1,500 WC & Sandhill habitat 500 Fish & macro for t & p	1,500 [1] WC & Sandhill habitat 500 [1] Fish & macro for t & p	500 [1] Fish & macro for t & p 500 [1] Fish & macro for t & p	1,800 **Fish community** 1,800 **Fish community**	3,700 **Fish community** 3,700 **Fish community**
December	500 Fish & macro for t & p	500 [1] Fish & macro for t & p	500 [1] Fish & macro for t & p	1,800 **Fish community**	3,700 **Fish community**
Annual Mean Discharge (and period of record)[11]	at Overton 1,664 (1942-2000) at Odessa 1,539 (1942-1991)	at Kearney 2,259 (1983-2000) at G. Island 1,658 (1942-2000)	at Duncan 1,883 (1942-2000)	at N Bend 4,687 (1949-2000)	at Louisville 7,158 (1953-2000)

Superscript notes for Table 3 (with purposes specified) continued:

1 = CPNRD

2 = **NGPC (50 cfs for maintaining whooping crane roost habitat)** <u>plus</u> CPNRD (1,300 cfs for maintaining staging and roosting stopover habitat for whooping and sandhill cranes).

3 = NGPC

4 = **NGPC (500 cfs for maintaining the fish community)** plus CPNRD (500 cfs for maintaining fish and macroinvertebrates as food for least terns and piping plovers).

5 = **NGPC (400 cfs for maintaining the fish community)** plus CPNRD (600 cfs for maintaining fish and macroinvertebrates as food for least terns and piping plovers).

6 = **NGPC (200 cfs for maintaining the fish community)** plus CPNRD (600 cfs for maintaining fish and macroinvertebrates as food for least terns and piping plovers).

7 = **NGPC (300 cfs for maintaining the fish community)** plus CPNRD (500 cfs for maintaining fish and macroinvertebrates as food for least terns and piping plovers).

8 = **NGPC (300cfs for maintaining the fish community)** plus CPNRD (600 cfs for maintaining fish and macroinvertebrated for least terns and piping plovers).

9 = **NGPC (400 cfs for maintaining the fish community)** plus CPNRD (500 cfs for mainting fish and macroinvertebrates as food for least terns and piping plovers).

10 = NDNR reduced the instream flow request because it exceeded the 20 percent exceedence flow limit set by statute.

11 = USGS, Water Resources Data, Nebraska, Water Year 2000. Water-Data Report NE-00-1

Other Notes:
WC = Federal and State listed **Endangered** Whooping Crane

Interior Least Tern = Federal and State listed **Endangered**

Piping plover = Federal and State listed **Threatened**

Table 4. Long Pine Creek **instream flows** in cubic feet per second **appropriated** by the NDWR (now Department of Natural Resources) **to the Nebraska Game and Parks Commission** on December 14, 1989 (effective priority date of April 29, 1988) by purpose, segment, time period, quantity, and reach.

Application	Purpose	Stream segment	Time period	Quantity	Stream reach/comment
A-16533, A-16534, A-16535 filed on January 8, 1987	To maintain fish and wildlife				On June 23, 1987 all three applications were denied on procedural grounds (Denied without Prejudice); not on their merits
A-6642A	Sustaining a natural reproducing rainbow and brown trout population	SW1/4 NW1/4 of Section 8, Township 30 North, Range 20 West of the 6th P.M.	Jan 1- Dec 31	50	The designated stream segment shall extend from the Highway 20 bridge crossing Long Pine Creek (NE1/4NW1/4 of Section 30, Township 30 North, Range 20 West) downstream to the confluence of Bone Creek and Long Pine Creek (SW1/4SW1/4 of Section 5, Township 31 North, Range 20 West)
A-6642B	Sustaining a natural reproducing rainbow and brown trout population	NW1/4Sw1/4 of Section 8, Township 31 North, Range 20 West of the 6th P.M.	Jan 1 – Dec 31	60	

A-16642A and B will be reviewed in a public hearing 15 years from the date the permits to appropriate water for instream flows were granted under the **rebuttable presumption**. The purpose of this hearing will be to receive evidence regarding whether the water appropriated under the permit still provides the beneficial uses for which the permit was granted and whether the permit is still in the public interest (State Statute 46-2,112). This means that 2004 was the year for the Long Pine Creek instream flow appropriation review. The hearing date and location is up to the Director of the Department of Natural Resources to set. The results of this process and the timeline which transpired are presented in a **Department of Natural Resources Order** (Roger K. Patterson, Director) dated October 14, 2004. Essentially, both appropriations were found to continue to be beneficial for the purpose for which they were granted, were in the public interest, and should continue in effect with no modifications.

APPENDIX B

List of select high priority streams and rivers in need of instream flows protection for fish, wildlife, and recreational purposes. This does not mean that those not listed are not important. All streams and rivers are important to the quality of life in Nebraska because they provide for a multitude of ecosystem goods and services such as water quality needs and groundwater recharge. Likewise, everyone lives downstream of someone else.

Other examples of free flowing rivers with outstanding features include: the 80 miles of Calamus River from the North Loup River to source, the 68 miles of the Dismal River from the Middle Loup River to the confluence of the north and south forks, the 89 miles of the Middle Loup River from Milburn Diversion Dam to the confluence of the north and south branches, and the 96 miles of the Snake River.

Table 1. High priority streams and rivers in need of instream flow protection.

River Basin	Stream / River	Comments
White River / Hat Creek	White River	Value Class I & III fisheries. Trout streams & fisheries that contribute substantially to recreation experiences of Pine Ridge vacationers.
Niobrara	**Long Pine Creek**	**Nebraska's first instream flow appropriations for fishery resources was granted to the Nebraska Game and Parks Commission via Nebraska Department of Natural Resources approval on 14 December 1989; effective priority date is 29 April 1988 for trout resources.** *This appropriation will be up for review 15 years from the date it was granted (NDNR Surface Water Rules, Chapter 46, Article 2, 2004, 46-2112). During 2004 the appropriations were found to continue to be used beneficially for the purpose for which they were granted, are in the public interest, and should continue in effect with no modifications.*
	Lower reach Snake River	Well documented as a high value trout fishery (Value Class I).
	Holt Creek, Keya Paha Co.	Habitat for minnow species classified threatened under Nebraska Nongame and Endangered Species Law. Designated Value Class I for fishery purposes.
	Niobrara River	Cornell Dam at Valentine to mouth is a Value Class I & II fishery, important for recruitment to Missouri River fishery. Outstanding canoeing above Rocky Ford attracts canoers from considerable distances. A 76 mile reach from the Borman Bridge south east of Valentine downstream to Nebraska highway 137 was federally listed as Scenic in 1991. Another 25 mile segment near the mouth was listed as Recreational. On May 24, 2006, the Board of Commissioners passed a Resolution directing NGPC staff to develop instream flow recommendations for the Niobrara and high quality tributaries. Unique ecosystem and threatened and endangered species utilize the river and tributaries.
North Platte	North Platte River	North Platte River between Wyoming/Nebraska state line and Lewellen is a Value Class I fishery. In addition it has migration and wintering habitat for ducks and geese.
	Nine Mile Creek	Value Class I fishery for trout.
Middle Platte	**Middle Platte River**	Wildlife values of international, national, regional, state, and local importance. Migratory waterfowl, sandhill and whooping cranes, bald eagle, interor least tern, piping plover, etc. Value Class II & III fishery (potential upgrade to Value Class I fishery). **Nebraska's second instream flow appropriations for fish and wildlife in the Lexington to Columbus reach approved 2 July 1992[1] and subsequently on September 23, 1994 . Effective appropriation priority date is 25 July 1990 and it is held by the Central Platte NRD.** *The 15 year review from the day it was granted means that in 2009 a public hearing will be conducted under the rebuttable presumption* . **On June 26, 1998 additional instream flows for fish and wildlife resources were granted to the Nebraska Game**

		and Parks Commission effective 30 November 1993. *The 15 year review from the day they were granted means that in 2013 a public hearing will be conducted under the rebuttable presumption*.
Lower Platte	**Lower Platte River**	Value Class I fishery, especially channel catfish. State listed lake sturgeon. State and federal listed (September 6, 1990) pallid sturgeon. The first bald eagle chick was hatched near Fremont in Spring 1991. **On June 26, 1998 additional instream flows for fishery resources were granted to the Nebraska Game and Parks Commission effective 30 November 1993.** The 15 year review *from the day they were granted means that in 2013 a public hearing under the rebuttable presumption will be conducted.*
Elkhorn	Elkhorn River	Value Class I & II fishery. In an area of the state with limited alternative fishing opportunity. Suggested by Nebraska Natural Resources Commission Director Dale Williamson
Loup	Cedar River	Value Class I fishery.
Nemaha	Big Nemaha	Includes North & South Branch Big Nemaha tributaries. All are Value Class I fisheries. Streams are vulnerable during moderate to severe droughts.
Missouri	Missouri River reaches	All reaches vital for reproduction of riverine fish species. Unchannelized 59 mile reach downstream of Gavins Point Dam designated a national Recreational River in 1978; channelized reach downstream of Sioux City has USACE mitigation ongoing. The 39 mile unchannelized reach above Gavins Point Dam was federally listed as a National Recreational River in May 1991. Threatened & endangered species include lake sturgeon, pallid sturgeon, least tern, and piping plover.
	Bazile Creek	Value Class II fishery; State Wildlife Management Area on the floodplain; and Lewis and Clark Lake.

Note: Value Classes per Office of Biological Services, Denver, Co. (USFWS 1978).

Superscript note:

1 = Originally the NDNR Order granted instream flow appropriations on the central Platte River to the CPNRD on July 2, 1992. Subsequently the State of Wyoming appealed this NDNR order to the Nebraska Court of Appeals and subsequently to the Nebraska Supreme Court (Central Platte NRD v. State of Wyoming 1994). On March 25, 1994 the Nebraska Supreme Court entered an Order that affirmed in part and reversed in part the July 2, 1992 Order of the NDNR Director. The Court remanded the matter to the NDNR to consider solely the possible effect of the Prairie Bend II Project on the instream flow applications. A hearing on remand was conducted on August 29, 1994 and the CPNRD offered evidence that the Prairie Bend II Project would be operated as if it were a junior right to the instream flow appropriations. (This, of course, assumed that the Prairie Bend II applications to divert water away from the Platte River would ultimately be approved by the NDNR). Finally, the NDNR Director issued a final Order regarding the CPNRD applications on September 23, 1994. The effective date is still the date the applications were originally filed, but the **15 year review date changes to September 23, 2009 rather than the 2007 date reported in previous performance reports.**

APPENDIX C

List of surface water applications to appropriate/divert South Platte and Platte River flows from 1976 through 1990 (Appendix C, Table 1). All applications were denied for one reason or another by the Director, Department of Water Resources. A Nebraska Supreme Court Case citation means that the Director's Order to deny an application to appropriate was appealed. Note total acre-feet requested versus the acre-feet available at the Grand Island gage station on an annual basis.

Table 1. List of applications to appropriate/divert South Platte and Platte River flows (1976-1990).

Year Applied	Applicant/s, Source of Water, Project/s	Maximun diversion request in acre-feet	Reference/s
1976	*Central Nebraska Conservation Association* **(Prairie Bend I Project-diversion of Platte River to two reservoirs along the central Platte)**	562,000	NDWR 1981-1982[1] Nebraska Supreme Court Case No. 91-315[4] (p35-43)
1977	*Little Blue NRD* **(<u>Transbasin diversion</u> from the Platte River to the Little Blue I, II, III and Catherland Project-Campbell Reservoir in the Little Blue River Basin).**	324,500	NDWR 1985-1986[2] Nebraska Supreme Court Case No. 84-175[2] (p15-21) and Case No. 86-692[3] (p55-60)
1980	*Hitchcock & Red Willow, Frenchman Valley, and Franchman-Cambridge Irrigation Districts* **(<u>Transbasin diversion</u> from S. Platte to Enders Reservoir in the Republican Basin).**	45,000	NDWR 1987-1988[3] Nebraska Supreme Court Case No. 86-008[3] (p15-25)
1981	*Twin Valley Conservation Association* (**Wood River et al. Project-diversion of Platte River to nine reservoirs along the central Platte**)	378,800	NDWR 1991-1992[4]
1981	*Twin Platte NRD* **(Diversion from S. Platte in Colorado via Perkins County Canal to six reservoirs along the S. Platte River in Nebraska).**	165,000	NDWR 1985-1986[2] Nebraska Supreme Court Case No. 85-473[2] (p38-43)
1981	*Upper Big Blue NRD* **(<u>Transbasin diversion</u> from Platte River to Landmark Project-six reservoirs in the Upper Big Blue Basin)**	444,000	NDWR 1982[6]
1981	Upper Big Blue NRD, CNPPID, and Platte River Whooping Crane Habitat Maintenance Trust **(Plum Creek Project-diversion of Platte River to one reservoir along the central Platte)**	315,000	NDWR 1991-1992[4]
1982	*Upper Republican NRD* (**<u>Transbasin diversion</u> from S. Platte River to five reservoirs in the Republican Basin)**	35,000	NDWR[6]
1990	*Central Platte NRD* (**Prairie Bend II-diversion of Platte River to one reservoir along the central Platte**)	129,000	NDWR 1991-1992[4] NDWR 1995-1996[5] and Nebraska Supreme Court Case No. S –95-629[5] (p42-54)
	Total surface water diversion requested from above projects	**2,393,800**	Zuerlein 2008
	Annual surface runoff at Grand Island gage (1942-1993)	**1,131,000**	Boohar et al. 1994

Appendix C, Table 1 References

Boohar, J.A., C. G. Hoy, and G.V. Steele. 1994. Water resources data in Nebraska water year 1993. U.S. Geological Survey Water-Data Report NE-93-1. p 107.

[1]NDWR (Nebraska Department Water Resources). 1981-1982. Forty-fourth biennial report, Department of Water Resources, to the Governor of Nebraska. p6-7.

[2] NDWR (Nebraska Department Water Resources). 1985-1986. Forty-sixth biennial report to the Governor of Nebraska. Nebraska Supreme Court Case No. 84-175 involving a diversion of Platte River to the Little Blue I, II, and III Project; Catherland Project in the Little Blue River Basin (p15-21) and Nebraska Supreme Court Case No. 85-473 involving the Twin Platte NRD Project (p38-43) of diverting S. Platte water in Colorado to projects along the S. Platte in Nebraska.

[3] NDWR (Nebraska Department Water Resources). 1987-1988. Forty-seventh biennial report to the Governor of Nebraska. Nebraska Supreme Court Case No. 86-008 involving a transbasin diversion from the S. Platte to the Enders Reservoir Project located in the Republican River Basin(p15-25) and Nebraska Supreme Court Case No. 86-692 involving diversion of Platte River water to the Little Blue Basin. p55-60.

[4] NDWR (Nebraska Department Water Resources), 1991-1992. Forty-ninth biennial report, Department of Water Resources, to the Governor of Nebraska. Nebraska Supreme Court Case No. 91-315 involving Prairie Bend I. p35-43.

[5] NDWR (Nebraska Department Water Resources). 1995-1996. Fifty-first biennial report, Department of Water Resources, to the Governor of Nebraska. Nebraska Supreme Court Case No. S-95-629 involving Prairie Bend II. p42-54.

[6] NDWR (Nebraska Department Water Resources). 1982. Summary of proposed projects from the Platte and South Platte rivers. Compiled January 19th.

Zuerlein, G. 2008. Personal communication (April 21) with Susan France, NDNR, regarding official requested quantities of water from the S. Platte and Platte River. Susan verified the quantities in the: Summary of proposed projects from the Platte and South Platte Rivers, a 1982 NDWR document.

APPENDIX D

Surface water gaging data for Nebraska streams and rivers along with the Montana method for analysis of flows for the April - September and October - March time frame. The Montana method of flow analysis is some times referred to as the Tennant method. It was used to determine seasonally adjusted instream flow recommendations that have hydrological relevance for maintaining natural habitat, as well as geomorphological and recreational attributes. It is based on percentages of average annual flow (QAA). Essentially, various percentages of QAA are calculated and applied to two 6 month time frames (October - March, and April - September) as follows (Annear et al. 2004):

Flow description[a]	April to September	October to March
Flushing or maximum flow	200% from 48 to 72 hours	
Optimum range of flow	60-100%	60-100%
Outstanding habitat	60%	40%
Excellant habitat	50%	30%
Good habitat	40%	20%
Fair or degraded habitat	30%	10%
Poor or minimum habitat[b]	10%	10%
Severe degradation	<10%	<10%

a For fish, wildlife, recreation, and related environmental resources.

b Only for short- term survival in most cases.

NEBRASKA GAME AND PARKS COMMISSION

Surface-water gaging stations (**=active station)

Mean monthly flows for period of record

USGS Station		Description	Period of Record	Average Annual Flow	Highest Annual Mean Flow	Lowest Annual Mean Flow	Ratio	Highest Daily Mean	Lowest Daily Mean	Ratio	Instantaneous Peak Flow
6453500		Ponca Creek at Anoka	1950-94	45.1	258	2.43	106.2	7990	0		9810
6453600	**	Ponca Creek at Verdel	1958-95	82.3	343	3.75	91.5	14800	0		15700
6454000		Niobrara River at Wyo-Ne Line	1956-94	3.63	5.77	2.14	2.7	352	0.54	651.9	2120
6454500		Niobrara River above Box Butte Reservoir	1947-94	28.8	42.8	18.6	2.3	1080	1.6	675.0	4950
6459475		Snake River at Doughboy	1982-93	164							
6459500		Snake River near Burge	1963-94	158	261	103	2.5	732	5.8	126.2	3170
6461000		Minnechaduza Creek at Valentine	1948-93	34.2							
6461500	**	Niobrara River near Sparks	1946-95	768							
6462500		Plum Creek at Meadville	1948-94	119	196	91.6	2.1	1540	15	102.7	2070
6463500	**	Long Pine Creek near Riverview	1948-95	152							
6464500	**	Keya Paha River at Wewala, SD	1939-95	73.4							
6464900		Keya Paha River near Naper	1958-94	139	389	44.5	8.7	6500	0		9280
6465000	**	Niobrara River near Spencer	1927-95	1449							
6465440		Redbird Creek at Redbird	1981-94	41.1	58.6	21.1	2.8	897	3.8	236.1	2140
6465500	**	Niobrara River near Verdel	1938-95	1640							
6465680		North Branch Verdigre Creek near Verdigre	1980-92	24.2							
6466500	**	Bazile Creek near Niobrara	1952-95	85.8							
6467500	**	Missouri River at Yankton	1976-95	26940							
6478518		Bow Creek near St.James	1979-93	79.8							
6486000	**	Missouri River at Sioux City	1958-95	28930							
6601000	**	Omaha Creek at Homer	1946-95	40.9							
6601200	**	Missouri River at Decatur	1988-95	26600							
6610000	**	Missouri River at Omaha	1958-95	32460							
6674500	**	North Platte River at Wyo-Ne Line	1929-95	781							
6677500		Horse Creek near Lyman	1931-94	74.9	174	18.1	9.6	1160	0.4	2900.0	5110
6679500		North Platte River at Mitchell	1958-94	803	3008	330	9.1	11400	54	211.1	27500
6686000		North Platte River at Lisco	1958-94	1381	3403	769	4.4	11700	43	272.1	20100
6690500		North Platte River near Keystone	1943-94	506	2162	108	20.0	8490	0		20300
6693000		North Platte River at North Platte	1943-94	748	2467	382	6.5	9100	97	93.8	29600
6764000	**	South Platte River at Julesburg	1902-95	544							
6764880	**	South Platte River at Roscoe, NE	1983-95	976							
6765500		South Platte River at North Platte	1947-94	431	2316	131	17.7	19700	35	562.9	37100
6768000		Platte River near Overton	1942-94	1593	5835	558	10.5	22300	2	11150.0	37600
6770200	**	Platte River near Kearney	1983-95	2239							
6770500	**	Platte River near Grand Island	1942-95	1579							
6772000		Wood River near Alda	1954-94	11.4	1993	0.089	22393.3	1590	0		1630

6773050		Prairie Creek near Ovina	1994	6.17							
6774000	**	Platte River near Duncan	1942-95	1791							
6775500	**	Middle Loup River at Dunning	1946-95	415							
6775900	**	Dismal River near Thedford	1967-95	199							
6776500	**	Dismal River at Dunning	1946-95	329							
6779000		Middle Loup River at Arcadia	1962-93	719							
6783500		Mud Creek near Sweetwater	1946-94	38.7	128	17.4	7.4	11400	0		27000
6784000	**	South Loup River at St.Michael	1944-95	239							
6784800		Turkey Creek near Dannebrog	1966-93	19.8							
6785000	**	Middle Loup River at St.Paul	1963-95	1118							
6786000	**	North Loup River at Taylor	1937-95	478							
6787000	**	Calamus River near Harrop	1979-95	251							
6787500	**	Calamus River near Burwell	1986-95	262							
6788500		North Loup River at Ord	1952-94	891	1098	769	1.4	6240	100	62.4	10100
6788988		Mira Creek near North Loup	1980-93	4.03							
6790500	**	North Loup River near St.Paul	1928-95	936							
6791500		Cedar River near Spaulding	1945-94	166	260	112	2.3	2240	30	74.7	4000
6792000	**	Cedar River near Fullerton	1941-95	258							
6793000	**	Loup River near Genoa	1944-95	692							
6794000	**	Beaver Creek at Genoa	1941-95	130							
6795500	**	Shell Creek near Columbus	1948-95	47.3							
6796000	**	Platte River at North Bend	1949-95	4569							
6796500	**	Platte River at Leshara	1994-95	7135							
6797500	**	Elkhorn River at Ewing	1947-95	195							
6798500		Elkhorn River at Neligh	1931-93	313							
6799000	**	Elkhorn River at Norfolk	1946-95	541							
6799080		Willow Creek near Foster	1976-93	15.3							
6799100	**	North Fork Elkhorn River near Pierce	1960-95	98.7							
6799230		Union Creek at Madison	1979-93	45.4							
6799350	**	Elkhorn River at West Point	1973-95	994							
6799385		Pebble Creek at Scribner	1979-93	53							
6799450		Logan Creek at Pender	1966-93	166							
6799500	**	Logan Creek near Uehling	1942-95	218							
6800000	**	Maple Creek near Nickerson	1952-95	74.1							
6800500	**	Elkhorn River at Waterloo	1929-95	1286							
6801000	**	Platte River near Ashland	1989-95	6795							
6803000	**	Salt Creek at Roca	1952-95	49.1							
6803080	**	Salt Creek at Pioneers Boulevard in Lincoln, NE	1995	107							
6803093	**	Haines Branch at SW 56th St at Lincoln, NE	1995	19.9							
6803170	**	Middle Creek at SW 40th St. at Lincoln, NE	1995	20.7							
6803500	**	Salt Creek at Lincoln	1950-95	237							
6803510	**	Little Salt Creek near Lincoln	1969-95	15.8							

6803513	**	Salt Creek at 70th Street at Lincoln, NE	1995	333							
6803520	**	Stevens Creek near Lincoln	1969-95	20							
6803530	**	Rock Creek near Ceresco, NE	1971-95	39.2							
6803555	**	Salt Creek at Greenwood	1952-95	353							
6803920	**	Cottonwood Creek above Czechland Lake near Re	1995	1.76							
6803935	**	Cottonwood Creek tributary above dam 6B near Pr	1995	0.83							
6804000	**	Wahoo Creek at Ithaca	1950-95	87.1							
6804700	**	Wahoo Creek at Ashland	1990-95	147							
6804900	**	Johnson Creek near Memphis	1991-95	3.8							
6805500	**	Platte River at Louisville	1953-95	6869							
6806500	**	Weeping Water Creek at Union	1951-95	103							
6807000	**	Missouri River at Nebraska City	1958-95	39020							
6811500	**	Little Nemaha River at Auburn	1950-95	314							
6813500	**	Missouri River at Rulo	1958-95	41850							
6814000	**	Turkey Creek near Seneca, KS	1949-95	132							
6814500	**	North Fork Big Nemaha River at Humboldt	1953-95	212							
6815000	**	Big Nemaha River at Falls City	1944-95	633							
6821500	**	Arikaree River at Haigler	1932-95	20.4							
6823000	**	North Fork Republican River at Co-Ne Line	1935-95	45.4							
6823500	**	Buffalo Creek near Haigler	1941-95	7.01							
6824000	**	Rock Creek at Parks	1941-95	13.2							
6824500		Republican River at Benkelman	1947-94	82.8	153	50.7	3.0	3700	0		6040
6827500	**	South Fork Republican River near Benkelman	1938-95	43.1							
6828500	**	Republican River at Stratton	1950-95	117							
6829500		Republican River at Trenton	1954-93	48.5							
6831500		Frenchman Creek near Imperial	1941-94	54.7	87.1	19.7	4.4	1820	4.8	379.2	2340
6832500		Frenchman Creek near Enders	1946-93	53.2							
6834000	**	Frenchman Creek at Palisade	1950-95	72.8							
6835000		Stinking Water Creek near Palisade	1950-94	37							
6835500	**	Frenchman Creek at Culbertson	1935-95	89.8							
6836500	**	Driftwood Creek near McCook	1946-95	9.78							
6837000	**	Republican River at McCook	1955-95	155							
6837300		Red Willow Creek above Hugh Butler Lake	1961-94	26.1							
6837500		Red Willow Creek near McCook	1962-93	19.5							
6838000	**	Red Willow Creek near Red Willow	1962-95	13.5							
6841000		Medicine Creek above Harry Strunk Lake	1950-94	62.3							
6842500		Medicine Creek below Harry Strunk Lake	1950-94	59.8							
6843500	**	Republican River at Cambridge	1950-95	248							
6844000		Muddy Creek at Arapahoe	1951-93	14.4							
6844210		Turkey Creek at Edison	1978-93	8.26							
6844500	**	Republican River near Orleans	1948-95	267							
6846500	**	Beaver Creek at Cedar Bluffs, KS	1946-95	14.3							

6847000		Beaver Creek near Beaver City	1938-94	19.7							
6847500	**	Sappa Creek near Stamford	1946-95	46.7							
6848500	**	Prairie Dog Creek near Woodruff, KS	1929-95	27.7							
6849500	**	Republican River below Harlan County Dam	1953-95	225							
6851000		Center Creek at Franklin	1948-93	8.4							
6851500		Thompson Creek at Riverton	1948-94	32.4							
6852000		Elm Creek at Amboy	1949-93	22.5							
6853020	**	Republican River at Guide Rock	1950-95	305							
6853500	**	Republican River near Hardy	1958-95	360							
6879900		Big Blue River at Surprise	1965-93	30							
6880000		Lincoln Creek near Seward	1954-94	54.5							
6880500		Big Blue River at Seward	1954-94	138							
6880800	**	West Fork Big Blue River near Dorchester	1958-95	189							
6881000	**	Big Blue River near Crete	1954-95	410							
6881200		Turkey Creek near Wilber	1960-94	95.5							
6881500		Big Blue River at Beatrice	1975-94	824							
6882000	**	Big Blue River at Barneston	1933-95	865							
6883000	**	Little Blue River near DeWeese	1954-95	150							
6883940		Big Sandy Creek at Alexandria	1980-93	115							
6884000	**	Little Blue River near Fairbury	1910-95	390							
6884025	**	Little Blue River at Hollenburg, KS	1975-95	570							

NEBRASKA GAME AND PARKS COMMISSION

Surface-water gaging stations (**=active station)

active = 89

USGS Station		Description	Period of Record	Average Annual Flow	Drainage area	Contributing	Mean annual discharge
6444000		White River at Crawford	1932-89*	20.2	313		14630
6445000		White River below Cottonwood Creek	1949-61	19.7	676		
6445500		White River near Chadron	1932-43	26.4	750		
6445590		Big Bordeaux Creek near Chadron	1969-79	0.56	9.42		
6453400		Ponca Creek near Naper	1968-79	29	373		
6453500		Ponca Creek at Anoka	1950-94	45.1	504		32690
6453550		Ponca Creek at Lynch	1961-64	104.4			
6453600	**	Ponca Creek at Verdel	1958-95	82.3	812		59620
6454000		Niobrara River at Wyo-Ne Line	1956-94	3.63	455		2630
6454100		Niobrara River at Agate	1957-89	13.7	840		9930
6454500		Niobrara River above Box Butte Reservoir	1947-94	28.8	1400		20850
6455000		Niobrara River below Box Butte Reservoir	1947-89	250	1460		18100
6455900		Niobrara River near Dunlap	1962-71*	38.4	1580		
6456500		Niobrara River near Hay Springs	1950-64	28.2	1790		
6458500		Bear Creek near Eli	1949-50	7.82	360		
6459000		Niobrara River near Cody	1947-57	320	5570		
6459200		Snake River above Merritt Reservoir	1963-81	203	440		
6459475		Snake River at Doughboy	1982-93	164	405	26	118500
6459500		Snake River near Burge	1963-94	158	646	30	114200
6460500		Niobrara River near Valentine	1929-32*	838	6160		
6460900		Minnechaduza Creek near Kilgore	1958-74	7.19	85		
6461000		Minnechaduza Creek at Valentine	1948-93	34.2	390	200	24750
6461500	**	Niobrara River near Sparks	1946-95	768	7150		556400
6462000		Niobrara River near Norden	1953-83	860	8390		
6462500		Plum Creek at Meadville	1948-94	119	536	340	86140
6463000		Niobrara River at Meadville	1951-52	1190			
6463080		Long Pine Creek near Long Pine	1980-89	102	246		73900
6463500	**	Long Pine Creek near Riverview	1948-95	152	458		110100
6463720		Niobrara River at Mariaville	1986-89	1410	9810		
6464500	**	Keya Paha River at Wewala, SD	1939-95	73.4	1070		53190
6464900		Keya Paha River near Naper	1958-94	139	1690		100400
6465000	**	Niobrara River near Spencer	1927-95	1449	11070		1049000
6465310		Eagle Creek near Redbird	1979-89	53.1	206		38470
6465440		Redbird Creek at Redbird	1981-94	41.1	157		29780
6465500	**	Niobrara River near Verdel	1938-95	1640	11580		1188000
6465680		North Branch Verdigre Creek near Verdigre	1980-92	24.2	137		17670

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6466000		Niobrara River at Niobrara	1955-57	1714			
6466500	**	Bazile Creek near Niobrara	1952-95	85.8	440		62190
6467500	**	Missouri River at Yankton	1976-95	26940	279500		2E+07
6478518		Bow Creek near St.James	1979-93	79.8	304		57830
6486000	**	Missouri River at Sioux City	1958-95	28930	314600	310641	2.1E+07
6601000	**	Omaha Creek at Homer	1946-95	40.9	174		29650
6601100		Blackbird Creek near Macy	1979-80	18.3	102		
6601200	**	Missouri River at Decatur	1988-95	26600	316200	312241	1.9E+07
6609000		New York Creek at Herman	1947-69	6.82	29.7		
6610000	**	Missouri River at Omaha	1958-95	32460	322800	318841	2.4E+07
6674500	**	North Platte River at Wyo-Ne Line	1929-95	781	22218	20289	565600
6675000		North Platte River at Henry	1914-15	1795			
6677100		Horse Creek at Wyo-Ne Line	1970	43.2			
6677300		Kiowa Creek near Lyman	1962-65	36.2			
6677500		Horse Creek near Lyman	1931-94	74.9	1707	1667	54280
6678000		Sheep Creek near Morrill	1932-89	55.2	362	337	39990
6679000		Dry Spotted Tail Creek at Mitchell	1947-79	34.1	77.2		
6679500		North Platte River at Mitchell	1958-94	803	24300	22300	581700
6680000		Tub Springs near Scottsbluff	1949-79	37.6			
6680700		Winters Creek at Tri-State Canal near Scottsb	1962-65	29.3			
6681000		Winters Creek near Scottsbluff	1932-79	52.9			
6682000		North Platte River near Minatare	1924-89*	1100	24700	22700	796200
6684000		Red Willow Creek near Bayard	1932-79	88.5	162		
6684500		North Platte River at Bridgeport	1917-89*	1400	25300	23300	1999100
6685000		Pumpkin Creek near Bridgeport	1932-89	27.2	1020		19710
6686000		North Platte River at Lisco	1958-94	1381	26700	24700	1000000
6686500		North Platte River at Oshkosh	1929-60	1319	31300		
6687000		Blue Creek near Lewellen	1930-89	69	1190	80	49990
6687500		North Platte River at Lewellen	1942-89	1559	28600	25400	1129000
6688000		North Platte River at Belmar	1921-25*	3525	29100		
6688500		Otter Creek near Lemoyne	1933-37	22.2	13.9		
6689000		North Platte River at Lemoyne	1926-27	3405			
6689500		North Platte River at Martin	1934-38	1204			
6690500		North Platte River near Keystone	1943-94	506	29400	25890	366300
6691000		North Platte River near Sutherland	1937-89*	600	29800	26120	387600
6691500		Birdwood Creek near Sutherland	1914-15	167	250		
6692000		Birdwood Creek near Hershey	1932-89	151	940	80	109400
6693000		North Platte River at North Platte	1943-94	748	30900	26300	541700
6762500		Lodgepole Creek at Bushnell	1932-89	10.4	1350		7530
6763500		Lodgepole Creek at Ralton	1952-79	6.31	3307		
6764000	**	South Platte River at Julesburg	1902-95	544	23193		385300
6764880	**	South Platte River at Roscoe, NE	1983-95	976			707300

6765000		South Platte River at Paxton	1940-69	226	24000		
6765500		South Platte River at North Platte	1947-94	431	24300		312200
6766000		Platte River at Brady	1939-89*	790	56200	51400	572400
6766500		Platte River at Cozad	1940-89	701	56500	51700	507900
6767000		Platte River near Lexington	1918-24*	3637	57300		
6767500		Plum Creek near Smithfield	1947-75*	6.72	229		
6768000		Platte River near Overton	1942-94	1593	56300	51620	1154000
6768500		Buffalo Creek near Darr	1947-69	4.22	63		
6769000		Buffalo Creek near Overton	1950-58	14	175		
6769500		Elm Creek near Overton	1947-58	2	31		
6770000		Platte River near Odessa	1938-89	1567	58100	53300	1135000
6770190		North Dry Creek near Kearney	1969-71	12.2			
6770200	**	Platte River near Kearney	1983-95	2239	57260	52540	1622000
6770478		Platte River near Grand Island (South Channe	1984-87	1633			
6770500	**	Platte River near Grand Island	1942-95	1579	57650	52940	1144000
6771000		Wood River near Riverdale	1947-73	12.5	379		
6771500		Wood River near Gibbon	1949-76	13.3			
6772000		Wood River near Alda	1954-94	11.4	599		8280
6773000		Dry Creek near Cairo	1949-53	3.2	25		
6773050		Prairie Creek near Ovina	1994	6.17	132		
6773500		Prairie Creek near Silver Creek	1949-53	28	406		
6774000	**	Platte River near Duncan	1942-95	1791	59300	54630	1297000
6774500		Middle Loup River near Mullen	1947-48	135	1120		
6775000		Middle Loup River near Seneca	1948-53	199	1140		
6775500	**	Middle Loup River at Dunning	1946-95	415	1830	79	300600
6775900	**	Dismal River near Thedford	1967-95	199	966	30	144200
6776000		Dismal River near Gem	1947-53	278	1360		
6776500	**	Dismal River at Dunning	1946-95	329	2040	45	238300
6777000		Middle Loup River near Milburn	1952-64*	765	3690		
6777500		Middle Loup River at Walworth	1941-60	798	4650		
6778000		Middle Loup River at Sargent	1953	820	4480		
6779000		Middle Loup River at Arcadia	1962-93	719	5040	820	520700
6779500		Middle Loup River at Loup City	1950-56	823	4860		
6780000		Middle Loup River at Rockville	1956-64	751	5310		
6781000		Middle Loup River at Boelus	1953-55	584			
6782000		South Loup River at Cumro	1947-53	165	1340		
6782500		South Loup River at Ravenna	1941-75*	192	1660		
6783000		Mud Creek near Broken Bow	1950-53	1.88	440		
6783500		Mud Creek near Sweetwater	1946-94	38.7	707	655	28000
6784000	**	South Loup River at St.Michael	1944-95	239	2320	1591	173200
6784300		Oak Creek near Loup City	1953-64*	1	41.9		
6784500		Oak Creek near Dannebrog	1950-57	8.05	122		

6800000	**	Maple Creek near Nickerson	1952-95	74.1	450		53660
6800500	**	Elkhorn River at Waterloo	1929-95	1286	6900	5870	931700
6801000	**	Platte River near Ashland	1989-95	6795	84200		4923000
6803000	**	Salt Creek at Roca	1952-95	49.1	167		34960
6803080	**	Salt Creek at Pioneers Boulevard in Lincoln, N	1995	107	220		77490
6803093	**	Haines Branch at SW 56th St at Lincoln, NE	1995	19.9	60		14430
6803170	**	Middle Creek at SW 40th St. at Lincoln, NE	1995	20.7	94		14990
6803400		Antelope Creek at 17th St.	1959-62	4.46	12.1		
6803450		Oak Creek near Raymond	1964-67	2.28	88.7		
6803500	**	Salt Creek at Lincoln	1950-95	237	685		172000
6803510	**	Little Salt Creek near Lincoln	1969-95	15.8	43.6		11480
6803513	**	Salt Creek at 70th Street at Lincoln, NE	1995	333	753		241400
6803520	**	Stevens Creek near Lincoln	1969-95	20	47.8		14510
6803530	**	Rock Creek near Ceresco, NE	1971-95	39.2			28370
6803555	**	Salt Creek at Greenwood	1952-95	353	1050		255600
6803920	**	Cottonwood Creek above Czechland Lake nea	1995	1.76			1270
6803935	**	Cottonwood Creek tributary above dam 6B ne	1995	0.83			602
6804000	**	Wahoo Creek at Ithaca	1950-95	87.1	273	268	63110
6804500		Silver Creek at Ithaca	1949-58	9.66	80		
6804700	**	Wahoo Creek at Ashland	1990-95	147	416		106600
6804900	**	Johnson Creek near Memphis	1991-95	3.8	21.5		2750
6805000		Salt Creek near Ashland	1947-67	487	1640		
6805500	**	Platte River at Louisville	1953-95	6869	85800	71000	4976000
6806500	**	Weeping Water Creek at Union	1951-95	103	241		74390
6807000	**	Missouri River at Nebraska City	1958-95	39020	410000	406041	2.8E+07
6810500		Little Nemaha River near Syracuse	1952-69	64.8	218		
6811500	**	Little Nemaha River at Auburn	1950-95	314	792		227200
6813500	**	Missouri River at Rulo	1958-95	41850	414900	410941	3E+07
6814000	**	Turkey Creek near Seneca, KS	1949-95	132	276		
6814500	**	North Fork Big Nemaha River at Humboldt	1953-95	212	548		153900
6815000	**	Big Nemaha River at Falls City	1944-95	633	1339		458600
6815500		Muddy Creek at Verdon	1953-72	66.3	186		
6821500	**	Arikaree River at Haigler	1932-95	20.4	1700	1020	14790
6823000	**	North Fork Republican River at Co-Ne Line	1935-95	45.4	2370	174	32900
6823500	**	Buffalo Creek near Haigler	1941-95	7.01	172	8.6	5080
6824000	**	Rock Creek at Parks	1941-95	13.2	23.6	20	9590
6824500		Republican River at Benkelman	1947-94	82.8	4880	1240	59980
6827500	**	South Fork Republican River near Benkelman	1938-95	43.1	2740	2190	31540
6828000		Republican River at Max	1929-45	186	7740		
6828490		Muddy Creek at Stratton	1978	0.7	157		
6828500	**	Republican River at Stratton	1950-95	117	8200	3690	84660
6829500		Republican River at Trenton	1954-93	48.5	8620	3940	35160

6830500		Frenchman Creek near Champion	1933-40	26.6	700		
6831000		Frenchman Creek below Champion	1935-56	42.5	721		
6831500		Frenchman Creek near Imperial	1941-94	54.7	1050	859	39650
6832500		Frenchman Creek near Enders	1946-93	53.2	950	790	38560
6833500		Frenchman Creek near Hamlet	1929-56*	83.9	1270		
6834000	**	Frenchman Creek at Palisade	1950-94	72.8	1300	1110	52760
6834500		Stinking Water Creek near Wauneta	1941-50	24.5	1330		
6835000		Stinking Water Creek near Palisade	1950-94	37	1500	380	26820
6835500	**	Frenchman Creek at Culbertson	1935-95	89.8	2990	1590	65050
6836000		Blackwood Creek near Culbertson	1947-86	5.85	320		
6836500	**	Driftwood Creek near McCook	1946-95	9.78	361	351	7140
6837000	**	Republican River at McCook	1955-95	155	12240	6220	112300
6837300		Red Willow Creek above Hugh Butler Lake	1961-94	26.1	582	194	18920
6837500		Red Willow Creek near McCook	1962-93	19.5	740	320	14110
6838000	**	Red Willow Creek near Red Willow	1962-94	13.5	820	405	9750
6839000		Medicine Creek at Maywood	1952-58	24.4	231		
6839500		Brushy Creek near Maywood	1952-58	1.84	95.3		
6840000		Fox Creek at Curtis	1952-89*	6.55	74.3		4750
6840500		Dry Creek near Curtis	1952-58	0.5	20		
6841000		Medicine Creek above Harry Strunk Lake	1950-94	62.3	770	530	45110
6841500		Mitchell Creek above Harry Strunk Lake	1957-74	2.3	52		
6842500		Medicine Creek below Harry Strunk Lake	1950-94	59.8	900	655	43330
6843000		Medicine Creek at Cambridge	1937-56*	64.9	909		
6843500	**	Republican River at Cambridge	1950-95	248	14460	7780	179500
6844000		Muddy Creek at Arapahoe	1951-93	14.4	246		10410
6844210		Turkey Creek at Edison	1978-93	8.26	74.9		5980
6844500	**	Republican River near Orleans	1948-95	267	15580	8880	193500
6845200		Sappa Creek near Beaver City	1937-72	38.3	1480		
6846500	**	Beaver Creek at Cedar Bluffs, KS	1946-95	14.3	1618	1324	10340
6847000		Beaver Creek near Beaver City	1938-94	19.7	2080	1760	14250
6847500	**	Sappa Creek near Stamford	1946-95	46.7	3840	3370	34110
6848500	**	Prairie Dog Creek near Woodruff, KS	1929-95	27.7	1007		20070
6849500	**	Republican River below Harlan County Dam	1953-95	225	20820	13590	163400
6850000		Turkey Creek at Naponee	1948-53	15.5	129		
6850200		Cottonwood Creek near Bloomington	1949-56	5.3	15.6		
6850500		Republican River near Bloomington	1929-57	155	21020		
6851000		Center Creek at Franklin	1948-93	8.4	177	56	6090
6851500		Thompson Creek at Riverton	1948-94	32.4	290	197	23510
6852000		Elm Creek at Amboy	1949-93	22.5	39.2		16320
6853020	**	Republican River at Guide Rock	1950-95	305	22030	14560	221000
6853500	**	Republican River near Hardy	1958-95	360	22401	14901	261100
6879900		Big Blue River at Surprise	1965-93	30	345		21760

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6880000		Lincoln Creek near Seward	1954-94	54.5	438		39490
6880500		Big Blue River at Seward	1954-94	138	1107		100100
6880800	**	West Fork Big Blue River near Dorchester	1958-95	189	1192		137000
6881000	**	Big Blue River near Crete	1954-95	410	2710		296700
6881200		Turkey Creek near Wilber	1960-94	95.5	461		69220
6881500		Big Blue River at Beatrice	1975-94	824	3900	3830	596900
6882000	**	Big Blue River at Barneston	1933-95	865	4447	4370	626500
6882900		Little Blue River below Pawnee Creek near Pa	1963-68	129	929		
6883000	**	Little Blue River near DeWeese	1954-95	150	979		108700
6883570		Little Blue River near Alexandria	1960-89*	248	1557		179700
6883940		Big Sandy Creek at Alexandria	1980-93	115	607		83210
6884000	**	Little Blue River near Fairbury	1910-95	390	2350		282700
6884025	**	Little Blue River at Hollenburg, KS	1975-95	570	2752		412600

NEBRASKA GAME AND PARKS COMMISSION

Surface-water gaging stations (**=active station)

Mean monthly flows for period of record ending October 1995

USGS Station		Description	Period of Record	Average Annual Flow	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
6453500		Ponca Creek at Anoka	1950-94	45.1	7.31	8.41	5.92	5.08	26.8	145	116	80.3	74.7	40.8	20.1	10.7
6453600	**	Ponca Creek at Verdel	1958-95	82.3	17.3	20.1	13.6	12.4	45.8	231	185	169	141	87.2	38.7	24
6454000		Niobrara River at Wyo-Ne Line	1956-94	3.63	2.69	2.91	2.92	3.1	4.33	5.6	5.43	4.54	3.99	3.37	2.55	2.21
6454500		Niobrara River above Box Butte Reservoir	1947-94	28.8	18.9	29.1	33	29.8	37	52.6	44.6	30.9	23.6	16.8	15.4	14.2
6459475		Snake River at Doughboy	1982-93	164	160	162	163	162	167	174	169	173	167	152	156	158
6459500		Snake River near Burge	1963-94	158	87.7	179	224	230	247	220	189	183	151	65.5	53.6	68.1
6461000		Minnechaduza Creek at Valentine	1948-93	34.2	26	30.2	29	27.2	36.7	57.1	53.4	47.1	36.3	24.2	21.1	21
6461500	**	Niobrara River near Sparks	1946-95	768	671	755	759	769	877	967	899	882	810	631	593	612
6462500		Plum Creek at Meadville	1948-94	119	101	103	101	99.9	113	143	153	152	132	118	102	101
6463500	**	Long Pine Creek near Riverview	1948-95	152	135	136	136	133	140	164	165	176	167	159	155	151
6464500	**	Keya Paha River at Wewala, SD	1939-95	73.4	35	39.6	31.8	26.3	58	177	157	135	98	60.9	33.7	28.3
6464900		Keya Paha River near Naper	1958-94	139	68.4	77.5	65	57.3	116	325	285	233	192	130	62.5	50.5
6465000	**	Niobrara River near Spencer	1927-95	1449	1249	1311	1149	1204	1585	2244	1925	1836	1613	1138	1026	1098
6465440		Redbird Creek at Redbird	1981-94	41.1	34.1	36.2	32.1	32.2	45.4	58.9	58.5	58.2	40.8	34.8	30.2	32.2
6465500	**	Niobrara River near Verdel	1938-95	1640	1363	1459	1320	1375	1793	2558	2235	2077	1771	1346	1091	1215
6465680		North Branch Verdigre Creek near Verdigre	1980-92	24.2	23.9	24.6	22.9	22.6	26.4	29.1	30.4	29.3	25.9	17.3	18.4	22.2
6466500	**	Bazile Creek near Niobrara	1952-95	85.8	48.7	52.4	45.8	45.7	78.7	155	134	128	161	75.7	57.8	45.1
6467500	**	Missouri River at Yankton	1976-95	26940	35190	30680	20060	17380	17240	18760	24720	28190	28500	31960	34050	35040
6478518		Bow Creek near St.James	1979-93	79.8	47.4	46.7	42.7	42.4	66.4	117	121	122	155	79.7	70.2	48.5
6486000	**	Missouri River at Sioux City	1958-95	28930	34960	30310	18470	15930	16840	22130	32610	32770	34320	35670	36370	36270
6601000	**	Omaha Creek at Homer	1946-95	40.9	20.6	18.8	16.3	16.2	46.9	72.4	53.8	56.8	85.8	50.7	29.5	24.4
6601200	**	Missouri River at Decatur	1988-95	26600	29410	19560	16040	16050	16910	20810	30140	33150	34740	35250	32680	34040
6610000	**	Missouri River at Omaha	1958-95	32460	37320	33160	20460	17470	19420	27400	38480	37630	40370	39930	38690	38710
6674500	**	North Platte River at Wyo-Ne Line	1929-95	781	513	431	383	338	345	497	600	1166	1633	1528	1274	874
6677500		Horse Creek near Lyman	1931-94	74.9	69.4	40.6	30.5	25.2	31.3	36.8	38.8	102	161	102	96.2	164
6679500		North Platte River at Mitchell	1958-94	803	849	671	568	505	495	758	970	1198	1486	807	581	744
6686000		North Platte River at Lisco	1958-94	1381	1647	1396	1199	1102	1128	1324	1460	1700	2022	1131	961	1500
6690500		North Platte River near Keystone	1943-94	506	289	141	95.3	69.6	114	195	286	554	875	1546	1300	563
6693000		North Platte River at North Platte	1943-94	748	624	532	470	412	494	612	652	791	961	1389	1264	745
6764000	**	South Platte River at Julesburg	1902-95	544	289	346	403	512	601	553	556	1070	1469	313	153	225
6764880	**	South Platte River at Roscoe, NE	1983-95	976	491	459	561	936	1152	918	969	1597	2943	982	239	517
6765500		South Platte River at North Platte	1947-94	431	273	216	209	294	417	331	376	979	1233	389	200	263

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6768000		Platte River near Overton	1942-94	1593	1337	1415	1538	1619	1932	2135	1924	2240	2294	984	626	1111
6770200	**	Platte River near Kearney	1983-95	2239	1576	1591	1825	2079	2500	2760	2524	2812	3954	2197	1213	1894
6770500	**	Platte River near Grand Island	1942-95	1579	1190	1287	1347	1445	1999	2408	2033	2262	2480	1171	495	881
6772000		Wood River near Alda	1954-94	11.4	2.73	0.37	0.33	0.94	4.39	19.8	3.95	12.4	41.6	31.1	12.8	6.24
6773050		Prairie Creek near Ovina	1994	6.17	6.18	4.89	4.62	4.4	4.14	11.9	9.1	4.85	6.41	11	8.85	0.24
6774000	**	Platte River near Duncan	1942-95	1791	1256	1405	1403	1499	2244	2955	2461	2614	2865	1434	533	873
6775500	**	Middle Loup River at Dunning	1946-95	415	402	413	410	404	424	452	449	437	414	389	391	394
6775900	**	Dismal River near Thedford	1967-95	199	195	200	199	199	200	205	207	204	197	195	192	194
6776500	**	Dismal River at Dunning	1946-95	329	324	328	326	321	336	345	346	340	328	318	318	319
6779000		Middle Loup River at Arcadia	1962-93	719	763	940	841	885	1051	1126	821	677	539	241	266	503
6783500		Mud Creek near Sweetwater	1946-94	38.7	22.2	21	21.3	23.1	38.9	66.7	36.1	44.5	95.8	48.2	25.6	20.9
6784000	**	South Loup River at St.Michael	1944-95	239	173	189	178	181	259	359	277	305	427	225	149	150
6784800		Turkey Creek near Dannebrog	1966-93	19.8	9.31	8.19	8.24	8.5	12.8	26.9	14.9	18.8	41.6	39.5	30.5	14.7
6785000	**	Middle Loup River at St.Paul	1963-95	1118	1094	1235	1126	1161	1492	1751	1337	1151	1157	652	545	748
6786000	**	North Loup River at Taylor	1937-95	478	476	506	477	486	556	620	597	540	478	317	299	386
6787000	**	Calamus River near Harrop	1979-95	251	240	241	236	234	256	292	286	283	259	233	225	226
6787500	**	Calamus River near Burwell	1986-95	262	180	189	265	291	291	227	204	258	235	319	322	369
6788500		North Loup River at Ord	1952-94	891	879	892	844	858	1015	1152	1057	978	896	660	662	801
6788988		Mira Creek near North Loup	1980-93	4.03	0.55	0.51	0.54	0.52	2.68	8.95	1.62	1.8	12.8	5.89	9.99	2.37
6790500	**	North Loup River near St.Paul	1928-95	936	885	919	860	871	1096	1266	1103	1056	1036	697	657	803
6791500		Cedar River near Spaulding	1945-94	166	149	151	147	150	168	202	203	193	187	154	146	145
6792000	**	Cedar River near Fullerton	1941-95	258	207	216	205	203	272	343	302	317	360	248	217	203
6793000	**	Loup River near Genoa	1944-95	692	129	406	1011	883	1268	1654	627	620	898	382	264	194
6794000	**	Beaver Creek at Genoa	1941-95	130	80.5	85.5	83.8	83.1	133	202	164	177	232	141	97.2	81.9
6795500	**	Shell Creek near Columbus	1948-95	47.3	17	15.2	14.5	17.7	50.9	100	40.2	67.6	117	64.4	38.3	24.8
6796000	**	Platte River at North Bend	1949-95	4569	3667	3991	3487	3380	5275	7630	6013	5962	6563	3746	2376	2967
6796500	**	Platte River at Leshara	1994-95	7135	4022	4611	5986	5352	5647	6055	7490	10650	17460	8221	3471	3493
6797500	**	Elkhorn River at Ewing	1947-95	195	86.1	84.2	77.1	67	137	362	489	406	299	170	79.3	80
6798500		Elkhorn River at Neligh	1931-93	313	182	184	170	159	264	542	633	543	501	263	161	153
6799000	**	Elkhorn River at Norfolk	1946-95	541	313	317	292	281	480	914	1040	870	903	486	320	281
6799080		Willow Creek near Foster	1976-93	15.3	8.82	9.38	8.89	8.11	14.5	33.1	32.8	22.1	15.7	14.7	7.56	7.95
6799100	**	North Fork Elkhorn River near Pierce	1960-95	98.7	47.2	47.8	45.5	43.4	103	205	179	151	173	95.7	51.6	48.5
6799230		Union Creek at Madison	1979-93	45.4	22.2	22.1	19.7	19.4	41.5	74.9	44.2	64.7	115	67	26.2	28.5
6799350	**	Elkhorn River at West Point	1973-95	994	512	554	534	498	989	1922	1825	1591	1464	981	562	505
6799385		Pebble Creek at Scribner	1979-93	53	45.4	27	21.1	22.4	53.6	107	72.7	89.6	232	100	34.6	38.8
6799450		Logan Creek at Pender	1966-93	166	91.6	81.1	73.2	78.6	225	273	230	210	367	175	105	87.7
6799500	**	Logan Creek near Uehling	1942-95	218	110	98.9	87.5	96	249	419	271	304	478	242	150	120
6800000	**	Maple Creek near Nickerson	1952-95	74.1	34.1	23	18.3	19.2	68	139	88.6	110	211	90.7	47.2	41.9

6800500	**	Elkhorn River at Waterloo	1929-95	1286	681	680	604	569	1124	2284	1967	1950	2705	1327	855	703
6801000	**	Platte River near Ashland	1989-95	6795	4605	4899	4919	4849	5986	10270	7697	8249	10990	9549	4722	4769
6803000	**	Salt Creek at Roca	1952-95	49.1	41.9	14.5	14.8	18.4	36.5	88.7	64.2	83.1	86.7	83.4	32.1	23.2
6803080	**	Salt Creek at Pioneers Boulevard in Lincoln, NE	1995	107	15.6	23.1	30.9	49.5	41	71.4	97.9	689	189	38.2	17.7	24.6
6803093	**	Haines Branch at SW 56th St at Lincoln, NE	1995	19.9	1.67	2.73	3.95	6.03	10	10.5	19.3	139	30.4	7.95	3.74	2.21
6803170	**	Middle Creek at SW 40th St. at Lincoln, NE	1995	20.7	5.12	5.44	6.89	7.68	9.71	12.7	17.5	136	28.2	7.29	3.68	6.53
6803500	**	Salt Creek at Lincoln	1950-95	237	177	104	93.5	103	171	348	280	374	491	341	186	178
6803510	**	Little Salt Creek near Lincoln	1969-95	15.8	10.9	7.23	6.51	7.39	12.6	28.5	18.1	21	22.8	29.5	12.5	11.1
6803513	**	Salt Creek at 70th Street at Lincoln, NE	1995	333	108	134	133	154	208	262	346	1644	567	204	114	143
6803520	**	Stevens Creek near Lincoln	1969-95	20	15.2	5.72	6.35	7.47	13.6	33.7	25	36.6	30.1	34.6	12.6	18.8
6803530	**	Rock Creek near Ceresco, NE	1971-95	39.2	25.2	15.9	15.1	15.9	34.4	62.9	44.5	56.6	59	60.7	52.7	26.2
6803555	**	Salt Creek at Greenwood	1952-95	353	261	158	141	156	263	532	411	531	687	528	322	266
6803920	**	Cottonwood Creek above Czechland Lake near Re	1995	1.76	0.83	2.8	1.55	1.9	2.15	0.82	1.38	5.55	2.62	2.83	0.52	0.91
6803935	**	Cottonwood Creek tributary above dam 6B near Pr	1995	0.83	0.21	0.33	0.28	0.28	0.83	0.89	0.97	2.23	2.52	1.58	0.27	0.35
6804000	**	Wahoo Creek at Ithaca	1950-95	87.1	51.7	38.6	34.5	38.6	74	127	89	117	220	88.8	94.2	73.2
6804700	**	Wahoo Creek at Ashland	1990-95	147	56.2	64	57.7	60.7	87	201	115	182	411	359	97.5	63.8
6804900	**	Johnson Creek near Memphis	1991-95	3.8	1.56	1.79	1.7	1.67	2.13	5.63	2.37	2.98	13.2	8.03	2.11	1.89
6805500	**	Platte River at Louisville	1953-95	6869	4892	5192	4641	4511	7283	11340	9716	9574	10970	6202	3795	4147
6806500	**	Weeping Water Creek at Union	1951-95	103	62.9	43.6	38.7	40.8	84	132	107	170	194	191	92.7	73.2
6807000	**	Missouri River at Nebraska City	1958-95	39020	41950	38100	25050	21170	26200	38090	48010	47050	51050	46160	42440	42590
6811500	**	Little Nemaha River at Auburn	1950-95	314	232	123	111	118	231	461	353	504	516	614	235	258
6813500	**	Missouri River at Rulo	1958-95	41850	43900	39930	26600	22420	28170	41740	51690	51300	55290	50800	44630	45330
6814000	**	Turkey Creek near Seneca, KS	1949-95	132	92.2	42.4	34.2	41.4	93.3	212	170	224	238	220	88.9	142
6814500	**	North Fork Big Nemaha River at Humboldt	1953-95	212	164	80.5	71.9	81.2	164	356	241	309	294	400	164	220
6815000	**	Big Nemaha River at Falls City	1944-95	633	445	237	185	233	443	916	776	1025	1156	1035	498	679
6821500	**	Arikaree River at Haigler	1932-95	20.4	10.2	8.52	6.9	8.13	16.6	29.6	24.2	42.9	42.1	21.1	19.1	16
6823000	**	North Fork Republican River at Co-Ne Line	1935-95	45.4	37.2	57.3	61.4	60.9	62.8	65.6	58.6	43.1	35.7	19.2	18.9	26.8
6823500	**	Buffalo Creek near Haigler	1941-95	7.01	7	8.26	8.44	8.67	9.31	9.61	9.37	7.98	5.9	2.9	2.49	4.37
6824000	**	Rock Creek at Parks	1941-95	13.2	12.7	13.7	13.6	13.7	13.9	14.1	14	14	13.4	12.2	11.6	12
6824500		Republican River at Benkelman	1947-94	82.8	55.6	84.5	86.7	90.1	113	128	117	107	93	46.6	37.5	40.5
6827500	**	South Fork Republican River near Benkelman	1938-95	43.1	17.3	22.4	21.4	23.9	41	54.3	60	76	77.5	62	37	25
6828500	**	Republican River at Stratton	1950-95	117	50.9	92.7	93	104	148	187	179	186	154	96.3	70.7	55
6829500		Republican River at Trenton	1954-93	48.5	10.9	9.35	11.4	15.6	27.1	35.9	54.1	74.9	76.6	132	108	24
6831500		Frenchman Creek near Imperial	1941-94	54.7	49.1	54.8	58.8	61.6	61.5	60.1	54.9	56.8	58.9	50	45.3	47.4
6832500		Frenchman Creek near Enders	1946-93	53.2	23	16.8	16.2	18.3	21.6	26.9	30.7	35.5	53.3	183	161	47.8
6834000	**	Frenchman Creek at Palisade	1950-95	72.8	41.4	36.4	36.5	38.4	44.2	49.7	49.1	55.4	74	189	179	73.2
6835000		Stinking Water Creek near Palisade	1950-94	37	29.1	34.7	34.5	35.5	42.3	50.1	43.9	44	47.2	32.1	26.2	25.2
6835500	**	Frenchman Creek at Culbertson	1935-95	89.8	77.6	95.5	102	102	123	133	105	90.5	109	60.2	38.7	60.2

NEBRASKA GAME AND PARKS COMMISSION

Surface-water gaging stations (**=active station)

Montana method analysis of flows
April - September

USGS Station		Description	Period of Record	Average Annual Flow	Flushing (200%)	Optimum (60-100%)	Outstanding (60%)	Excellent (50%)	Good (40%)	Fair (30%)	Poor (10%	Severe (<10%)
6444000		White River at Crawford	1932-89*	20.2	40.4	12.1	12.1	10.1	8.1	6.1	2.0	2.0
6445000		White River below Cottonwood Creek	1949-61	19.7	39.4	11.8	11.8	9.9	7.9	5.9	2.0	2.0
6445500		White River near Chadron	1932-43	26.4	52.8	15.8	15.8	13.2	10.6	7.9	2.6	2.6
6445590		Big Bordeaux Creek near Chadron	1969-79	0.56	1.1	0.3	0.3	0.3	0.2	0.2	0.1	0.1
6453400		Ponca Creek near Naper	1968-79	29	58.0	17.4	17.4	14.5	11.6	8.7	2.9	2.9
6453500		Ponca Creek at Anoka	1950-94	45.1	90.2	27.1	27.1	22.6	18.0	13.5	4.5	4.5
6453550		Ponca Creek at Lynch	1961-64	104.4	208.8	62.6	62.6	52.2	41.8	31.3	10.4	10.4
6453600	**	Ponca Creek at Verdel	1958-95	82.3	164.6	49.4	49.4	41.2	32.9	24.7	8.2	8.2
6454000		Niobrara River at Wyo-Ne Line	1956-94	3.63	7.3	2.2	2.2	1.8	1.5	1.1	0.4	0.4
6454100		Niobrara River at Agate	1957-89	13.7	27.4	8.2	8.2	6.9	5.5	4.1	1.4	1.4
6454500		Niobrara River above Box Butte Reservoir	1947-94	28.8	57.6	17.3	17.3	14.4	11.5	8.6	2.9	2.9
6455000		Niobrara River below Box Butte Reservoir	1947-89	250	500.0	150.0	150.0	125.0	100.0	75.0	25.0	25.0
6455900		Niobrara River near Dunlap	1962-71*	38.4	76.8	23.0	23.0	19.2	15.4	11.5	3.8	3.8
6456500		Niobrara River near Hay Springs	1950-64	28.2	56.4	16.9	16.9	14.1	11.3	8.5	2.8	2.8
6458500		Bear Creek near Eli	1949-50	7.82	15.6	4.7	4.7	3.9	3.1	2.3	0.8	0.8
6459000		Niobrara River near Cody	1947-57	320	640.0	192.0	192.0	160.0	128.0	96.0	32.0	32.0
6459200		Snake River above Merritt Reservoir	1963-81	203	406.0	121.8	121.8	101.5	81.2	60.9	20.3	20.3
6459475		Snake River at Doughboy	1982-93	164	328.0	98.4	98.4	82.0	65.6	49.2	16.4	16.4
6459500		Snake River near Burge	1963-94	158	316.0	94.8	94.8	79.0	63.2	47.4	15.8	15.8
6460500		Niobrara River near Valentine	1929-32*	838	1676.0	502.8	502.8	419.0	335.2	251.4	83.8	83.8
6460900		Minnechaduza Creek near Kilgore	1958-74	7.19	14.4	4.3	4.3	3.6	2.9	2.2	0.7	0.7
6461000		Minnechaduza Creek at Valentine	1948-93	34.2	68.4	20.5	20.5	17.1	13.7	10.3	3.4	3.4
6461500	**	Niobrara River near Sparks	1946-95	768	1536.0	460.8	460.8	384.0	307.2	230.4	76.8	76.8
6462000		Niobrara River near Norden	1953-83	860	1720.0	516.0	516.0	430.0	344.0	258.0	86.0	86.0
6462500		Plum Creek at Meadville	1948-94	119	238.0	71.4	71.4	59.5	47.6	35.7	11.9	11.9
6463000		Niobrara River at Meadville	1951-52	1190	2380.0	714.0	714.0	595.0	476.0	357.0	119.0	119.0
6463080		Long Pine Creek near Long Pine	1980-89	102	204.0	61.2	61.2	51.0	40.8	30.6	10.2	10.2
6463500	**	Long Pine Creek near Riverview	1948-95	152	304.0	91.2	91.2	76.0	60.8	45.6	15.2	15.2
6463720		Niobrara River at Mariaville	1986-89	1410	2820.0	846.0	846.0	705.0	564.0	423.0	141.0	141.0
6464500	**	Keya Paha River at Wewala, SD	1939-95	73.4	146.8	44.0	44.0	36.7	29.4	22.0	7.3	7.3
6464900		Keya Paha River near Naper	1958-94	139	278.0	83.4	83.4	69.5	55.6	41.7	13.9	13.9

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6465000	**	Niobrara River near Spencer	1927-95	1449	2898.0	869.4	869.4	724.5	579.6	434.7	144.9	144.9
6465310		Eagle Creek near Redbird	1979-89	53.1	106.2	31.9	31.9	26.6	21.2	15.9	5.3	5.3
6465440		Redbird Creek at Redbird	1981-94	41.1	82.2	24.7	24.7	20.6	16.4	12.3	4.1	4.1
6465500	**	Niobrara River near Verdel	1938-95	1640	3280.0	984.0	984.0	820.0	656.0	492.0	164.0	164.0
6465680		North Branch Verdigre Creek near Verdigre	1980-92	24.2	48.4	14.5	14.5	12.1	9.7	7.3	2.4	2.4
6466000		Niobrara River at Niobrara	1955-57	1714	3428.0	1028.4	1028.4	857.0	685.6	514.2	171.4	171.4
6466500	**	Bazile Creek near Niobrara	1952-95	85.8	171.6	51.5	51.5	42.9	34.3	25.7	8.6	8.6
6467500	**	Missouri River at Yankton	1976-95	26940	53880.0	16164.0	16164.0	13470.0	10776.0	8082.0	2694.0	2694.0
6478518		Bow Creek near St.James	1979-93	79.8	159.6	47.9	47.9	39.9	31.9	23.9	8.0	8.0
6486000	**	Missouri River at Sioux City	1958-95	28930	57860.0	17358.0	17358.0	14465.0	11572.0	8679.0	2893.0	2893.0
6601000	**	Omaha Creek at Homer	1946-95	40.9	81.8	24.5	24.5	20.5	16.4	12.3	4.1	4.1
6601100		Blackbird Creek near Macy	1979-80	18.3	36.6	11.0	11.0	9.2	7.3	5.5	1.8	1.8
6601200	**	Missouri River at Decatur	1988-95	26600	53200.0	15960.0	15960.0	13300.0	10640.0	7980.0	2660.0	2660.0
6609000		New York Creek at Herman	1947-69	6.82	13.6	4.1	4.1	3.4	2.7	2.0	0.7	0.7
6610000	**	Missouri River at Omaha	1958-95	32460	64920.0	19476.0	19476.0	16230.0	12984.0	9738.0	3246.0	3246.0
6674500	**	North Platte River at Wyo-Ne Line	1929-95	781	1562.0	468.6	468.6	390.5	312.4	234.3	78.1	78.1
6675000		North Platte River at Henry	1914-15	1795	3590.0	1077.0	1077.0	897.5	718.0	538.5	179.5	179.5
6677100		Horse Creek at Wyo-Ne Line	1970	43.2	86.4	25.9	25.9	21.6	17.3	13.0	4.3	4.3
6677300		Kiowa Creek near Lyman	1962-65	36.2	72.4	21.7	21.7	18.1	14.5	10.9	3.6	3.6
6677500		Horse Creek near Lyman	1931-94	74.9	149.8	44.9	44.9	37.5	30.0	22.5	7.5	7.5
6678000		Sheep Creek near Morrill	1932-89	55.2	110.4	33.1	33.1	27.6	22.1	16.6	5.5	5.5
6679000		Dry Spotted Tail Creek at Mitchell	1947-79	34.1	68.2	20.5	20.5	17.1	13.6	10.2	3.4	3.4
6679500		North Platte River at Mitchell	1958-94	803	1606.0	481.8	481.8	401.5	321.2	240.9	80.3	80.3
6680000		Tub Springs near Scottsbluff	1949-79	37.6	75.2	22.6	22.6	18.8	15.0	11.3	3.8	3.8
6680700		Winters Creek at Tri-State Canal near Scottsb	1962-65	29.3	58.6	17.6	17.6	14.7	11.7	8.8	2.9	2.9
6681000		Winters Creek near Scottsbluff	1932-79	52.9	105.8	31.7	31.7	26.5	21.2	15.9	5.3	5.3
6682000		North Platte River near Minatare	1924-89*	1100	2200.0	660.0	660.0	550.0	440.0	330.0	110.0	110.0
6684000		Red Willow Creek near Bayard	1932-79	88.5	177.0	53.1	53.1	44.3	35.4	26.6	8.9	8.9
6684500		North Platte River at Bridgeport	1917-89*	1400	2800.0	840.0	840.0	700.0	560.0	420.0	140.0	140.0
6685000		Pumpkin Creek near Bridgeport	1932-89	27.2	54.4	16.3	16.3	13.6	10.9	8.2	2.7	2.7
6686000		North Platte River at Lisco	1958-94	1381	2762.0	828.6	828.6	690.5	552.4	414.3	138.1	138.1
6686500		North Platte River at Oshkosh	1929-60	1319	2638.0	791.4	791.4	659.5	527.6	395.7	131.9	131.9
6687000		Blue Creek near Lewellen	1930-89	69	138.0	41.4	41.4	34.5	27.6	20.7	6.9	6.9
6687500		North Platte River at Lewellen	1942-89	1559	3118.0	935.4	935.4	779.5	623.6	467.7	155.9	155.9
6688000		North Platte River at Belmar	1921-25*	3525	7050.0	2115.0	2115.0	1762.5	1410.0	1057.5	352.5	352.5
6688500		Otter Creek near Lemoyne	1933-37	22.2	44.4	13.3	13.3	11.1	8.9	6.7	2.2	2.2
6689000		North Platte River at Lemoyne	1926-27	3405	6810.0	2043.0	2043.0	1702.5	1362.0	1021.5	340.5	340.5
6689500		North Platte River at Martin	1934-38	1204	2408.0	722.4	722.4	602.0	481.6	361.2	120.4	120.4
6690500		North Platte River near Keystone	1943-94	506	1012.0	303.6	303.6	253.0	202.4	151.8	50.6	50.6

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6691000		North Platte River near Sutherland	1937-89*	600	1200.0	360.0	360.0	300.0	240.0	180.0	60.0	60.0
6691500		Birdwood Creek near Sutherland	1914-15	167	334.0	100.2	100.2	83.5	66.8	50.1	16.7	16.7
6692000		Birdwood Creek near Hershey	1932-89	151	302.0	90.6	90.6	75.5	60.4	45.3	15.1	15.1
6693000		North Platte River at North Platte	1943-94	748	1496.0	448.8	448.8	374.0	299.2	224.4	74.8	74.8
6762500		Lodgepole Creek at Bushnell	1932-89	10.4	20.8	6.2	6.2	5.2	4.2	3.1	1.0	1.0
6763500		Lodgepole Creek at Ralton	1952-79	6.31	12.6	3.8	3.8	3.2	2.5	1.9	0.6	0.6
6764000	**	South Platte River at Julesburg	1902-95	544	1088.0	326.4	326.4	272.0	217.6	163.2	54.4	54.4
6764880	**	South Platte River at Roscoe, NE	1983-95	976	1952.0	585.6	585.6	488.0	390.4	292.8	97.6	97.6
6765000		South Platte River at Paxton	1940-69	226	452.0	135.6	135.6	113.0	90.4	67.8	22.6	22.6
6765500		South Platte River at North Platte	1947-94	431	862.0	258.6	258.6	215.5	172.4	129.3	43.1	43.1
6766000		Platte River at Brady	1939-89*	790	1580.0	474.0	474.0	395.0	316.0	237.0	79.0	79.0
6766500		Platte River at Cozad	1940-89	701	1402.0	420.6	420.6	350.5	280.4	210.3	70.1	70.1
6767000		Platte River near Lexington	1918-24*	3637	7274.0	2182.2	2182.2	1818.5	1454.8	1091.1	363.7	363.7
6767500		Plum Creek near Smithfield	1947-75*	6.72	13.4	4.0	4.0	3.4	2.7	2.0	0.7	0.7
6768000		Platte River near Overton	1942-94	1593	3186.0	955.8	955.8	796.5	637.2	477.9	159.3	159.3
6768500		Buffalo Creek near Darr	1947-69	4.22	8.4	2.5	2.5	2.1	1.7	1.3	0.4	0.4
6769000		Buffalo Creek near Overton	1950-58	14	28.0	8.4	8.4	7.0	5.6	4.2	1.4	1.4
6769500		Elm Creek near Overton	1947-58	2	4.0	1.2	1.2	1.0	0.8	0.6	0.2	0.2
6770000		Platte River near Odessa	1938-89	1567	3134.0	940.2	940.2	783.5	626.8	470.1	156.7	156.7
6770190		North Dry Creek near Kearney	1969-71	12.2	24.4	7.3	7.3	6.1	4.9	3.7	1.2	1.2
6770200	**	Platte River near Kearney	1983-95	2239	4478.0	1343.4	1343.4	1119.5	895.6	671.7	223.9	223.9
6770478		Platte River near Grand Island (South Channe	1984-87	1633	3266.0	979.8	979.8	816.5	653.2	489.9	163.3	163.3
6770500	**	Platte River near Grand Island	1942-95	1579	3158.0	947.4	947.4	789.5	631.6	473.7	157.9	157.9
6771000		Wood River near Riverdale	1947-73	12.5	25.0	7.5	7.5	6.3	5.0	3.8	1.3	1.3
6771500		Wood River near Gibbon	1949-76	13.3	26.6	8.0	8.0	6.7	5.3	4.0	1.3	1.3
6772000		Wood River near Alda	1954-94	11.4	22.8	6.8	6.8	5.7	4.6	3.4	1.1	1.1
6773000		Dry Creek near Cairo	1949-53	3.2	6.4	1.9	1.9	1.6	1.3	1.0	0.3	0.3
6773050		Prairie Creek near Ovina	1994	6.17	12.3	3.7	3.7	3.1	2.5	1.9	0.6	0.6
6773500		Prairie Creek near Silver Creek	1949-53	28	56.0	16.8	16.8	14.0	11.2	8.4	2.8	2.8
6774000	**	Platte River near Duncan	1942-95	1791	3582.0	1074.6	1074.6	895.5	716.4	537.3	179.1	179.1
6774500		Middle Loup River near Mullen	1947-48	135	270.0	81.0	81.0	67.5	54.0	40.5	13.5	13.5
6775000		Middle Loup River near Seneca	1948-53	199	398.0	119.4	119.4	99.5	79.6	59.7	19.9	19.9
6775500	**	Middle Loup River at Dunning	1946-95	415	830.0	249.0	249.0	207.5	166.0	124.5	41.5	41.5
6775900	**	Dismal River near Thedford	1967-95	199	398.0	119.4	119.4	99.5	79.6	59.7	19.9	19.9
6776000		Dismal River near Gem	1947-53	278	556.0	166.8	166.8	139.0	111.2	83.4	27.8	27.8
6776500	**	Dismal River at Dunning	1946-95	329	658.0	197.4	197.4	164.5	131.6	98.7	32.9	32.9
6777000		Middle Loup River near Milburn	1952-64*	765	1530.0	459.0	459.0	382.5	306.0	229.5	76.5	76.5
6777500		Middle Loup River at Walworth	1941-60	798	1596.0	478.8	478.8	399.0	319.2	239.4	79.8	79.8
6778000		Middle Loup River at Sargent	1953	820	1640.0	492.0	492.0	410.0	328.0	246.0	82.0	82.0

6796985		Elkhorn River at Emmet	1980-82	67.6	135.2	40.6	40.6	33.8	27.0	20.3	6.8	6.8
6797500	**	Elkhorn River at Ewing	1947-95	195	390.0	117.0	117.0	97.5	78.0	58.5	19.5	19.5
6798000		South Fork Elkhorn River near Ewing	1948-89*	69.5	139.0	41.7	41.7	34.8	27.8	20.9	7.0	7.0
6798300		Clearwater Creek near Clearwater	1962-89*	43.3	86.6	26.0	26.0	21.7	17.3	13.0	4.3	4.3
6798500		Elkhorn River at Neligh	1931-93	313	626.0	187.8	187.8	156.5	125.2	93.9	31.3	31.3
6798800		Elkhorn River at Meadow Grove	1961-65	398	796.0	238.8	238.8	199.0	159.2	119.4	39.8	39.8
6799000	**	Elkhorn River at Norfolk	1946-95	541	1082.0	324.6	324.6	270.5	216.4	162.3	54.1	54.1
6799080		Willow Creek near Foster	1976-93	15.3	30.6	9.2	9.2	7.7	6.1	4.6	1.5	1.5
6799100	**	North Fork Elkhorn River near Pierce	1960-95	98.7	197.4	59.2	59.2	49.4	39.5	29.6	9.9	9.9
6799230		Union Creek at Madison	1979-93	45.4	90.8	27.2	27.2	22.7	18.2	13.6	4.5	4.5
6799350	**	Elkhorn River at West Point	1973-95	994	1988.0	596.4	596.4	497.0	397.6	298.2	99.4	99.4
6799385		Pebble Creek at Scribner	1979-93	53	106.0	31.8	31.8	26.5	21.2	15.9	5.3	5.3
6799450		Logan Creek at Pender	1966-93	166	332.0	99.6	99.6	83.0	66.4	49.8	16.6	16.6
6799500	**	Logan Creek near Uehling	1942-95	218	436.0	130.8	130.8	109.0	87.2	65.4	21.8	21.8
6800000	**	Maple Creek near Nickerson	1952-95	74.1	148.2	44.5	44.5	37.1	29.6	22.2	7.4	7.4
6800500	**	Elkhorn River at Waterloo	1929-95	1286	2572.0	771.6	771.6	643.0	514.4	385.8	128.6	128.6
6801000	**	Platte River near Ashland	1989-95	6795	13590.0	4077.0	4077.0	3397.5	2718.0	2038.5	679.5	679.5
6803000	**	Salt Creek at Roca	1952-95	49.1	98.2	29.5	29.5	24.6	19.6	14.7	4.9	4.9
6803080	**	Salt Creek at Pioneers Boulevard in Lincoln, N	1995	107	214.0	64.2	64.2	53.5	42.8	32.1	10.7	10.7
6803093	**	Haines Branch at SW 56th St at Lincoln, NE	1995	19.9	39.8	11.9	11.9	10.0	8.0	6.0	2.0	2.0
6803170	**	Middle Creek at SW 40th St. at Lincoln, NE	1995	20.7	41.4	12.4	12.4	10.4	8.3	6.2	2.1	2.1
6803400		Antelope Creek at 17th St.	1959-62	4.46	8.9	2.7	2.7	2.2	1.8	1.3	0.4	0.4
6803450		Oak Creek near Raymond	1964-67	2.28	4.6	1.4	1.4	1.1	0.9	0.7	0.2	0.2
6803500	**	Salt Creek at Lincoln	1950-95	237	474.0	142.2	142.2	118.5	94.8	71.1	23.7	23.7
6803510	**	Little Salt Creek near Lincoln	1969-95	15.8	31.6	9.5	9.5	7.9	6.3	4.7	1.6	1.6
6803513	**	Salt Creek at 70th Street at Lincoln, NE	1995	333	666.0	199.8	199.8	166.5	133.2	99.9	33.3	33.3
6803520	**	Stevens Creek near Lincoln	1969-95	20	40.0	12.0	12.0	10.0	8.0	6.0	2.0	2.0
6803530	**	Rock Creek near Ceresco, NE	1971-95	39.2	78.4	23.5	23.5	19.6	15.7	11.8	3.9	3.9
6803555	**	Salt Creek at Greenwood	1952-95	353	706.0	211.8	211.8	176.5	141.2	105.9	35.3	35.3
6803920	**	Cottonwood Creek above Czechland Lake ne	1995	1.76	3.5	1.1	1.1	0.9	0.7	0.5	0.2	0.2
6803935	**	Cottonwood Creek tributary above dam 6B ne	1995	0.83	1.7	0.5	0.5	0.4	0.3	0.2	0.1	0.1
6804000	**	Wahoo Creek at Ithaca	1950-95	87.1	174.2	52.3	52.3	43.6	34.8	26.1	8.7	8.7
6804500		Silver Creek at Ithaca	1949-58	9.66	19.3	5.8	5.8	4.8	3.9	2.9	1.0	1.0
6804700	**	Wahoo Creek at Ashland	1990-95	147	294.0	88.2	88.2	73.5	58.8	44.1	14.7	14.7
6804900	**	Johnson Creek near Memphis	1991-95	3.8	7.6	2.3	2.3	1.9	1.5	1.1	0.4	0.4
6805000		Salt Creek near Ashland	1947-67	487	974.0	292.2	292.2	243.5	194.8	146.1	48.7	48.7
6805500	**	Platte River at Louisville	1953-95	6869	13738.0	4121.4	4121.4	3434.5	2747.6	2060.7	686.9	686.9
6806500	**	Weeping Water Creek at Union	1951-95	103	206.0	61.8	61.8	51.5	41.2	30.9	10.3	10.3
6807000	**	Missouri River at Nebraska City	1958-95	39020	78040.0	23412.0	23412.0	19510.0	15608.0	11706.0	3902.0	3902.0

6843000		Medicine Creek at Cambridge	1937-56*	64.9	129.8	38.9	38.9	32.5	26.0	19.5	6.5	6.5
6843500	**	Republican River at Cambridge	1950-95	148	296.0	88.8	88.8	74.0	59.2	44.4	14.8	14.8
6844000		Muddy Creek at Arapahoe	1951-93	14.4	28.8	8.6	8.6	7.2	5.8	4.3	1.4	1.4
6844210		Turkey Creek at Edison	1978-93	8.26	16.5	5.0	5.0	4.1	3.3	2.5	0.8	0.8
6844500	**	Republican River near Orleans	1948-95	267	534.0	160.2	160.2	133.5	106.8	80.1	26.7	26.7
6845200		Sappa Creek near Beaver City	1937-72	38.3	76.6	23.0	23.0	19.2	15.3	11.5	3.8	3.8
6846500	**	Beaver Creek at Cedar Bluffs, KS	1946-95	14.3	28.6	8.6	8.6	7.2	5.7	4.3	1.4	1.4
6847000		Beaver Creek near Beaver City	1938-94	19.7	39.4	11.8	11.8	9.9	7.9	5.9	2.0	2.0
6847500	**	Sappa Creek near Stamford	1946-95	46.7	93.4	28.0	28.0	23.4	18.7	14.0	4.7	4.7
6848500	**	Prairie Dog Creek near Woodruff, KS	1929-95	27.7	55.4	16.6	16.6	13.9	11.1	8.3	2.8	2.8
6849500	**	Republican River below Harlan County Dam	1953-95	225	450.0	135.0	135.0	112.5	90.0	67.5	22.5	22.5
6850000		Turkey Creek at Naponee	1948-53	15.5	31.0	9.3	9.3	7.8	6.2	4.7	1.6	1.6
6850200		Cottonwood Creek near Bloomington	1949-56	5.3	10.6	3.2	3.2	2.7	2.1	1.6	0.5	0.5
6850500		Republican River near Bloomington	1929-57	155	310.0	93.0	93.0	77.5	62.0	46.5	15.5	15.5
6851000		Center Creek at Franklin	1948-93	8.4	16.8	5.0	5.0	4.2	3.4	2.5	0.8	0.8
6851500		Thompson Creek at Riverton	1948-94	32.4	64.8	19.4	19.4	16.2	13.0	9.7	3.2	3.2
6852000		Elm Creek at Amboy	1949-93	22.5	45.0	13.5	13.5	11.3	9.0	6.8	2.3	2.3
6853020	**	Republican River at Guide Rock	1950-95	305	610.0	183.0	183.0	152.5	122.0	91.5	30.5	30.5
6853500	**	Republican River near Hardy	1958-95	360	720.0	216.0	216.0	180.0	144.0	108.0	36.0	36.0
6879900		Big Blue River at Surprise	1965-93	30	60.0	18.0	18.0	15.0	12.0	9.0	3.0	3.0
6880000		Lincoln Creek near Seward	1954-94	54.5	109.0	32.7	32.7	27.3	21.8	16.4	5.5	5.5
6880500		Big Blue River at Seward	1954-94	138	276.0	82.8	82.8	69.0	55.2	41.4	13.8	13.8
6880800	**	West Fork Big Blue River near Dorchester	1958-95	189	378.0	113.4	113.4	94.5	75.6	56.7	18.9	18.9
6881000	**	Big Blue River near Crete	1954-95	410	820.0	246.0	246.0	205.0	164.0	123.0	41.0	41.0
6881200		Turkey Creek near Wilber	1960-94	95.5	191.0	57.3	57.3	47.8	38.2	28.7	9.6	9.6
6881500		Big Blue River at Beatrice	1975-94	824	1648.0	494.4	494.4	412.0	329.6	247.2	82.4	82.4
6882000	**	Big Blue River at Barneston	1933-95	865	1730.0	519.0	519.0	432.5	346.0	259.5	86.5	86.5
6882900		Little Blue River below Pawnee Creek near Pa	1963-68	129	258.0	77.4	77.4	64.5	51.6	38.7	12.9	12.9
6883000	**	Little Blue River near DeWeese	1954-95	150	300.0	90.0	90.0	75.0	60.0	45.0	15.0	15.0
6883570		Little Blue River near Alexandria	1960-89*	248	496.0	148.8	148.8	124.0	99.2	74.4	24.8	24.8
6883940		Big Sandy Creek at Alexandria	1980-93	115	230.0	69.0	69.0	57.5	46.0	34.5	11.5	11.5
6884000	**	Little Blue River near Fairbury	1910-95	390	780.0	234.0	234.0	195.0	156.0	117.0	39.0	39.0
6884025	**	Little Blue River at Hollenburg, KS	1975-95	570	1140.0	342.0	342.0	285.0	228.0	171.0	57.0	57.0

NEBRASKA GAME AND PARKS COMMISSION

Surface-water gaging stations (**=active station)

Montana method analysis of flows
October - March

USGS Station		Description	Period of Record	Average Annual Flow	Flushing (200%)	Optimum (60-100%)	Outstanding (40%)	Excellent (30%)	Good (20%)	Fair (10%)	Poor (10%	Severe (<10%)
6444000		White River at Crawford	1932-89*	20.2	40.4	12.1	8.1	6.1	4.0	2.0	2.0	2.0
6445000		White River below Cottonwood Creek	1949-61	19.7	39.4	11.8	7.9	5.9	3.9	2.0	2.0	2.0
6445500		White River near Chadron	1932-43	26.4	52.8	15.8	10.6	7.9	5.3	2.6	2.6	2.6
6445590		Big Bordeaux Creek near Chadron	1969-79	0.56	1.1	0.3	0.2	0.2	0.1	0.1	0.1	0.1
6453400		Ponca Creek near Naper	1968-79	29	58.0	17.4	11.6	8.7	5.8	2.9	2.9	2.9
6453500		Ponca Creek at Anoka	1950-94	45.1	90.2	27.1	18.0	13.5	9.0	4.5	4.5	4.5
6453550		Ponca Creek at Lynch	1961-64	104.4	208.8	62.6	41.8	31.3	20.9	10.4	10.4	10.4
6453600	**	Ponca Creek at Verdel	1958-94	82.3	164.6	49.4	32.9	24.7	16.5	8.2	8.2	8.2
6454000		Niobrara River at Wyo-Ne Line	1956-94	3.63	7.3	2.2	1.5	1.1	0.7	0.4	0.4	0.4
6454100		Niobrara River at Agate	1957-89	13.7	27.4	8.2	5.5	4.1	2.7	1.4	1.4	1.4
6454500		Niobrara River above Box Butte Reservoir	1947-94	28.8	57.6	17.3	11.5	8.6	5.8	2.9	2.9	2.9
6455000		Niobrara River below Box Butte Reservoir	1947-89	250	500.0	150.0	100.0	75.0	50.0	25.0	25.0	25.0
6455900		Niobrara River near Dunlap	1962-71*	38.4	76.8	23.0	15.4	11.5	7.7	3.8	3.8	3.8
6456500		Niobrara River near Hay Springs	1950-64	28.2	56.4	16.9	11.3	8.5	5.6	2.8	2.8	2.8
6458500		Bear Creek near Eli	1949-50	7.82	15.6	4.7	3.1	2.3	1.6	0.8	0.8	0.8
6459000		Niobrara River near Cody	1947-57	320	640.0	192.0	128.0	96.0	64.0	32.0	32.0	32.0
6459200		Snake River above Merritt Reservoir	1963-81	203	406.0	121.8	81.2	60.9	40.6	20.3	20.3	20.3
6459475		Snake River at Doughboy	1982-93	164	328.0	98.4	65.6	49.2	32.8	16.4	16.4	16.4
6459500		Snake River near Burge	1963-94	158	316.0	94.8	63.2	47.4	31.6	15.8	15.8	15.8
6460500		Niobrara River near Valentine	1929-32*	838	1676.0	502.8	335.2	251.4	167.6	83.8	83.8	83.8
6460900		Minnechaduza Creek near Kilgore	1958-74	7.19	14.4	4.3	2.9	2.2	1.4	0.7	0.7	0.7
6461000		Minnechaduza Creek at Valentine	1948-93	34.2	68.4	20.5	13.7	10.3	6.8	3.4	3.4	3.4
6461500	**	Niobrara River near Sparks	1946-95	768	1536.0	460.8	307.2	230.4	153.6	76.8	76.8	76.8
6462000		Niobrara River near Norden	1953-83	860	1720.0	516.0	344.0	258.0	172.0	86.0	86.0	86.0
6462500		Plum Creek at Meadville	1948-94	119	238.0	71.4	47.6	35.7	23.8	11.9	11.9	11.9
6463000		Niobrara River at Meadville	1951-52	1190	2380.0	714.0	476.0	357.0	238.0	119.0	119.0	119.0
6463080		Long Pine Creek near Long Pine	1980-89	102	204.0	61.2	40.8	30.6	20.4	10.2	10.2	10.2
6463500	**	Long Pine Creek near Riverview	1948-95	152	304.0	91.2	60.8	45.6	30.4	15.2	15.2	15.2
6463720		Niobrara River at Mariaville	1986-89	1410	2820.0	846.0	564.0	423.0	282.0	141.0	141.0	141.0
6464500	**	Keya Paha River at Wewala, SD	1939-95	73.4	146.8	44.0	29.4	22.0	14.7	7.3	7.3	7.3
6464900		Keya Paha River near Naper	1958-94	139	278.0	83.4	55.6	41.7	27.8	13.9	13.9	13.9

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6465000	**	Niobrara River near Spencer	1927-95	1449	2898.0	869.4	579.6	434.7	289.8	144.9	144.9	144.9
6465310		Eagle Creek near Redbird	1979-89	53.1	106.2	31.9	21.2	15.9	10.6	5.3	5.3	5.3
6465440		Redbird Creek at Redbird	1981-94	41.1	82.2	24.7	16.4	12.3	8.2	4.1	4.1	4.1
6465500	**	Niobrara River near Verdel	1938-95	1640	3280.0	984.0	656.0	492.0	328.0	164.0	164.0	164.0
6465680		North Branch Verdigre Creek near Verdigre	1980-92	24.2	48.4	14.5	9.7	7.3	4.8	2.4	2.4	2.4
6466000		Niobrara River at Niobrara	1955-57	1714	3428.0	1028.4	685.6	514.2	342.8	171.4	171.4	171.4
6466500	**	Bazile Creek near Niobrara	1952-95	85.8	171.6	51.5	34.3	25.7	17.2	8.6	8.6	8.6
6467500	**	Missouri River at Yankton	1976-95	26940	53880.0	16164.0	10776.0	8082.0	5388.0	2694.0	2694.0	2694.0
6478518		Bow Creek near St.James	1979-93	79.8	159.6	47.9	31.9	23.9	16.0	8.0	8.0	8.0
6486000	**	Missouri River at Sioux City	1958-95	28930	57860.0	17358.0	11572.0	8679.0	5786.0	2893.0	2893.0	2893.0
6601000	**	Omaha Creek at Homer	1946-95	40.9	81.8	24.5	16.4	12.3	8.2	4.1	4.1	4.1
6601100		Blackbird Creek near Macy	1979-80	18.3	36.6	11.0	7.3	5.5	3.7	1.8	1.8	1.8
6601200	**	Missouri River at Decatur	1988-95	26600	53200.0	15960.0	10640.0	7980.0	5320.0	2660.0	2660.0	2660.0
6609000		New York Creek at Herman	1947-69	6.82	13.6	4.1	2.7	2.0	1.4	0.7	0.7	0.7
6610000	**	Missouri River at Omaha	1958-95	32460	64920.0	19476.0	12984.0	9738.0	6492.0	3246.0	3246.0	3246.0
6674500	**	North Platte River at Wyo-Ne Line	1929-95	781	1562.0	468.6	312.4	234.3	156.2	78.1	78.1	78.1
6675000		North Platte River at Henry	1914-15	1795	3590.0	1077.0	718.0	538.5	359.0	179.5	179.5	179.5
6677100		Horse Creek at Wyo-Ne Line	1970	43.2	86.4	25.9	17.3	13.0	8.6	4.3	4.3	4.3
6677300		Kiowa Creek near Lyman	1962-65	36.2	72.4	21.7	14.5	10.9	7.2	3.6	3.6	3.6
6677500		Horse Creek near Lyman	1931-94	74.9	149.8	44.9	30.0	22.5	15.0	7.5	7.5	7.5
6678000		Sheep Creek near Morrill	1932-89	55.2	110.4	33.1	22.1	16.6	11.0	5.5	5.5	5.5
6679000		Dry Spotted Tail Creek at Mitchell	1947-79	34.1	68.2	20.5	13.6	10.2	6.8	3.4	3.4	3.4
6679500		North Platte River at Mitchell	1958-94	803	1606.0	481.8	321.2	240.9	160.6	80.3	80.3	80.3
6680000		Tub Springs near Scottsbluff	1949-79	37.6	75.2	22.6	15.0	11.3	7.5	3.8	3.8	3.8
6680700		Winters Creek at Tri-State Canal near Scottsb	1962-65	29.3	58.6	17.6	11.7	8.8	5.9	2.9	2.9	2.9
6681000		Winters Creek near Scottsbluff	1932-79	52.9	105.8	31.7	21.2	15.9	10.6	5.3	5.3	5.3
6682000		North Platte River near Minatare	1924-89*	1100	2200.0	660.0	440.0	330.0	220.0	110.0	110.0	110.0
6684000		Red Willow Creek near Bayard	1932-79	88.5	177.0	53.1	35.4	26.6	17.7	8.9	8.9	8.9
6684500		North Platte River at Bridgeport	1917-89*	1400	2800.0	840.0	560.0	420.0	280.0	140.0	140.0	140.0
6685000		Pumpkin Creek near Bridgeport	1932-89	27.2	54.4	16.3	10.9	8.2	5.4	2.7	2.7	2.7
6686000		North Platte River at Lisco	1958-94	1381	2762.0	828.6	552.4	414.3	276.2	138.1	138.1	138.1
6686500		North Platte River at Oshkosh	1929-60	1319	2638.0	791.4	527.6	395.7	263.8	131.9	131.9	131.9
6687000		Blue Creek near Lewellen	1930-89	69	138.0	41.4	27.6	20.7	13.8	6.9	6.9	6.9
6687500		North Platte River at Lewellen	1942-89	1559	3118.0	935.4	623.6	467.7	311.8	155.9	155.9	155.9
6688000		North Platte River at Belmar	1921-25*	3525	7050.0	2115.0	1410.0	1057.5	705.0	352.5	352.5	352.5
6688500		Otter Creek near Lemoyne	1933-37	22.2	44.4	13.3	8.9	6.7	4.4	2.2	2.2	2.2
6689000		North Platte River at Lemoyne	1926-27	3405	6810.0	2043.0	1362.0	1021.5	681.0	340.5	340.5	340.5
6689500		North Platte River at Martin	1934-38	1204	2408.0	722.4	481.6	361.2	240.8	120.4	120.4	120.4
6690500		North Platte River near Keystone	1943-94	506	1012.0	303.6	202.4	151.8	101.2	50.6	50.6	50.6

6691000		North Platte River near Sutherland	1937-89*	600	1200.0	360.0	240.0	180.0	120.0	60.0	60.0	60.0
6691500		Birdwood Creek near Sutherland	1914-15	167	334.0	100.2	66.8	50.1	33.4	16.7	16.7	16.7
6692000		Birdwood Creek near Hershey	1932-89	151	302.0	90.6	60.4	45.3	30.2	15.1	15.1	15.1
6693000		North Platte River at North Platte	1943-94	748	1496.0	448.8	299.2	224.4	149.6	74.8	74.8	74.8
6762500		Lodgepole Creek at Bushnell	1932-89	10.4	20.8	6.2	4.2	3.1	2.1	1.0	1.0	1.0
6763500		Lodgepole Creek at Ralton	1952-79	6.31	12.6	3.8	2.5	1.9	1.3	0.6	0.6	0.6
6764000	**	South Platte River at Julesburg	1902-95	544	1088.0	326.4	217.6	163.2	108.8	54.4	54.4	54.4
6764880	**	South Platte River at Roscoe, NE	1983-95	976	1952.0	585.6	390.4	292.8	195.2	97.6	97.6	97.6
6765000		South Platte River at Paxton	1940-69	226	452.0	135.6	90.4	67.8	45.2	22.6	22.6	22.6
6765500		South Platte River at North Platte	1947-94	431	862.0	258.6	172.4	129.3	86.2	43.1	43.1	43.1
6766000		Platte River at Brady	1939-89*	790	1580.0	474.0	316.0	237.0	158.0	79.0	79.0	79.0
6766500		Platte River at Cozad	1940-89	701	1402.0	420.6	280.4	210.3	140.2	70.1	70.1	70.1
6767000		Platte River near Lexington	1918-24*	3637	7274.0	2182.2	1454.8	1091.1	727.4	363.7	363.7	363.7
6767500		Plum Creek near Smithfield	1947-75*	6.72	13.4	4.0	2.7	2.0	1.3	0.7	0.7	0.7
6768000		Platte River near Overton	1942-94	1593	3186.0	955.8	637.2	477.9	318.6	159.3	159.3	159.3
6768500		Buffalo Creek near Darr	1947-69	4.22	8.4	2.5	1.7	1.3	0.8	0.4	0.4	0.4
6769000		Buffalo Creek near Overton	1950-58	14	28.0	8.4	5.6	4.2	2.8	1.4	1.4	1.4
6769500		Elm Creek near Overton	1947-58	2	4.0	1.2	0.8	0.6	0.4	0.2	0.2	0.2
6770000		Platte River near Odessa	1938-89	1567	3134.0	940.2	626.8	470.1	313.4	156.7	156.7	156.7
6770190		North Dry Creek near Kearney	1969-71	12.2	24.4	7.3	4.9	3.7	2.4	1.2	1.2	1.2
6770200	**	Platte River near Kearney	1983-95	2239	4478.0	1343.4	895.6	671.7	447.8	223.9	223.9	223.9
6770478		Platte River near Grand Island (South Channe	1984-87	1633	3266.0	979.8	653.2	489.9	326.6	163.3	163.3	163.3
6770500	**	Platte River near Grand Island	1942-95	1579	3158.0	947.4	631.6	473.7	315.8	157.9	157.9	157.9
6771000		Wood River near Riverdale	1947-73	12.5	25.0	7.5	5.0	3.8	2.5	1.3	1.3	1.3
6771500		Wood River near Gibbon	1949-76	13.3	26.6	8.0	5.3	4.0	2.7	1.3	1.3	1.3
6772000		Wood River near Alda	1954-94	11.4	22.8	6.8	4.6	3.4	2.3	1.1	1.1	1.1
6773000		Dry Creek near Cairo	1949-53	3.2	6.4	1.9	1.3	1.0	0.6	0.3	0.3	0.3
6773050		Prairie Creek near Ovina	1994	6.17	12.3	3.7	2.5	1.9	1.2	0.6	0.6	0.6
6773500		Prairie Creek near Silver Creek	1949-53	28	56.0	16.8	11.2	8.4	5.6	2.8	2.8	2.8
6774000	**	Platte River near Duncan	1942-95	1791	3582.0	1074.6	716.4	537.3	358.2	179.1	179.1	179.1
6774500		Middle Loup River near Mullen	1947-48	135	270.0	81.0	54.0	40.5	27.0	13.5	13.5	13.5
6775000		Middle Loup River near Seneca	1948-53	199	398.0	119.4	79.6	59.7	39.8	19.9	19.9	19.9
6775500	**	Middle Loup River at Dunning	1946-95	415	830.0	249.0	166.0	124.5	83.0	41.5	41.5	41.5
6775900	**	Dismal River near Thedford	1967-95	199	398.0	119.4	79.6	59.7	39.8	19.9	19.9	19.9
6776000		Dismal River near Gem	1947-53	278	556.0	166.8	111.2	83.4	55.6	27.8	27.8	27.8
6776500	**	Dismal River at Dunning	1946-95	329	658.0	197.4	131.6	98.7	65.8	32.9	32.9	32.9
6777000		Middle Loup River near Milburn	1952-64*	765	1530.0	459.0	306.0	229.5	153.0	76.5	76.5	76.5
6777500		Middle Loup River at Walworth	1941-60	798	1596.0	478.8	319.2	239.4	159.6	79.8	79.8	79.8
6778000		Middle Loup River at Sargent	1953	820	1640.0	492.0	328.0	246.0	164.0	82.0	82.0	82.0

6779000		Middle Loup River at Arcadia	1962-93	719	1438.0	431.4	287.6	215.7	143.8	71.9	71.9	71.9
6779500		Middle Loup River at Loup City	1950-56	823	1646.0	493.8	329.2	246.9	164.6	82.3	82.3	82.3
6780000		Middle Loup River at Rockville	1956-64	751	1502.0	450.6	300.4	225.3	150.2	75.1	75.1	75.1
6781000		Middle Loup River at Boelus	1953-55	584	1168.0	350.4	233.6	175.2	116.8	58.4	58.4	58.4
6782000		South Loup River at Cumro	1947-53	165	330.0	99.0	66.0	49.5	33.0	16.5	16.5	16.5
6782500		South Loup River at Ravenna	1941-75*	192	384.0	115.2	76.8	57.6	38.4	19.2	19.2	19.2
6783000		Mud Creek near Broken Bow	1950-53	1.88	3.8	1.1	0.8	0.6	0.4	0.2	0.2	0.2
6783500		Mud Creek near Sweetwater	1946-94	38.7	77.4	23.2	15.5	11.6	7.7	3.9	3.9	3.9
6784000	**	South Loup River at St.Michael	1944-95	239	478.0	143.4	95.6	71.7	47.8	23.9	23.9	23.9
6784300		Oak Creek near Loup City	1953-64*	1	2.0	0.6	0.4	0.3	0.2	0.1	0.1	0.1
6784500		Oak Creek near Dannebrog	1950-57	8.05	16.1	4.8	3.2	2.4	1.6	0.8	0.8	0.8
6784800		Turkey Creek near Dannebrog	1966-93	19.8	39.6	11.9	7.9	5.9	4.0	2.0	2.0	2.0
6785000	**	Middle Loup River at St.Paul	1963-95	1118	2236.0	670.8	447.2	335.4	223.6	111.8	111.8	111.8
6785500		North Loup River at Brewster	1945-51	378	756.0	226.8	151.2	113.4	75.6	37.8	37.8	37.8
6786000	**	North Loup River at Taylor	1937-95	478	956.0	286.8	191.2	143.4	95.6	47.8	47.8	47.8
6786500		North Loup River at Burwell	1953-60	505	1010.0	303.0	202.0	151.5	101.0	50.5	50.5	50.5
6787000	**	Calamus River near Harrop	1979-95	251	502.0	150.6	100.4	75.3	50.2	25.1	25.1	25.1
6787500	**	Calamus River near Burwell	1986-95	262	524.0	157.2	104.8	78.6	52.4	26.2	26.2	26.2
6788500		North Loup River at Ord	1952-94	891	1782.0	534.6	356.4	267.3	178.2	89.1	89.1	89.1
6788988		Mira Creek near North Loup	1980-93	4.03	8.1	2.4	1.6	1.2	0.8	0.4	0.4	0.4
6789000		North Loup River at Scotia	1937-69	864	1728.0	518.4	345.6	259.2	172.8	86.4	86.4	86.4
6789500		Davis Creek near Cotesfield	1950-58	5.64	11.3	3.4	2.3	1.7	1.1	0.6	0.6	0.6
6790000		North Loup River near Cotesfield	1950-56	902	1804.0	541.2	360.8	270.6	180.4	90.2	90.2	90.2
6790500	**	North Loup River near St.Paul	1928-95	936	1872.0	561.6	374.4	280.8	187.2	93.6	93.6	93.6
6791000		Spring Creek at Cushing	1949-53	16	32.0	9.6	6.4	4.8	3.2	1.6	1.6	1.6
6791500		Cedar River near Spaulding	1945-94	166	332.0	99.6	66.4	49.8	33.2	16.6	16.6	16.6
6791750		Cedar River at Primrose	1961-64	208	416.0	124.8	83.2	62.4	41.6	20.8	20.8	20.8
6791800		Cedar River at Belgrade	1960-65	227	454.0	136.2	90.8	68.1	45.4	22.7	22.7	22.7
6792000	**	Cedar River near Fullerton	1941-95	258	516.0	154.8	103.2	77.4	51.6	25.8	25.8	25.8
6793000	**	Loup River near Genoa	1944-95	692	1384.0	415.2	276.8	207.6	138.4	69.2	69.2	69.2
6793500		Beaver Creek at Loretto	1945-89*	90	180.0	54.0	36.0	27.0	18.0	9.0	9.0	9.0
6794000	**	Beaver Creek at Genoa	1941-95	130	260.0	78.0	52.0	39.0	26.0	13.0	13.0	13.0
6794500		Loup River at Columbus	1934-77*	960	1920.0	576.0	384.0	288.0	192.0	96.0	96.0	96.0
6795000		Shell Creek at Newman Grove	1950-67	13.2	26.4	7.9	5.3	4.0	2.6	1.3	1.3	1.3
6795500	**	Shell Creek near Columbus	1948-95	47.3	94.6	28.4	18.9	14.2	9.5	4.7	4.7	4.7
6796000	**	Platte River at North Bend	1949-95	4569	9138.0	2741.4	1827.6	1370.7	913.8	456.9	456.9	456.9
6796500	**	Platte River at Leshara	1994-95	7135	14270.0	4281.0	2854.0	2140.5	1427.0	713.5	713.5	713.5
6796973		Elkhorn River near Atkinson	1983-89	111	222.0	66.6	44.4	33.3	22.2	11.1	11.1	11.1
6796978		Holt Creek near Emmet	1979-89	34.8	69.6	20.9	13.9	10.4	7.0	3.5	3.5	3.5

6796985		Elkhorn River at Emmet	1980-82	67.6	135.2	40.6	27.0	20.3	13.5	6.8	6.8	6.8
6797500	**	Elkhorn River at Ewing	1947-95	195	390.0	117.0	78.0	58.5	39.0	19.5	19.5	19.5
6798000		South Fork Elkhorn River near Ewing	1948-89*	69.5	139.0	41.7	27.8	20.9	13.9	7.0	7.0	7.0
6798300		Clearwater Creek near Clearwater	1962-89*	43.3	86.6	26.0	17.3	13.0	8.7	4.3	4.3	4.3
6798500		Elkhorn River at Neligh	1931-93	313	626.0	187.8	125.2	93.9	62.6	31.3	31.3	31.3
6798800		Elkhorn River at Meadow Grove	1961-65	398	796.0	238.8	159.2	119.4	79.6	39.8	39.8	39.8
6799000	**	Elkhorn River at Norfolk	1946-95	541	1082.0	324.6	216.4	162.3	108.2	54.1	54.1	54.1
6799080		Willow Creek near Foster	1976-93	15.3	30.6	9.2	6.1	4.6	3.1	1.5	1.5	1.5
6799100	**	North Fork Elkhorn River near Pierce	1960-95	98.7	197.4	59.2	39.5	29.6	19.7	9.9	9.9	9.9
6799230		Union Creek at Madison	1979-93	45.4	90.8	27.2	18.2	13.6	9.1	4.5	4.5	4.5
6799350	**	Elkhorn River at West Point	1973-95	994	1988.0	596.4	397.6	298.2	198.8	99.4	99.4	99.4
6799385		Pebble Creek at Scribner	1979-93	53	106.0	31.8	21.2	15.9	10.6	5.3	5.3	5.3
6799450		Logan Creek at Pender	1966-93	166	332.0	99.6	66.4	49.8	33.2	16.6	16.6	16.6
6799500	**	Logan Creek near Uehling	1942-95	218	436.0	130.8	87.2	65.4	43.6	21.8	21.8	21.8
6800000	**	Maple Creek near Nickerson	1952-95	74.1	148.2	44.5	29.6	22.2	14.8	7.4	7.4	7.4
6800500	**	Elkhorn River at Waterloo	1929-95	1286	2572.0	771.6	514.4	385.8	257.2	128.6	128.6	128.6
6801000	**	Platte River near Ashland	1989-95	6795	13590.0	4077.0	2718.0	2038.5	1359.0	679.5	679.5	679.5
6803000	**	Salt Creek at Roca	1952-95	49.1	98.2	29.5	19.6	14.7	9.8	4.9	4.9	4.9
6803080	**	Salt Creek at Pioneers Boulevard in Lincoln, N	1995	107	214.0	64.2	42.8	32.1	21.4	10.7	10.7	10.7
6803093	**	Haines Branch at SW 56th St at Lincoln, NE	1995	19.9	39.8	11.9	8.0	6.0	4.0	2.0	2.0	2.0
6803170	**	Middle Creek at SW 40th St. at Lincoln, NE	1995	20.7	41.4	12.4	8.3	6.2	4.1	2.1	2.1	2.1
6803400		Antelope Creek at 17th St.	1959-62	4.46	8.9	2.7	1.8	1.3	0.9	0.4	0.4	0.4
6803450		Oak Creek near Raymond	1964-67	2.28	4.6	1.4	0.9	0.7	0.5	0.2	0.2	0.2
6803500	**	Salt Creek at Lincoln	1950-95	237	474.0	142.2	94.8	71.1	47.4	23.7	23.7	23.7
6803510	**	Little Salt Creek near Lincoln	1969-95	15.8	31.6	9.5	6.3	4.7	3.2	1.6	1.6	1.6
6803513	**	Salt Creek at 70th Street at Lincoln, NE	1995	333	666.0	199.8	133.2	99.9	66.6	33.3	33.3	33.3
6803520	**	Stevens Creek near Lincoln	1969-95	20	40.0	12.0	8.0	6.0	4.0	2.0	2.0	2.0
6803530	**	Rock Creek near Ceresco, NE	1971-94	39.2	78.4	23.5	15.7	11.8	7.8	3.9	3.9	3.9
6803555	**	Salt Creek at Greenwood	1952-95	353	706.0	211.8	141.2	105.9	70.6	35.3	35.3	35.3
6803920	**	Cottonwood Creek above Czechland Lake nea	1995	1.76	3.5	1.1	0.7	0.5	0.4	0.2	0.2	0.2
6803935	**	Cottonwood Creek tributary above dam 6B ne	1995	0.83	1.7	0.5	0.3	0.2	0.2	0.1	0.1	0.1
6804000	**	Wahoo Creek at Ithaca	1950-95	87.1	174.2	52.3	34.8	26.1	17.4	8.7	8.7	8.7
6804500		Silver Creek at Ithaca	1949-58	9.66	19.3	5.8	3.9	2.9	1.9	1.0	1.0	1.0
6804700	**	Wahoo Creek at Ashland	1990-95	147	294.0	88.2	58.8	44.1	29.4	14.7	14.7	14.7
6804900	**	Johnson Creek near Memphis	1991-95	3.8	7.6	2.3	1.5	1.1	0.8	0.4	0.4	0.4
6805000		Salt Creek near Ashland	1947-67	487	974.0	292.2	194.8	146.1	97.4	48.7	48.7	48.7
6805500	**	Platte River at Louisville	1953-95	6869	13738.0	4121.4	2747.6	2060.7	1373.8	686.9	686.9	686.9
6806500	**	Weeping Water Creek at Union	1951-95	103	206.0	61.8	41.2	30.9	20.6	10.3	10.3	10.3
6807000	**	Missouri River at Nebraska City	1958-95	39020	78040.0	23412.0	15608.0	11706.0	7804.0	3902.0	3902.0	3902.0

6810500		Little Nemaha River near Syracuse	1952-69	64.8	129.6	38.9	25.9	19.4	13.0	6.5	6.5	6.5
6811500	**	Little Nemaha River at Auburn	1950-95	314	628.0	188.4	125.6	94.2	62.8	31.4	31.4	31.4
6813500	**	Missouri River at Rulo	1958-95	41850	83700.0	25110.0	16740.0	12555.0	8370.0	4185.0	4185.0	4185.0
6814000	**	Turkey Creek near Seneca, KS	1949-95	132	264.0	79.2	52.8	39.6	26.4	13.2	13.2	13.2
6814500	**	North Fork Big Nemaha River at Humboldt	1953-95	212	424.0	127.2	84.8	63.6	42.4	21.2	21.2	21.2
6815000	**	Big Nemaha River at Falls City	1944-95	633	1266.0	379.8	253.2	189.9	126.6	63.3	63.3	63.3
6815500		Muddy Creek at Verdon	1953-72	66.3	132.6	39.8	26.5	19.9	13.3	6.6	6.6	6.6
6821500	**	Arikaree River at Haigler	1932-95	20.4	40.8	12.2	8.2	6.1	4.1	2.0	2.0	2.0
6823000	**	North Fork Republican River at Co-Ne Line	1935-95	45.4	90.8	27.2	18.2	13.6	9.1	4.5	4.5	4.5
6823500	**	Buffalo Creek near Haigler	1941-95	7.01	14.0	4.2	2.8	2.1	1.4	0.7	0.7	0.7
6824000	**	Rock Creek at Parks	1941-95	13.2	26.4	7.9	5.3	4.0	2.6	1.3	1.3	1.3
6824500		Republican River at Benkelman	1947-94	82.8	165.6	49.7	33.1	24.8	16.6	8.3	8.3	8.3
6827500	**	South Fork Republican River near Benkelman	1938-95	43.1	86.2	25.9	17.2	12.9	8.6	4.3	4.3	4.3
6828000		Republican River at Max	1929-45	186	372.0	111.6	74.4	55.8	37.2	18.6	18.6	18.6
6828490		Muddy Creek at Stratton	1978	0.7	1.4	0.4	0.3	0.2	0.1	0.1	0.1	0.1
6828500	**	Republican River at Stratton	1950-95	117	234.0	70.2	46.8	35.1	23.4	11.7	11.7	11.7
6829500		Republican River at Trenton	1954-93	48.5	97.0	29.1	19.4	14.6	9.7	4.9	4.9	4.9
6830500		Frenchman Creek near Champion	1933-40	26.6	53.2	16.0	10.6	8.0	5.3	2.7	2.7	2.7
6831000		Frenchman Creek below Champion	1935-56	42.5	85.0	25.5	17.0	12.8	8.5	4.3	4.3	4.3
6831500		Frenchman Creek near Imperial	1941-94	54.7	109.4	32.8	21.9	16.4	10.9	5.5	5.5	5.5
6832500		Frenchman Creek near Enders	1946-93	53.2	106.4	31.9	21.3	16.0	10.6	5.3	5.3	5.3
6833500		Frenchman Creek near Hamlet	1929-56*	83.9	167.8	50.3	33.6	25.2	16.8	8.4	8.4	8.4
6834000	**	Frenchman Creek at Palisade	1950-95	72.8	145.6	43.7	29.1	21.8	14.6	7.3	7.3	7.3
6834500		Stinking Water Creek near Wauneta	1941-50	24.5	49.0	14.7	9.8	7.4	4.9	2.5	2.5	2.5
6835000		Stinking Water Creek near Palisade	1950-94	37	74.0	22.2	14.8	11.1	7.4	3.7	3.7	3.7
6835500	**	Frenchman Creek at Culbertson	1935-95	89.8	179.6	53.9	35.9	26.9	18.0	9.0	9.0	9.0
6836000		Blackwood Creek near Culbertson	1947-86	5.85	11.7	3.5	2.3	1.8	1.2	0.6	0.6	0.6
6836500	**	Driftwood Creek near McCook	1946-95	9.78	19.6	5.9	3.9	2.9	2.0	1.0	1.0	1.0
6837000	**	Republican River at McCook	1955-95	155	310.0	93.0	62.0	46.5	31.0	15.5	15.5	15.5
6837300		Red Willow Creek above Hugh Butler Lake	1961-94	26.1	52.2	15.7	10.4	7.8	5.2	2.6	2.6	2.6
6837500		Red Willow Creek near McCook	1962-93	19.5	39.0	11.7	7.8	5.9	3.9	2.0	2.0	2.0
6838000	**	Red Willow Creek near Red Willow	1962-95	13.5	27.0	8.1	5.4	4.1	2.7	1.4	1.4	1.4
6839000		Medicine Creek at Maywood	1952-58	24.4	48.8	14.6	9.8	7.3	4.9	2.4	2.4	2.4
6839500		Brushy Creek near Maywood	1952-58	1.84	3.7	1.1	0.7	0.6	0.4	0.2	0.2	0.2
6840000		Fox Creek at Curtis	1952-89*	6.55	13.1	3.9	2.6	2.0	1.3	0.7	0.7	0.7
6840500		Dry Creek near Curtis	1952-58	0.5	1.0	0.3	0.2	0.2	0.1	0.1	0.1	0.1
6841000		Medicine Creek above Harry Strunk Lake	1950-94	62.3	124.6	37.4	24.9	18.7	12.5	6.2	6.2	6.2
6841500		Mitchell Creek above Harry Strunk Lake	1957-74	2.3	4.6	1.4	0.9	0.7	0.5	0.2	0.2	0.2
6842500		Medicine Creek below Harry Strunk Lake	1950-94	59.8	119.6	35.9	23.9	17.9	12.0	6.0	6.0	6.0

6843000		Medicine Creek at Cambridge	1937-56*	64.9	129.8	38.9	26.0	19.5	13.0	6.5	6.5	6.5
6843500	**	Republican River at Cambridge	1950-95	248	496.0	148.8	99.2	74.4	49.6	24.8	24.8	24.8
6844000		Muddy Creek at Arapahoe	1951-93	14.4	28.8	8.6	5.8	4.3	2.9	1.4	1.4	1.4
6844210		Turkey Creek at Edison	1978-93	8.26	16.5	5.0	3.3	2.5	1.7	0.8	0.8	0.8
6844500	**	Republican River near Orleans	1948-95	267	534.0	160.2	106.8	80.1	53.4	26.7	26.7	26.7
6845200		Sappa Creek near Beaver City	1937-72	38.3	76.6	23.0	15.3	11.5	7.7	3.8	3.8	3.8
6846500	**	Beaver Creek at Cedar Bluffs, KS	1946-95	14.3	28.6	8.6	5.7	4.3	2.9	1.4	1.4	1.4
6847000		Beaver Creek near Beaver City	1938-94	19.7	39.4	11.8	7.9	5.9	3.9	2.0	2.0	2.0
6847500	**	Sappa Creek near Stamford	1946-95	46.7	93.4	28.0	18.7	14.0	9.3	4.7	4.7	4.7
6848500	**	Prairie Dog Creek near Woodruff, KS	1929-95	27.7	55.4	16.6	11.1	8.3	5.5	2.8	2.8	2.8
6849500	**	Republican River below Harlan County Dam	1953-95	225	450.0	135.0	90.0	67.5	45.0	22.5	22.5	22.5
6850000		Turkey Creek at Naponee	1948-53	15.5	31.0	9.3	6.2	4.7	3.1	1.6	1.6	1.6
6850200		Cottonwood Creek near Bloomington	1949-56	5.3	10.6	3.2	2.1	1.6	1.1	0.5	0.5	0.5
6850500		Republican River near Bloomington	1929-57	155	310.0	93.0	62.0	46.5	31.0	15.5	15.5	15.5
6851000		Center Creek at Franklin	1948-93	8.4	16.8	5.0	3.4	2.5	1.7	0.8	0.8	0.8
6851500		Thompson Creek at Riverton	1948-94	32.4	64.8	19.4	13.0	9.7	6.5	3.2	3.2	3.2
6852000		Elm Creek at Amboy	1949-93	22.5	45.0	13.5	9.0	6.8	4.5	2.3	2.3	2.3
6853020	**	Republican River at Guide Rock	1950-95	305	610.0	183.0	122.0	91.5	61.0	30.5	30.5	30.5
6853500	**	Republican River near Hardy	1958-95	360	720.0	216.0	144.0	108.0	72.0	36.0	36.0	36.0
6879900		Big Blue River at Surprise	1965-93	30	60.0	18.0	12.0	9.0	6.0	3.0	3.0	3.0
6880000		Lincoln Creek near Seward	1954-94	54.5	109.0	32.7	21.8	16.4	10.9	5.5	5.5	5.5
6880500		Big Blue River at Seward	1954-94	138	276.0	82.8	55.2	41.4	27.6	13.8	13.8	13.8
6880800	**	West Fork Big Blue River near Dorchester	1958-95	189	378.0	113.4	75.6	56.7	37.8	18.9	18.9	18.9
6881000	**	Big Blue River near Crete	1954-95	410	820.0	246.0	164.0	123.0	82.0	41.0	41.0	41.0
6881200		Turkey Creek near Wilber	1960-94	95.5	191.0	57.3	38.2	28.7	19.1	9.6	9.6	9.6
6881500		Big Blue River at Beatrice	1975-94	824	1648.0	494.4	329.6	247.2	164.8	82.4	82.4	82.4
6882000	**	Big Blue River at Barneston	1933-95	865	1730.0	519.0	346.0	259.5	173.0	86.5	86.5	86.5
6882900		Little Blue River below Pawnee Creek near Pa	1963-68	129	258.0	77.4	51.6	38.7	25.8	12.9	12.9	12.9
6883000	**	Little Blue River near DeWeese	1954-95	150	300.0	90.0	60.0	45.0	30.0	15.0	15.0	15.0
6883570		Little Blue River near Alexandria	1960-89*	248	496.0	148.8	99.2	74.4	49.6	24.8	24.8	24.8
6883940		Big Sandy Creek at Alexandria	1980-93	115	230.0	69.0	46.0	34.5	23.0	11.5	11.5	11.5
6884000	**	Little Blue River near Fairbury	1910-95	390	780.0	234.0	156.0	117.0	78.0	39.0	39.0	39.0
6884025	**	Little Blue River at Hollenburg, KS	1975-95	570	1140.0	342.0	228.0	171.0	114.0	57.0	57.0	57.0

APPENDIX E

Nebraska Water Marketing Policy Changes by J. David Aiken, University of Nebraska Lincoln, Water Current, Vol. 34, No. 4, August 2002.

Nebraska Water Marketing Policy Choices

by J. David Aiken,
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Water marketing is a powerful water management tool that allows water to be reallocated to new uses. However, water marketing involves considerable transaction costs that may significantly disadvantage current water users. Water marketing has not developed in Nebraska because municipalities and industry can generally obtain needed water supplies from Nebraska's generally abundant ground water supplies. Water marketing will probably be adopted sometime in the near future in order to successfully implement the Platte River endangered species cooperative agreement.

Water Marketing Basics

Water marketing usually involves the buyer purchasing a perpetual water right from the seller (only 5-year water leases are currently under discussion in Nebraska). The buyer typically is a city or industry, while the seller usually is an irrigator. Water right transfers must go through an administrative process to ensure that the rights of other water users are not harmed by the transfer. Specifically the seller cannot purchase the buyer's return flows that are relied upon by downstream water users.

Hypothetical: Seller irrigates 100 acres with 300 acre feet (AF) of water. Of the 300 AF applied, 200 AF are consumed in crop growth and 100 AF are return flows. These return flows return to the stream where they are used by downstream appropriators, both senior and junior to the seller. In this case the Seller can sell only the 200 AF of consumptive use to the Buyer; the Buyer cannot acquire more than the Seller's consumptive use.

In the real world, it is not always clear how much water has been diverted by the Seller, how much of that diverted amount is consumed, and the quantity of return flows. In water marketing proceedings, deep pocket buyers will seek to maximize the seller's consumptive use (and minimize return flows) through the use of technical consultants in order to have the most water available for purchase. Similarly downstream appropriators (who are often required at their own expense to participate in water marketing proceedings to protect their interests) seek to maximize the return flows (and minimize the consumptive use).

The state water engineer (in Nebraska, the Director of Natural Resources) can go a long way in making these proceedings less burdensome, particularly to the downstream appropriators (whose interest the state engineer is legally required to protect) by being more than a passive referee in these proceedings. As these transaction costs are likely to be a significant issue in Nebraska water marketing policy debates, care must be taken to insure that they do not burden downstream appropriators.

Nebraska Water Marketing?

Other western states have water marketing not just because it is good policy (it is), but because some interest group (probably municipalities) needs the law to be changed in order to allow it to acquire needed water supplies. We have only very limited water marketing in Nebraska because municipalities haven't needed marketing to satisfy the needs of growing urban populations. Indeed, LB1209, the first of the recent conjunctive use statutes adopted, was enacted because Lincoln and Omaha needed water rights for their Platte river wells, not because conjunctive use needed to be addressed in Nebraska water law.

Community impacts. A related concern is that water marketing will reduce irrigation such that local agribusinesses and communities dependent upon irrigation will fail. Other states have tried to deal with this issue by limiting the percentage of irrigation rights that can be sold in an area and by requiring the buyers to make economic development payments to the communities or counties from which the water rights came from. This will be a significant issue in the Nebraska water marketing debate.

Political dimensions. Water marketing is viewed with suspicion by surface irrigators in Nebraska for a variety of reasons, including (1) transaction costs, (2) distrust of those promoting water marketing, and (3) concerns that cities etc. will buy up all agricultural water rights, leading to the decline of Nebraska's irrigated agriculture economy. Municipal use is only two to three percent of Nebraska water use and irrigation nearly 90 percent, so even doubling municipal use would not have a significant impact on irrigation statewide (local impacts might be more significant however).

Platte Cooperative Agreement

The primary impetus for current water marketing discussions is the Platte River Cooperative Agreement (CA). Under the CA, Nebraska, Colorado and Wyoming have agreed to provide 130,000-150,000 acre-feet (AF) of water for habitat streamflow increases by 2010-2013. The states have already implemented water projects to provide 60,000-70,000 AF of this first increment of increased habitat streamflow. Water marketing is one of several water management alternatives being considered to provide the remaining 60,000-90,000 AF of increased habitat streamflow.

Water Right Prices

Irrigated values minus dryland values. A simple way to estimate water values is the difference between irrigated land values or cash rent rates and dryland land values or cash rent rates. For the south central crop reporting district, 2001 differences between dryland and irrigated land values would be $1053-1085/A. Cash rent differentials would be $76-81/A. These values suggest a range of minimum prices for purchasing or leasing surface water rights. This approach was used by Wyoming in the Nebraska v. Wyoming lawsuit to estimate damages that Wyoming's water overuse caused Nebraska.

Land taxed as irrigated. At least one other factor might increase water prices. Current water marketing proposals all require the seller to continue paying irrigated land property taxes on land that has been dried out by water marketing. Having to pay property taxes on dryland at least double what dryland property taxes would be would decrease the value of the dried out land, which could increase the asking price for water.

Third-Party Impacts

Irrigation district impacts. If an irrigation district water is sold, typically the irrigation district must approve the sale. Typically irrigation districts will not approve the sale unless the buyer agrees in writing to continue all payments to the irrigation district.

Community impacts. Reduced irrigation impacts spending on agricultural production inputs and reduce community economic activity. Nebraska water marketing proposals to require dried up land to continue paying irrigated property taxes would help maintain property tax payments. Other states have required buyers to pay impact fees to communities affected by reduced irrigation. A similar approach is to cap or limit the amount of land that can be dried up in a area. However, unless the community can find replacement economic activity to make up for the reduction in agricultural spending, drying up irrigated land ultimately harms agriculturally dependent communities.

If the quantity of water transferred out of agriculture is large in relative terms, this could lead to long-term declines in agriculture. This has community implications and statewide political implications as well. Rural communities are already stressed, and uncontrolled water marketing could increase that stress. Rural areas competing for other statewide political objectives could be stressed as well.

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APPENDIX F

Implementing instream flow protection in prior appropriation systems: continuing challenges by Janet C. Neuman. 2000. Rivers, Vol. 7, Number 4, pages 345 - 351.

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Review of Legal Developments
A. DAN TARLOCK, *Legal Developments Editor*

Implementing Instream Flow Protections In Prior Appropriation Systems: Continuing Challenges

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STATUS OF INSTREAM FLOW PROTECTION IN THE WESTERN UNITED STATES

In spite of attempts to refine the prior appropriation doctrine to accommodate instream needs, depleted instream flows are still a serious problem in the arid western United States, and expected western population growth will only exacerbate the problem. During most of the first one hundred years of western water law development, the prior appropriation doctrine encouraged and rewarded diversion and consumptive use of water exclusively, resulting in a failure to account for or protect instream flows.

Although all of the western states have now attempted to provide some form of protection for water instream, in many areas such protections offer too little, too late. Full appropriation or overappropriation is common and longstanding in many western surface waterbodies, as is overdraft of groundwater aquifers, which are often interconnected with surface water. The widespread commitment of water to consumptive uses long before instream uses were even recognized by the law means that instream needs are often still left high and dry in spite of new legal protections.

A recent report by The Western States Water Council of the Western Governors' Association (1997) summarized the member states' responses to a survey of their most significant water problems. The problem of "providing supplies for growing consumptive demands" was ranked by all states as the number one problem, and "meeting expanding environmental needs, including instream needs," was identified by all but two states as the number two problem (Western States Water Council 1997).

Several years ago, water law scholar Dan Tarlock (1993) identified three stages of instream flow protection: denial, recognition, and implementation and accommodation. He noted that the western states had already passed through the first two stages and had entered the third. In this article, I briefly review the various forms of recognition embodied in the laws of the western states and then discuss the problems of implementation and accommodation that still limit the promise of instream flow protections. Passing mention will also be made of some resurgence of "denial."

LEGAL RECOGNITION OF INSTREAM FLOWS

Although Oregon and Idaho law provided some protections for instream flows in special waterbodies in the 1920s and earlier, significant legal protection throughout the West was still decades into the future. Oregon and Washington enacted additional protections in the 1940s and 1950s, but most of the existing instream flow laws in the western states have evolved within the last 25 years. (For a detailed discussion of instream flow laws in the western states, see Gillilan and Brown 1997, or Covell 1998.)

Fifteen western states now recognize instream water rights in some form, although the rights vary considerably in their terms, length of existence, and whether they are explicitly provided by statute, ordained by judicial opinion, or simply acknowledged by attorney general opinion. States whose statutes allow for instream water rights include Alaska (Alaska Stat. § 4615.145), California (Cal. Water Code § 1707), Colorado (Colo. Rev. Stat. § 37-92-102(3)), Idaho (Idaho Code § 42-1501), Montana (Mont. Code § 85-2-316), Nebraska (Neb. Rev. Stat. § 46-2, 108), Oregon (Or. Rev. Stat. § 537.332-.360), Texas (Tex. Water Code §15.7031), Utah (Utah Code § 73-3-3(11)), Washington (Wash. Rev. Code § 90.22.010), and Wyoming (Wyo. Stat.§ 41-3-1001). States where judicial opinions bless instream rights include Arizona, Nevada, and South Dakota (*McClellan v. Jantzen*, 547 P. 2d 494 (Ariz. 1976); *Nevada v. Morros*, 766 P. 2d 263(Nev. 1988); *In re* Water Right Claim No. 1927-2, 524 N.W. 2d 855 (S.D. 1994). New Mexico and Texas were the last holdouts, but recent developments have brought them both into the fold. In 1997, the Texas legislature adopted limited authority for instream rights, and a 1998 New Mexico Attorney General opinion concluded that instream uses are legitimate beneficial uses under existing state law, and that existing consumptive rights can thus be transferred to instream purposes (Tex. Water Code § 15.7031; Fort 2000).

In most of these states, requests for or ownership of instream water rights is limited to public agencies, primarily water management, wildlife management, pollution control, or recreation agencies. In Alaska, Arizona, California, Nevada, and now New Mexico, it appears that private parties can hold instream rights as well. In both California and New Mexico, existing consumptive water rights can be transferred or dedicated to instream uses, but the law does not authorize new instream appropriations.

Some states attempt to protect instream flows in some other manner, without giving them official status as water rights. For instance, Hawaii, Idaho, Kansas, Montana, Texas and Washington use minimum streamflows or reservations of water instream to protect certain streams from future appropriation or from depletion below a minimum level (Haw. Rev. Stat. § 174C-71; Idaho Code § 1501-1505; Kan. Stat. § 82a-703a et. seq.; Mont. Code § 85-2-316; Wash. Rev. Stat. § 90.22.020-90.22.040). All of these states except Hawaii and Kansas also recognize instream water rights, but on a limited basis; thus, the minimum flows and reservations are alternative means of instream flow protection.

All western states except Colorado and Oklahoma review new water rights applications to determine whether they are contrary to the public interest (Gillilan and Brown 1997; Covell 1998). Some states also conduct public interest reviews in "transfer" proceedings, when a water user is applying for a change in type of use, place of use, or other component of a water right. These public interest reviews generally consider protection of instream values among many other factors of concern, but the extent to which protection of instream flows and uses are actually accounted for in the reviews varies widely.

Many of the western states conduct some sort of water availability review to determine if unappropriated water is actually available before granting new appropriations. Although the states' processes, formulas, and burden of proof requirements vary widely, for the most part

they do not require that any water be deducted for instream needs unless some other state law (such as minimum streamflows or reservations) so requires. Thus the water availability reviews do not contribute to instream flow protection in most places.

Another possible device for protecting instream values is the public trust doctrine, a common law doctrine with ancient roots in English and Roman law (MacGrady 1975). The doctrine arguably requires a state, in managing its water resources, to protect public rights to use waterbodies for commerce, navigation, and fisheries—and possibly for recreation and esthetics as well (Blumm 1995). The doctrine has been linked to water allocation and use decisions, either by statute or court decision, in Alaska, California, Hawaii, Montana, and North Dakota (*Owsichek v. State Guide Licensing and Control Board*, 763 P. 2d 488 (Alaska 1988); *National Audubon Society v. Superior Court of Alpine County*, 658 P. 2d 709 (Cal. 1983); *In Re Water Use Permit Application*, 9P.3d 409 (Hawaii 2000); *Montana Coalition for Stream Access, Inc. v. Hildreth*, 684 P.2d 1088 (Mont. 1984); *United Plainsmen Association v. North Dakota State Water Conservation Commission*, 247 N.W. 2d 457 (N.D. 1976).

State wild and scenic river legislation also gives special status to particular waterbodies in seven western states, including California, Idaho, Montana, North Dakota, Oklahoma, Oregon, and South Dakota (Covell 1998). The laws generally focus on prohibiting certain structures and activities, and only rarely does designation also directly impose instream flow protections of any sort.

Instream flow protection is also available in some instances through application of federal law (Estes 1992; Yuffee 1993). Federal reserved water rights may exist for instream flows in conjunction with Indian reservations, national parks or monuments, federally designated wild and scenic rivers, or other federal land reservations (Weiss 1998). Recent changes in federal law have revised the primary purposes and operating criteria for certain federal reclamation projects, mandating restoration of instream flows (e.g., Reclamation Projects Authorization and Adjustment Act of 1992, Public Law 102-575, 106 U.S. Stat. 4600 (1992)). The Endangered Species Act (ESA) (16 U.S.C. § 1531-1544) and the Clean Water Act (CWA) (33 U.S.C. § 1251-1387) are providing impetus for restoring instream flows in many places throughout the West. Under the Supremacy Clause of the United States Constitution (Art. VI, § 2), the ESA and the CWA can take precedence over state law; thus, state water right holders may be required to change the method or amount of their water use to leave water in the stream for species or quality needs (Estes 1992). The objection that federal regulation amounts to a compensable taking of state-issued water rights may be raised, but unless the federal regulation is so onerous as to amount to a total deprivation of the water right holder's value, federal law will probably prevail (Yuffee 1993).

CHALLENGES TO IMPLEMENTING AND ACCOMMODATING INSTREAM PROTECTIONS IN PRIOR APPROPRIATION SYSTEMS

All of the western states have now recognized at least some need to protect instream values and have adopted a variety of legal devices to do so, from official instream water rights to review of new water rights applications against public interest criteria that include instream values. Furthermore, a number of federal laws have elevated the status of instream uses of water; yet, the westwide perspective on how well these laws have performed to date to protect, enhance, or restore instream flows is not exactly glowing. None of the states believe by any stretch of the imagination that they have instream flow problems licked. What, then, are the implementation problems that continue to constrain instream flow protection?

There are several significant challenges that are more practical than legal (Neuman and Chapman 1999). These include problems of science, money, and politics. In terms of science, there is not yet a single, widely-accepted, uniformly-applied methodology for evaluating the ecological value of instream flows (Gillilan and Brown 1997). The federal agencies prefer a method known as the Instream Flow Incremental Methodology (IFIM) (Neuman and Chapman 1999). This method uses a computer model to predict relations between flows and habitat conditions. It is expensive to use, requires a great deal of data, and is time consuming: a complete analysis for a single stream segment may take years. In the end, it still offers only a prediction based on a model. Some states prefer competing methodologies of their own devising. For example, the

Wyoming instream appropriations statute contains a detailed methodology for determining the proper amounts and locations of instream rights (Wyo. Stat. § 41-3-1003(b), 1004(a), 1006(b)). In Oregon, state fish and wildlife officials use what is known as the Oregon Method, which is a less expensive, more site-specific alternative to IFIM (Smith 1973). None of the methods are widely accepted, however, and all of them have their critics (Gillilan and Brown 1997).

The lack of a useful and credible scientific tool hampers inititial protection decisions, such as the amount of water that should be included in an instream water right or minimum streamflow to accomplish the desired goal (e.g., restoring fish habitat). Later evaluation of the instream flow is also difficult: Are the desired benefits actually being produced at the level necessary to show the required beneficial use under state law?

Policy makers need answers to their scientific questions about instream flow, and an acceptable methodology for determining flow needs. Information is needed in many areas, such as hydraulics, fish passage, groundwater/surface water connections, and the interaction of quantity, quality, and temperature of water with habitat and life cycle needs. The needed information may often be quite site and species specific. The problem is the same whether a state grants official water rights status for instream flows, or simply attempts to reserve an adequate minimum streamflow from appropriation to protect instream values. Without a well-developed and credible science of instream flows, any legal action taken to protect instream flows may falter on the science. Furthermore, as long as good information is lacking, interest groups on all sides of these issues will continue to use the uncertainty to argue for their respective positions.

Another practical problem, related to the lack of scientific methodology but also with broader implications for interfering with instream flow protection, is the lack of consistently applied measurement and reporting requirements for many western water users. Although the level of measurement activity varies widely from state to state, and intra-state as well, many thousands of consumptive water users throughout the West do not have even rudimentary measurement technology to accurately track their water use, and many stream systems have inadequate gauging, if any at all. The lack of good data makes it very difficult to define and protect instream rights or minimum streamflow requirements and allocate water among instream and out-of-stream uses.

An additional and thorny practical barrier to instream flow protection is money. The places most in need of instream flows are those western waterbodies in which flow is limited or nonexistent, resulting in serious consequences for water quality and aquatic life as well as for esthetic and recreational values. These are the waterbodies already overappropriated by consumptive water right holders. If any instream flow restoration is going to occur, it will have to be through conversion of senior consumptive rights to instream rights. Most of the states that recognize instream rights seem to provide for such conversions. But water rights are valuable property rights in the West, and it is unlikely that many water right holders are simply going to dedicate their water to instream purposes for altruistic reasons. A market is growing to purchase or lease water from senior right holders for dedication to instream flows, but markets require money (Willey and Diamant 1996; Gillilan and Brown 1997; Neuman and Chapman 1999).

The money problem is twofold: how do you value instream flows in order to set an acquisition price, and then how do you get enough money to acquire enough water for instream purposes to make a difference? In the same way that the science of instream flows is immature, so, too, is the economic methodology of valuing water for instream uses (Neuman and Chapman 1999). How much is fish habitat worth? How much is a fish worth? What dollar value do we place on seeing water in a stream?

Of course, in the end, the value that perhaps matters most is the amount required by water right holders to convince them to part with some of their water. An irrigator can assign value based on farm crop budget analyses or comparison sales of water or of land with and without water rights. But even this side of the equation is skewed somewhat because most irrigators do not pay directly for their water.

One way or another, however, the "market price" will be set by agreement between buyers and sellers. Nevertheless, those entering the market for instream flows will need to wait years for feedback from the stream itself on whether the desired benefits were obtained and whether the price paid was therefore appropriate.

Furthermore, whatever particular valuation method is used, acquiring water for instream flows at the level needed in many areas is expensive. In the Pacific Northwest, recent prices

paid for permanent acquisitions average about $330 an acre-foot, and westwide instream acquisition prices have been as high as $850 an acre-foot (compared to $3,000 an acre foot for municipal acquisitions) (Neuman and Chapman 1999). In California, the Bureau of Reclamation has spent millions of dollars to acquire tens of thousands of acre-feet of water from irrigators to restore instream flows to support fish and wildlife, and in Colorado, the water rights in a transaction between the City of Boulder and the Colorado Water Conservation Board were estimated at a value of $12 million (Natural Resources Law Center 1997). Restoring depleted streamflows using the market, acre-foot by acre-foot, will take billions of dollars westwide.

Although the scientific and economic challenges in implementing instream flows are significant, perhaps the single, biggest continuing practical barrier is political resistance. Although we say that everybody has their price, in fact, all the money in the world cannot necessarily guarantee a willing seller, so even if the legal framework exists to protect instream flows, either as actual water rights, or with some other workable device, and even if science and money problems can be solved, political barriers can still prevent real instream flow protection.

Indeed, political backlash against instream flows in some states is significant enough that it seems to represent a resurgence of the "denial" phase that Tarlock (1993) identified some years ago. Even the most protective state legal systems, such as full-fledged water rights' status for instream flows, with possible conversion of senior consumptive rights, depends on public acceptance to be ultimately effective. But now that instream flows are, in fact, finally being recognized and even protected at some level—through a combination of all of the various means outlined above—an anti-instream backlash is developing.

For instance, in Oregon, the instream water rights law has been on the books since 1987; however, until 1993, it had only been used to grant new junior rights for instream purposes (Neuman and Chapman 1999). In 1993, the Oregon Water Trust was formed as a nonprofit corporation to acquire senior water rights in the market for conversion to instream rights, which is also allowed by the law. In every legislative session since the Oregon Water Trust began its work, there has been a run at instream water rights, either in the form of proposed limitations on transfers to instream uses, or outright attempts to repeal the instream water rights law. Several prominent agricultural leaders and interest groups have made no secret of their opposition in principle to instream rights (Neuman and Chapman 1999). Anti-instream sentiment is still common around the west and flares up whenever existing uses feel threatened (Gillilan and Brown 1997; Fort 2000).

According to Tarlock (1993), effective instream flow protection rests on the triple bases of public acceptance, economic rationality, and science. Seven years of experience implementing instream flow laws since that time suggests that all three of these bases are still rather wobbly.

My discussion, so far, has concentrated on these three major practical barriers to successful integration of instream flows into prior appropriation frameworks. Legal and policy barriers still exist, as well, however. The legal and policy issues can generally be grouped in two categories: (1) whether the state legal framework contains the necessary components to effectively put water back in the stream and protect it "free from call," and (2) whether disparate treatment of instream uses is undermining the process of integrating them into a system designed primarily for consumptive uses.

In theory, the 15 states that recognize official instream water rights should meet the test of offering solid legal protection for instream water. But the statutes allowing for the creation of instream rights were mostly all passed within the last two decades; thus, any new rights sanctioned under the laws will have relatively recent priority dates. Instream water rights with junior priority can only help to keep water in the stream if the water body was not already overappropriated at the time the rights were recognized. In areas of longstanding overappropriation, which includes much of the arid West, junior instream rights are simply not good enough to help solve the problem of depleted flows. Thus, in most areas of critical need, the only tools that can really restore those flows are those that allow conversion of senior consumptive rights to instream flows. Any state that does not allow and actively promote such conversion may end up with instream rights on paper only.

It appears that in all of the 15 states, senior rights may be converted to instream purposes through one means or another. Yet very few conversions have, in fact, occurred. In order for the situation to change, either private parties or public agencies will need to promote (and probably fund) conversion transactions. To accomplish acquisition of any significant amounts of water

from senior consumptive users, the state will probably need to assist with water conservation projects to support continued consumptive use as well as instream flow restoration.

The states that do not recognize official instream water rights are in an even less favorable position. Laws providing for minimum streamflows or reservations of water from appropriation are only helpful from the date of adoption forward. Because most of these laws are fairly recent (compared to the longstanding consumptive water rights), they will not be very effective at providing instream flows in the areas of greatest need. The states that rely only on public interest review or similar means to consider instream values also have no way to influence historical allocations. Of course, federal law can trump state law in various ways and require instream restoration in spite of existing water rights, but this is precisely why many western water users are so vociferous in their opposition to evolving federal requirements.

Even in the states that offer a fair amount of protection for instream flows, the experience of the last 20 years demonstrates that often instream rights or uses are subject to disparate, even "second-class," treatment as compared to traditional consumptive rights. Indeed, sometimes special treatment is built directly into the law.

For instance, all but four of the states that recognize official instream water rights limit ownership of the rights to public agencies. This approach is understandable and makes some sense, given the public character of instream uses, but it creates tensions as well. For instance, an important premise of the prior appropriation system is that it is "complaint-driven" (Sterne 1997). In other words, since water rights are satisfied and enforced according to seniority, it is up to water right holders to complain when they are not receiving their water, and then the management agency is supposed to respond to enforce delivery of water according to priority. If the owner of an instream right with a decent priority date is the water management agency, such as, for example, in Colorado and Oregon, the political pressure on the agency not to "call" or enforce the priority of its own instream right can be significant. This is especially so if satisfying the instream right will come at the expense of the agency's other "clients" and largest constituency—consumptive water rights holders—who will have to watch the instream flow go by and not be able to take water for themselves. Of course, other parties or interest groups can monitor and call for enforcement in favor of instream rights, but they are unlikely to have quite the same clout or standing (either legal or political) as an actual water right owner.

Furthermore, placing ownership with public entities leaves instream rights more vulnerable to shifts in the political winds over the longer term than if ownership is private. If political opposition to instream flow protection grows, there may be nothing to prevent the severe curtailment or even complete elimination of the rights.

Other examples of disparate treatment include provisions of law explicitly subordinating instream rights to other uses. For instance, Oregon law subordinates post-1987 instream rights to municipal water uses, multipurpose storage projects, or certain hydroelectric projects (Or. Rev. Stat. § 537.352). Kansas and Colorado law also subordinate instream flow reservations and instream water rights to other uses differently than if they were consumptive rights (Kan. Stat. Ann. § 82a-703b(a); Colo. Rev. Stat. § 37-92-102(3)(b)). In Alaska, Montana, and Nebraska, instream reservations or appropriations of water are subject to periodic reviews (every 5, 10, or 15 years, depending on the state) for possible modification or elimination (Alaska Stat. § 46.15.145(f); Mont. Code Ann. § 85-2-316(10); Neb. Rev. Stat. § 46-2,112).

Even where disparate treatment is not built into the law, some subtle differences in treatment arise. For instance, the experience of the Oregon Water Trust has been that the state water management agency in Oregon is stricter in scrutinizing past use of water when a transfer is proposed to an instream purpose than if a transfer is proposed to another consumptive purpose.

CONCLUSION

During the past 25 years, the western states have adopted a variety of legal protections for instream flows. However, in most cases, the laws themselves cannot assure the full integration of instream uses into a system that was designed to encourage and promote consumptive uses of water and has had nearly a century's head start. Tarlock (1993) characterized the three phases of instream flow protection as denial, recognition, and implementation and accommodation. Although the states have officially moved past denial, political opposition to instream flows

continues to flare up. Recognition of the need for some kind of instream flow protection is west-wide, but the chosen devices vary widely in terms of potential effectiveness, and recognition by itself has not lead to restoration. The states are continuing to struggle with implementation, and significant legal and practical barriers still stand in the way of achieving the full promise of instream flow restoration and protection.

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APPENDIX G

Nebraska Supreme Court. 2005. Spear T Ranch v. Knaub, 269 Neb. 177, 186, 691 N.W. 2d 116, 127 (2005) Comment: Nebraska's constitution provides that the use of water is dedicated to the people of the state, but also proclaims: "The right to divert unappropriated waters of every natural stream for beneficial use shall never be denied except when such denial is demanded by the public interest" This language has been interpreted by the Nebraska Supreme Court as allowing the Nebraska Legislature to define the "Public Interest." In the above case, the **Nebraska Supreme Court concluded that** "**a right to appropriate surface water…is not an ownership of property**" It went on to further state **"Instead water is viewed as a public want and the appropriation is a right to use the water."**

This distinction between ownership and mere right to use water made a significant difference in the Spear T Ranch case where the plaintiff was a surface water appropriation holder harmed by groundwater pumping in proximity to his ranch. The Supreme Court rejected Spear T's attempt to protect its "property" under a theory of conversion, leaving it to tort remedies. Subsequently, Spear T's claim against the Nebraska Department of Natural Resources for a taking of property under the Nebraska Constitution was also dismissed.

Zellmer and Harder (2007) in their article entitled: *Is Water Property?* shed a little light on the Spear T. Ranch v. Knaub case. The Nebraska Supreme Court Case concluded in 2005 that the ranch could sue the groundwater pumpers. However, after 8 years of litigation, the parties settled out of court in December 2009. Water law in Nebraska may very likely have to be re-written because of the ramifications of this surface water vs. groundwater issue (Personal communication with Justin Lavene, Nebraska Attorney General's Office).

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Is Water Property?

By Sandra B. Zellmer and Jessica Harder

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Introduction

One of the most controversial issues in natural resources law is whether interests in water are property. In the western United States, water is typically viewed by appropriators as a form of private property, while in the East it is not. In either case, the law is surprisingly unsettled, notwithstanding the important consequences that follow, particularly under constitutional takings jurisprudence.

Treating water as property has significant implications for investment, conservation and environmental protection as well. Establishing secure property rights can foster stewardship and wise investment of labor and capital. By the same token, the absence of property ownership can result in a "tragedy of the commons," where a common resource is plundered as each selfish, yet economically rational, actor takes steps to promote self-interest with little regard for externalities that deplete the resource. On the other hand, public ownership of water is deeply embedded in western legal traditions, in recognition that water is essential to all life and must be safeguarded to prevent depletion and ensure satisfaction of a broad range of public needs.

This brief essay considers whether interests in surface water are property. Just over a year ago, in *Spear T. Ranch v. Knaub*,[2] the Nebraska Supreme Court held "no," but provided scant analysis in support of its conclusion. We assess both the nature of property and the nature of water, and then turn to the implications of treating water as property (or not) in Nebraska. These topics are the subject of a longer article in progress, which looks at water rights nationwide.

I. What is Property and Why Do We Care?

Property law helps create and safeguard stable relationships between persons and things, allowing property owners to extract the greatest value from that relationship and to protect it against competing claims.[3] Characterizing a thing as property has significant legal ramifications. First, it is essential for establishing a Fifth Amendment takings claim against the United States or an expropriation claim under international investment treaties.[4] Characterization as property has many other important legal consequences. Take remedies, for example. Property rules are often enforced through injunctions, in contrast with tort or contract liabilities, which typically lead to monetary relief. Classification as property may also be determinative of issues involving mortgaging, the creation of present and future interests, and special treatment under federal or state tax laws (like conservation easements, amortization, or like-kind exchanges).

In spite of its importance, the concept of property is frustratingly ambiguous. According to the Restatement (First) of the Law of Property, the term describes "legal relations between persons with respect to a thing."[5] But of course, not all economic relationships give rise to property rights, and herein lies the rub, as they say. According to the Supreme Court, "only those economic advantages are 'rights' which have the law in back of them."[6] In *Klamath Irrigation District v. U.S.*, the federal claims court framed its struggle to define water rights as follows:

> **What is property?** The derivation of the word is simple enough, arising from the Latin *proprietas* or "ownership," in turn stemming from *proprius*, meaning "own" or "proper." But, this etymology reveals little. Philosophers such as Aristotle . . . and Locke each, in turn, have debated the meaning of this term, as later did legal luminaries such as Blackstone, Madison and Holmes . . .[7]

Among the scholars and jurists cited by the court, surely Sir William Blackstone is the most familiar to property law aficionados. The American view of private property in land has been indelibly shaped by Blackstone, who described it as "that sole and despotic dominion . . . over the external things of the world, in total exclusion of the right of any other."[8] Ironically, it is highly unlikely that landowners enjoyed unfettered rights to real property when this phrase was penned, and Blackstone himself expressed some misgivings about the notion of exclusive dominion. Regardless, the concept is still influential today and has taken on near-mythical proportions among property rights proponents.

No doubt, exclusivity is a key feature of a property right; some have argued that it is in fact *the* key feature of property.[9] One way to break down the concept of property is to consider whether an interest in a thing enjoys the standard incidents of property ownership: the right to use (or not), the right to convey, and especially the right to exclude. Interests in water, as described below, are neither exclusive nor freely conveyable. Although such interests include usage, it is forbidden to *not* use water for speculative, aesthetic, or any other purpose. Yet, this begs the question—if exclusivity or one of the other incidents is lacking or severely diminished, are we dealing with something other than property?

Here is where the "bundle of sticks" metaphor may be useful. Though this conceptual tool has garnered its share of criticism, it has been employed by countless law professors to illustrate the nature of interests in property to first year students, and has become part of the "intellectual zeitgeist" of American property law.[10] The bundle represents the sum total of rights one can have with respect to a parcel of land. The sticks in the bundle can be disaggregated without defeating the characterization of the parcel as property. A reversion, a life estate, a remainder, and a fee simple determinable each represent but one stick in the bundle of legally protected property interests. Likewise, a right to exclude, to use, and to convey are each but one stick in the bundle. Collectively, the various estates or, in the second example, the various incidents, add up to the whole bundle: the fee simple absolute.

What does the metaphor tell us about things other than land, specifically, water? For one thing, it illustrates that perhaps public rights in navigation, fisheries, recreation or water quality can comprise one of the sticks in the bundle without completely eviscerating the notion that a private interest to use the water is indeed property. But if we remove the exclusivity stick, which represents the very essence of property ownership, does the entire bundle fall apart, leaving us with a few scattered twigs, but not property? Conversely, are there still enough of the incidents or attributes of property left to justify treating the interest in water as property? In effect, this exercise brings us back to square one, but at the same time it prompts us to take a closer look at water and the various interests that are asserted in water.

II. Water is a Unique Public Trust Resource

There are at least two possible ways to unbundle the notion of property in water. The first is to consider whether water is a thing that is ever subject to ownership as a form of property. In other words, do water and relationships to water possess the essential characteristics of property: exclusivity, use, and transferability? Although this approach fosters stability in the rule of law, it is quite inflexible.[11] As first year law students learn, there are very few absolutes in the law. Yet, the Nebraska Supreme Court appears to have taken this path in the *Spear T* cases, described in Part III below.

An alternative path is to review the caselaw that has addressed the issue in various contexts and draw conclusions from those cases about the fundamental nature of water. Courts employ this method frequently, although they do not always articulate it as such. In *International News Service v. Associated Press*,[12] for example, the Supreme Court characterized the news as "quasi-property" for purposes of a dispute between newspapers, but refused to recognize property rights against the general public. This contextual approach allows decision-makers to treat a thing or relationship as property in one circumstance but not necessarily others, and in doing so it promotes flexible, equitable results.

Both alternatives require a close look at the elemental nature of water. Water is a unique resource. It is essential to all life. Its physical properties are unlike any other thing. There is no capacity for exclusive possession or use of water in a stream, a lake or even an irrigation ditch. It is constantly moving along the surface, seeping into the ground, evaporating into the air, and being taken up by plants, fish and other aquatic species. Quantities are never entirely certain; drought, precipitation, and even the practices of other users create ever-changing circumstances.

According to Professor Joseph Sax, who has written frequently on the nature of property rights, the uniqueness of water as a legal concern is universally acknowledged:

> The roots of private property have never been deep enough to vest in water users a compensable right to diminish lakes and rivers or to destroy the marine life within them. Water is not like a pocket watch or a piece of furniture, which an owner may destroy with impunity. The rights of use in water, however long standing, should never be confused with more personal, more fully owned, property.[13]

In systems built on English common law, surface water is viewed as a type of "public trust" resource, where the sovereign retains rights and responsibilities to protect the resource for the public. The public trust doctrine traces its pedigree to Roman law. Because water is an essential resource upon which all life depends, navigable waterways, tidal areas, shorelines and stream beds cannot be held exclusively in private hands, but are impressed with the *jus publicum*, the public right. Although the doctrine was adopted in the United States through the incorporation of English common law, there is "an astonishingly universal regard for communal values in water worldwide."[14] A review of Asian, African, Islamic and Native American laws reveals rivulets of the public trust doctrine flowing from all reaches of the basins of the world.[15]

The public trust doctrine has enjoyed modern staying power in caselaw at both the federal and state level. In the eastern United States, it undergirds the law of "reasonable use," where riparian land owners have usufructuary rights to water that flows through or past their land, but may not deplete the flow in a way that harms other riparians or interferes with public access. In the West, the doctrine is embodied in provisions that give authority to the state to administer appropriative systems and ensure beneficial use of water resources. The public trust, however, has rarely acted a significant curb on private appropriators' rights to water. In a marked deviation from this trend, the Supreme Court of California imposed it in *National Audubon Society v. Superior Court* (the Mono Lake case):

The state as sovereign retains continuing supervisory control over its navigable waters and the lands beneath those

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waters. This principle, fundamental to the concept of the public trust, applies to rights in flowing waters as well as to rights in tidelands and lakeshores; it prevents any party from acquiring a vested right to appropriate water in a manner harmful to the interests protected by the public trust.[16]

The Mono Lake decision is frequently cited by courts all across the nation, but it has had relatively little on-the-ground impact on the exploitation of water resources outside of California and a handful of other jurisdictions. Even so, the public trust doctrine is expressed in western legislation and caselaw through constraints on the use and conveyance of water, both of which are heavily regulated.

III. The Nature of Water Rights in Nebraska

Over-appropriation has become an almost insurmountable problem throughout Nebraska and in many watersheds of the West. This is hardly surprising. Prior appropriation arose during the late 1800s as a way to maximize use and promote settlement and economic development, and in fact it did just that, with little regard for the long-term sustainability of the resource or the communities—ecological and human—that rely on it.[17]

The prior appropriation regime, often described as "first in time, first in right," is an expedient means of determining who gets water, how much she gets and when. The Nebraska Supreme Court has described this system of distributing water according to appropriators' respective priorities as "undoubtedly enacted in furtherance of a wise public policy to afford an economical and speedy remedy to those whose rights are wrongfully disregarded by others, as well as to prevent waste, and to avoid unseemly controversies that may occur where many persons are entitled to share in a limited supply of public water for the purposes of irrigation."[18]

In the West, private interests in water use are typically ensconced in state constitutions. The Colorado constitution, for example, provides that "the right to divert the unappropriated waters of any natural stream to beneficial uses shall never be denied."[19] Yet another provision specifies that water is "the property of the state, and the same is dedicated to the use of the people of the state, *subject to appropriation* ..."[20] Courts have held that these provisions create compensable property rights to use water.[21]

Nebraska's constitution is similar, with an important distinction. It first provides that the use of water is dedicated to the people of the state, and goes on to proclaim: "The right to divert unappropriated waters of every natural stream for beneficial use shall never be denied *except when such denial is demanded by the public interest*."[22] This language has been construed by the Nebraska Supreme Court as allowing the legislature to define the "public interest."[23] Accordingly, statutes allow only beneficial use, require permits, forbid waste, and prohibit non-use through forfeiture provisions.[24] The legislature has also restricted transfers between domestic, industrial, and agricultural preference categories, and imposed strict requirements on transfers within each category to prevent harm to other appropriators.[25] More recently, the state has taken strides toward sustainable, integrated management of surface and groundwater resources through the enactment and implementation of LB 962 and other measures,[26] some of which might not have been possible if private interests in water were viewed as inviolate property rights.

In its 2005 opinion in *Spear T. Ranch v. Knaub*, the Nebraska Supreme Court summed up these provisions to conclude that "[a] right to appropriate surface water . . . *is not an ownership of property*."[27] As unequivocal as this sounds, the court tempered its statement in the next line: "Instead, the water is viewed as a public want and the appropriation is a right to use the water."[28] One might view this as a distinction without a difference, because rights to water have always been recognized as usufructuary—a right to use but not outright ownership in the corpus of the water *in situ*.[29] Given the usufructuary nature of water rights, appropriators' expectations of exclusive enjoyment are far less than those of landowners.[30]

The distinction between ownership of water and a mere right to use water, however, made a tremendous difference to the Spear T plaintiff, a surface water appropriator harmed by groundwater pumping. The court rejected Spear T's attempt to protect its "property" under a theory of conversion (an act of dominion wrongfully asserted over another's property), and left Spear T to tort remedies.[31] Likewise, Spear T's claim against the Department of Natural Resources for a taking of property under the Nebraska Constitution was dismissed.[32]

Curiously, the court cited only groundwater-related precedent in holding that Spear T had no property interest in its surface water.[33] In Nebraska, groundwater is not subject to private ownership; rather, it is owned by the state for the benefit of the public.[34] Indeed, "Nebraska law has never considered ground water to be a market item freely transferable for value among private parties."[35]

Previous surface water cases had concluded just the opposite: that appropriators who complied with statutory requirements did in fact possess vested property rights.[36] In 1952, *City of Scottsbluff v. Winters Creek Canal Co.* invalidated an ordinance that deemed open canals to be public nuisances and required owners to fill them or construct water pipes.[37] The court found that the ordinance was an arbitrary exercise of the police power, and opined in dicta that it would result in "confiscation of the company's property without due process or payment of just compensation."[38]

The issue was addressed directly in *Enterprise Irrigation Dist. v. Willis*.[39] There, the court held that the 1895 Irrigation Act, which limited appropriations to three acre-feet per acre, was not intended to apply retroactively. It conceded that the state may control the distribution of water to ensure beneficial use and guard against waste by virtue of its police power, but concluded that the statutory limitation could not be applied to an appropriation that vested prior to enactment. "That an appropriator of public water, who has complied with existing statutory requirements, obtains a vested property right has been announced by this court on many occasions."[40] The

court continued that the state's police power had never been expanded so far as to allow the legislature "to destroy vested rights in private property when such rights are being exercised and such property is being employed in the useful and in no-wise harmful production of wealth" unless use of the property is "shown to be inimical to public health or morals or to the general welfare."[41]

Perhaps *Spear T* evidences an evolution in the law to reflect modern social values, or perhaps the opinion is simply a more reasoned application of the long-standing notion that water is a "public want." Whether an emerging trend in the law is a deviation or merely a reflection of background principles of property law is an issue often raised in regulatory takings cases. State law takings jurisprudence typically follows Supreme Court precedent under the U.S. Constitution, where a governmental regulation that goes "too far" in impacting private property will be considered a compensable taking.[42] Once a property right is found to have been affected, courts employ a fact-based balancing approach that considers the effects of the regulation on reasonable investment-backed expectations and the character of government action.[43] In rare cases where a regulatory action causes a physical invasion of the property or denies all economically beneficial use, however, the balancing test is not applied; rather, a per se taking will be found.[44] That is, compensation must be paid unless the interest in question was already limited by a background principle of law that inheres in the claimant's title.[45]

Although background principles are generally found in state property law, when it comes to water, principles of federal law can also impose an inherent limitation on the claimant's interest. In *U.S. v. Rands*, the Supreme Court concluded that landowners adjacent to the Columbia River had no property rights as against the United States in any interests subject to the navigational servitude, including the flow of the water in the river, access to the water, and other values attributable to proximity to water: "these rights and values are not assertable against the superior rights of the United States, [and] are not property within the meaning of the Fifth Amendment . . ."[46]

Conversely, in *Tulare Lake v. U.S.*, the federal claims court awarded irrigators some $20 million when the Bureau of Reclamation curtailed contract allowances to provide flow for endangered species.[47] The court concluded that the plaintiffs had vested property rights by virtue of their contracts and California water law. Although there was "no dispute that [the supplier's] permits, and in turn plaintiffs' contract rights, are subject to the doctrines of reasonable use and public trust and to the tenets of state nuisance law," the court concluded that only the state Water Resources Control Board could modify the permit terms to reflect changing needs.[48] Because the Board had not done so during the period in question, the court declined: the laws "require a complex balancing of interests . . . and an exercise of discretion for which this court is not suited and with which it is not charged."[49]

The same court reached the opposite conclusion a few years later in a case arising in Oregon, *Klamath Irrigation District v. U.S.*[50] There, summary judgment was granted to the United States on the grounds that any interest the irrigators had in Reclamation water was contractual and not property. The court explicitly criticized the *Tulare* opinion for failing to assess the underlying nature of the interest in question to discern whether the plaintiffs in fact possessed property rights: "Tulare appears to be wrong on some counts, incomplete in others and, distinguishable, at all events."[51]

Reluctant to delve into the nuances of the reasonable use and public trust doctrines, [in *Tulare*,] the Court of Federal Claims seized on [the Board's previous decision to grant the permit] . . . as the conclusive definition of the water rights . . . In essence, the court decided that an appropriator is legally entitled to engage in (and has property rights to) any conduct that is authorized by its water rights permit or license. This interpretation oversimplifies—and therefore misapprehends—the nature of California water rights.[52]

Notably, the public trust doctrine is an inherent limitation on interests in water, the exercise of which is not a taking.[53] In California, at least, the public trust doctrine forms a fundamental component of the water rights system. One distinction between California and Nebraska water law, however, is that the California code has been construed as providing the Board with continuing jurisdiction over water permits.[54] Although the Nebraska Department of Natural Resources has no parallel authority, it must remain vigilant against forfeiture or waste and scrutinize new appropriations and transfers to ensure that the public interest is satisfied.

Conclusion

What of the Nebraska Supreme Court's bold stance that "[a] right to appropriate surface water . . . is not an ownership of property?" It appears legally defensible, at least as between an appropriator and the state, on either of two grounds: (1) interests in water are not property at all when asserted against the state, acting to protect the public trust, or (2) interests in water are only quasi-property, restricted by inherent public trust requirements and the innate physical limitations of water. Arguably, the second rationale also justifies the dismissal of Spear T's property-based claims against groundwater pumpers, although this result seems less convincing. The court's sweeping conclusion is most difficult to justify as applied to disputes between individual surface water appropriators. An appropriator's right to use surface water *vis a vis* other appropriators is the very essence of the prior appropriation system, and the strongest stick in the appropriator's bundle of rights. In order for appropriators to execute water transfers, engage in water banking, conserve instream flows, or engage in the myriad of conventional beneficial uses, a clear characterization of what (if any) incidents of property inhere in a water right must be delineated in law and interpreted consistently by the courts. Moreover, adequate remedies for real world disputes between users must be available to water rights holders in order for the prior appropriation system to function and to evolve in a fashion that promotes both stability and the full range of values associated with water.

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Is Water Property? *(continued from pages 16 and 17)*

Endnotes

[1]The views presented here are solely those of the authors.

[2]269 Neb. 177, 185, 691 N.W.2d 116, 127 (2005).

[3]Abraham Bell and Gideon Parchomovsky, A Theory of Property, 90 Cornell L. Rev. 531, 580-581 (2005).

[4]U.S. Const. Amd. V; North American Free Trade Agreement, U.S.-Can.-Mex., Dec. 17, 1992, 32 I.L.M. 612 (entered into force Jan. 1, 1994).

[5]Restatement (First) of Property (1936). *See Wood v Security Mut. Life Ins. Co.*, 112 Neb 66, 198 NW 573 (1924) (for purposes of construing a lease, "property" includes every interest that one may have in anything that is the subject of ownership); *U.S. v. General Motors Corp.*, 323 U.S. 373 (1945) (for purposes of the Fifth Amendment, "property" denotes the group of rights inhering in the relation to a thing, as the right to possess, use, and dispose of it).

[6]*United States v. Willow River Power Co.*, 324 U.S. 499, 502 (1945).

[7]*Klamath Irrigation Dist. v. U.S.*, 67 Fed. Cl. 504, 515 (2005), *cert. denied*, 69 Fed.Cl. 160 (2005).

[8]2 William Blackstone, Commentaries (Edward Christian ed., A Strahan 1823) (1800).

[9]*See* J.E. Penner, The "Bundle of Rights" Picture of Property, 43 UCLA L. Rev. 711, 717, 742-743, 766 (1996); *Dolan v City of Tigard*, 512 US 374, 384 (1994).

[10]Penner, *supra* note 9, at 715. *See* Myrl L. Duncan, Reconceiving the Bundle of Sticks: Land as a Community-Based Resource, 32 Entl. L. 773, 774 (2002).

[11]Penner, *supra* note 9, at 723.

[12]248 U.S. 215 (1918).

[13]Joseph L. Sax, The Limits of Private Rights in Public Waters, 19 Envtl. L. 473, 482 (1989). *See* Joseph L. Sax, Understanding Transfers: Community Rights and the Privatization of Water, 1 West N.W. 13 (1994); Joseph L. Sax, The Public Trust Doctrine in Natural Resource Law: Effective Judicial Intervention, 68 Mich. L. Rev. 471 (1970).

[14]Erin Ryan, Public Trust and Distrust: The Theoretical Implications of the Public Trust Doctrine for Natural Resource Management, 31 Envtl. L. 477, 478 (2001).

[15]Charles F. Wilkinson, The Headwaters of the Public Trust: Some Thoughts on the Source and Scope of the Traditional Doctrine, 19 Envtl. L. 425, 431 (1989).

[16]*National Audubon Society v. Superior Court*, 658 P.2d 709, 727 (1983) (emphasis added).

[17]Janet C. Neuman, Beneficial Use, Waste, and Forfeiture: The Inefficient Search for Efficiency in Western Water Use, 28 Envtl. L 919, 967 (1998).

[18]*Enterprise Irrigation Dist. v. Willis*, 135 Neb. 827, 830, 284 N.W. 326, 329 (1939). *See Farmers' Canal Co. v. Frank*, 72 Neb. 136, 100 N.W. 286, 294 (1904).

[19]Colo. Const. Art. XVI, § 6.

[20]Colo. Const. Art. XVI, § 5 (emphasis added).

[21]*Public Service Co. of Colorado v. F.E.R.C.*, 754 F.2d 1555 (10th Cir. 1985), *cert. denied*, 474 U.S. 1081 (1986); *Ackerman v. City of Walsenburg*, 171 Colo. 304, 467 P.2d 267, 270 (1970); *Farmers Irr. Co. v. Game & Fish Comm.*, 149 Colo. 318, 369 P.2d 557 (1962). But *see Central Colorado Water Conservancy Dist. v. Simpson*, 877 P.2d 335, 347 (Colo. 1994) (regulations that "somewhat . . . decrease" the amount of water available for use will not entitle an appropriator to compensation because there is no title to water flowing in the river).

[22]Neb. Const. Art. XV, §§ 5-6 (emphasis added).

[23]*See In re* Applications A-16642 236 Neb. 671, 463 N.W.2d 591, 604-605 (1990); *In re* Applications A-16027 et al. 242 Neb. 315, 495 N.W.2d 23, 31-34 (1993); Central Platte Natural Resources District v. City of Fremont 250 Neb 252, 549 N.W.2d 112,116-118 (1996).

[24]Neb. Rev. Stat. §§ 46.229 – 46.229.04, 46.231, 46.233.01.

[25]Neb. Rev. Stat. §§ 46-289, 46-294.

[26]Laws 2004, LB 962, operative date July 16, 2004 (codified in various sections of chapter 46, inter alia, of the Nebraska Code).

[27]269 Neb. 177, 186, 691 N.W.2d 116, 127 (2005) (emphasis added).

[28]*Id.*

[29]Richard S. Harnsberger, Josephine R. Potuto and Norman W. Thorson, Interstate Transfers of Water: State Options after Sporhase, 70 Neb. L. Rev. 754, 787 n.139 (1991).

[30]A. Dan Tarlock, Law of Water Rights and Resources § 3:10 (2006 update), citing *inter alia* Eric Pearson, Constitutional Restraints on Water Diversions in Nebraska: The Little Blue Controversy, 16 Creighton L. Rev. 695, 707 (1983); *In re* Applications A-16027 et al., 495 N.W.2d 23 (Neb. 1993), modified, 499 N.W.2d 548 (1993).

[31]269 Neb. at 185-186, 691 N.W.2d at 127. For commentary, see LeRoy W. Sievers, Nebraska Water Law Facing Dramatic Changes in our State: The Spear T Ranch Case, *Neb. Law.*, June 2005, at 14; Donald Blankenau et al., *Spear T Ranch v. Knaub:* The Reincarnation of Riparianism in Nebraska Water Law, 38 Creighton L. Rev. 1203 (2005); J. David Aiken, Hydrologically-Connected Ground Water, Section 858, and the Spear T Ranch Decision, 84 Neb. L. Rev. 962 (2006).

[32]*Spear T. Ranch v. Nebraska Dept. of Natural Resources*, 270 Neb. 130, 139, 699 N.W.2d 379, 386 (2005).

[33]*Spear T Ranch*, 269 Neb. at 185-186, 691 N.W.2d at 127, citing Richard S. Harnsberger & Norman W. Thorson, Nebraska Water Law & Administration § 5.27 at 266-67 (1984); State *ex rel.* Douglas v. Sporhase, 208 Neb. 703, 305 N.W.2d 614 (1981), reversed on other grounds, 458 U.S. 941 (1982).

[34]Neb. Rev. Stat. § 46-702.

[35]Sporhase, 208 Neb. at 705, 305 N.W.2d at 616; *Bamford v. Upper Republican NRD*, 245 Neb. 299, 512 N.W.2d 642 (1992); *In re* Application U-2, 226 Neb. 594, 605, 413 N.W.2d 290, 298 (1987); *Prather v. Eisenmann*, 200 Neb. 1, 7, 261 N.W.2d 766, 770 (1978). But see *Sorensen v. Lower Niobrara Natural Resources Dist.*, 221 Neb. 180, 376 N.W.2d 539 (1985) (superseded by statute).

[36]Joseph A. Kishiyama, Note, The Prophecy of Poor Dick: The Nebraska Supreme Court Recognizes a Surface Water Appropriator's Claim Against a Hydrologically Connected Ground Water User in *Spear T Ranch, Inc. v. Knaub*, 85 Neb. L. Rev. 284, 285 (2006).

[37]155 Neb. 723, 728-730, 53 N.W.2d 543, 547-548 (1952).

[38]155 Neb. at 728-730, 53 N.W.2d at 547-548.

[39]135 Neb. 827, 830, 284 N.W. 326, 329 (1939).

[40]*Id.*

[41]*Id.* at 331, citing *Herminghaus v. Southern Cal. Edison Co.*, 200 Cal. 81, 252 P. 607, 622, *cert. dismissed*, 275 U.S. 486 (1927).

[42]*Pennsylvania Coal Co. v. Mahon*, 260 U.S. 393, 413 (1922).

[43]*Penn Central Transp. Co. v. New York City*, 438 U.S. 104, 123-24 (1978).

[44]*Lucas v. South Carolina Coastal Council*, 505 U.S. 1003 (1992).

[45]*Id.* at 1029.

[46]389 U.S. 121, 126 (1967).

[47]49 Fed. Cl. 313 (2001).

[48]*Id.* at 324.

[49]*Id.* at 323-24.

[50]67 Fed.Cl. 504, *cert. denied*, 69 Fed. Cl. 160 (2005).

[51]*Id.* at 538.

[52]Brian E. Gray, The Property Right in Water, 9 Hastings W.-Nw . J. Envtl. L. & Pol'y 1, 9 (2002), citing 49 Fed. Cl. at 324. For a contrary view, see Douglas L. Grant, ESA Reductions in Reclamation Water Contract Deliveries: A Fifth Amendment Taking of Property?, 36 Envtl. L. 1331 (2006).

[53]*See* Melinda Harm Benson, The Tulare Case: Water Rights, The Endangered Species Act, and the Fifth Amendment, 32 Envtl. L. 551, 571 (2002).

[54]

APPENDIX H

Governors letter (2003) to Judge Craig Manson and the Honorable John Woodley, Jr. regarding an alternative flow scenario for Gavins Point Dam releases within the context of litigation over the USACE Master Manual. Essentially, this is the default flow regime agreed to in the December 2003 Amendment to the 2000 Biological Opinion for the Master Manual in the event that the USACE, USFWS, states, and other stakeholders can not come up with a better flow regime to start with. During 2005, after consulting with the USACE and USFWS, the U.S. Institute for Environmental Conflict Resolution (USIECR) contracted with a collaborative decision-making and conflict resolution firm (CDR Associates in Boulder Colorado) to bring stakeholders together and attempt to formulate an alternative to the default flow regime.

December 2, 2003

Judge Craig Manson
Assistant Secretary of the Interior
1849 C St NW
Washington, DC 20240

Honorable John Paul Woodley, Jr.
Assistant Secretary of the Army (Civil Works)
108 Army Pentagon Rm 3E446
Washington, DC 20310-0108

Dear Assistant Secretary Manson and Assistant Secretary Woodley:

We are writing concerning the Missouri River and the ongoing stalemate in moving forward with changes to the Master Manual. We are hopeful that the United States Army Corps of Engineers and the United States Fish & Wildlife Service are on the brink of making final decisions and that the revision process will be completed by 2004. It is in the spirit of facilitating those final decisions that we write.

We are offering a proposal that has the support of the undersigned Missouri River Basin States, representing both the Upper and Lower Basin. The submission of this proposal does not constitute a waiver of rights by any of the States nor does it constitute a river basin compact or equitable apportionment of the waters of the Missouri River Basin among the States. The proposal is provided for the sole purpose of assisting the federal agencies in the ongoing consultation related to the Corps of Engineers revision of the Master Manual. Accordingly, please include this proposal in the administrative record of the ongoing consultation.

The proposal contains elements of the Corps of Engineers current proposed action, the Missouri River Basin Association recommendations from 1999 and an alterative flow scenario for Gavins Point releases for consideration as an entire package by the Federal agencies. It is our hope that the FWS and Corps of Engineers would utilize this alternative as part of the ongoing Section 7 consultation process if, and only if, the Service finds that the proposed action described in the Corps Biological Assessment dated November 17, 2003, poses jeopardy to the listed species.

The proposal contains six elements:

1) Flow modification from current operations at Gavins Point (see attachment and discussion below) and Ft. Peck Tests (see MRBA recommendations November 19, 1999; see Biological Assessment Section III.C.2.c.4);
2) Drought conservation measures consistent with the level proposed by MRBA (see attachment);
3) Adaptive management framework – including an acknowledgement that this proposal is the first increment (see discussion below; see Biological Assessment Section II.A. p. 4, Section III.C.1.b. Intrasystem Unbalancing);
4) Comprehensive monitoring and study (see MRBA recommendations November 19, 1999; see Biological Assessment Section III.C.2.a-b);
5) Habitat modification, creation and restoration – including mitigation of adverse economic impacts (see Biological Assessment Section III.C.2.c.2-3); and
6) Stakeholder involvement – Missouri River Recovery Implementation Committee (see MRBA recommendations November 19, 1999; see Biological Assessment Section II.B.; this committee should also advise the Corps of Engineers on Intrasystem Unbalancing.)

Most of these elements have been discussed previously and have significant widespread support throughout the Basin. The new aspect in the proposal is the proposed flow changes at Gavins Point. Our discussion will focus on this aspect. We want to stress that proposed flow changes out of Gavins Point would only be conducted if modeling by the Corps of Engineers demonstrates the water neutral nature compared to the previously agreed MRBA conservation levels of this proposal, excluding periods of flood pool evacuation.

Potential flow changes below Gavins Point have been a point of major controversy for years. When the states, through the Missouri River Basin Association, provided drought conservation and habitat improvement recommendations in November 1999, they specifically suggested that flow changes at Gavins Point not be implemented until additional monitoring and study could be carried out. The Service, in its November 2000 Biological Opinion concluded otherwise; i.e. they concluded that flow changes are needed immediately. Unfortunately, for many of us, the changes proposed by the Service are not acceptable. The magnitude of the spring rise and the level of the low summer flows are not acceptable to some of us with regard to the significant adverse economic impact and abrogation of Congressionally authorized project purposes.

In an effort to fashion a flow pattern that might achieve a higher level of acceptability, South Dakota Governor Mike Rounds hosted a Missouri River summit on September 24, 2003. Several Basin Governors, tribal representatives, other stakeholders and agency representatives attended the summit. At the summit South Dakota presented a compromise proposal for consideration. Their proposal attempted to meet not only the biological objectives expressed by the Service, but also address concerns expressed by the various interests in the Basin.

Following the summit, a group of technical staff worked to further refine the proposal. Nebraska representatives also met with interests upstream and downstream on the river. From that technical work and those discussions came a refined flow change proposal put forth by Nebraska. The refined flow change proposal is attached for your consideration. In general, the proposed flow changes include two spring habitat flow enhancements that mimic the natural hydrograph but without adversely impacting the Congressionally authorized purposes of flood control and navigation. The shape of the flow enhancements also provides the steady or rising water levels critical to the spawn of recreational fish and prey fish in the upstream reservoirs. The proposed flow changes also include a lower summer flow than currently provided but with flow targets that provide some assurance that the power plants along the river below the reservoirs can maintain operations critical to the economies of the basin states.

In addition, we want to strongly emphasize that within the adaptive management framework, this proposal is the first increment in the efforts to address the needs of endangered and threatened species and achieve restoration of the health of the river while maintaining the economic viability of the Congressionally authorized purposes. We believe that the time frame included in the previous proposal of the MRBA in February 2002 (continue for three cycles of higher springtime flows, or approximately ten years after which time the federal agencies and members of a multi-stakeholder group will determine whether to continue or modify the new release schedule.) is an appropriate length of time to study and gauge the effectiveness of the proposed flow changes. Four years have passed since the MRBA made its initial recommendations to the Corps. Had some or all of these recommendations been implemented much could have been done and much would have been learned. We have squandered opportunities in the past; we believe strongly that now is the time to make reasonable and prudent changes and move forward. We need to learn what does or does not benefit the endangered species and involve the affected stakeholders (state agencies, tribes and federal agencies) in evaluating what next steps would give the greatest benefit to recovery of the species.

We all recognize that Gavins Point flows are only a small part of the picture. Comprehensive monitoring, adaptive management, stakeholder involvement, habitat restoration and mitigation of impacts, and drought conservation measures are undoubtedly of equal or more importance. We believe these measures must all be included as part of a final decision package.

We appreciate the hard work of all that have worked for many years on these difficult issues. Please don't hesitate to contact us if we can be of additional assistance.

Sincerely,

Governor
State of Nebraska

Attorney General
State of Nebraska

Governor
State of Wyoming

Governor
State of South Dakota

John Hoeven
Governor of North Dakota

Governor
State of Montana

cc: Thomas Sansonetti

Flow Modifications and Drought Conservation Measures
Proposal of December 2003

Proposed Flow Modifications at Gavins Point

The proposed changes are intended to be included in the initial phase of an adaptive managemer program that will also include monitoring, mitigation and habitat restoration. The proposal segregates flow into three categories: high (upper 1/3rd), median (middle 1/3rd) and low (lower 1/3rd). The proposal addresses flow changes in four time steps: pre-spring, spring, summer, fall and winter.

Pre-Spring Flow Period

The proposed changes in the pre-spring period are the same for high, median and low flow levels. The proposed changes from current operations and Corps proposed action in November 2003 Biological Assessment are:

- Start the navigation season one week earlier when possible.
- When determined beneficial and having stored water for this purpose, provide a channel conditioning flow of 31,000 cfs for the first week of the navigation season.
- Full service navigation flows until April 14th followed by intermediate or minimum service flows.

The changes attempt to: (1) fulfill the Missouri River commercial navigators need for water earl in the season, (2) help scour the channel and ease the transition from winter to navigation flows, (3) provide a plains snow type of increase in flow (15,000 cfs increase), and (4) provide stable o slightly rising reservoir levels during spawning periods of recreational fisheries.

Spring Flow Period

The changes in the spring flow period vary depending on the flow level.

In high flow periods, the Corps is operating the system for flood control and no flow changes are proposed. The proposal does recommend that the Corps manage evacuation of water to create sandbars and generate downstream recreation opportunities while maintaining flood control.

In low flow periods, there is no proposed change except that the Corps would operate at minimum service levels throughout the spring flow period.

The proposal does provide for spring species enhancement flow by means of an increase in flow releases from Gavins Point during median flow level. In one of every three years (in other words increased flow during median years) releases from Gavins Point will incorporate a spring species enhancement flow.

Specific proposed changes from current operations and Corps proposed action in November 2003 Biological Assessment in flow releases from Gavins Point during the median flow level in the spring period are:

- Spring species flow increase of 16,000 cfs to 40,000 cfs from approximately 24,000 cfs beginning around May 7 and lasting for 14 days followed by full service + 5000 cfs flows for approximately 30 days.

The changes should not increase the risk of flooding to farm fields south of the Platte River from the risk posed by current operations or the changes proposed in the Corps Biological Assessment. The duration of the period of increased flows is 14 days, which is the length of time recommended by the Fish & Wildlife Service. The primary benefit of a spring species flow increase of 16,000 cfs is a spawning cue to endangered and native fish. The overall flow increase of 16,000 cfs is comparable in the scope of change (spawning cue) to the 17,500 cfs flow increase recommended by the Fish & Wildlife Service. It should provide secondary benefits of maintaining low sandbars and wetting some backwaters and side channels.

Combined together, the pre-spring flow increase mimics the plains snow runoff flows of the average natural hydrograph and the spring species enhancement flow increase mimics a mountain snow type of flow increase. The proposal provides a flow pattern that follows the changes in flow seen in an average natural hydrograph during the spring native fish spawning season.

Summer Flow Period

The changes in the summer flow period vary depending on the flow level.

In high flow periods, the Corps is operating the system for flood control and no flow changes are proposed. The proposal does recommend that the Corps manage evacuation of water to create sandbars and generate downstream recreation opportunities while maintaining flood control.

In low flow periods, because of the low tributary inflows during low flow years, the summer habitat flow will be held to flow targets at what is now considered minimum service during July and August.

The proposal does provide for summer species enhancement flow by means of a decrease in flow releases from Gavins Point during median flow level.

Specific proposed changes from current operations and Corps proposed action in November 2003 Biological Assessment in flow releases from Gavins Point during the median flow level in the summer period are:

- Median flow years – between July 15th and August 15th, releases will be targeted for 25,000 cfs out of Gavins Point. They may be adjusted to meet summer thermal power flow targets of 25,000 cfs at Omaha and 31,000 cfs at Nebraska City.

- Return to full navigation by stair stepping increases to intermediate service then to full service

The reduction from full navigation service will increase the amount of shallow water habitat. When releases are returned to the full service navigation target starting on August 15th, recreatio on the lower river should benefit because of increased sandbar and shoreline exposure. The water saved can then be released later in the fall or winter when it can be used to build and maintain sandbars above Ponca, Nebraska. When intermediate flows are called for by the navigation curves, going to minimum service in July and August saves water. That water can then be released later in the winter as an extension to the navigation season.

Fall/Winter Release Period

The proposed changes in the fall/winter period are the same for high, median and low flow levels. The proposed changes from current operations and Corps proposed action in November 2003 Biological Assessment are:

- Keep the level of service at full service through the end of the season.
- Use previously saved water and/or evacuation water from the flood control zone to do one or more of the following:
  - Increase the navigation season length by 10 days.
  - Increase winter flows by 3,000 cfs to benefit hydropower generation during second highest peak demand period.
  - Begin the navigation season one week early.
- When possible, manage flood evacuation water to benefit downstream recreation and sandbar building.
- When the system storage level falls to a low level the navigation season will be shortene according to the curves.

The increase in winter flows provides an increase in power production to offset the lost production during the summer thirty-day low flow. The increase in winter flows also provides benefit to municipal water supplies in Kansas City, Kansas and Kansas City, Missouri.

Figure 1 shows an idealized hydrograph for the median periods – the middle 1/3.
Figure 2 shows an idealized hydrograph for the high flow periods – the upper 1/3.
Figure 3 shows idealized hydrographs for the low flow period – the lower 1/3.

Proposed Flow Drought Conservation Methods

The proposed changes also include the drought conservation measures modeled by the Corps o Engineers as BBADY1. The level of drought conservation achieved by BBADY1, although accomplished using different criteria, is the same as the level of conservation recommended by MRBA in its November 19, 1999 recommendations. Specifically, if system storage on March is greater than 54.5 MAF, full service navigation flows will be provided; if system storage on March 15 is 49 MAF or less, minimum navigation service (6,000 cfs less than full service will provided; if system storage is between 49 and 54.5 MAF, the service level will be prorated

between full service and minimum service. If the July 1 system storage is greater that 59 MAF, full service navigation flows will be provided; if the July 1 system storage is 55 MAF or less, minimum navigation service will be provided; if the July 1 system storage is between 55 MAF and 59 MAF, the service level will be prorated between full service and minimum service. In addition, if the July 1 system storage is greater than 51.5 MAF, a full eight month navigation season will be provided; if the July 1 system storage is 42 MAF or less, the navigation season will be shortened to six months; if the July 1 system storage is between 42 and 51.5 MAF, the length of the season will be prorated between six and eight months. Finally, if the March 15 system storage is less than 31 MAF there will be no navigation support that year, however, minimum flows of 12,000 cfs in the winter, 9,000 cfs in the spring and fall, and 18,000 cfs in the summer will be provided in these non-navigation years.

The proposed flow changes out of Gavins Point would only be conducted if modeling by the Corps of Engineers demonstrates the water neutral nature compared to the previously agreed MRBA conservation levels of this proposal, excluding periods of flood pool evacuation.

Figure 1

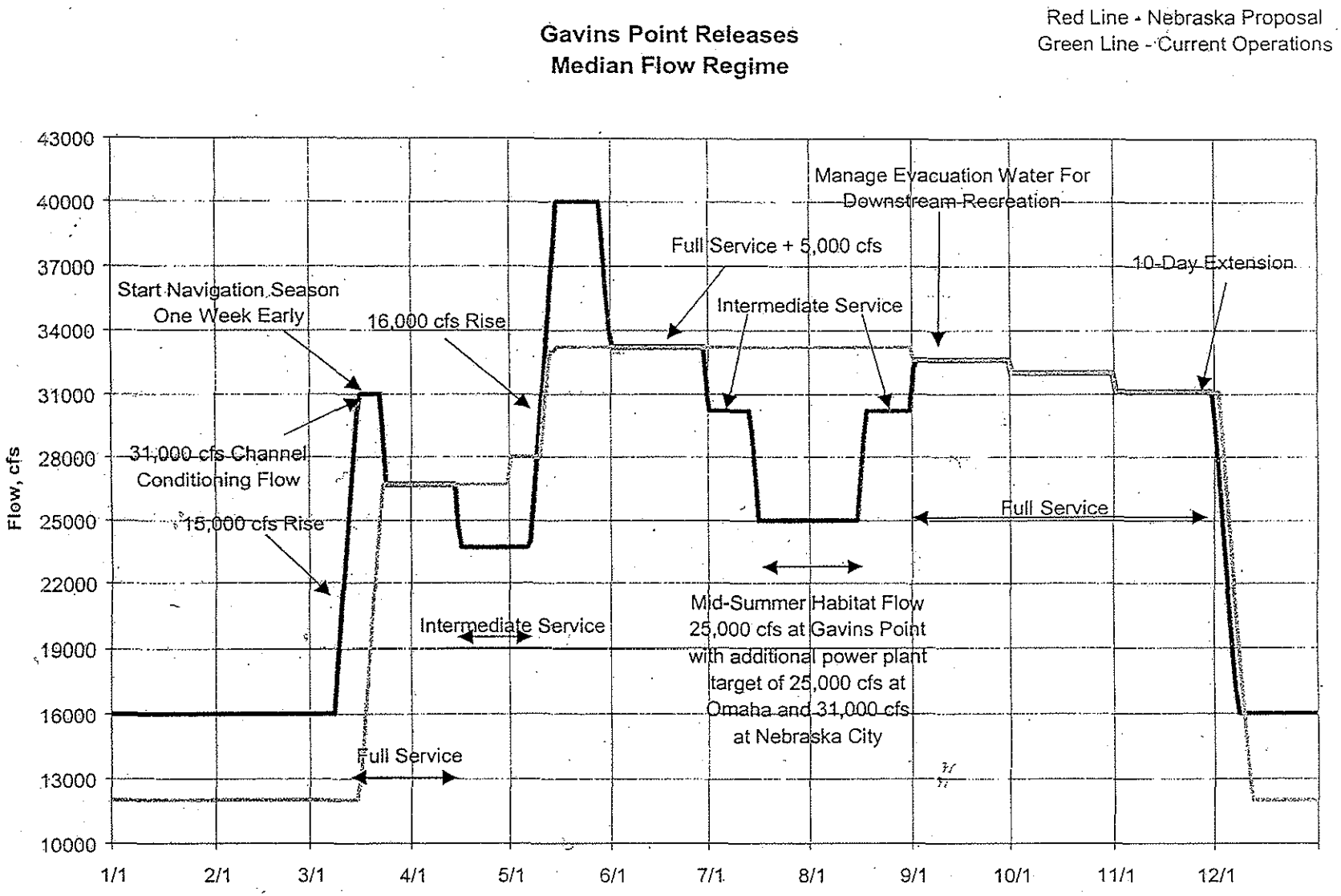

Gavins Point Releases
Median Flow Regime
Red Line - Nebraska Proposal
Green Line - Current Operations
Flow, cfs
43000
40000
37000
34000
31000
28000
25000
22000
19000
16000
13000
10000
1/1
2/1
3/1
4/1
5/1
6/1
7/1
8/1
9/1
10/1
11/1
12/1
Start Navigation Season One Week Early
31,000 cfs Channel Conditioning Flow
15,000 cfs Rise
16,000 cfs Rise
Full Service
Intermediate Service
Full Service + 5,000 cfs
Intermediate Service
Mid-Summer Habitat Flow 25,000 cfs at Gavins Point with additional power plant target of 25,000 cfs at Omaha and 31,000 cfs at Nebraska City
Manage Evacuation Water For Downstream Recreation
Full Service
10-Day Extension

Figure 2

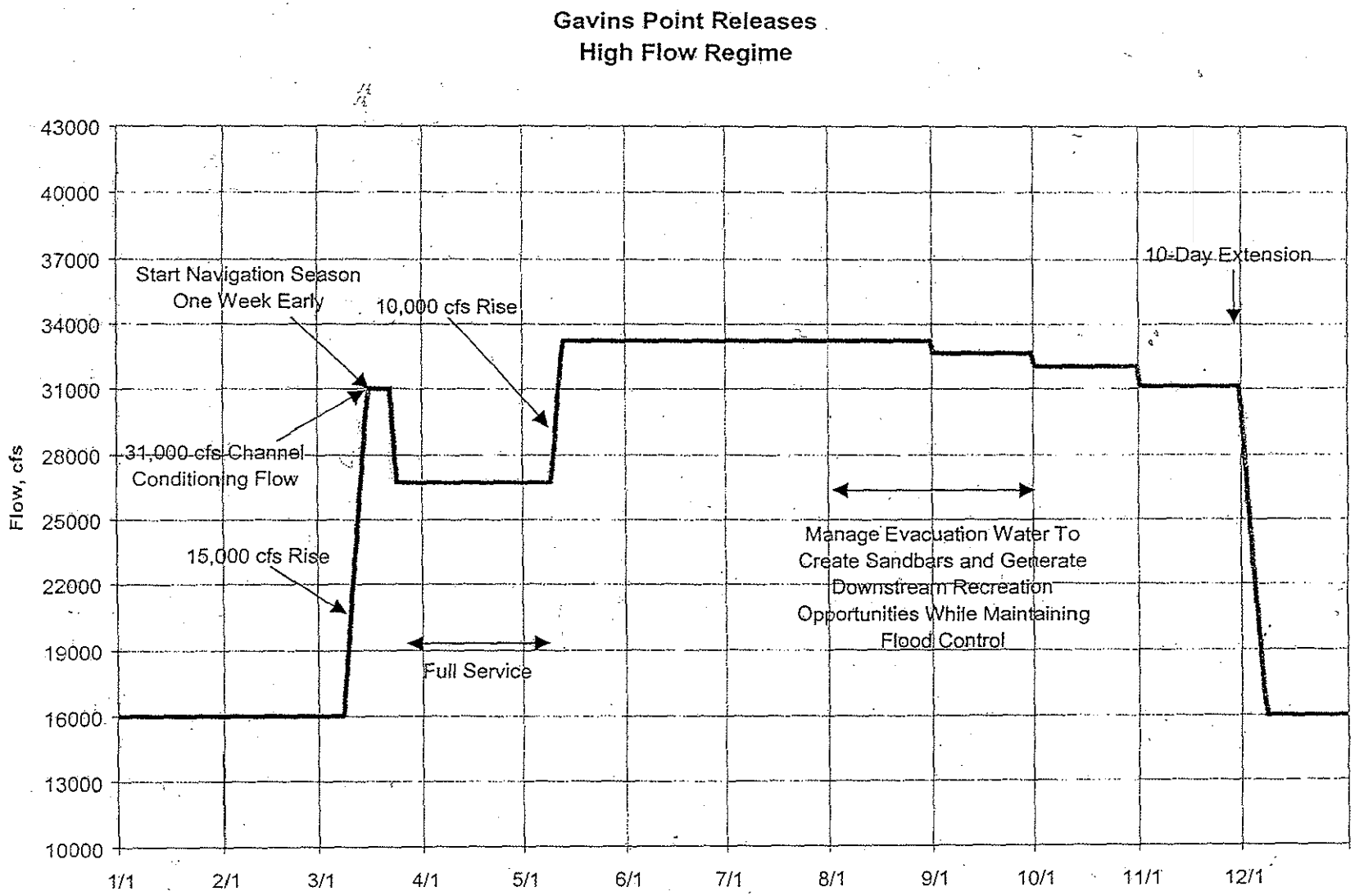
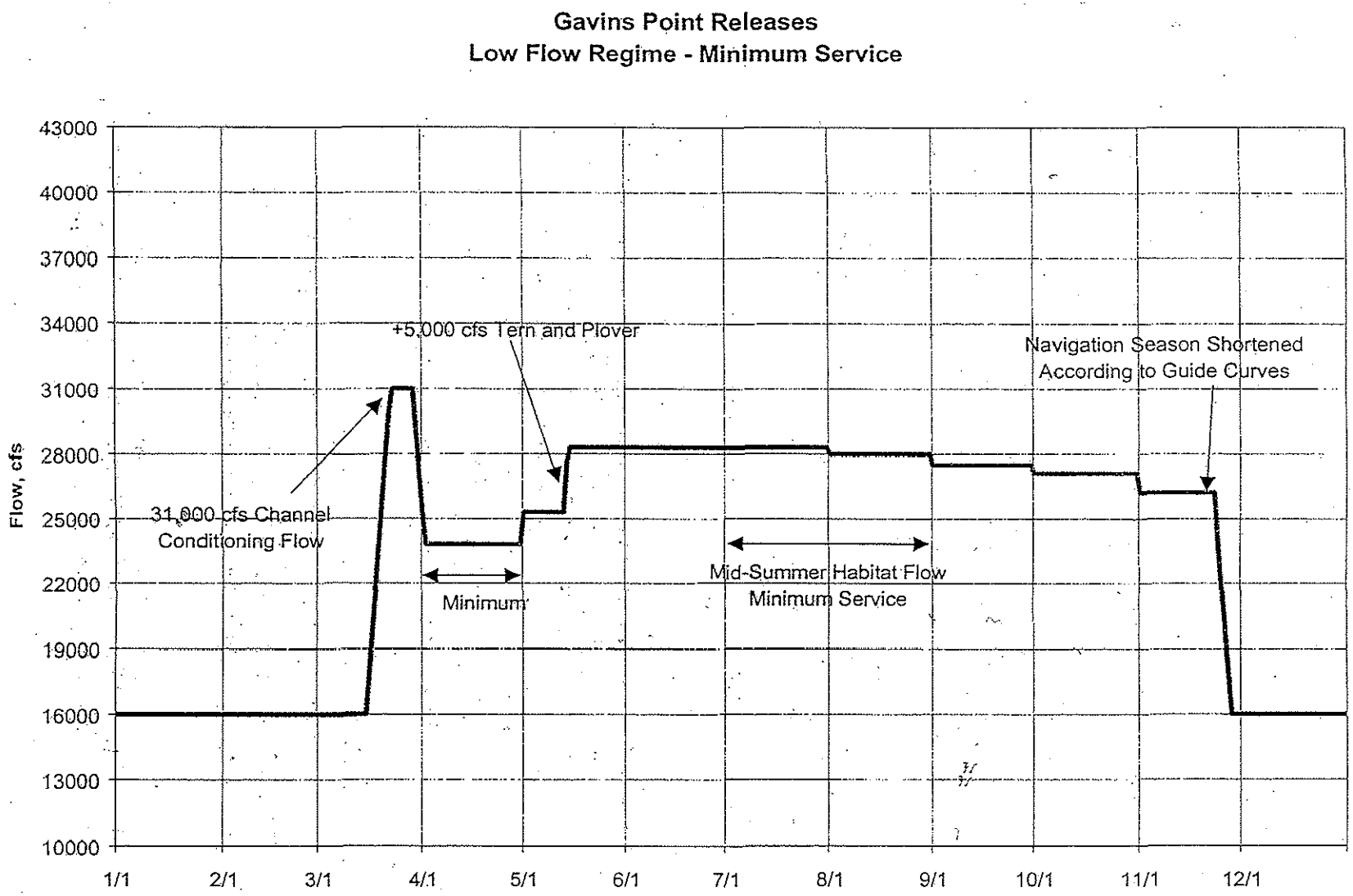

Gavins Point Releases
High Flow Regime
Flow, cfs
43000
40000
37000
34000
31000
28000
25000
22000
19000
16000
13000
10000
1/1
2/1
3/1
4/1
5/1
6/1
7/1
8/1
9/1
10/1
11/1
12/1
Start Navigation Season
One Week Early
10,000 cfs Rise
10-Day Extension
31,000 cfs Channel
Conditioning Flow
15,000 cfs Rise
Full Service
Manage Evacuation Water To
Create Sandbars and Generate
Downstream Recreation
Opportunities While Maintaining
Flood Control

Figure 3


Gavins Point Releases
Low Flow Regime - Minimum Service
Flow, cfs
43000
40000
37000
34000
31000
28000
25000
22000
19000
16000
13000
10000
1/1
2/1
3/1
4/1
5/1
6/1
7/1
8/1
9/1
10/1
11/1
12/1
+5,000 cfs Tern and Plover
Navigation Season Shortened
According to Guide Curves
31,000 cfs Channel
Conditioning Flow
Minimum
Mid-Summer Habitat Flow
Minimum Service

Source: U.S. Fish and Wildlife Service, 2003 Amendment to the Biological Opinion on the Operation of the Missouri River Main Stem Reservoir System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas Reservoir System. Dated December 16, 2003.

VII. Flow Modification

Gavins Point downstream

Biological Needs

The Service has determined restoration of a normalized river hydrograph below Gavins Point Dam is still necessary to avoid jeopardizing the continued existence of the pallid sturgeon. Several biologically relevant features are needed in the reach. Flows to cue spawning that are sufficiently high for an adequate duration and flows that provide for

connection of low-lying lands adjacent to the channel. Inundation of low-lying lands is important processes for pallid sturgeon survival. This provides organic material and redistribution to produce forage for rearing fish at a time synchronized with the presence of larval and juvenile fish. Flows that are sufficiently low to provide for shallow water habitat as rearing refugia and foraging areas for larval, juvenile, and adult pallid sturgeon are also necessary.

1. Flows below Gavins Point Dam

To meet the biological needs for the pallid sturgeon, the Service finds that the Corps shall no later than the 2004 annual operation (which will begin in March, 2004):

a) ensure that the Final Environmental Impact Statement and subsequent Master Manual is changed to ensure the long term capability to provide a summer habitat flow of no greater than 25 Kcfs beginning no later than July 1, 2004 lasting for a minimum of 30 days at its lowest point. To subsequently raise flows from this target the Corps must demonstrate tangible impacts to other project purposes. The Corps shall ramp down to the habitat flow over a minimum of 7 days. Once the Corps begins to ramp up to meet new service levels, such ramping will be gradual over no less than 7 days. As shallow water habitat is developed, through re-engineering of the channel below Sioux City to St. Louis, the level of the habitat flow may be increased proportionally to optimize the habitat suitability, based on adaptive management and monitoring. This element may be subsequently modified or superceded by the flow options developed under other sections of elements I and II of this opinion.

b) in any year that the Drought Conservation Plan results in a shortening of the navigation season, the Corps shall ensure that the period of time that the navigation is suspended shall occur during the low summer flow period previously described for the pallid sturgeon. When approximately 1,200 acres of new shallow water habitat has been made available above that which currently exists between Sioux City and Omaha (approximately the amount that would be developed through flow management) the Corps, in consultation with the Service, may modify flows to take advantage of that habitat and more fully meet project purposes.

c) the Corps shall ensure that the Master Manual and the corresponding NEPA document provide the latitude for the eventual implementation of a spring rise and summer low flow of at least a magnitude identified in the Draft Environmental Impact Statement (USACE, 2001) as alternative GP2021. A variation that was not part of this alternative was the bimodal nature of the naturalized river hydrology that will need to be evaluated.

d) Within the first 2 years, as the information is available to establish an acceptable flow management plan identified in I.A.1.d, the Corps shall, if hydrologic conditions are suitable, initiate an experimental spring pulse to

assist and inform the process for establishing the long-term flow plan. Such a pulse shall be developed collaboratively, in collaboration with the Service and the USGS as well as with Tribes, States, and stakeholders

e) The Corps shall ensure that within 2 years, based on the results of the adaptive management and feasibility processes outlined below, a flow management plan will be implemented to provide a spring rise and summer low flow which will provide for the life history needs of the pallid sturgeon. This long-term flow regime must address, based on the best available information, spawning, rearing, maximization of floodplain connectivity, forage production and shallow water habitat. The long-term flow regime shall be reflective of the normalized river hydrology in order to be responsive to dry, intermediate, and wet conditions.

f) If the Corps, with the review and approval of the Service , is unable to determine a suitable flow management paln that incorporates the life history needs of the pallid sturgeon over all relevant flow frequencies within 2 years the Corps shall operate in the following manner in the operating year that begins on March 1, 2006. This initial starting point shall be subject to annual review and modification based on data collected and evaluated under the adaptive management program. This assumes a median hydroclimatic conditions in the basin based on system storage, past precipitation, and projections of future precipitation based on historical probabilities:

   i. During the winter release of 2006, the Corps shall minimize the releases from Gavins Point Dam to 16 Kcfs or less.

   ii. Beginning on or about March 15, 2006, the Corps shall provide for an early spring pulse of at least 31Kcfs which will last at least 7 days at the peak. Such a rise will have an ascending limb of approximately 7 days and a descending limb of approximately 7 days. After the pulse the Corps will reduce flows to the minimum amount possible while still maintaining project purposes.

   iii. Beginning on or about May 1, 2006 but not later than May 15, 2006 the Corps shall provide a second spring pulse release that will be no less than 16 Kcfs, added to the existing flow (i.e. if the flow on May 1 is 24 Kcfs the pulse would be 40 Kcfs). This pulse will last for a minimum of 14 days at its peak. The ascending limb of this pulse will not be less than 7 days but no longer than 10. The descending limb of this pulse will be no less than 7 days but may extend for longer as project purposes demand.

   iv. Beginning on or about June 15, 2006 but no later than July 1, 2006 the Corps shall begin reducing flows to provide a minimum 30 day summer low flow release of no greater than 25 Kcfs. Once the low

flow period has been achieved, the Corps may increase flows the minimum amount necessary to achieve project purposes by September 1, 2006.

v. If the operating year starting on March 1, 2006 is other than a median year, the Corps shall proportionally modify the flow regime either up or down depending on if runoff is projected to be in the upper quartile water year definition or the lower quartile, and within the bounds of health and human safety for the wetter period. Summer low flows must always be no greater 25 Kcfs and may extend for longer periods of time depending on hydrology.

vi. When the navigation season is shortened through implementing the drought conservation program, the Corps shall coordinate that period of non-navigation (with the summer habitat flow described in this section) to maximize benefits to pallid sturgeon.

Justification

Based on the effects described in the Effects of the Action it is the opinion of the Service that the flow regime elements described here will provide suitable spawning cues of enough frequency for pallid sturgeon to exploit the entire reach of the Missouri River from Gavins Point Dam to the confluence with the Mississippi River. By providing flows that are sufficiently high in the spring, connectivity to low-lying lands will be enhanced thereby providing additional production and input of nutrients and forage items for YOY fish at a time needed to enhance survival through the first year. Habitat flows will subsequently provide low velocity refugia habitat, enhanced in-channel productivity and provide for the spatial and temporal concentration of forage and prey items to areas where YOY and adult fish can exploit the prey base.

Fort Peck flow enhancements

Biological needs

The pallid sturgeon that occur in the reach of the river below Fort Peck Lake require a spawning cue of suitable magnitude, duration, timing and temperature to complete this life history element. Water temperature and flows are a controlling factor in this reach both for the spawning cue and over summer temperatures. Water temperature is an essential element of spawning cues for fish. Additionally, if the water temperatures dramatically drop after spawning it affects larval pallid sturgeon development as well as suppressing production and sustainability of forage throughout the summer. Low water temperatures may even induce mortality in young pallid sturgeon.

1. Flow Enhancement below Fort Peck Dam

To meet the biological needs for the pallid sturgeon the Serivce finds that the Corps shall no later than the 2004 annual operation, which will begin in March, 2004:

APPENDIX I

Memorandum from Sandi Zellmer (2006), University of Nebraska Law College, to Jessica Harder regarding Nebraska Instream Flow Legislation on 10/02/06. The purpose of this legal review was to provide information on Nebraska's instream flow law for members of the Nebraska Unicameral during the 2007 Legislative Session.

Memorandum

To: Jessica Harder
From: Sandi Zellmer[1]
Date: 10/2/2006
Re: Nebraska Unicameral Memo on Instream Flow Legislation

Introduction

In the west, state law historically considered water left in the stream to be wasted. Western states, which rely heavily on diversions to meet their water needs, have encouraged full appropriation of rivers and streams. In many cases, however, diversions have resulted in the depletion of stream flow reliant ecosystems and adversely affected fish, wildlife, recreation and river navigation.

Today, protective instream flow legislation has been implemented in many states across the nation.[2] Without protection, "[s]almon populations were crashing, riparian habitat was being lost, and . . . legendary rivers like the Rio Grande had become little more than concrete-lined conduits. People began to demand that the law protect the rivers they fished, rafted, and admired."[3]

While the majority of western states have enacted some form of instream flow legislation, the parameters of the legislation and on-the-ground implementation vary widely from state to state. For example, since the passage of its instream flow legislation in 1984, only 247 miles (2%) of Nebraska's 12,371 miles of streams and rivers have

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1 The author acknowledges the research assistance of Mick Connealy (JD 2006) and Michelle Weber (JD Candidate 2008).

2 Cynthia F. Covell, A Survey of State Instream Flow Programs In the Western United States, 1 U. Denv. Water L. Rev. 177, 178 (1998).

3 Jesse A. Boyd, Hip Deep: A Survey of State Instream Flow Law From the Rocky Mountains to the Pacific Ocean, 43 Nat. Resources J. 1151, 1152 (2003).

received some protection through instream flow appropriations (8 miles on Long Pine Creek and 239 miles on the Platte River).[4]

This memo provides a brief overview of Nebraska's instream flow law and draws comparisons to the approaches taken in other western states. It analyzes the following issues: (1) the ecological and economic benefits of instream flow protection; (2) which water sources may be used for instream flow appropriations; (3) who may obtain instream flow rights; (4) the purposes for which instream rights may be appropriated; and (5) miscellaneous restrictions on instream flow appropriations. Although this memo focuses on state law, the reader should note that federal legislation, especially the Endangered Species Act and the Clean Water Act, often plays a major role in protecting instream flows.

I. The Benefits of Instream Flow Protection

Protection of instream flows benefits both ecological and economic interests. Adequate stream flows are the essence of what makes a stream or river. As such, they contribute to many ecosystem goods and services, including filtration, dilution of sewage and other effluents, livestock watering, increased land values, fish and wildlife needs, and recreational forms of all types, such as fishing, hunting, boating and aesthetics). Instream flows also supply cooling water for electrical generating plants, hydro-electric power, drinking water sources and groundwater recharge. Maintaining instream flows also benefits riparian wetlands, which in turn help absorb flood waters and polluted runoff,

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4 Nebraska Game and Parks Commission (NGPC), Federal Aid in Sport Fish and Wildlife Restoration, Program Narrative, FW-19-T (2006). Current miles of select high priority streams and rivers that have *not* been protected with instream flows include but are not limited to the White River (70), lower Snake (14), Holt Creek (19), Niobrara River (487), North Platte River (164), Nine mile Creek (13), Elkhorn River (382), Cedar River (88), Big Nemaha (140), Missouri River (313) and Brazile Creek (42).

provide wildlife habitat, keep exotic species in check, and promote economic vitality for nearby communities.[5] The State of Nebraska Policy Issue Study on Instream Flows lists fishery resources, recreation and aesthetics, compliance with interstate compacts and judicial decrees, hydroelectric power, aquifer recharge, subirrigation, navigation, wildlife, wild and scenic rivers, and water quality as instream water uses.[6]

A significant proportion of Nebraska's future economic vitality could potentially revolve around its streams and rivers if instream flows are protected. Examples include ecotourism on the central Platte for birdwatching; ecotourism on the Niobrara for canoeing and tubing; and ecotourism on the Missouri from boating and other recreational uses.[7] The 2001 U.S. Fish and Wildlife survey provides the following monetary values for recreational activities in Nebraska: Fishing - $306.6 million; Wildlife-Watching - $210.7 million; Hunting - $306.1 million.[8] A 1996 study shows that expenditures related to wildlife-watching on the central Platte totaled between $13-20 million, with over 75% originating from residents of other states.[9]

II. Water Sources for Instream Flow Appropriations

Almost every western state with an instream flow law addresses what source of water can be utilized for instream flow appropriations. In Nebraska, appropriations for

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5 B. Richter, A. Warner, J. Meyer and K. Lutz, A Collaborative and Adaptive Process for Developing Environmental Flow Recommendations, River Research Applications, 22: 297-318 (2006) (describing ecological benefits of instream base flows, high pulse flows and flood flows).

6 Natural Resources Commission, Policy Issue Study on Instream Flows, State Water Planning and Review Process (1982).

7 E. Nieimi and T. Raterman, Natural-Resource Amenities and Nebraska's Economy: Current Connections, Challenges, and Possibilities (ECONorthwest 2006).

8 U.S. Department of Interior, Fish and Wildlife Service and U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau (2001).

9 FERMATA, Inc., Platte River Nature Recreation Study (1996), http://www.fermatainc.com/eco_nebplatte.html.

instream flows can utilize unappropriated water or, if there is insufficient unappropriated water available, stored water.[10] According to the Nebraska Supreme Court, the statutory term "available" means "fairly dependable and continuous."[11] Arizona, Alaska, and Idaho share Nebraska's requirement that the instream flow waters must come from unappropriated sources. The other western states either explicitly allow for additional sources or place no restriction upon the source of instream flow appropriations. Limiting instream appropriations to only unappropriated sources limits Nebraska's ability to protect instream flows, and places Nebraska's instream flow law among the most restrictive in the west.

The instream flow statute further restricts "available" water by requiring that there be "unappropriated water available to provide the approved instream flow rate at least twenty percent of the time during the period requested."[12] The twenty percent limitation in Neb. Rev. Stat. § 46-2,115 stands alone among the other western states, none of which require that water appropriated for instream flow use be available for any particular amount of time. In 2005, the Nebraska legislature considered a bill that would have made the availability requirement even more stringent. LB 1226 proposed to change §46-2,115 to require that the unappropriated water be available eighty percent of the time.[13] This change would have resulted in a drastic reduction of instream flow protections. The amount of unappropriated water in Nebraska is limited, and the existing requirement that instream flow rights be granted only for "unappropriated" water already

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10 Neb. Rev. Stat. § 46-2,115 (2004); Neb. Rev. Stat. § 46-2,116.01 (2004).

11 Central Platte Natural Resources Dist. v. Wyoming, 245 Neb. 439, 454, 513 N.W.2d 847, 859 (1994). *See* In re Application A-16642, 236 Neb. 671, 692, 463 N.W.2d 591, 606 (1990) (Long Pine Creek).

12 Neb. Rev. Stat. § 46-2,115(1).

13 Neb. Leg. Bill 1226, 99th Leg. 2nd Reg. Sess. (introduced Jan. 18, 2006).

inhibits the state's ability to protect instream flows with water from sources like donations or purchases.[14]

III. Who Can Appropriate Instream Flows?

Nebraska also takes a restrictive approach with regard to the entities allowed to obtain instream flow appropriations. Where many states allow individual citizens to petition the state for instream flow rights or to change the purpose of their existing water rights to use it for stream flows, Nebraska Revised Statute § 46-2,108 allows only the Game and Parks Commission and the Natural Resource Districts to own an instream flow right. Out of 23 Natural Resource Districts (NRDs) in the state with authority to obtain instream flow appropriations, only one NRD has attempted to apply for an instream flow appropriation since 1984; the Central Platte NRD now holds instream flow appropriations on the Platte River for fish and wildlife purposes.[15]

Nebraska law does allow individuals to change the purpose of their water right to instream flows,[16] but the consequences of such a change are unclear. Fear of losing one's water right to the state may deter people from converting their current use to instream flow. This lingering question may be an appropriate subject for future legislation.

IV. For What Purpose may Instream Flows be Appropriated?

States can benefit in a number of ways by maintaining natural flow regimes in their streams, but state laws vary with respect to which benefits are deemed worth the cost of having less water to appropriate for other purposes. The most widely cited

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14 Neb. Rev. Stat. § 46-2,115.
15 Interview with Gene Zuerlein, Game and Parks Commission, Sept. 13, 2006.
16 Neb. Rev. Stat. § 46-290(3)(c).

purpose for which an instream flow can be appropriated is to benefit fish and wildlife.[17] Recreation is also a recognized purpose in most states.[18] Fewer western states explicitly allow instream flows for navigation, water quality or aesthetics.[19]

In comparison with other western states, Nebraska recognizes relatively few allowable purposes. Nebraska law allows instream flows to be appropriated "to maintain the existing recreational uses or needs of existing fish and wildlife species."[20] The Nebraska Supreme Court has upheld an instream flow appropriation to preserve Platte River wildlife species.[21]

It is not clear whether the legislature intended the word "existing" to serve as a limiting term. The issue has not been litigated, but arguably instream flows could not be appropriated to feed man-made recreational lakes created after the law's effective date, or to protect any species of fish or wildlife that is discovered or introduced into an area after the law's effective date. Nebraska is the only state that uses this particular limiting term.

The Nebraska statute also appears to restrict instream flow purposes to the maintenance (not enhancement) of existing recreational uses and fish and wildlife

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17 *See* Neb. Rev. Stat. § 46-2,115(2); Ariz. Rev. Stat. § 45-151A; Alaska Stat. § 46.15.145(a)(1-4); Cal. Water Code § 1707 (a)(1); Kan. Stat. Ann. § 82a-928 (i); Idaho Code § 42-1501; Mont. Cod Ann. § 85-2-316(2)(a); Or. Rev. Stat. § 537.336(1); Utah Code Ann. § 73-3-3(11)(a)(i-iii); Wash. Rev. Code § 90.22.010; Wyo. Stat. Ann. § 41-3-1002(d).

18 *See* Neb. Rev. Stat. § 46-2,115(2); Ariz. Rev. Stat. § 45-151A; Alaska Stat. § 46.15.145(a)(1-4); Cal. Water Code § 1707 (a)(1); Kan. Stat. Ann. § 82a-928 (i); Idaho Code § 42-1501; Mont. Cod Ann. § 85-2-316(2)(a); Utah Code Ann. § 73-3-3(11)(a)(i-iii); Wash. Rev. Code § 90.22.010.

19 *See* Alaska Stat. § 46.15.145(a)(1-4); Kan. Stat. Ann. § 82a-928 (i); Idaho Code § 42-1501; Mont. Cod Ann. § 85-2-316(2)(a); Or. Rev. Stat. § 537.336(1); Wash. Rev. Code § 90.22.010.

20 Neb. Rev. Stat. § 46-2,115(2).

21 *Central Platte Natural Resources Dist.*, 513 N.W.2d at 858-862.

needs.[22] Along with other areas described above, this makes Nebraska's instream flow provision among the most restrictive western statutory schemes.

V. Other Restrictions

Nebraska's instream flow legislation includes other miscellaneous substantive and procedural restrictions on instream flow appropriations. As in all western states, instream flows in Nebraska must not interfere with senior surface water appropriations.[23] Most instream flow programs are of recent vintage, with junior priority dates, so they can only safeguard the stream against diversions by subsequent new users.[24] Also, instream flow appropriations can only be applied to the segment of the stream indicated in the application, and once the water passes through that segment, all rights to it are relinquished.[25]

In addition, Nebraska, like most states, imposes a"public interest" review on instream flow applications. However, a unique aspect of Nebraska law explicitly requires instream flow appropriations to be weighed against specified economic and social values.[26] In other words, although instream flows for recreation, fish, and wildlife have been statutorily recognized as beneficial uses in Nebraska, an application for one of these uses may only be granted if the balance tips in favor of the application over other

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22 Neb. Rev. Stat. § 46-2,115(2).

23 *Id.* § 46-2,115.

24 Christine Klein, On Integrity: Some Considerations for Water Law, 56 Ala. L. Rev. 1009, 1047 (2005).

25 *Id.* § 46-2,118.

26 *See* Neb. Rev. Stat. § 46-2,116 ("In determining whether an application for an instream appropriation is in the public interest, the director shall consider the following factors: (1) The economic, social, and environmental value of the instream use or uses including, but not limited to, recreation, fish and wildlife, induced recharge for municipal water systems, and water quality maintenance; and (2) The economic, social, and environmental value of reasonably foreseeable alternative out-of-stream uses of water that will be foregone or accorded junior status if the appropriation is granted.").

economic and social considerations, such as induced recharge for municipal water systems and water quality maintenance.[27] The Department of Natural Resources is charged with making these determinations, and the Nebraska Supreme Court has upheld the DNR's denial of trans-basin diversions under the public interest standard due to the potential for adverse effects on wildlife and endangered species in the basin of origin and the unavailability of a dependable flow.[28]

Nebraska statutes also impose various procedural requirements on instream flow applications. First, before the Department Natural Resources proceeds with a hearing on a contested instream application, the applicant and opposing parties must attempt to resolve their differences through mediation or arbitration.[29] In addition, instream appropriations must be reviewed every 15 years to determine if they are still in the public interest.[30] Finally, instream appropriations may be amended by the DNR if they would interfere with certain types of applications, such as induced recharge for public water supply wells.[31] These requirements are unique to instream flow appropriations, and are not imposed on other types of public or private surface water rights.

Conclusion

A comparison of Nebraska law to the water law of other western states demonstrates that Nebraska's existing instream flow legislation is quite narrow. Nebraska statutes impose a variety of restrictions on instream flow appropriations, many

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27 *Id.*

28 *See* In re Application A-15738 of the Hitchcock and Red Willow Irrigation Dist., 226 Neb. 146, 410 N.W.2d 101 (1987); In re Application A-16642, 463 N.W.2d 591 (Neb. 1990) (Long Pine Creek); In re Applications A-16027, et al., of the Upper Big Blue NRD, 495 N.W.2d 23 (Neb. 1993), motion for rehearing overruled and opinion modified, 499 N.W.2d 548 (Neb. 1993).

29 Neb. Rev. Stat. § 46-2,117.

30 Neb. Rev. Stat. § 46-2,112.

31 Neb. Rev. Stat. § 46-2,113.

APPENDIX J

NDNR (2008a) Order Of Final Determination that a portion of the lower Niobrara River Basin is fully appropriated, that the stays on new surface water uses and on increases in the number of surface water irrigated acres shall continue, and designating the geographic area within which the surface water and ground water are hydrologically connected. Order date is January 25th, 2008.

The criteria for fully appropriated determination are set out in rule and regulation. The above ruling was contested by four NRDs (Middle Niobrara NRD, Upper Elkhorn NRD, Upper Loup NRD,the Lower Niobrara NRD and one person on the basis that the January 25th, 2008 Order was arbitrary and capricious, or contrary to law, and therefore invalid in whole or in part. After due process of the contested case and after consideration of the facts, the NDNR Director concluded the January 25th , 2008 Order that portions of the Lower Niobrara Basin to be fully appropriated was not arbitary or capricious, or contrary to law, or invalid, in whole or in part. Final Order date is December 17th , 2009.

The above ruling did not satisfy the contesting parties, consequently they have appealed the NDNR Directors decision to a higher appellate court. This means that instead of initiating an Integrated Management Plan with NDNR in 2010, there will be a delay, possibly as long as two years (2012).

STATE OF NEBRASKA

DEPARTMENT OF NATURAL RESOURCES

ORDER OF FINAL DETERMINATION THAT A PORTION OF THE LOWER NIOBRARA RIVER BASIN IS FULLY APPROPRIATED, THAT THE STAYS ON NEW SURFACE WATER USES AND ON INCREASES IN THE NUMBER OF SURFACE WATER IRRIGATED ACRES SHALL CONTINUE, AND DESIGNATING THE GEOGRAPHIC AREA WITHIN WHICH THE SURFACE WATER AND GROUND WATER ARE HYDROLOGICALLY CONNECTECTED

Background

1. On October 16, 2007, the Department of Natural Resources (Department) completed the evaluation required by Neb. Rev. Stat. Section 46-713(1)(a) of the expected long-term availability of hydrologically connected water supplies for both existing and new surface water uses and existing and new ground water uses in the river basins which had not previously been determined to be fully appropriated, and issued a report, the 2008 Annual Evaluation of Availability of Hydrologically Connected Water Supplies, (2008 Evaluation) describing the results of its evaluation.

2. The 2008 Evaluation concluded as a preliminary matter that a portion of the Lower Niobrara River Basin is fully appropriated. The fully appropriated portion is located in the Upper Niobrara White Natural Resources District (the "UNWNRD"), the Middle Niobrara Natural Resources District (the "MNNRD"), the Lower Niobrara Natural Resources District (the "LNNRD"), the Upper Loup Natural Resources District (the "ULNRD"), and the Upper Elkhorn Natural Resources District (the "UENRD").

3. On October 17, 2007, pursuant to Neb. Rev. Stat. Section 46-714, notice of the preliminary determination was given to the public, the UNWNRD, the MNNRD, the LNNRD, the ULNRD, and the UENRD, and the licensed water well contractors in the state. The notice identified the portion of the Lower Niobrara River Basin that was preliminarily determined to be fully appropriated and the geographic areas in which the surface water and groundwater are hydrologically connected.

4. Under Department rule, 457 NAC 24.001.02, the hydrologically connected area is the area within which the pumping of a well for 50 years will deplete the river or a baseflow tributary thereof by at least 10% of the amount pumped in that time (the "10/50" area). To make its determination of the "10/50" area, the Department utilized data from the University of Nebraska Conservation and Survey Division and the Jenkins Stream Depletion Factor Analysis, which is the best scientific data and information currently available for determining the hydrologically connected area.

5. The Department issued notice of, and held, three public information meetings and three public hearings on the 2008 Evaluation on December 20, 2007, in Atkinson and Valentine, Nebraska; and December 27, 2007, in Gordon, Nebraska.

6. Public testimony was taken at each public hearing, and the record in each public hearing was held open for at least one full week following the date of the public hearing, in order to allow the receipt of any additional written testimony into the record. A transcript was made for each public hearing.

7. As required by Neb. Rev. Stat. Section 46-714(4) each irrigation district, reclamation district, public power and irrigation district, mutual irrigation company, canal company, or municipality that relies on water from the affected portion of the Lower Niobrara River Basin and other water users and stakeholders deemed appropriate by the Department or the affected natural resources district were consulted.

8. Testimony from 28 witnesses at the hearings on December 20, 2007, and December 27, 2007, and 43 exhibits were presented for the hearing record. A variety of factual and legal arguments were asserted. Some the issues raised related to the economic impacts of the determination the basin would be fully appropriated, stream flow hydrographs and water table elevation data, the difference between the criteria used to administer water rights as opposed to determining a basin is fully appropriated, the need to establish a baseline to determine the availability of water at the time the permit was granted, the determination of the boundary of the ground water area considered to be hydrologically connected to the surface watershed of the Niobrara River and the question of how the preference laws should be integrated with the determination of whether a basin is fully appropriated.

9. The Department has carefully considered the record and based on this review has determined that the preliminary determination should be accepted, except that based on testimony regarding the extent of the hydrologically connected ground water area, the Department determined that Section 6 of Township 29 North, Range 14 West; Sections 20, 28, and 36 of Township 30 North, Range 15 West; Sections 4, 5, and 6 of Township 30 North, Range 16 West; Sections 5 and 6 of Township 30 North, Range 17 West; and Sections 3 and 6 of Township 30 North, Range 18 West that were preliminarily considered to be hydrologically connected to the Niobrara River should not be included in the area considered to be hydrologically connected to the Niobrara River. Accordingly these sections were removed from the area determined to be fully appropriated.

10. As required by the Nebraska Nongame and Endangered Species Conservation Act (Neb. Rev. Stat. Sections 37-801 to 37-811), the Department consulted with the Nebraska Game and Parks Commission regarding whether or not continuing the stays on new and expanded uses of ground and surface water in the fully appropriated Basin would jeopardize the continued existence of any endangered or threatened species or result in the destruction or modification of habitat of any endangered or threatened species that the Commission has determined is critical. The Commission determined that continuing the stays will have no effect on any state listed threatened or endangered species.

Conclusions

After due consideration of the comments received about the 2008 Annual Evaluation of Hydrologically Connected Water Supplies and the Department's preliminary determination that a portion of the Lower Niobrara River Basin is fully appropriated and its preliminary determination of the "10/50" area, and based on information in the 2008 Evaluation, it is CONCLUDED that:

(1) the portion of the Lower Niobrara River Basin between the Mirage Flats diversion dam and the Spencer Hydropower Plant are fully appropriated;

(2) it is in the public interest to continue the stays on new surface water uses and on increases in the number of surface water irrigated acres in the fully appropriated area; and,

(3) the area within which surface water and ground water are hydrologically connected is as shown on the map in Appendix II and the legal description of the land within the "10/50" area in Appendix III.

Order

It is hereby ORDERED that:

1. The Department's preliminary determination that the portion of the Lower Niobrara River Basin between the Mirage Flats Diversion Dam and the Spencer Hydropower Plant is fully appropriated is final.

2. The stays on new surface water uses and on increases in the number of surface water irrigated acres, that took effect as a result of the Department's preliminary determination that the portion of the Lower Niobrara River Basin between the Mirage Flats Diversion Dam and the Spencer Hydropower Plant is fully appropriated shall remain in effect until (a) they are terminated pursuant to law, (b) an integrated management plan for the affected area has been adopted and has taken effect, (c) the Department has completed a reevaluation of the area and has determined that the affected area is not fully appropriated, or (d) the stays expire pursuant to law. The surface water stays are in effect in the area depicted on the map in Appendix I.

3. The geographic area within which the Department has determined ground water to be hydrologically connected to the surface water is as depicted on the map in Appendix II and described in Appendix III.

4. The stays on the construction of new water wells and on increases in acres irrigated with ground water remain in effect unless terminated by the pertinent natural resources districts as authorized in Neb. Rev. Stat. Section 46-714.

DEPARTMENT OF NATURAL RESOURCES

January 25, 2008

Ann Bleed

Ann Bleed, Director

Any person with sufficient legal interest who has been or may be substantially affected by this order may request a contested case hearing in

accordance with the Nebraska Administrative Procedures Act (Neb. Rev. Stat., Sections 84-901 et. seq.) and the Department's Rules of Practice and Procedure (454 N.A.C. Chapter 007). The request must be received by the Department at its Lincoln Office (301 Centennial Mall South, 4th Floor State Office Building, Lincoln, NE 68509-4676) within 15 days of the date of this order and be accompanied by a filing fee of $10.

CERTIFICATE OF SERVICE

A copy of the foregoing ORDER OF FINAL DETERMINATION THAT A PORTION OF THE LOWER NIOBRARA RIVER BASIN IS FULLY APPROPRIATED, THAT THE STAYS ON NEW SURFACE WATER USES AND ON INCREASES IN THE NUMBER OF SURFACE WATER IRRIGATED ACRES SHALL CONTINUE, AND DESIGNATING THE GEOGRAPHIC AREA WITHIN WHICH THE SURFACE WATER AND GROUND WATER ARE HYDROLOGICALLY CONNECTECTED with Appendices, was mailed to the Upper Niobrara White, the Middle Niobrara, the Lower Niobrara, the Upper Loup, and the Upper Elkhorn Natural Resources Districts, posted on the Department's website and provided to the Department's field offices on January 25, 2008.

STATE OF NEBRASKA

DEPARTMENT OF NATURAL RESOURCES

In the Matter of the January 25, 2008, Order of Final Determination That a Portion of the Lower Niobrara River Basin is Fully Appropriated.	))))	Case Number #006-08CC FINAL ORDER

The above captioned matter comes before the Director of the Department of Natural Resources. Five cases (001 to 005-08CC) were originally filed on the same general matter. Four cases were filed by individual natural resources districts (NRDs): the Middle Niobrara, Upper Elkhorn, Upper Loup, and Lower Niobrara with identical pleadings; and one case was filed by a person, Michael Jacobson (Jacobson). After amended pleadings by Jacobson, all the pleadings were substantially similar and all five cases were joined by prehearing order, without objection, for the purpose of a single hearing under this caption and case number. The Department of Natural Resources, through its staff attorney, entered as a party.

For purposes of this order "Director" is used when referring to the Director of the Department of Natural Resources as the final decision maker in this contested case hearing. "DNR" is used when referring to the Department of Natural Resources as a party to this case. "Department" is used when referring to general terms regarding duties assigned to the Department through statutes and rules, or for other roles of the Department including roles for the director as decision maker for anything but this contested case hearing. There are a few exceptions located within quotes.

STATEMENT OF THE CASE

The Department is required by the Nebraska Ground Water Management and Protection Act (the Act), specifically Neb. Rev. Stat. § 46-713, to conduct an annual evaluation of the availability of water in the river basins of the state for the purpose of evaluating whether any new river basins, portions of basins, or river reaches meet the criteria for fully appropriated. The criteria for fully appropriated determination are set out in rule and regulation. If a basin, subbasin or reach is found to be fully appropriated, the Department is to issue a preliminary determination; hold hearings; and make a final determination in accordance with the Act and statutorily required Department rules and regulations. This case challenges the Department's interpretation of the statutes and regulations it administers in reaching essentially technical conclusions, and poses the question that if the Department did not sufficiently follow them, whether the resulting order is invalid as a matter of law.

The pleadings generally state the cause of action is the Department's January 25, 2008, Order of Final Determination That a Portion of the Lower Niobrara River Basin is Fully Appropriated (Order), and assert that through the particular contested facts alleged in the pleadings for establishing procedural or factual defect, that the Order is arbitrary and capricious, or contrary to the law, and therefore invalid in whole or in part.

STATEMENT OF THE ISSUES

Standing to bring this action was not raised in the hearing record, but is discussed in this order. The petitioners, in seeking to overturn the administrative decision, have the burden of proof for establishing facts congruent with the allegation of arbitrary, capricious, or contrary to law decision making.

Prehearing conferences were held setting a discovery schedule intended to result in stipulation by the parties of the issues before the Director, to stipulate certain facts relevant to a decision on the issues, and identify and exchange experts' affidavits in order to limit any need for live testimony at the hearing. Issues for consideration in this case and some relevant facts were jointly stipulated by the NRDs and DNR, but not by Jacobson. Jacobson did not object to the stipulation.

Pursuant to a stipulated agreement between the NRDs and DNR, closing briefs from the parties were filed after the hearing. The petitioners, in their final briefs, reframe the issues that were before the Director at the hearing and make arguments for them. DNR, in its final brief, rebutted the petitioners' final briefs. The closing briefs raised some issues in argument that were not specifically before the Director through the pleadings or evidence and may thus be considered extraneous to the case. They are nevertheless addressed below for a thorough deliberation of the matter.

FINDINGS OF FACT AND CONCLUSIONS OF LAW

Evidence is submitted to the hearing record in Exhibits 1 through 16, some with attachments, and the material filed in the case record, which is undisputed. The Director after examination of the record makes these FINDINGS OF FACT and CONCLUSIONS OF LAW:

1. The thirty stipulated undisputed material facts and six documents appended to the stipulation of facts (Exhibits 1 and 2) are considered facts for the resolution of the case, with two exceptions:

   Stipulated Fact 1. The Director notes that after the cause of action, initiation of the case, and completed hearing on the case, but before this final order, LB 483 was enacted which modifies the requirement for an annual evaluation of all river basins by making river basins subject to a status change of not fully appropriated optionally reviewable within four years of the status change. This does not change the impact of Stipulated Fact 1 for decision in this case.

   Stipulated Fact 10. The status of In Re 2007 Administration of Niobrara River, NDNR # 001-07-CC, A-08-823 as "on appeal" became outdated with the Court's remand of the case back to the Department.

   The Director finds as a conclusion of law, that neither of these modifications to the stipulated undisputed facts are relevant to the decision in this case.

2. Based upon the record, this hearing was held under the authority of Neb. Rev. Stat. § 61-206(1) as a contested case hearing pursuant to the Administrative Procedures Act (APA), Neb. Rev. Stat. §§ 84-901 to § 84-920. Nebraska statute § 61-206(1) requires the Department to grant a contested case hearing in those instances when a final decision

is made by the Department without a hearing. In this case the "decision made without a hearing" is the Order.

The Director concludes:

A. "Without a hearing" in the pertinent portion of Neb. Rev. Stat. § 61-206(1) is interpreted to mean without a contested case hearing. Therefore, non-adjudicatory hearings held in conformance with Neb. Rev. Stat. § 46-714(4) to provide information to, and obtain information from, the public on the preliminary determination fall within the interpretation of "without a hearing."

B. The petitioners have the burden of proof in establishing the facts for this case pursuant to Neb. Rev. Stat. § 61-206(1).

3. The NRDs did not specifically allege in their pleadings, but argued nevertheless, that the hearing is procedurally flawed in that the record for the hearing should include all information, communications, and material used by the Department prior to making the "2008 Annual Evaluation of Availability of Hydrologically Connected Water Supplies" report (2008 Report) and the record does not include it. The parties stipulated that, for making its annual evaluation and particularly for a resulting preliminary determination of fully appropriated status, the Department relies upon specific statutory authorities and must meet specific statutory requirements. Statutory requirements include promulgating rules and regulations specifying the types of scientific data and other information it will consider in making the determination, and providing enough information and data in the annual evaluation to allow the results to be independently replicated and assessed. Any relevant information provided by any interested party and included in the annual evaluation is, as specified by Neb. Rev. Stat. § 46-713(1)(c), "for informational purposes only."

For their pleading that the Order is arbitrary, capricious, and therefore null in whole or part, the NRDs argued that the materials offered as evidence by DNR of the Department's fulfillment of the Neb. Rev. Stat. § 46-713(1)(c) and (d) requirements and included in the hearing record, are insufficient "post hoc rationalizations." At the extreme, such a characterization suggests there is something lacking in the hearing record if it does not include notes verifying the thought processes of those involved while they arrived at a decision. This is generally inappropriate unless bad faith is alleged and it is not.

Evidence presented by DNR in the case included documents published by the Department, relevant laws and rules, as well as affidavits (offered by stipulation in lieu of live testimony) of technical staff that contributed to the agency analysis and report. The NRDs exercised their right for discovery in this case extensively, but did not present any of the discovered material into evidence at the hearing. The NRDs asked for a confirmation during the hearing (page 24) whether "all filings" made in the case were part of the hearing record. The hearing officer concluded at that time that all filings were part of the "case record." Responsive discovery materials produced as requested by the NRDs were filed by DNR in the case record. The Director finds that there is no evidence that the hearing is procedurally flawed for incompleteness of the hearing record.

The NRDs presented no evidence at the hearing from the discovered material created prior to the Order, essentially an administrative record of the Department's considerations made prior to the Order. They nevertheless argue in their closing that the Order and this proceeding are procedurally flawed. The NRDs argued that the hearings held prior to the Order should have been adjudicatory in form and should have created a complete formal administrative record. The NRDs, therefore, believe the record from this hearing is necessarily incomplete or flawed because evidence is being produced for review after the Order was made.

The NRDs chiefly relied upon Citizens to Preserve Overton Park v. Volpe, 401 U.S. 402, 420 (1971), in support of their argument; but the Director finds as a conclusion of law that *Overton Park* is not on point for the NRDs argument. In the *Overton Park* case the Court held in part that no judicial hearing was required prior to the Secretary of Transportation's decision in the matter. Rather the issue was only what was available for the lower courts' subsequent consideration of the challenged validity of the Secretary's decision.

The NRDs argued on page 11 of their final brief that this hearing is procedurally flawed because ". . . a contested case process was employed **after** [sic] the agency acted," implying that a contested case on the decision was required by law before the Order was issued. Neb. Rev. Stat. § 61-206(1), the authority for this hearing, provides for a contested case adjudicatory hearing for any decision made by the Department without a hearing. The APA, therefore, clearly anticipates administrative decisions made prior to a contested case hearing and provides the due process right to a contested case hearing after the fact of the final decision.

Statutory criteria for declaring a basin fully appropriated are set out in Neb. Rev. Stat. § 46-713(3) as, ". . . if the department determines based upon its evaluation conducted pursuant to subsection (1) of this section [the preliminary determination based upon evidence from the annual evaluation] and information presented at the hearing pursuant to subsection (4) of section 46-714 . . . ." (Emphasis added) The Order, in paragraph No. 9 (Exhibit 16), clearly states, "The Department has carefully considered the record [of the public hearings] and based on this review has determined that the preliminary determination should be accepted, except that based upon testimony regarding the extent of the hydrologically connected groundwater area . . . ." Following consideration of the information provided, the Department changed its preliminary map to that designated in the Order.

As stated in the Order, nothing presented at the hearings held between the preliminary determination and the final determination (which as stated in paragraph No. 2 above are determined to be non-adjudicatory hearings) changed conclusions from the preliminary determination of fully appropriated. That these hearings were meant to be non-adjudicatory, non-contested case hearings is shown by the statutorily required time limit on the decision making process and on the requirement to consult with other entities outside the hearing process at the same time the hearing process is required. Neb. Rev. Stat. § 46-714(4) requires that within a 90-day time period, the Department give notice, hold hearings, simultaneously consult with other entities

outside the hearing process, and use the information from both the hearings and from the consultation process when making the final decision (the Order). It is likely that the consultation process would include persons or entities that may also appear at the hearings. Such process described by the Act is determined by the Director to conflict with the legal standards required for a contested case hearing.

There was no motion at the hearing on this case to introduce pre Order hearing records as evidence in this case. The Director finds as a matter of law that no formal adjudicatory hearing resulting in specific findings of fact and conclusions of law on all the issues is required by Neb. Rev. Stat. § 46-714(4) prior to Department action for either the preliminary or final determination of fully appropriated or prior to the resulting Order, and that the Department complied with Neb. Rev. Stat. § 46-714(4) by holding public hearings to inform the public and to hear any information proffered for consideration by the Department on the Order.

4. The NRDs alleged that "Prior to January 25, 2008, DNR was provided with extensive information, data and argument demonstrating that the Lower Niobrara River Basin is not fully appropriated . . . and that the geographic area of hydrologically connected ground water was in error." This argument is unfounded. As a factual determination, the Director finds that the Order (Exhibit 16) includes references to the preliminary determination hearings conducted, witness testimony, the Department's "careful consideration . . . and review" of all the information prior to issuing the Order, and the use of such information in modifying the preliminarily determined area of hydrologically connected water for the Order.

5. The NRDs argued in their closing brief that:

   A. The geographic area of hydrologically connected water, the area encompassed by the "10/50" line is too broad;

   B. That the Department lacked sufficient information from well pumping to accurately measure impact on surface water; and

   C. That the Department used excessive well pumping estimates for its purposes.

The NRDs' expert's affidavits that were produced in support of the arguments do not evaluate the Department's methodology actually used to determine the area of hydrologically connected water, but rather criticize the methodology used in favor of an alternative method, unavailable to the Department. No evidence was presented by the NRDs or Jacobson that showed the Department had alternative means available to assess the "10/50" area for purposes of the Order, or that the means of analysis used by the Department was unreasonable.

The alternative method described by the NRDs' expert was and still is unavailable to the Department. Therefore, the methodology, assumptions, and results on the hydrologically connected area are sufficiently described both in the report and in DNR expert affidavits and other documents entered into evidence. Even if there was credible evidence of an available alternative method, the Department may rely upon its scientific judgment of the available data including its

interpretation of what constitutes "the best available scientific data" for purposes of Neb. Rev. Stat. § 46-713. "If the administrative record contains evidence that supports the positions of both the agency and the party seeking relief, the agency is entitled to rely on its experts' tests and observations, and decisions made in such reliance are not arbitrary and capricious." Central South Dakota Cooperative Grazing District v. Secretary, U.S.D.A., 266 F.3d 889, 8th U.S. Cir. (2001). The Director concludes, as a matter of law, that the NRDs did not meet their burden of proof of showing that the area of hydrologically connected water described in the Order is in error or that the methodology used to determine the area was not in compliance with Neb. Rev. Stat. §§ 46-713 or 46-714(4).

6. The NRDs and Jacobson alleged that the Department failed to "rely on the best scientific data, information, and methodologies readily available to ensure that the conclusions and results are reliable." This allegation quotes one of the statutory requirements of Neb. Rev. Stat. § 46-713(1)(d). In addition to that requirement, Neb. Rev. Stat. § 46-713(1)(d) also requires the Department to, "...specify by rule and regulation the types of scientific data and other information that will be considered for making the preliminary determinations required by this section." These rules and regulations, 457 NAC 24, are identified as stipulated facts and are included in Exhibit 11. Department rule 457 NAC 24 002 reasonably identifies and clarifies the Department's intent for the statutory requirement as "...the Department will use the best scientific data and information readily available to the Department at the time of the determination." (Emphasis added) This is reasonable in view of the time limitation, imposed by Neb. Rev. Stat. § 46-713, inherent in preparing an annual evaluation to be used for the purpose of arriving at any (preliminary or final) conclusions about whether a basin is fully appropriated. Therefore, the test of "best...readily available" must practically mean the data, information, or methodologies available at the time the Department needs to use or apply it.

The NRDs presented evidence (Exhibits 3 and 4) and contend in argument that the scientific methodology the Department used for analysis, the Jenkins method, was not the best methodology. They contend that a numerical model is the best, and argue that conclusions so derived from the Jenkins method were arbitrary and capricious. DNR presented affidavits from the technical staff in charge of the scientific methodologies and analysis (Exhibits 5, 6, 11, 12, 13, 14 and 15). These affidavits state that a numerical model, while probably the better tool for a similarly applicable hydrologic analysis, was not available to Department staff to use at the time of the Niobrara analysis. DNR evidence confirms that the Jenkins model or method was used, but only after concluding that the basin was overappropriated under the 457 NAC 24 formulas, and then only for determining a different requirement of Neb. Rev. Stat. § 46-713, the area of hydrologically connected water ("10/50 line"). The effect was that a model analysis was not necessary or used to conclude the basin fully appropriated.

Examination of the decision tree implicit in 457 NAC 24, and explained in the 2008 Report (Attachment 1 to Exhibit 11) shows that the analysis of the adequacy of the water supply for existing uses, based upon streamflow data and needs of surface water appropriators, was enough to

make the conclusion of fully appropriated and was the only criteria that needed to be evaluated in this instance to warrant such conclusion in the Order. In other words, a conclusion that the basin was fully appropriated under statute and Department rules did not involve the use of any model. Use of a model was limited to a secondary requirement, establishing the area of hydrologically connected water. The adequacy of any hydrologic model used is, therefore, relevant only to the validity of the area of hydrologically connected water outlined in the Order, rather than the Order's conclusion of fully appropriated, and the method used for determining it was the only "readily available" methodology.

Jacobson presented evidence on his idea of a possible better scientific methodology, chemical analysis of water (Exhibits 8, 9 and 10) in order to establish that the Department did not use the "best methodology" for arriving at conclusions for the Order. However, this methodology is foreign to Department staff for the purposes of Neb. Rev. Stat. § 46-713, according to DNR affidavits (Exhibits 14 and 15). The Director, after review of the information, agrees with DNR's experts' affidavits. Jacobson's methods or data are not considered superior, and are not found to meet the burden of proof for invalidating the Department's choices for scientific methodology or conclusions.

The stipulated facts establish the statutory and rule requirements of the Department for making the pertinent decisions preceding the Order. If these requirements were followed (as it was established as fact by DNR affidavits pertaining to what scientific data, information, and methodologies were available to the Department at the time needed, and what scientific data, information, and methodologies were available and chosen best for actual use by the Department), this pattern of planned, systematic examination and analysis may not rise to the level of arbitrary or capricious as alleged. The Director concludes then as a matter of law that neither the NRDs nor Jacobson met the burden of proof for establishing their assertion that the Department did not use the best, readily-available scientific data, information, and methodologies required by Neb. Rev. Stat. § 46-713 in making the Order.

7. Both the NRDs and Jacobson argued that another statutory element of Neb. Rev. Stat. § 46-713(1)(d), "In its report, the department shall provide sufficient documentation to allow these data, information, methodologies, and conclusions to be independently replicated and assessed" was not met. For example: (1) Exhibit 3 at number 6, states that the report itself lacked complete streamflow information; (2) Exhibit 3 at number 7, states that once the Department provided the data, it was not clearly identified which datasets were relevant, preventing "replication of certain findings" of the report; and, (3) Exhibit 3 at number 8, states that the Department failed to "verify" its results with in situ stream flow observations. DNR answered in rebuttal affidavits clarifying it was not practically possible to include all necessary streamflow data in the 2008 Report, that the requested information was provided, and that the "verification" method suggested was practically irrelevant in the time frame of developing an annual evaluation report with conclusions. Also, Exhibit 10 at number 4, states that the "...mathematical bases tools [sic] provided in the Jenkins Report are not understandable."

The Director finds sufficient explanation of the 2008 Report's data, information, methodologies, and conclusions in the stipulated facts and exhibits to support the adequacy of the 2008 Report for the "replication" element of Neb. Rev. Stat. § 46-713(1)(d) and further finds that providing any additional data or information in it would not change the conclusions of the 2008 Report. The basis for this finding is in part a recognition of the specific offer in the 2008 Report which states, "All data utilized in this report are available from the Department upon request" and, citations in the 2008 Report indicating where additional relevant information may be found. The 2008 Report is an attachment to Exhibit 11.

As a matter of law, the Director concludes from the record that neither petitioning party met the burden of proof to establish that the "replication" element of Neb. Rev. Stat. § 46-713(1)(d) was flawed for the conclusions of the 2008 Report or the Order. For this conclusion, the Director relies in part upon the Nebraska Supreme Court's instructions in Upper Big Blue v. NDNR, 276 Neb. 612 (2008), citing Belle Terrace v. State, 274 Neb. 612, 742 N.W.2d 237 (2007), "Deference is accorded to an agency's interpretation of its own regulations unless plainly erroneous or inconsistent."

8. The NRDs asserted that the Department did not properly analyze the essential legal criteria of "fully appropriated" as set out in Neb. Rev. Stat. § 46-713(3) for the purposes of the Order. Neb. Rev. Stat. § 46-713(3) requires the Department to issue the Order if ". . . then-current uses of hydrologically connected surface water and ground water in the river basin, subbasin, or reach cause or will in the reasonably foreseeable future cause [either] (a) the surface water supply to be insufficient to sustain over the long term the beneficial or useful purposes for which existing natural-flow or storage appropriations were granted and the beneficial or useful purposes for which, at the time of approval, any existing instream appropriation was granted, [or] (b) the streamflow to be insufficient to sustain over the long term the beneficial uses from wells constructed in aquifers dependent on recharge from the river or stream involved . . . ." Both criteria are not required to be met, only one.

The Department adopted rules under the APA (457 NAC 24) as required by Neb. Rev. Stat. § 46-713(1)(d) for describing the methodology used. The Department saw fit to only memorialize the methodology for Neb. Rev. Stat. § 46-713(3)(a) criteria in rule, reasoning that "(a)" was hydrologically the "canary in a coal mine" criteria, or essentially that "(b)" could not be met without "(a)" being met first, cited in the 2008 Report, Appendix H. Department rule 457 NAC 24 is included in the 2008 Report (Attachment 1 to Exhibit 11). The 2008 Report describes the analysis and calculations using 457 NAC 24 001.01A for determining Neb. Rev. Stat. § 46-713(3)(a) for the preliminary determination, and for the Order. This is usually referred to as the "65/85 rule."

The process is relatively simple, and does not involve "flow demands" or complex analysis of quantities of water. Rather, the process is based upon whether a senior appropriator makes a valid call, and whether the affected junior appropriator's right is met based upon the "65/85" criteria due to the call. Various documentation of the Department's analysis that Nebraska Public Power District's (NPPD) call was valid (the senior appropriation used for the 2008 Report regarding

the Niobrara) was produced in discovery, and was filed in this case by DNR. In addition, the Director has personal knowledge through his previous position in the Department that the call made was researched and found valid prior to any administration of surface water rights.

The NRDs did not present any substantive evidence that the analysis, as carried out, is wrong. In argument, the NRDs challenged the "flow demand" used for the calculation on the basis of an alleged misassignment of the amount due NPPD under appropriation A-359R. DNR offered that this amount is insignificant to the result for the purpose of Neb. Rev. Stat. § 46-713(3)(a) in rebuttal affidavits of its experts. The NRDs present only a legal argument made through their hydrology expert, (Exhibit 3, at pages 35 and 36) that the flow demand of the senior appropriator, NPPD for Spencer Hydropower Plant, used by the Department for calculation of the Neb. Rev. Stat. § 46-713(3)(a) criteria was erroneous. The expert argued that the Department should have subtracted flow amounts attributable to subordination agreements with upstream junior appropriators made by NPPD pursuant to the constitutional preference system for water uses. No legal basis for the supposed hydrologic assertion was provided, nor was any evidence in support of the legal argument presented in this case.

The NRDs made a parallel argument in their post-hearing brief that the validity of the senior appropriator's (NPPD's) right used for assessment of fully appropriated status was uncertain due to the Department's dismissal of a third party's case asking the Department to deny NPPD's right to make a call on the river for their appropriation. The Department dismissed that case (In Re 2007 Administration of Niobrara River, NDNR # 001-07-CC) after a hearing on a motion to dismiss for mootness and lack of jurisdiction. The dismissal was appealed, and was returned to the Department on July 31, 2009, on remand for hearing.

While the plaintiffs in *2007 Administration* have no privity to NRDs, the NRDs argued offensive collateral estoppel in the case at bar based upon a pending appeal of *2007 Administration* before the Court of Appeals, now remanded back to the Department. Estoppel under neither claim nor issue preclusion are appropriate based upon the pleadings in the two cases because neither are the issues the same, nor is there any mutuality to the claims. The six elements required to be met for equitable estoppel to apply, as set out in Becton-Dickenson, 276 Neb. 640, 756 N.W.2d 280 (2008) are not met. The NRDs' argument that the Order should not have been issued without resolution of *2007 Administration* is not convincing.

The Department has no authority to delay its duty to timely evaluate and make basin determinations under Neb. Rev. Stat. § 46-713 based upon any pending litigation. Generally, the Department has no practical alternative but to consider its rules valid and its orders *res judicata* for the purposes of other matters before it and for carrying out its statutory duties on time. This position is supported both by administrative necessity, principles of judicial efficiency, and the common law notion that a pending writ of error does not vacate a judgment, *Restatement, Judgments § 41.*

The NRDs argued in their closing brief that NPPD, the senior appropriator for purposes of the circumstances leading to the Order, has a defective appropriation for this purpose, in that NPPD's appropriative right is for use to generate power rather than for irrigation. The NRDs asserted that such a right is defective for the purposes of 457 NAC 24 001.001 because it is "...at all times subject to divestiture under the Constitutional preference afforded to irrigators." The NRDs misunderstand the Constitutional preference, characterizing it as a "divestiture" and ignoring the central context and objective of that provision for distinguishing who is due any compensation in conflicts between water users. Both water rights of the competing uses remain valid and ongoing, even in the event of subordination agreements drawn to establish compensation due under the preference. In any event, having determined the senior calling right valid for purposes of the call prior to issuing closing notices, no additional analysis is necessary by the Department for purposes of the annual evaluation. Subordination agreements are between individual appropriators, do not affect priority, and are unnecessary to the Department's knowledge and consideration for determining a basin fully appropriated. The legal arguments offered only tend to obscure the simpler calculations required by Neb. Rev. Stat. § 46-713(3)(a) and the Department's rules.

The NRDs' arguments generally restate the case of In Re 2007 Administration of Niobrara River, NDNR # 001-07-CC, but it is not specifically part of the pleadings in the case at bar. As noted above, that case is currently before the Director. For this case, the Director finds as a legal fact based upon documents filed in this case, that the appropriations held by the senior appropriator used for purposes of calculations under Neb. Rev. Stat. § 46-713(3)(a) were examined for current beneficial uses and considered valid by the Department at the time of their use for developing the Order. The Director, therefore, concludes that all the criteria necessary for the Order under Neb. Rev. Stat. § 46-713(3)(a) is met, the required analysis is sufficiently described for the purpose of Neb. Rev. Stat. § 46-713(1)(d), is legally sufficient for the Order, and is not, therefore, arbitrary or capricious.

9. The NRDs did not plead but did assert in their closing brief that the holding of Spear T Ranch v. Knaub, 269 Neb. 177 (2005) invalidates the Department's use of calls by senior surface water appropriators, as in 457 NAC 24 001.01A, to affect a determination that a basin is fully appropriated which, in turn, may subsequently affect ground water users in that basin. No evidence was presented in support of the contention. However, the stipulated facts do include 457 NAC 24, which says in conclusion of 001, "...nothing in this section is intended to express or imply a priority of use between surface water uses and ground water uses." Rule 457 NAC 24 is valid, was used as intended for the Department's analysis under Neb. Rev. Stat. § 46-713, and is not challenged by pleadings in this case. In addition to the irrelevancy of the NRDs' argument for this case, the Director believes that if a criteria alleged preferable by the NRDs in their closing brief, that only a losing stream or reach may be designated as fully appropriated, had been used for the purposes of the Order, it would be immediately suspect as flawed under other existing criteria for arbitrariness in addition to defeating the intent of LB 962. The Director finds as a matter of law that the methods used by the Department for the

evaluation of hydrologically connected water and performing its duties under Neb. Rev. Stat. § 46-713 do not express or imply any priority of use between surface water uses and ground water uses, and concludes the methods appropriately assess the availability of hydrologically connected water as required, and there is no resulting legal impairment to the Order.

10. Jacobson argued, but does not present evidence, that the Order amounts to an unconstitutional taking of private property without compensation, and that the Order violates the Commerce Clause of the U.S. Constitution. In a related argument, Jacobson asserted that the Order violates the federal Homestead Act, and that the Department lacks subject matter jurisdiction to hear his case. The Director finds evidence presented at the hearing to the effect that the Order, authorized by Neb. Rev. Stat. § 46-713, has the legal context of an administrative duty of the Department pursuant to the regulatory scheme of the Act and concludes, as a matter of law, it is as such a legal limitation on the use of ground water (and surface water), is not a taking, and is reasonable.

    Neb. Rev. Stat. § 46-702 clarifies that the State owns the water, but landowners are entitled to reasonable and beneficial use of the ground water underlying their land consistent with common law but subject to the correlative rights of other landowners and the State's authority to regulate pursuant to Nebraska Statutes Chapter 46, Article 6, and the Act. The Director concludes as a matter of law, in any event, that the Department has no jurisdiction to find a state statute unconstitutional, that the federal Homestead Act has no bearing on this case, and that while Jacobson is correct that the Department lacks jurisdiction to decide issues of constitutional and other federal law, the Department does have jurisdiction to hear cases derived from final administrative decisions made by the Department without a prior hearing.

11. The NRDs pled that the Department exceeded its authority by including areas outside the Niobrara River surface water basin within the hydrologically connected area for the Order. No evidence or argument was later provided, undoubtedly because the Nebraska Supreme Court settled the question in Upper Big Blue v. NDNR, 276 Neb. 612 (2008) holding that the Act anticipated that hydrologically connected water might be outside a surface water basin boundary, and that the Department did not exceed its authority under Neb. Rev. Stat. § 46-713(1)(a) and (d) or 457 NAC 24 001.02 to make such a determination.

12. Both Jacobson and the NRDs pled that the Department was in error for not considering economic impacts to the affected area in making a determination for the Order. Both allegations misread the Department's actual duties under Neb. Rev. Stat. § 46-713 and electively substitute a requirement for an integrated management plan developed some time after the effective Order. "An integrated management plan shall include the following: (a) Clear goals and objectives with a purpose of sustaining a balance between water uses and water supplies so that the economic viability, social and environmental health, safety, and welfare of the river basin, subbasin, or reach can be achieved and maintained for both the near term and the long term . . . ." Neb. Rev. Stat. § 46-715(2). The Director finds, as a matter of law, that there

is no legal requirement for the Department to consider economic impacts in developing the Order, that lacking economic impact analysis is no error or flaw for the Order, and that if the Department had considered economic impacts for purposes of determinations for the Order it would have exceeded its authority.

13. The ultimate question before the Director in this case is whether data, information, and calculations used for conclusions of the 2008 Report, and therefore the resulting Order, are not supported by competent and relevant evidence, or that they are arbitrary, capricious, unreasonable or contrary to law. The burden of proof on the question is that of petitioners Jacobson and the NRDs. The criteria for analysis is the same addressed by the Nebraska Supreme Court in In re Water Appropriation A-4924, 267 Neb. 430 (2004) and are the same as would be addressed in any similar challenge to administrative decisions on appeal. (See City of Lincoln v. Central Platte NRD, 263 Neb. 141, 638 N.W.2d 839 (2002).) Therefore, the Director uses the same criteria from *A-4924* to apply for consideration in this case:

    A. "A decision is arbitrary when it is made in disregard of the facts or circumstances and without some basis which would lead a reasonable person to the same conclusion." Bethesda Found. v. Buffalo Cty. Bd. of Equal., 263 Neb. 454, 640 N.W.2d 398 (2002);

    B. "A capricious decision is one guided by fancy rather than by judgment or settled purpose." In re Application of Neb. Pub. Serv. Comm., 260 Neb. 780, 619 N.W.2d 809 (2000); and,

    C. "The term 'unreasonable' can be applied to an administrative decision only if the evidence presented leaves no room for differences of opinion among reasonable minds." Pittman v. Sarpy Cty. Bd. of Equal., 258 Neb. 390, 603 N.W.2d 447 (1999).

    The Director finds that the evidence presented shows that the decisions made for the 2008 Report and the Order are supported by competent and relevant evidence, and are not arbitrary, capricious, unreasonable, or an abuse of discretion.

14. The other question raised in this case is whether the Department, in the administration of its duties under Neb. Rev. Stat. §§ 46-713 and 46-714, applied procedures that were so flawed as to invalidate the Order. The burden of proof on this question is that of petitioners Jacobson and the NRDs. Based upon the stipulated facts and the preponderance of the evidence presented, the Director finds as a matter of law that the petitioners did not meet their burden of proof and that the Department followed the statutes and procedures outlined in valid rules and regulations, that the Department's decision was not arbitrary or capricious or an abuse of discretion or otherwise not in accordance with law. The Director further finds that the "deference . . . accorded to an agency's interpretation of its own regulations unless plainly erroneous or inconsistent," as cited in Upper Big Blue v. NDNR, 276 Neb. 612 (2008) requires a conclusion of law that procedures used by the Department in developing the 2008 Report and Order were not flawed for the purpose of invalidating the Order in whole or in part.

15. As noted above, standing to bring this action was not raised in the hearing record, nor was it argued, and an analysis of standing is not

necessary for reaching the decision in the case. Nevertheless, the Director wishes to note that the NRDs properly identify themselves as governmental entities in the pleadings and do not convincingly assert they will be harmed or affected in a legally cognizable way. Their assertion of interest is a statement that they will be required to engage in developing an integrated management plan at the cost of their taxpayers and that it may result in economic harm to the area.

As the Court held in Metropolitan Utilities District v. Twin Platte NRD, 550 N.W. 2d 907 (1996), the fact that a natural resources district's constituents might be affected by the case's subject matter did not itself confer standing. In addition, Saunders County v. MUD, 645 N.W.2d 805 (2002) held that while both the U.S. and Nebraska constitutional guarantees of due process apply to any "person" and ". . . a creature and political subdivision of the State . . . is neither a natural nor an artificial person." However, natural resources districts as "entities," may be considered "interested persons" under NAC 454 7 001.05 if they "... [are] or could be adversely affected in a legally cognizable way by the outcome of a [contested] proceeding." The Director notes that integrated water management planning, a consequence if a basin is declared fully appropriated, is a statutory duty of both natural resources districts and the Department under the Act, while final determination of fully appropriated is solely the duty of the Department under Neb. Rev. Stat. § 46- 714(5). The Director does not consider engaging in their statutorily designated duties as an adverse affect to the NRDs as a result of the Order. The Act, specifically Neb. Rev. Stat. §§ 46-718 and 46-719, otherwise identifies conflicts or disagreement between the Department and the NRDs over integrated management plans as the jurisdiction of the Interrelated Water Review Board (Board). The Board has never been called, and there is, therefore, no case law on a Board decision. No ruling is made on standing for this case as the hearing proceeded and the findings and conclusions otherwise made above support the original Order.

AS A RESULT OF THE ABOVE ANALYSIS OF THE HEARING AND CASE RECORD, THE DIRECTOR MAKES THESE FINAL CONCLUSIONS OF LAW:

1. The Department's annual evaluation of the Niobrara River Basin as published in the *2008 Annual Evaluation of Hydrologically Connected Water Supplies* meets all the requirements of law for making the preliminary determination that portions of the Lower Niobrara Basin are fully appropriated.

2. The January 25, 2008, Order determining portions of the Lower Niobrara Basin to be fully appropriated is not arbitrary or capricious; or contrary to law; or invalid, in whole or in part, and is within the Department's authority.

AND ORDERS: The January 25, 2008, Order is hereby upheld.

DEPARMENT OF NATURAL RESOURCES

December 17, 2009

Brian P. Dunnigan, P.E., Director

CERTIFICATE OF SERVICE

The undersigned certifies a copy of this Final Order was served personally to the Department's staff attorney, Jean Angell, and was served via first class U.S. Mail on December 17, 2009, to the following parties of record or their counsel:

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Ron Theis, Clerk

Acronyms

AID	**Ainsworth Irrigation District**
AOP	**Annual Operating Plan**
BA	**Biological Assessment**
BO	**Biological Opinion**
CA	**Cooperative Agreement**
CDR	**Center Conflict Resolution**
CNPPID	**Central Nebraska Public Power and Irrigation District**
COHYST	**Cooperative Hydrology Study**
CPNRD	**Central Platte Natural Resource District**
CY	**Calendar Year**
EA	**Environmental Account**
EAC	**Environmental Account Committee**
ECONorthwest	**ECONorthwest**
Excom	**Executive Committee of Instream Flow Council**
FEIS	**Final Environmental Impact Statement for the Master Manual**
FERC	**Federal Energy Regulatory Commission**
IAFWA	**International Association Fish and Wildlife Agencies**
IFC	**Instream Flow Council**
IFCRC	**Instream Flow Coordination and Review Committee**
IMP	**Intergrated Management Plan**
LNNRD	**Lower Niobrara Natural Resource District**
MNNRD	**Middle Niobrara Natural Resource Committee**
MRRIC	**Missouri River Recovery Implementation Committee**
NEPA	**National Environmental Protection Act**
NNESC	**Nebraska Non-Game and Endangered Species Conservation Act**
NDC	**New Depletions Committee**
NDNR	**Nebraska Department Natural Resources (formerly Nebraska Department of Water Resources-NDWR)**
NGPC	**Nebraska Game and Parks Commission**
NPPD	**Nebraska Public Power District**
NRC	**National Research Council**
NRD	**Natural Resource District**
NWPTF	**Nebraska Water Policy Task Force**
PS Task Force	**Pallid Sturgeon and Sturgeon Chub Task Force**
QAA	**Discharge Average Annual**
ROD	**Record of Decision**
UENRD	**Upper Elkhorn Natural Resource District**
ULNRD	**Upper Loup Natural Resource District**
UNWNRD	**Upper Niobrara White Natural Resoource District**
USACE	**United States Army Corps of Engineers**
USBR	**United States Bureau of Reclamation**
USDCDC	**United States District Court for District of Columbia**
USDI	**United State Department of Interior**
USFWS	**United State Fish and Wildlife Service**

USGS	**United States Geological Survey**
USIECR	**United States Institute for Environmental Conflict Resolution**
WWPRAC	**Western Water Policy Review Advisory Commission**

Water Equivalents Table

1. 1 cubic foot = 7.48 gallons = 62.4 lbs of water
2. 1 acre-foot = 43,560 cubic feet = 325,851 gallons of water
3. 1 acre-foot covers 1 acre of land with water 1 foot deep
4. 1 cubic foot per second (cfs) = 448.8 gallons per minute
5. 1 cfs = 646,272 gallons per day:
- For 24 hours = 1.984 acre-feet
- For 30 days = 59.5 acre-feet
- For 1 year = 724 acre feet

6 1 million gallons = 3.07 acre-feet
7. 1 million gallons per day (mgd) = 1,121 acre-feet per year
8. 1,000 gallons per minute (gpm) = 2.23 cfs
9. 1,000 gpm = 4.42 acre-feet per day
10. 10 cents per 1,000 gallons = $32.59 per acre-foot

Source: Water Center, University of Nebraska-Lincoln, UNL Water Center, http://watercenter.unl.edu

11.	**cfs**	**x**	**1.9835**	**=**	**acre-feet per day**
12.	**cfs**	**x**	**55.54**	**=**	**acre-feet per 28 day month**
13.	**cfs**	**x**	**57.52**	**=**	**acre-feet per 29 day month**
14.	**cfs**	**x**	**59.51**	**=**	**acre-feet per 30 day month**
15.	**cfs**	**x**	**61.49**	**=**	**acre-feet per 31 day month**
16.	**cfs**	**x**	**724**	**=**	**acre-feet per 365 day year**
17.	**cfs**	**x**	**726**	**=**	**acre-feet per 366 day year**

Source: Bentall, R. 1982. Nebraska's Platte River, A graphic analysis of flows. Nebraska Water Survey Paper 53, Conservation and Survey Division, Institute of Agriculture and Natural Resources, The University of Nebraska, Lincoln.