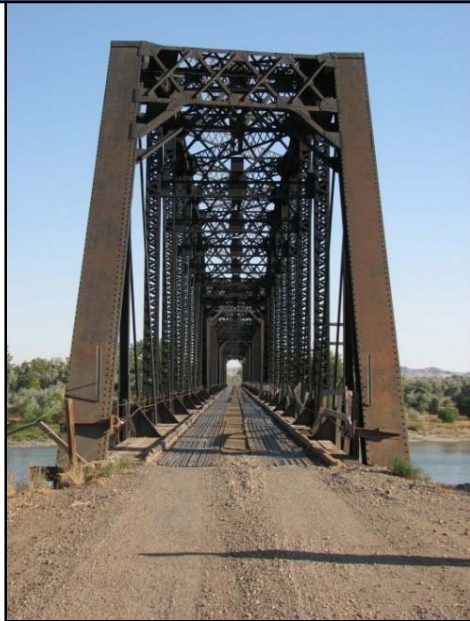


# Final Report

November 17, 2008

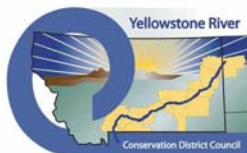
## Yellowstone River Historic Events Timeline

*Flooding, Ice Jams, Bridges, and Irrigation Infrastructure*



Prepared for:

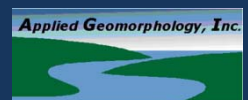
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## 1 Introduction

Over the last century, evolving land uses along the Yellowstone River have been accompanied by numerous types of human influences in the stream corridor. Common activities along the river and its major tributaries include bank armoring, land use conversion, irrigation infrastructure development, and transportation corridor development. Understanding the cumulative impacts of these activities requires some sense of their occurrence through time. Additionally, interpreting the driving forces for the activities requires an understanding of the timing of natural events such as floods. The information presented in this report is intended to support the development of a timeline that describes the progressive construction of numerous types of physical features within the stream corridor, along with the timing of natural events. To that end, this report provides tabulated summaries of historic occurrences in the corridor related to bridge construction, irrigation structure development, ice jam formation, natural grade control removal, and flooding.

The information provided in this report supplements a separate document entitled “*Yellowstone River Human Impacts Timeline*” (DTM and AGI, 2008). This Human Impacts Timeline document, which addresses Stillwater, Dawson, and Yellowstone Counties, describes the results of an air photo analysis of specific physical features such as dikes, levees, armor, and transportation embankments. For these three counties, a construction time frame was assigned to each mapped physical feature based on the interpretation of air photos dated 1950, 1976, 1995, and 2004. Whereas the first report contains results for Stillwater, Dawson, and Yellowstone Counties, the results presented herein are system-wide, and include documented floods, bridge construction, irrigation dam construction, and ice jams that have been identified between Gardiner, Montana, and the Missouri River Confluence in McKenzie County, North Dakota.

This work has been performed in support of the Yellowstone River Conservation District Council’s (YR CDC) ongoing efforts to complete a Cumulative Effects Study (CES) for the Yellowstone River corridor. This work was performed for the Custer County Conservation District and the Yellowstone River Conservation Districts Council.

The historic occurrences tabulation consists of the following primary tasks:

- Identify and tabulate historic flood events;
- Summarize the historic occurrences of ice jams based on available information;
- As possible, identify construction dates for bridges; and
- Summarize the historic implementation of major irrigation and flood control infrastructure.

In addition to the tabulated summaries, summary graphics have been developed to show the spatial and/or temporal distribution of these events.



## 2 Data Sources

All of the tables presented in this report reflect the compilation of existing data regarding historical events related to floods, ice jams, and bridge construction on the Yellowstone River. The following section describes those data sources.

### 2.1 Flood Events

A 75-year flood history for the Yellowstone River was developed based on available USGS gage data (Table 1). In addition to five Yellowstone River stream gages, major contributing tributary gages are included for the Shields, Boulder, Stillwater, Clarks Fork, Bighorn, Tongue, and Powder Rivers. The flood histories have been identified in terms of specific dates upon which the annual peak discharge equaled or exceeded a 10-year event. The flood frequencies were derived from the USGS flood frequency curves generated for each of the gages (<http://mt.water.usgs.gov/>).

**Table 1. USGS Stream gages utilized in flood history summary.**

USGS Stream Gage	Gage Number	Drainage Area (sq mi)	Period of Record
Yellowstone River at Livingston	6192500	3,551	1929-2007
Yellowstone River at Billings	6214500	11,805	1929-2007
Yellowstone River at Forsyth	6295000	40,146	1978-2007
Yellowstone River at Miles City	6309000	48,235	1929-2007
Yellowstone River at Sidney	6329500	69,083	1911-2007
Shields River near Livingston	6195600	852	1979-2007
Boulder River at Big Timber	6200000	523	1947-2007
Stillwater River near Absarokee	6025000	975	1935-2007
Clarks Fork Yellowstone at Edgar	6208500	2,022	1922-2007
Bighorn River near St Xavier	6287000	19,667	1935-2007
Tongue River at Miles City	6308500	5,397	1938-2007
Powder River near Locate	6326500	13,068	1938-2007

### 2.2 Ice Jams

The information regarding ice jams that is contained within this report was obtained from the Ice Jam Information Clearinghouse maintained by the Ice Engineering Group at the Army Corps of Engineers Cold Regions Research and Engineering Laboratory (<https://rsgis.crrel.usace.army.mil/icejam/>). The database currently holds over 16,000 records of ice jams from across the United States.

### 2.3 Bridges

Bridge information was compiled from a variety of sources. The Transportation Infrastructure framework Geodatabase (<http://giscoordination.mt.gov/transportation/data.asp>), maintained by Montana's Information Technology Services Division (ITSD) served as the foundation for the bridges dataset. Additional attributes for the Montana Department of Transportation (MDT) structures were obtained directly from MDT. Finally, some additional historical information was

obtained from the *Historic Bridges of the United States* website (<http://bridgehunter.com/category/waterway/yellowstone-river/>).

## **2.4 Irrigation-Related Infrastructure**

The irrigation infrastructure summary describes major irrigation-related structures on the Yellowstone River. The information for major structures was largely pulled from descriptions made available by the US Fish and Wildlife Service (<http://www.fws.gov/YellowstoneRiverCoordinator/fishpassage.html>) as well as the US Bureau of Reclamation (<http://www.usbr.gov/dataweb/html/loweryel.html>). Additional information regarding the history of these structures was provided by Burt Williams of The Nature Conservancy. Other, smaller scale diversion structures were mapped using aerial photography, the NRCS physical features inventory, and ditch locations as identified on topographic maps.



### 3 Results

The following section summarizes historic events on the Yellowstone River related to floods, ice jams, bridge construction, major irrigation infrastructure construction, and natural grade control removal. Detailed tables supporting this discussion can be found in Appendix A through Appendix C.

#### 3.1 Flood Histories

Flooding on the Yellowstone River is an important driving force with respect to channel migration, infrastructure damage, and bank armoring. Understanding historic rates of bank armoring requires an assessment of flood impacts, and historic aerial imagery and associated mapping should also be interpreted in the context of flood history. For this effort, all floods with a 10-year return interval (Q10) or larger have been identified. The Q10 is the flood that has a 10 percent probability of happening in any given year. The floods described as Q25, Q50, and Q100 (“100-yr flood”) have a 4%, 2%, and 1% probability of occurring in any given year, respectively.

Flood events that exceed Q10 at tributary and mainstem gaging stations are listed in Appendix A. On the mainstem, flood events that exceeded Q10 occurred in 1943, 1944, 1952, 1967, 1974, 1978, 1996, and 1997 (Figure 3-1). Each of these events is described in some detail in Table 2. When the peak flow records are scrutinized with respect to the events, only the 1943 flooding appears to be a system-wide snowmelt event. Typically, single major flood events either occur on the upper river or lower river, but not both.

On the mainstem Yellowstone River, these floods most commonly occur during the month of June, although at Sydney, three of the recorded annual peaks that have exceeded Q10 occurred in March (Figure 3-2). The flood histories on the tributaries support this trend, with peak annual flooding occurring in June and July on the upper tributaries (Shields, Boulder, Stillwater, Clarks Fork and Bighorn), and between February and May on the lower Tributaries (Powder and Tongue Rivers).

In general the flood history in the Yellowstone River corridor shows the following characteristics:

- Flood events recorded since 1942 can generally be described as “upper river floods” or “lower river floods”;
- The 1953-1966 time frame is characterized by numerous flood events on tributary streams, but no resulting flooding on the mainstem of the Yellowstone;
- The 1979-1995 and 1998-2007 time frames are characterized by minimal flooding on tributaries, and no floods on the Yellowstone River;
- Tributary flooding from the Boulder River at Big Timber to the Bighorn River tends to occur during the months of June and July;
- Tributary flooding on the Tongue and Powder Rivers is most pronounced between February and May.

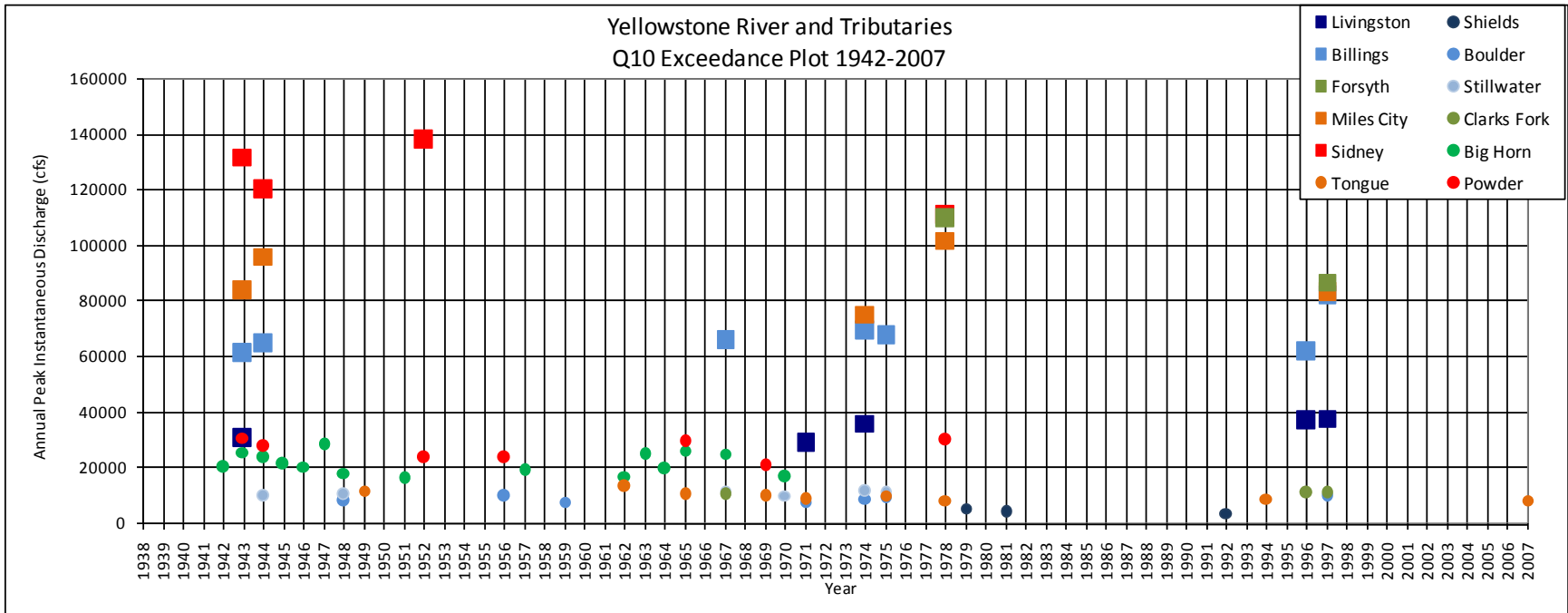
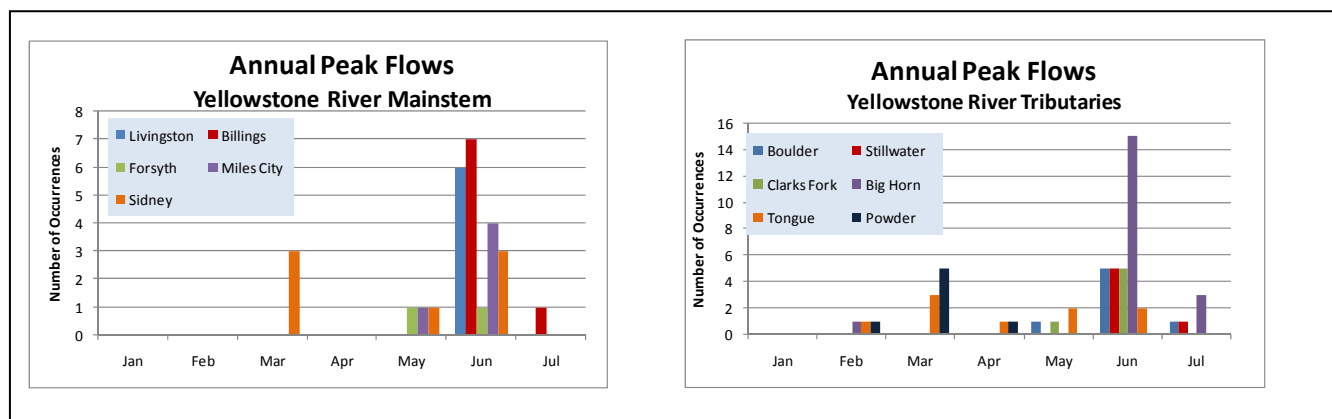


Figure 3-1. Flood events with discharges exceeding a 10-year return interval, Yellowstone River corridor.

**Table 2. Summary of flood events on Yellowstone River since 1942.**

<i>Year</i>	<i>Peak Discharge at Livingston</i>	<i>Peak Discharge at Miles City</i>	<i>Peak Discharge at Sydney</i>	<i>Tributaries Flowing at &gt;10 yr event</i>	<i>Comment</i>
1943	Q10-Q25 (30,600 cfs on June 20)	Q10- Q25 (83,700 cfs on June 26)	Early season Q25-Q50 (132,000 on March 29)	Bighorn	Two events in 1943. In March, a lower river 25-50 year event was recorded at Sydney. Later, on June 27, the mean daily flow at Sydney was 83,600 cfs (no instantaneous peak flow is available for this event). The largest contributing tributary to the June flood was the Bighorn River with 50-100 year event (25,800 cfs). The Powder River peak (31,000 cfs) in 1943 was Feb 19, prior to these two floods.
1944	<Q10	Q50-Q100 (96,300 cfs on June 19)	Q10- Q25 (120,000 on June 21)	Stillwater, Powder, and Bighorn	Largest tributary flood on Bighorn: 25-50 yr event (23,900 cfs on June 28); Powder River annual peak (28,000 cfs, 10-25 yr event) was on Mar 19, but mean daily flow on June 20 was 23,500 cfs (>10 yr event), so Powder was the major contributor to June 21 peak at Sydney. Stillwater peaked at 9820cfs (10-25 yr event) on June 27.
1952	< Q10	< Q10	Q25-Q50 (138,000 cfs on March 31)	Powder	Early season event on lower river; Powder River contributed 10-25 yr event (23,900 cfs) on March 30.
1967	< Q10	< Q10	< Q10	Stillwater, Clarks Fork, Bighorn	Major flood on Stillwater River (12,000 cfs, 50-100 yr event on June 15); also, later, a 25-50 yr event on Bighorn (25,300 cfs on July 5); mainstem peak at Billings occurred with the Stillwater flooding, with a 10-25 year event (66,100 cfs) on June 16. No other mainstem discharges exceeded 10-yr event.
1971	Q10 -Q25 yr event (29,200 cfs on June 23)	< Q10	< Q10	Boulder, Tongue (Feb)	Relatively small event on upper river; 8000 cfs (10-25 yr event) on Boulder, with June 23 peak; Tongue River peak in 1971 (9,000 cfs) was on February 15, so not part of this event.
1974	Q50-Q100 (36,300 cfs on June 17)	Q10- Q25 (75,400 cfs on June 22)	< Q10	Boulder, Stillwater	Upper river flood event; Boulder contributed 10-25 yr event (9,080 cfs on June 18), and Stillwater contributed 25-50 yr event (11,600 cfs on June 18).
1975	< Q10	< Q10	< Q10	Boulder, Stillwater, Tongue	~25 yr flood event at Billings (67,600 cfs on July 7); primary contribution from 25-50 yr event on Boulder (9450 cfs on July 5), also earlier ~50 yr event on Stillwater (11,600 on June 18). Tongue River peak (10,200 cfs) was earlier, on May 7.
1978	<10 yr event	Q50-Q100 (102,000 cfs on May 22)	Q10- Q25 (110,000 cfs on May 23)	Tongue, Powder	Lower river event; 50-100 yr event at Forsyth (109,800 on May 21); major tributary contribution from Tongue (10-25 yr event , 8650 cfs on May 23). Powder had a mean daily flow of 22,200 cfs on May 22 (>10 yr event), although annual peak was 25-50 yr event (30,000 cfs) on March 22, prior to this flood.
1996	Q50-Q100 (37,100 cfs on June 10)	< Q10	< Q10	Clarks Fork	Upper river event; 10-25 yr event at Billings (61,900 on June 12); 10-25 yr event on Clarks Fork (11,000 cfs on June 15).
1997	Q50-Q100 (38,000 cfs on June 6)	Q10- Q25 (83,300 on June 15)	< Q10	Boulder, Clarks Fork	Primarily upper river event; 50-100 yr event at Billings (82,000 cfs on June 12); 10-25 yr event at Forsyth (87,100 cfs on June 14); Boulder River contributed 25-50 yr event (9,940 cfs on June 5), and Clarks Fork contributed 10-25 yr event (11,100 cfs on June 12).



**Figure 3-2. Months during which annual peak discharges exceeded a 10 year event, Yellowstone River and tributaries.**

### 3.2 Ice Jams

Since the late 1800s over 100 ice jams have been occurred on the Yellowstone River. These ice jams have caused infrastructure damage, flooding, and loss of life and property. Similar to flooding, the ice jam history on the Yellowstone may play an important role in interpreting human impacts within the river corridor, as areas most prone to ice jamming have management challenges that are different than those where ice jams are rare. Also, certain human impacts, such as bridges, may result in flow constrictions and a higher propensity for ice jamming.

Appendix B contains a tabulated summary of ice jam events that are recorded in the USACOE Ice Jam Information Clearinghouse for the Yellowstone River and its major tributaries. The table contains the location of the ice jam, its date of occurrence, and the ice jam description contained within the database. Each jam recorded for the Yellowstone River has also been attributed by reach designations that were developed as part of the Cumulative Effects Study (AGI and DTM, 2004). In many cases, multiple jams occurred on a single date. In only one case, however, (April 7, 1965) two entries exist for the same ice jam.

On the Yellowstone River, only three reaches have more than five reported ice jams. These reaches include Reach C16, Reach D6, and Reach D13. Reach C16 is located at Miles City. Descriptions of the Miles City ice jams include gage height measurements that reflect backwatering from ice (Appendix B), descriptions of flooding on both the Tongue and Yellowstone Rivers, levee damage, and large scale evacuations. The majority of ice jams at Miles City occurred in March (Figure 3-3). One ice jam that occurred at Miles City on March 20, 1944, was bombed by planes in an effort to break up the jam (Appendix B):

March 20, 1944. Note says "Backwater from ice; gage height, 21.7 feet, present site and datum, from flood mark." As reported in the Miles City Star on Tuesday, June 17, 1997, "Severe ice jams in 1944 pushed the Yellowstone past 19 feet before the river crested. Hundreds of residences had to be evacuated before planes were called in to bomb the ice jams and even the flow. ... After the dike was built, [the Miles City Dike, built in 1936] it suffered its first extensive damage during the March 1944 flood in Miles city. The cause of the flood was by ice jams at the mouth of the Tongue River during the spring runoff and ice breakup, which caused the water to back up and rise, according to Corps history. Due to runoff and ice-breakup period in

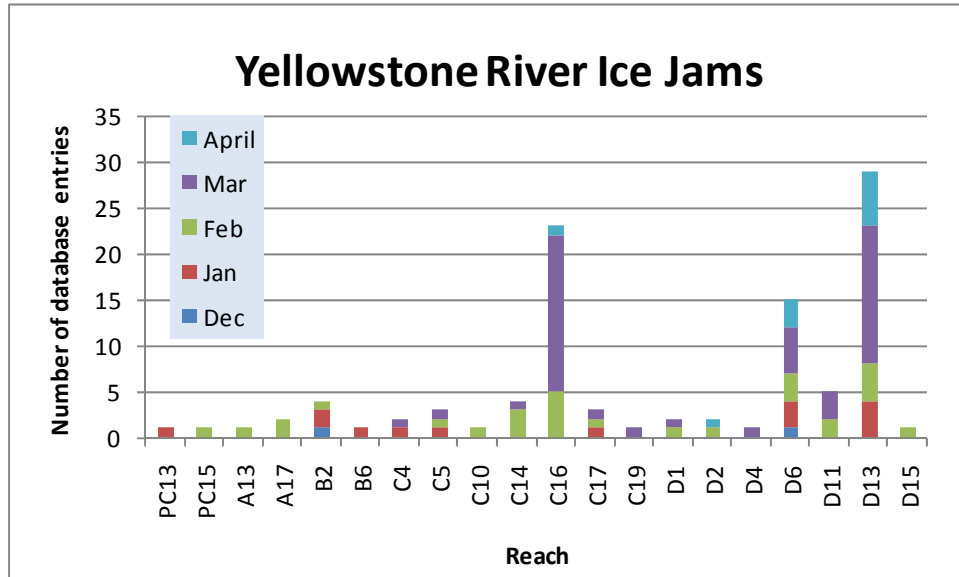
March the flow in the Yellowstone River subjected the levee to erosion and undercutting. Local interests are reported to have fixed the damage and restore the levee to its original cross-section, orientation and profile. Four locations were listed by the Corps for areas of damage during the 1944 flood. The first place was upstream from Main Street bridge during that era. The second place was downstream from the Chicago, Milwaukee, St. Paul and Pacific Railroad area. At this site, the Tongue River overflowed the levee, washing out the dike for about 60 feet. The third place was at the intersection of the levee and Vinton Street, where the Yellowstone River undercut the levee through erosion of the river bank and the levee slope-foundation for approximately 125 feet. The final location of damage was between Lewis Street and Tatro Street, where the levee was breached for about 220 feet, according to the Corps report, which added that repairs were completed that same year by local interests as a cost unknown." -- Keywords: Yellowstone River at Miles City, MT on Mar 20, 1944 [11440]

Reach D6 is located at Glendive, where ice jams have developed during the months of December, January, February, March, and April (Figure 3-3). One of the most damaging ice jams happened in Reach D6 at Glendive in 1899, where three bridges were destroyed and 12 people died. Based on records from the Glendive Independence newspaper, the summary of the event contained in the ice jam database is as follows (Appendix B):

Yellowstone River at Glendive--1899 Often a search of local historical records reveals ice jam information that is not contained elsewhere. One such example is the Yellowstone River flood at Glendive in April 1899, of which no mention was made in the usual sources. Discussions with local residents led to a search of old newspaper records which indicated that, in fact, twelve people lost their lives, numerous livestock drowned, many homes were washed away, and several spans of the Yellowstone River Bridge were destroyed during this event. These types of historical records can be quite dramatic: according to the newspaper records, when the ice broke and began running on Friday evening, April 7, 1899, nearly the entire population of Glendive gathered to view the huge (nearly one hundred square foot) cakes of ice crush against the ice breaks (rock-filled timber crib structures) built in front of each pier on the Yellowstone River Bridge. Moments before the ice began to move, the water gage on the ice break registered 19 feet, but after the ice began moving the gage rapidly rose to 30 feet. After the ice run, three of the bridge spans had been washed downstream. Witnesses said that had the bridge been five feet higher, and had all of the ice breaks been built as large and as strong as ice break No. 2, the bridge would still be standing. At the time, the Yellowstone River Bridge was the largest wagon bridge in the entire northwest. It was 1750 feet long and included a draw span that was 326 feet long. The bridge, including approaches and ice breaks, cost Dawson County 50,000 dollars to construct, and was estimated to cost at least 20,000 dollars to rebuild (1899 dollars). According to the newspaper account, when the waters started to inundate the land surrounding the Snyder Ranch, Mrs. R.W. Snyder, Miss Nellie Regan, Miss Rose Wybrecht, Mr. Eugene O'Conner, and Mr. Joseph Myers had to decide whether to move to higher ground (the railroad embankment) or to stay at the ranch. When they finally did make their decision to move to higher ground, which was approximately one block from the ranch, it was too late. The icy water was up to their waists before they made it halfway to the railroad embankment. Mr. O'Conner and Mr. Myers tried to assist the women into a tree, but the water and ice made it impossible, so they decided to tie Miss Regan and Miss Wybrecht to the tree with their suspenders so that the women wouldn't be washed downstream. Mr. Myers was able to climb the tree, but Mr. O'Conner and Mrs. Snyder were unable to climb to safety and were washed downstream, never to be found. Miss Regan and Miss Wybrecht were later found dead, still tied to the tree by the suspenders. Mr. Myers, the only ranch survivor, spent seven hours in the tree before he was rescued. The Snyder Ranch lost all of its livestock except two horses, one cow, two chickens, and two dogs. The bodies of the James Sullivan family were found on Sunday, April 9, 1899. All were found in bed except the eldest daughter and one of the younger children, who were found on the floor. The eldest daughter's skull was crushed. It was presumed that she received the wound from a piece of ice while trying to battle the angry waters. (The above information was edited from the Glendive Independence. The dateline for Saturday, April 8, 1899, appeared on the paper, although it was actually printed on Sunday, April 9, 1899, because of the ice jam.) -- Keywords: Yellowstone River at Glendive, MT on Apr 07, 1899 [20000216100330]

Reach D13 is located in Richland County near Sydney. In 1944, two floods on the Yellowstone were caused by "ice jams, heavy rains, and snowmelt." An ice jam in March 1951 caused the middle span of the Hwy 14 bridge on the south side of Sidney to fail. This reach has the largest number of ice jams recorded on the Yellowstone River. The description of the April 1, 1952 ice jam is as follows (Appendix B):

Two people of Richland County lost a law suit to the county on charges that their negligence was the cause of the flood. Supposedly, the dam they were attending to (Upper Anderson Dam) was neglected and as it gave out it let out tons of chunks of ice and debris which jammed and caused the massive flooding. The county was awarded \$27,473.33 in damages. The flooding occurred on the north side of the river east of Buford and south of Trenton. In a later lawsuit the Andersons won the case. By May 1, the state of Montana was awaiting a \$25 million appropriation for flood relief. maximum annual gage height of 19.7 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney, on March 30, 1952. March 31, 1952 C.F.S= 138,000 A printout obtained by Andy Tuthill from Richland county, Montana reported a 1952 flood caused by ice jams caused an estimated \$44,900 in rural damages. -- Keywords: Yellowstone River at Sidney, MT on Apr 01, 1952 [9154].



**Figure 3-3. Number of ice jam database entries for reaches of the Yellowstone River (multiple entries may exist for a single event).**

The tabulated summary of ice jams in Appendix B also contains records for major tributaries. A plot of the number of database entries present for the major tributaries show that the vast majority of ice jam database entries are for the Tongue River and Powder River. The majority of the jam events occurred during the month of March on both rivers. On the Tongue River, most of the reported ice jams occurred at the mouth, at Miles City. In February 1996, ice jamming was particularly extensive on the Yellowstone River and its tributaries. The Tongue River ice jam event description for Feb 6 1996, which includes descriptions of jams on the Little Bighorn River and Yellowstone River is as follows (Appendix B):

“An ice jam on the Little Bighorn River near Crow Agency, MT completely flooded four homes and threatened 50-60 others. The jam was located south of Crow Agency near the I-90 interchange with Route 212. I-90 was being flooded though it remained open to traffic. The jam was estimated as 3 football fields long. Other jams were reported along the Yellowstone south of Billings where Jellison and River Roads were being flooded. Another jam near Huntley was causing some flooding along the Yellowstone. Dynamite was used in Laurel to blast other jams on the Yellowstone. In Miles City, a five-mile-long jam blocked the mouth of the Tongue River where it empties into the Yellowstone (it was reported that it was backed up to the I-94 bridge south of Miles City) forcing the evacuation of about 10 families in Clinton. Twenty-nine of Montana's 56 counties reported flooding on this day. Ice jams were also reported between Miles City and Big Timber along the Yellowstone. Approximately, 50,000 sand bags were ordered from Fort Peck, MT. The total damages for February's ice jams in Montana include...\$1.8 million in publically owned facilities, two homes completely destroyed, 197 homes damaged 46 of which had to be evacuated, three deaths and two train

derailments. MRD Datacol and NWS Flood Advisories reported an ice jam on the Tongue River in Miles City, MT on 2/9/96. -- Keywords: Tongue River at Miles City, MT on Feb 06, 1996 [9040].”

On the Powder River, ice jams have been documented at Locate as well as near Moorhead. One event in March of 1944 described “large ice jams on the Powder River about 20 miles south of Broadus”. As USGS gaging stations are present at both Locate and Moorhead, the ice jam database contains numerous references to the gage height as affected by backwater from ice.

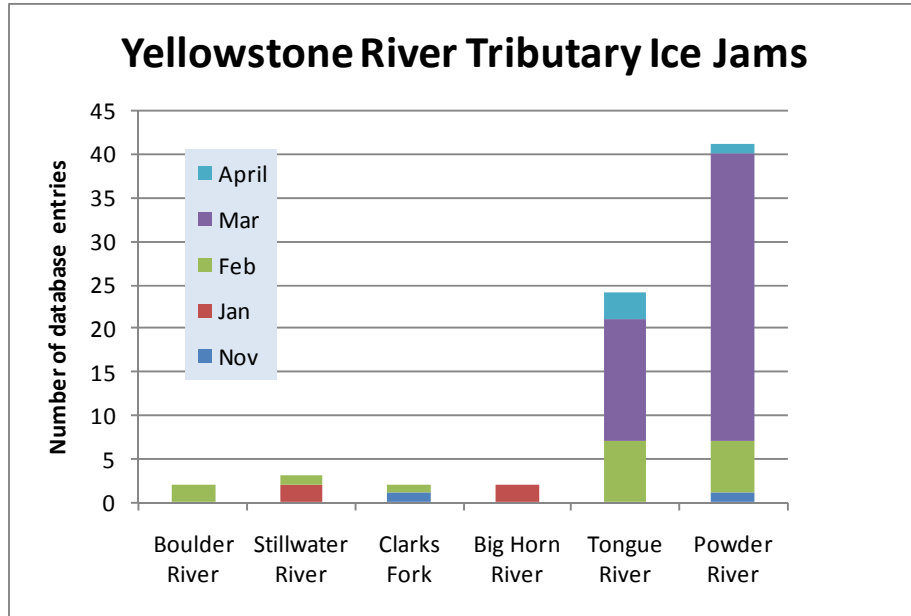


Figure 3-4. Number of ice jam database entries for major Yellowstone River tributaries.

### 3.3 Bridges

Bridges can have a major influence on river behavior, by encroaching into the river corridor, creating backwater-induced flooding, and promoting the use of bank armor to protect approaches and abutments. Bridges are also an important component of the overall transportation infrastructure of the Yellowstone River corridor, contributing to the economies of local communities. As the Yellowstone River supports railroad lines and an Interstate Highway, the largest bridges are commonly associated with these transportation features. Numerous smaller structures are also present, however, that may be important components of the overall human impacts to the system. The “*Yellowstone River Human Impacts Timeline*” (DTM and AGI, 2008) summarizes the lengths of encroaching bridge approaches in Stillwater, Dawson, and Yellowstone Counties based on air photo interpretation.

Information has been compiled for a total of 55 bridges that cross the Yellowstone River (Appendix C). Park County has the highest number of bridges, with a total of 16 (Figure 3-5). Prairie County and Richland County have only one bridge each. When the average bridge length is calculated for all of the bridges within a single county, it is clear that as the river increases in size downstream as bridge lengths increase commensurately (Figure 3-6). In Park County, the

average span is approximately 400 feet, whereas in Dawson County, the bridges average over 1,500 feet in length.

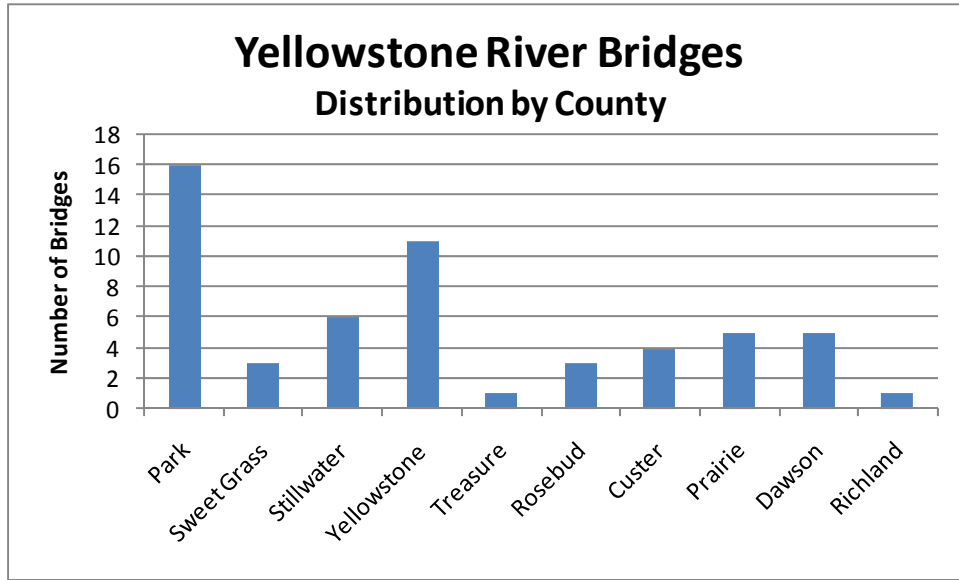


Figure 3-5. Number of bridges inventoried in each county.

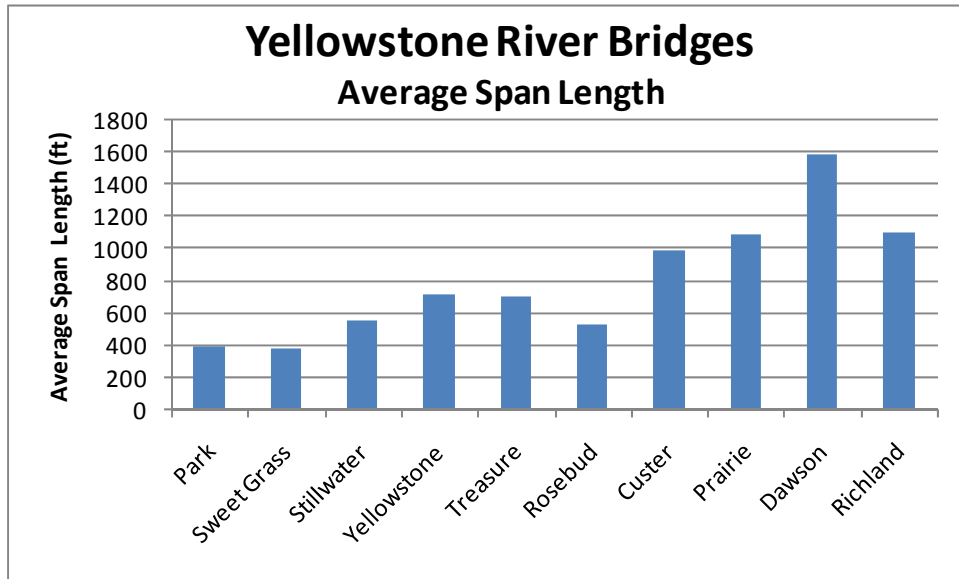


Figure 3-6. Average span length of Yellowstone River bridges by county.



### 3.4 In-Stream Structures

On the Yellowstone River, human influences over the past century have included the construction of infrastructure within the active channel cross section. Irrigation diversions composed of rock or concrete typically block or partially block the primary channel. Several large pump stations on the channel margin also support irrigation activities. These structures all feed canals and ditch systems, which may isolate historic floodplain area. All of these features, as well as tributary structures, affect the hydrology of the Yellowstone River, as well as the nature of sediment transport through the system. Other types of instream structures that may be important to understanding the human influences in the system are natural grade controls, as several of these bedrock drops have been removed to facilitate navigation on the river. To that end, the instream structures summarized in this report include the following:

- Major irrigation diversion structures
- Minor irrigation diversion structures
- Major irrigation pumping plants
- Major tributary dams
- Natural bedrock formations

#### 3.4.1 Major Diversion Structures

Between Billings and Sydney, a total of six irrigation diversion dams cross the Yellowstone River. These dams include Huntley, Waco-Custer, Rancher’s Ditch, Yellowstone, Cartersville, and Intake (Table 3). All six of these major irrigation structures are fish passage barriers to some extent. However, the degree to which each structure impedes passage depends on river stage and the swimming ability of the various species trying to negotiate the structures (<http://www.fws.gov/YellowstoneRiverCoordinator/fishpassage.html>).

In addition to these diversions, the Buffalo Rapids project consists of a large irrigation pumping system that provides irrigation water to the Glendive, Fallon, and Terry areas. Numerous other small diversions have been mapped, and summarized by location. Natural bedrock grade controls are also summarized, as several of these features have been modified to facilitate navigation on the lower river.

**Table 3. Summary information for six major irrigation diversions between Billings and Sydney.**

<i>Name</i>	<i>Location</i>	<i>Reach</i>	<i>Crest Length (ft)</i>	<i>Diversion Capacity (cfs)</i>	<i>Date Completed</i>
Huntley Dam	Huntley	B4	325	600	1934
Waco-Custer	W of Custer	B9	210	125	1907
Rancher's Ditch	Downstream of Bighorn R. confluence	C1	1,040	No data	1904
Yellowstone Ditch	W of Hysham	C3	660	No data	1909
Cartersville	Forsyth	C10	800	No data	1934
Intake Diversion	Downstream of Glendive	D8	700	1,200	1911

### 3.4.2 Huntley

Huntley Diversion Dam (Plate 1), which is approximately two miles southwest (upstream) of Huntley, feeds a 32 mile long main canal trends easterly and irrigates a strip of land ranging from one to four miles in width (<http://www.usbr.gov/dataweb/html/huntley1.html>). The structure diverts flow into the Huntley Main Canal, which follows the southern margin of the Yellowstone River floodplain. The diversion capacity of Huntley Dam is 600 cfs, and the project has the capacity to provide irrigation water to 30,000 acres of farm land. The crest length of the structure is 325 feet, and its structural height is 10.5 feet ([http://www.usbr.gov/dataweb/dams/yellowstone\\_river\\_diversion.htm](http://www.usbr.gov/dataweb/dams/yellowstone_river_diversion.htm)). The Huntley diversion structure was originally constructed as a temporary earthfill dam in 1931. In 1934, the temporary structure was modified to a concrete weir. In 1959, the dam underwent considerable rehabilitation due to undermining caused by settling and cracking of the concrete structure. As part of repairs required after recent flooding on the river, a fish passage channel was constructed around the north end of the dam. The structure is located at a point of split flow on the river, and blocks only the main channel. However, 2001 color infra red air photos of the site show that at low flows, the unblocked secondary channels are essentially dry and therefore incapable of passing fish.



Plate 1. 2005 aerial image of Huntley Diversion Dam.

### 3.4.3 Waco-Custer

The Waco-Custer ditch company was formed in the early 1900's, and the diversion dam was constructed shortly thereafter (<http://www.fws.gov/YellowstoneRiverCoordinator/Waco-custer.html>). The Waco-Custer diversion (Plate 2) supports approximately 4,300 acres of irrigation, with a diversion capacity of 125 cfs. The structure is located approximately eight miles west of Custer, at River Mile 320. At the diversion, the Yellowstone River flows through two main channels, and the structure itself blocks only the right channel. The structure feeds the Waco-Custer Canal, which flows on the right (as viewed downstream) floodplain surface of the Yellowstone River.



Plate 2. 2004 aerial image of Waco-Custer Diversion Dam.

### 3.4.4 Ranchers Ditch

The Rancher's Ditch diversion dam (Plate 3) is located approximately 2.5 miles downstream of the Bighorn River confluence. The dam was constructed in the early part of the 20<sup>th</sup> century and feeds a canal that flows on the north side of the Yellowstone River. The diversion capacity of Rancher's Ditch diversion is unknown. There is a large, vegetated island in the Yellowstone River at the point of diversion, and diversion dams block channels on both sides of the island.



Plate 3. 2005 aerial image of Rancher's Ditch Diversion Dam.

### 3.4.5 Yellowstone Ditch

The Yellowstone Ditch Diversion Dam (Plate 4) is located west of Hysham at River Mile 282. The structure was built in 1909. At the diversion, the Yellowstone River flows within a single thread, however the channel segment upstream of the bridge that extends to Myers Bridge is characterized by multiple anabranching channels that form large vegetated islands.

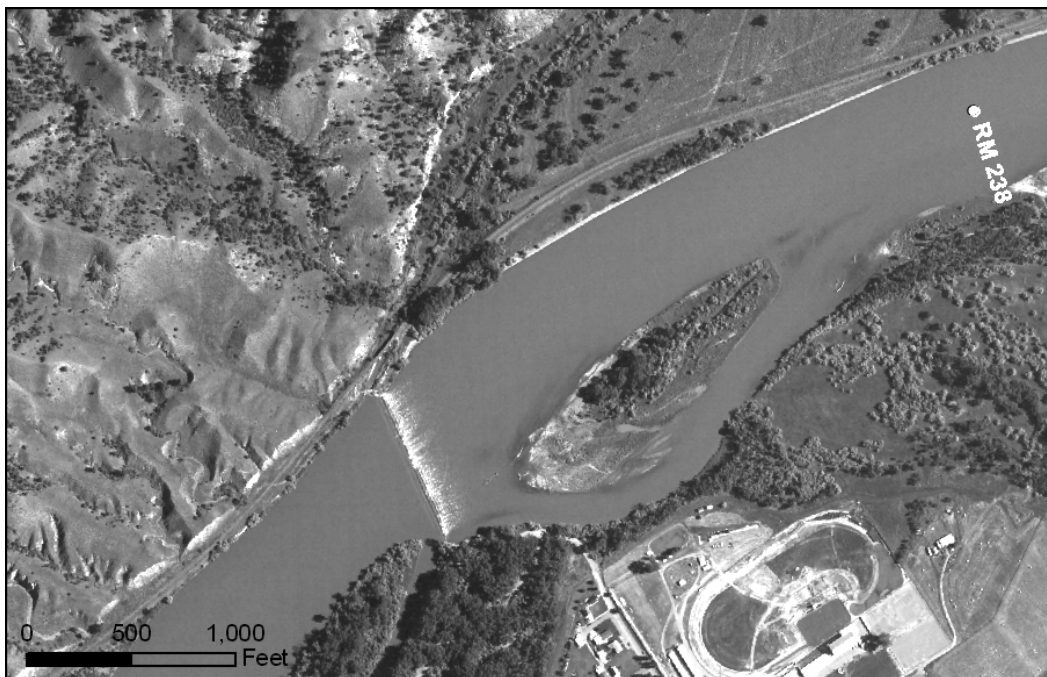


Plate 4. 2005 aerial image of Yellowstone Ditch Diversion Dam.



### 3.4.6 Cartersville

Cartersville Dam (Plate 5), constructed in the early 1930's at Forsyth, consists of a rock rubble riprap core that is capped by concrete (<http://www.fws.gov/YellowstoneRiverCoordinator/Cartersville.html>). The structure is 800 feet long, spanning the width of the Yellowstone River. The river flows within a single thread at the structure, flowing along the northern bluffline of the Yellowstone River valley. The city of Forsyth is located on the opposite (southern) bank. Because of its impacts on the Yellowstone River fishery, efforts have begun to develop suitable alternatives and bypass designs to promote fish passage at Cartersville.



**Plate 5. 2005 aerial image of Cartersville Diversion Dam.**

### 3.4.7 Intake

The largest diversion dam on the Yellowstone River is Intake (Plate 6). Construction of the dam began in 1905, in response to authorization under the Reclamation Act of 1902 (<http://www.fws.gov/yellowstonerivercoordinator/Intake.html>). Intake Dam was completed in 1911 and is used to irrigate 50,000 acres of land in eastern Montana and western North Dakota (<http://fwp.mt.gov/mtoutdoors/html/articles/2005/DiversionDams.htm>). The original dam crest was 12 feet above the river bed; and the structure stretches 700 feet across the river. With a diversion capacity of 1,200 cfs, it feeds Intake Canal and a ~225 mile network of lateral canals that distribute water to approximately 500 farms. Fish passage issues at this structure are currently being addressed by the collaborative efforts of the Bureau Reclamation, US Army Corps of Engineers, MT Fish Wildlife and Parks, US Fish and Wildlife Service, and Lower Yellowstone Irrigation District.



Plate 6. 2005 aerial image of Intake Diversion Dam.

### 3.4.8 Minor Diversion Structures

As described in Section 3.4.1, there are six major diversion structures on the Yellowstone River. In addition to these major structures, there are features on the river that are relatively small, yet block or partially block the river. In order to identify these smaller diversion structures, existing data were utilized to locate and describe observable features that encroach into the channel. The NRCS physical features inventory was used to locate headgates, and where these headgates were associated with a visible diversion in the channel, it was mapped as a structure. Using available topograph maps, the diversions were then named by the ditch that they feed. Using this methodology, a total of 12 additional diversion structures were mapped between Gardiner, Montana and McKenzie County, North Dakota (Table 4).

**Table 4. Summary information for minor irrigation diversions between Billings and Sydney.**

<i>Diversion Name</i>	<i>Channel Obstruction</i>	<i>County</i>	<i>River Mile</i>	<i>Reach</i>
Kinsey Main Canal	Partial span	Custer	175.0	C19
Italian Ditch	Spans side channel	Stillwater	400.0	A15
Big Ditch	Spans side channel	Stillwater	405.4	A15
Cove Ditch	Spans side channel	Stillwater	410.0	A14
Merrill Columbus Ditch	Partial span	Stillwater	428.2	A11
Prather Mayborn Westfall Ditch	Partial span	Sweetgrass	476.5	A1
Hunters Hot Springs Canal	Partial span	Park	480.9	PC21
Middle Windsor Ditch	Spans side channel	Park	492.2	PC18
Vallis Ditch?	Partial span	Park	496.7	PC16
Vallis Ditch	Partial span	Park	500.4	PC15
Livingston Ditch	Spans side channel	Park	507.0	PC12
Park Branch Canal	Spans side channel	Park	534.0	PC7

The majority of small diversion structures are located in the counties located in the upper river, including Park, Sweetgrass, and Stillwater counties (Figure 7). One small diversion is located in Custer County, which feeds the Kinsey Main Canal. In the upper river, the smaller diversion structures span only a portion of the channel, or are located on side channels (Figure 8). In Yellowstone County, Huntley Diversion Dam, which is a major structure, spans the main channel, leaving a seasonal channel open. In Treasure, Rosebud, and Dawson Counties, all of the diversions present are major and either span the entire length of a single thread, or in the case of Rancher's Ditch, spans the entirety of two channels.



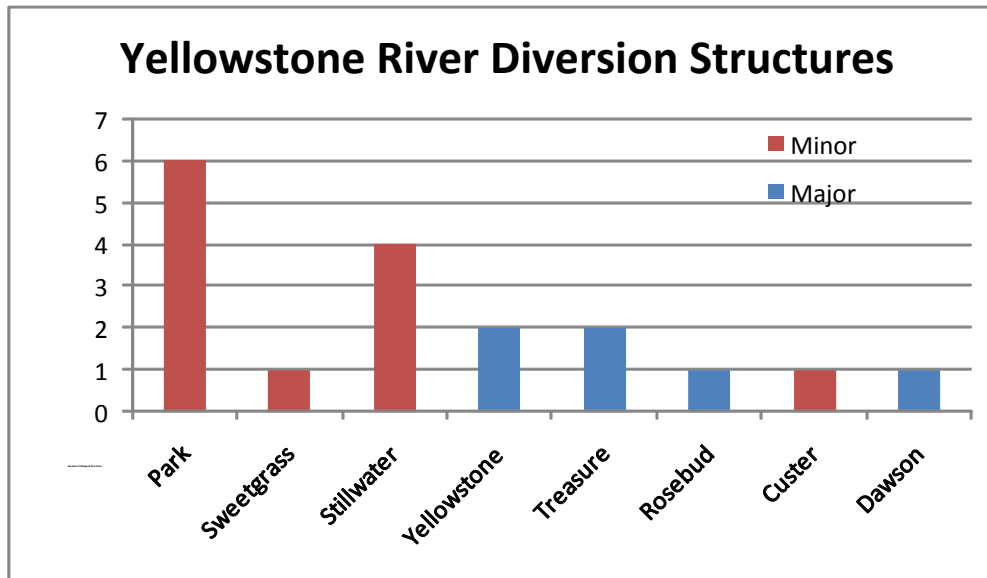


Figure 7. Number of diversion structures mapped in each county, Yellowstone River.

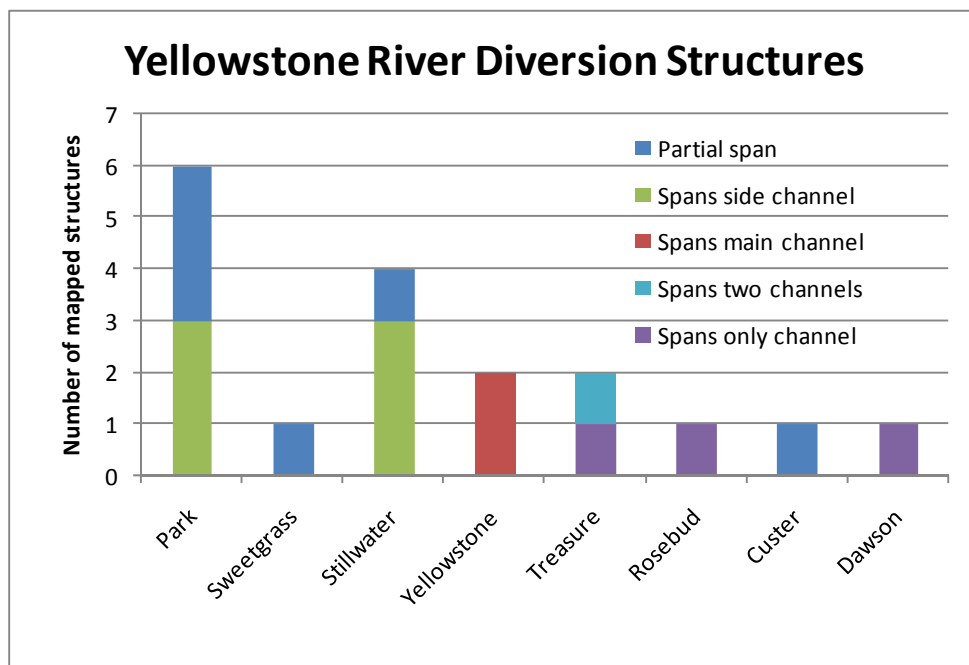


Figure 8. Extent of channel blockage of diversion structures, Yellowstone River.

### 3.4.9 Buffalo Rapids Project (Pumping Plants)

In addition to diversion dams, irrigation pumps are extensively utilized on the Yellowstone River. The largest of these pumping systems is the Buffalo Rapids Project. The Buffalo Rapids Project is a series of pumping plants on the Lower Yellowstone River. The project consists of six pumping plants and 63 miles of canals; providing irrigation water for 22,719 acres of land in

the vicinity of Glendive, Fallon, and Terry (<http://www.usbr.gov/dataweb/html/buffrap.html>). The Fallon Pumping Plant, with a diversion capacity of 72 cfs, is located approximately 3 miles east of Fallon, and was constructed in 1946-1948. The Shirley Pumping Plant is located approximately 20 miles southwest of Terry and has a capacity of 111 cfs. The Glendive Pumping Plants (No1 and No2) is located near Fallon and has a total diversion capacity of 368 cfs. The Terry Pumping Plant, with a diversion capacity of 60 cfs, is located approximately 6 miles east of Terry.

### **3.4.10 Bighorn River Flood Control Structures**

Two major dams are located on the Bighorn River. Boysen Dam is located approximately 20 miles south of Thermopolis, Wyoming. Boysen Dam impounds water used for power generation, irrigation, flood control, sediment retention, fish propagation, and recreation (<http://www.usbr.gov/dataweb/html/boysen.html>). Construction of Boysen Dam began in 1947 and was completed in 1952.

Yellowtail Dam is located on the Bighorn River approximately 45 miles southwest of Hardin Montana, in Big Horn County. The structure is a 1,480 ft long concrete arch that has a structural height of 525 ft. The dam was constructed between 1961 and 1966. The total storage at Yellowtail Dam (to elevation 3660) is 1,427,840 acre-ft (<http://www.usbr.gov/dataweb/dams/mt00576.htm>). The dam is the highest dam in the Missouri River Basin, and was constructed for power generation, irrigation, flood control, and recreation.

### **3.4.11 Mapped Bedrock Grade Controls**

Several outcrops of bedrock have been described as locally steep channel segments in the Lower Yellowstone River (Table 5). These outcrops have the potential to serve as natural grade controls for the system, and if they are eroded out or removed, they have the potential to induce downcutting upstream.

In July, 1806, as William Clark of the Lewis and Clark Expedition traveled down the Yellowstone River, he described a series of anomalously steep sections of river channel. Approximately 12 miles downstream of the Tongue River confluence, the party encountered what has been generally referred to as the Menagerie Rapids. Downstream of that point, at Buffalo Shoals, a three foot drop in the channel bed extended almost the entire width of the river (Silverman and Tomlinson, 1984). Approximately 60 years later, it was reported that the drop on the shoals had been considerably reduced. Approximately 20 miles further downstream, a second series of rapids was named Bear Rapids. The last of the *animal series*, called Wolf Rapids, was located about three miles downstream of the mouth of the Powder River. Wolf Rapids were considered the most difficult navigation challenge of the lower river. The rapids consisted of a vertical drop of 4 feet over approximately 250 feet, where the channel flowed over a “rocky bed” along a 50 foot high riverbank (Confluence, 2003).

All of the grade breaks described above are between Miles City and Glendive. A few other rapids were described downstream of Glendive by the Maguire Survey of the mid- 1870’s (Table 5). The presence of headcuts, nickpoints, or rapids in the channel bed indicates active

downcutting of the river system. For the grade breaks to manifest themselves in the form of rapids or waterfalls, the bed substrate must have sufficient erosion resistance to maintain the steep drop. It is therefore likely that the series of steep drops reflect the response of the river to base level lowering, and the concentration of the features reflects the presence of Ft. Union Formation in the channel bed between Glendive and Miles City. The cause of base level lowering is not clear.

In 1877, efforts were made to remove the grade break at Wolf Rapids to improve navigation. The Buffalo and Bear rapids were also removed as transportation on the river increased in the late 1800's. It is possible that the removal of these grade controls may have induced some channel response upstream.

**Table 5. Identified natural grade controls, Lower Yellowstone River**

<i>Approximate RM</i>	<i>Year Identified</i>	<i>Name</i>	<i>Description</i>
RM 175 (10 miles d/s of Tongue River confluence)	1806 (Lewis and Clark)	Menagerie Rapids	
RM 163	1806 (Lewis and Clark); 1873-1876 (Maguire)	Buffalo Shoals	Approximately 3 ft drop over entire channel width (considerable erosion of scarp by 1866 reported)
RM 157 (?)	1806 (Lewis and Clark)	Bear Rapids	
RM 152	1873-1876 (Maguire)	Bower	Upstream of Powder River
RM 142 (6 miles d/s of Powder River confluence)	1806 (Lewis and Clark)	Wolf Rapids	Fall of 4 ft in 250 yards; Rough rocky bed
RM 145	1878 (Maguire)	Key West, Crosby's, Jacob's, and McLewn's Rapids	Downstream of Powder River, (~Wolf Rapids)
RM 112	2001 (Womack)		Sandstone ledge
RM 109	1878 (Maguire)	Walker's, Murdock's	Cabin Creek Confluence
RM 90	1878 (Maguire)	Glendive, Monroe	Near Glendive
RM 79	1873-1876 (Maguire)	Unnamed	Upstream of Intake
RM 63	1873-1876 (Maguire)	Unnamed	Downstream of Intake

## **4 References**

Applied Geomorphology (AGI), and DTM Consulting, Inc. (DTM), 2004. Geomorphic Reconnaissance and GIS Development, Yellowstone River, Montana – Springdale to Missouri River Confluence: Final Report prepared for Custer County Conservation District, Miles City, MT, 108p.

Confluence Consulting, Inc., 2003. Yellowstone River Historical Retrospective Completion Report, Report prepared for Montana Department of Environmental Quality, Helena, MT.

## Appendix A. Annual Peaks Flows Greater than a 10-Year Event

<i>Gauge</i>	<i>USGS Gauge Number</i>	<i>Period of Record</i>	<i>Q10</i>	<i>Q25</i>	<i>Q50</i>	<i>Q100</i>	<i>Date Q10 Exceeded</i>	<i>Q on that date</i>
Yellowstone River at Livingston	6192500	1929-2007	28700	32600	35500	38300	6/11/1902	30100
							6/20/1943	30600
							6/23/1971	29200
							6/17/1974	36300
							6/10/1996	37100
							6/6/1997	38000
Yellowstone River at Billings	6214500	1929-2007	58900	67700	74100	80400	6/15/1918	78100
							6/21/1943	61200
							6/27/1944	64800
							6/16/1967	66100
							6/19/1974	69500
							7/7/1975	67600
							6/12/1996	61900
							6/12/1997	82000
Yellowstone River at Forsyth	6295000	1978-2007	74100	89700	102000	115000	5/21/1978	109800
							6/14/1997	87100
Yellowstone River at Miles City	6309000	1929-2007	74700	87100	96000	105000	6/26/1943	83700
							6/19/1944	96300
							6/22/1974	75400
							5/22/1978	102000
							6/15/1997	83300
Yellowstone River at Sidney	6329500	1911-2007	106000	125000	139000	152000	3/29/1912	114000
							6/20/1918	126000
							6/21/1921	159000
							10/3/1923	134000
							3/29/1943	132000
							6/21/1944	120000
							3/31/1952	138000

<i>Gauge</i>	<i>USGS Gauge Number</i>	<i>Period of Record</i>	<i>Q10</i>	<i>Q25</i>	<i>Q50</i>	<i>Q100</i>	<i>Date Q10 Exceeded</i>	<i>Q on that date</i>
							5/23/1978	111000
Shields River near Livingston	6195600	1979-2007	3970	5150	6110	7140	6/20/1979	5600
							5/23/1981	4170
							6/17/1992	4000
Boulder River at Big Timber	6200000	1947-2007	7930	9120	10000	10900	6/5/1948	8190
							5/28/1956	9840
							6/15/1959	8050
							6/23/1971	8000
							6/18/1974	9080
							7/5/1975	9450
							6/5/1997	9940
Stillwater near Absarokee	6025000	1935-2007	9440	10700	11700	12600	6/27/1944	9820
							6/3/1948	10600
							6/15/1967	12000
							6/28/1970	10300
							6/18/1974	11600
							7/6/1975	11300
Clarks Fork River at Edgar	6208500	1922-2007	10600	11900	12800	13600	5/26/1928	10600
							6/8/1932	10800
							6/2/1936	10900
							6/23/1967	10600
							6/15/1996	11000
							6/12/1997	11100
Big Horn River at St Xavier	6287000	1935-2007	16400	21500	25700	30200	6/16/1935	37400
							6/3/1936	19700
							6/24/1937	23700
							6/25/1938	22600
							6/11/1942	20500
							6/24/1943	25800
							6/28/1944	23900

<i>Gauge</i>	<i>USGS Gauge Number</i>	<i>Period of Record</i>	<i>Q10</i>	<i>Q25</i>	<i>Q50</i>	<i>Q100</i>	<i>Date Q10 Exceeded</i>	<i>Q on that date</i>
							6/26/1945	21600
							6/25/1946	20700
							6/22/1947	28300
							6/12/1948	18300
							6/3/1951	16400
							7/2/1957	19400
							2/14/1962	17200
							6/18/1963	25000
							6/10/1964	19900
							6/28/1965	26400
							7/5/1967	25300
							7/2/1970	17000
Tongue River at Miles City	6308500	1938-2007	8510	11800	14500	176000	3/6/1949	12000
							6/15/1962	13300
							4/4/1965	10400
							3/18/1969	10000
							2/15/1971	9000
							5/7/1975	10200
							5/23/1978	8650
							3/4/1994	9100
							6/8/2007	8520
Powder River near Locate	6326500	1938-2007	20500	29000	35900	43200	2/19/1943	31000
							3/19/1944	28000
							3/30/1952	23900
							3/23/1956	24000
							4/3/1965	29600
							3/22/1969	21100
							3/22/1978	30000

## Appendix B. Ice Jam Occurrences

### B.1. Mainstem Yellowstone

<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
Yellowstone	Livingston	PC13	1/17/2007	Released	At 955 AM MST Wednesday 17 January 2007, the National Weather Service of Billings MT, issued a Flood Warning for Central Park County in South Central Montana. The Department of Emergency Services in Park County reported flooding along the Yellowstone River, 13 miles south of Livingston, caused by water backup due to a freeze-up ice jam. Water had inundated one house in the area. People residing in the area along the Yellowstone River, from 4 miles south of Livingston to Pine Creek, were urged to be alert to the possibility of flooding through Thursday morning. In an Area Forecast Discussion issued by NWS in Billings at 853 AM MST Fri 19 January, the flood warning was canceled. River gages indicated that the jam had released and water was flowing freely again. -- Keywords: Yellowstone River at Livingston, MT on Jan 17, 2007 [20070117130138]	1 house flooded
Yellowstone	Livingston	PC15	2/8/1996		Ice jams clog rivers and create floods. Livingston is among the "hardest hit" [Billings Gazette, Feb, 8, 1996]. The counties of Carbon, Custer, Lewis and Clark, Lincoln, Park Sanders, Stillwater and Teton also reported flooding from ice jams. -- Keywords: Yellowstone River at Livingston, MT on Feb 08, 1996 [20010717135823]	?
Yellowstone	Columbus	A13	2/6/1996	Break-up	As reported in the Billings Gazette on February 6, 1996, "Gary Witt;s bowling night was cut short Thursday, when he had to rescue 22 head of his father's from the flooding Yellowstone River across the street from Air Bowl Lanes in Columbus. 'When I went bowling at about 7 p.m. (Thursday) everything was fine,' he said. 'About an hour later the whole field was flooded.' Witt and about five other volunteers from Columbus spent the next hour and a half in waist-deep water getting Witt's father's cows out of the pasture-turned-lake. Fourteen cows, six yearlings and two baby calves were taken from the field and moved out to Witt's brother's property outside of town. Just one stubborn cow remains roaming around on the high ground in the field. Witt said an ice jam on the Yellowstone sent water into his father's pasture on the southern edge of Columbus. The ice jam broke and the water has receded, but the one cow in the field remains uncooperative." -- Keywords: Yellowstone River at Columbus, MT on Feb 06, 1996 [1757]	Flooding



<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
Yellowstone	Laurel	A17	2/6/1996		An ice jam on the Little Bighorn River near Crow Agency, MT completely flooded four homes and threatened 50-60 others. The jam was located south of Crow Agency near the I-90 interchange with Route 212. I-90 was being flooded though it remained open to traffic. The jam was estimated as 3 football fields long. Other jams were reported along the Yellowstone south of Billings where Jellison and River Roads were being flooded. Another jam near Huntley was causing some flooding along the Yellowstone. Dynamite was used in Laurel to blast other jams on the Yellowstone. In Miles City, a five-mile-long jam blocked the mouth of the Tongue River where it empties into the Yellowstone. Twenty-nine of Montana's 56 counties reported flooding on this day. Hysham had reportedly been flooded with 5 feet of Yellowstone water on a nearby highway on Feb 8. The total damages for February's ice jams in Montana include...\$1.8 million in publically owned fascilities, two homes completely destroyed, 197 homes damaged 46 of which had to be evacuated, three deaths and two train derailments. -- Keywords: Yellowstone River at Laurel, MT on Feb 06, 1996 [1767]	Flooding
Yellowstone	Laurel	A17	2/21/1997	Freeze-up	An ice jam was reported on Feb 21, 1997 as moving toward Miles City at 1.5 feet above flood stage. The jam was located near the 7th Street Bridge. Water was seen flowing over the ice. More ice is moving towards the jam and building up towards Miles City. In Laurel, a jam is causing lowland flooding around the 56th Street Bridge area. Another jam has been spotted in Hathaway as well. Flooding was also occurring in Kinsey. The Miles City jam was reported to extend several miles. -- Keywords: Yellowstone River at Laurel, MT on Feb 21, 1997 [1768]	?
Yellowstone	Billings	B2	12/31/1968	Freeze-up	The 1969 USGS Water Resources Data for Montana reported a minimum discharge on the Yellowstone River at Billings, MT, of 1,090 cfs on 31 December 1968 as a result of a freeze-up ice event. Gage height was 1.44 ft. No other information was available. -- Keywords: Yellowstone River at Billings, MT on Dec 31, 1968 [20060717192230]	?
Yellowstone	Billings	B2	2/6/1996		An ice jam on the Little Bighorn River near Crow Agency, MT completely flooded four homes and threatened 50-60 others. The jam was located south of Crow Agency near the I-90 interchange with Route 212. I-90 was being flooded though it remained open to traffic. The jam was estimated as 3 football fields long. Other jams were reported along the Yellowstone south of Billings where Jellison and River Roads were being flooded. Another jam near Huntley was causing some flooding along the Yellowstone. Dynamite was used in Laurel to blast other jams on the Yellowstone. In Miles City, a five-mile-long jam blocked the mouth of the Tongue River where it empties into the Yellowstone. Twenty-nine of Montana's 56 counties reported flooding on this day. Hysham had reportedly been flooded with 5 feet of Yellowstone water on a nearby highway on Feb 8. The total damages for February's ice jams in Montana include...\$1.8 million in publically owned fascilities, two homes completely destroyed, 197 homes damaged 46 of which had to be evacuated, three deaths and two train derailments. -- Keywords: Yellowstone River at Billings, MT on Feb 06, 1996 [1754]	Flooded roadways

<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
Yellowstone	Billings	B2	1/3/1997		Ice floes, several miles long, was jamming the Yellowstone River causing evacuations from homes and ranches. Over a foot of water covered Riverfront Park where the Yellowstone's waters surpassed bankful. Ice jams were also reported along the Musselshell River between Lavina and Ryegate (causing minor flooding of U.S. Highway 12) and the Bighorn River which reached its flood stage of 9.0 feet. Ice jams continued to cause flooding on Jan 4 with waters covering and forcing the closure of North 14th Road in Billings. Some of the chunks of ice left behind in yards were 1.5 feet thick. This flooding was estimated to cause \$40,000-50,000 in damages to Yellowstone County. Six homes and a trailer park (Blain's Mobile Home Court) were affected. Outside of Yellowstone County, the river never reached its flood stage. An ice jam was also forming around West 57th Street west of Billings by Jan 12. Another ice jam was located near the Duck Creek Bridge, extending at least a half a mile west of the bridge. By Feb 22, 1997 the ice jam north of Miles City broke up, but smaller ice jams still persisted near Rosebud, Hathaway, Huntley (Road 14), Pompeys, and Laurel though they have all broken up into smaller packs of ice less than a quarter mile long. -- Keywords: Yellowstone River at Billings, MT on Jan 03, 1997 [1755]	Flooding, evacuations
Yellowstone	Billings	B2	1/10/1997		An ice jam was forming and water was ponding in low-lying areas as a result just West of Billings. This ice jam is located at the 56th Street Bridge area and is backed up toward Laurel. An ice jam was also located near the Clarks Fork confluence near Laurel. Minor low-land flooding was reported. In February, the ice jam is still located near the Duck Creek Bridge and was backed up toward Laurel. Another ice jam was located at the confluence of the Yellowstone and Tongue Rivers adding to the low-land flooding with water backing up behind the jam. -- Keywords: Yellowstone River at Billings, MT on Jan 10, 1997 [1756]	?
Yellowstone	Worden	B6	1/3/1997	Freeze-up	Severe flooding along the Yellowstone River, east of Worden, forced a few families to evacuate due to high waters and ice jams. The "ice dam" was located between North 7th and 8th Roads. -- Keywords: Yellowstone River at Worden, MT on Jan 03, 1997 [1777]	Severe flooding, evacuations
Yellowstone	Glendive	C4	1/1/1962	Break-up	As reported by McClure and Herman, "A fairly new bridge built in the latter 1950's on the State Primary System at Glendive, Montana ended up with a badly cracked pier after the spring ice run [on the Yellowstone River] of 1962." -- Keywords: Yellowstone River at Glendive, MT on ? ?, 1962 [20000224082744]	pier cracked
Yellowstone	Glendive	C4	3/15/1972		According to Anderson (1972), several ice jams along the Yellowstone River affected towns from Glendive through the confluence of the Yellowstone and Missouri Rivers. The river waters raged through for four days before subsiding. Many people were evacuated as several feet of water raged through their homes and the hardest hit area was Cheney point as well as the lowlands near Savage and Crane. This flood has been dubbed the worst flood since 1928. Ice jams were reported along the Lone Tree Creek, Fox Creek, and Yellowstone Rivers due to warm temperatures and high waters. Roberts (1972) reported that the Highway 16 Bridge in Sidney was weakening with only 2 of the 3 piers were standing. Also, Highway 16 to Glendive was closed. Also, due to the Fox Creek waters in the Newlon area, the East Redwater Bridge was	Severe flooding

<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
					washed out (between Richey and Highway 201) and the Kenneth Voss Bridge was washed out. There were no reported injuries or deaths. In some areas, the Yellowstone River waters extended over four miles wide. -- Keywords: Yellowstone River at Glendive, MT on Mar 15, 1972 [9128]	
Yellowstone	Hysham	C5	2/8/1996	Freeze-up	Ice jams clog rivers causing them to overflow. "State officials received a report of 5 feet of Yellowstone River water over a highway near Hysham" [Billings Gazette, Feb. 8, 1996]. The counties of Carbon, Custer, Lewis and Clark, Lincoln, Park Sanders, Stillwater and Teton also reported flooding from ice jams. -- Keywords: Yellowstone River at Hysham, MT on Feb 08, 1996 [20010717141128]	?
Yellowstone	Hysham	C5	1/2/1997		An ice jam just East of Hysham in Treasure County has caused the Yellowstone River to flood a fish and game preserve North of town. Many low-land areas have been flooded as well as some roadways near streams and rivers. -- Keywords: Yellowstone River at Hysham, MT on Jan 02, 1997 [1765]	?
Yellowstone	Hysham	C5	3/15/2003	Break-up	The NWS reports on 16 March 2003 that the Flash flood warning due to ice jam has been canceled at Hysham. However, the ice jam that broke up Saturday night on the Yellowstone River near Hysham has moved downstream and set up near Hathaway. No other information available. -- Keywords: Yellowstone River at Hysham, MT on Mar 15, 2003 [20030317103005]	?
Yellowstone	Forsyth	C10	2/7/1996	Break-up	A 2/7/96 NWS Flood Advisory stated that an ice jam had formed on the Yellowstone River in Forsyth, MT. -- Keywords: Yellowstone River at Forsyth, MT on Feb 07, 1996 [1762]	?
Yellowstone	Hathaway	C14	2/7/1996	Break-up	A NWS Flood Advisory on 2/7/96 reported that the Yellowstone River had an ice jam in Hathaway, MT and was causing flooding. -- Keywords: Yellowstone River at Hathaway, MT on Feb 07, 1996 [1763]	Flooding
Yellowstone	Hathaway	C14	2/20/1997	Freeze-up	An ice jam was reported on Feb 21, 1997 as moving toward Miles City at 1.5 feet above flood stage. The jam was located near the 7th Street Bridge. Water was seen flowing over the ice. More ice is moving towards the jam and building up towards Miles City. In Laurel, a jam is causing lowland flooding around the 56th Street Bridge area. Another jam has been spotted in Hathaway as well. Flooding was also occurring in Kinsey. The Miles City jam was reported to extend several miles. An ice jam has been reported near Hathaway in Custer County along the Yellowstone, 16 miles Southwest of Miles City and East of Rosebud. Low-land flooding had occurred. Much of the jamming was closer to Rosebud than Miles City concerning Hathaway. Hathaway was being flooded as a result of those jams near Rosebud. -- Keywords: Yellowstone River at Hathaway, MT on Feb 20, 1997 [1764]	Lowland flooding
Yellowstone	Hathaway	C14	2/3/1998	Break-up	On Tuesday, February 3, 1998 at 5:37 pm the NWS reported that ice jams had developed along the Yellowstone River near the town of Hathaway in Rosebud County. Water was flowing into low lying areas and most back channels were reported full. Livestock had been moved from the ice jam area. On Thursday, February 5, 1998 at 3:49 pm the NWS reported that minor ice jamming near Hathaway dissipated. Minor flooding was no longer being reported. -- Keywords: Yellowstone River at	Lowland flooding

<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
					Hathaway, MT on Feb 03, 1998 [2035]	
Yellowstone	Hathaway	C14	3/15/2003	Break-up	The NWS report for March 15: at 930 PM MST an ice jam on the Yellowstone River just west of Hathaway broke and caused a surge of water to flow rapidly downstream. This surge of water resulted in flooding along the Yellowstone River in Hathaway. As this water surge moves downstream flooding will be possible up to 10 to 15 miles downstream of Hathaway. Flash flood warnings in effect. The NWS report for March 16: Rosebud County Emergency Manager reports that the Yellowstone River in Hathaway continues to remain frozen this morning. This is allowing the water levels to continue to rise in Hathaway. At 432 PM EST it was reported that the ice jam in Hathaway broke free. This has allowed the water in the Yellowstone River in the vicinity of Hathaway to flow freely. The flood warning has been canceled. -- Keywords: Yellowstone at Hathaway, MT on Mar 15, 2003 [20030317105016]	?
Yellowstone	Miles City	C16	3/10/1934		maximum annual gage height of 11.02 feet, affected by backwater from ice, reported at USGS gage Yellowstone River at Miles City on March 10, 1934. -- Keywords: Yellowstone River at Miles City, MT on Mar 10, 1934 [11436]	?
Yellowstone	Miles City	C16	3/22/1939		maximum annual gage height of 11.37 feet, affected by backwater from ice, reported at USGS gage Yellowstone River at Miles City on March 22, 1939. -- Keywords: Yellowstone River at Miles City, MT on Mar 22, 1939 [11437]	?
Yellowstone	Miles City	C16	3/23/1941		maximum annual gage height of 7.82 feet, affected by backwater from ice, reported at USGS gage Yellowstone River at Miles City on March 23, 1941. -- Keywords: Yellowstone River at Miles City, MT on Mar 23, 1941 [11438]	?
Yellowstone	Miles City	C16	3/26/1943		maximum annual gage height of 14.0 feet, affected by backwater from ice, reported at USGS gage Yellowstone River at Miles City on March 26, 1943. Maximum high water stage for the period 1923, 1929-1963: 14.05 feet (82,800 cfs) on June 30, 1944, followed by 13.05 feet (70,500 cfs) on June 8, 1948. -- Keywords: Yellowstone River at Miles City, MT on Mar 26, 1943 [11439]	?
Yellowstone	Miles City	C16	3/20/1944		maximum annual gage height of 12.9 feet, affected by backwater from ice, reported at USGS gage Yellowstone River at Miles City on March 20, 1944. Note says "Backwater from ice; gage height, 21.7 feet, present site and datum, from flood mark." As reported in the Miles City Star on Tuesday, June 17, 1997, "Severe ice jams in 1944 pushed the Yellowstone past 19 feet before the river crested. Hundreds of residences had to be evacuated before planes were called in to bomb the ice jams and even the flow. ... After the dike was built, [the Miles City Dike, built in 1936] it suffered its first extensive damage during the March 1944 flood in Miles city. The cause of the flood was by ice jams at the mouth of the Tongue River during the spring runoff and ice breakup, which caused the water to back up and rise, according to Corps history. Due to runoff and ice-breakup period in March the flow in the Yellowstone River subjected the levee to erosion and undercutting. Local interests are reported to have fixed the damage and restore the levee to its original cross-section, orientation and profile. Four locations were listed by the Corps for areas of damage during the 1944 flood. The first place was upstream from Main Street bridge during	Flooding and evacuations

<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
					that era. The second place was downstream from the Chicago, Milwaukee, St. Paul and Pacific Railroad area. At this site, the Tongue River overflowed the levee, washing out the dike for about 60 feet. The third place was at the intersection of the levee and Vinton Street, where the Yellowstone River undercut the levee through erosion of the river bank and the levee slope-foundation for approximately 125 feet. The final location of damage was between Lewis Street and Tatro Street, where the levee was breached for about 220 feet, according to the Corps report, which added that repairs were completed that same year by local interests as a cost unknown." -- Keywords: Yellowstone River at Miles City, MT on Mar 20, 1944 [11440]	
Yellowstone	Miles City	C16	3/2/1946	Break-up	Weather Bureau reports ice broke up in the Yellowstone River March 2, 1946. Stage at gage at Miles City was 5.0 feet on March 1, 8.3 feet on March 2, and 5.0 feet on March 3. Gage datum 2337.88 feet MSL, flood stage 13 feet. -- Keywords: Yellowstone River at Miles City, MT on Mar 02, 1946 [11441]	?
Yellowstone	Miles City	C16	3/20/1947	Break-up	Weather bureau reports ice jam downstream from gage Yellowstone River at Miles City on March 20, 1947. Peak stage 12.6 ft. Gage datum 2337.88 ft MSL, flood stage 13 ft. -- Keywords: Yellowstone River at Miles City, MT on Mar 20, 1947 [11442]	?
Yellowstone	Miles City	C16	3/26/1949		maximum annual gage height of 10.3 feet, affected by backwater from ice, reported at USGS gage Yellowstone River at Miles City on March 26, 1949. -- Keywords: Yellowstone River at Miles City, MT on Mar 26, 1949 [11443]	?
Yellowstone	Miles City	C16	4/6/1950		maximum annual gage height of 13.8 feet, affected by backwater from ice, reported at USGS gage Yellowstone River at Miles City on April 6, 1950. -- Keywords: Yellowstone River at Miles City, MT on Apr 06, 1950 [11444]	?
Yellowstone	Miles City	C16	3/26/1951		maximum annual gage height of 12.8 feet, affected by backwater from ice, reported at USGS gage Yellowstone River at Miles City on March 26, 1951. -- Keywords: Yellowstone River at Miles City, MT on Mar 26, 1951 [11445]	?
Yellowstone	Miles City	C16	3/26/1956		maximum annual gage height of 12.42 feet, affected by backwater from ice, reported at USGS gage Yellowstone River at Miles City on March 26, 1956. -- Keywords: Yellowstone River at Miles City, MT on Mar 26, 1956 [11446]	?
Yellowstone	Miles City	C16	2/21/1958		maximum annual gage height of 10.83 feet, affected by backwater from ice, reported at USGS gage Yellowstone River at Miles City on February 21, 1958. -- Keywords: Yellowstone River at Miles City, MT on Feb 21, 1958 [11447]	?
Yellowstone	Miles City	C16	3/13/1959		maximum annual gage height of 12.9 feet, affected by backwater from ice, reported at USGS gage Yellowstone River at Miles City on March 13, 1959. -- Keywords: Yellowstone River at Miles City, MT on Mar 13, 1959 [11448]	?
Yellowstone	Miles City	C16	3/19/1960		maximum annual gage height of 15.5 feet, affected by ice, reported at USGS gage Yellowstone River at Miles City on March 19, 1960. This is the maximum stage for the period 1923, 1929-1963 (see note on 3/20/44); maximum open water stages: 14.05 feet (82,800 cfs) on June 30, 1944 and 13.05 feet (70,500 cfs) on June 8, 1948. -- Keywords: Yellowstone River at Miles City, MT on Mar 19, 1960 [11449]	?

<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
Yellowstone	Miles City	C16	2/17/1962		maximum annual gage height of 14.84 feet, affected by backwater from ice, reported at USGS gage Yellowstone River at Miles City on February 17, 1962. Maximum open water stages for the period 1923, 1929-1963: 14.05 feet (82,800 cfs) on June 30, 1944 and 13.05 feet (70,500 cfs) on June 8, 1948. -- Keywords: Yellowstone River at Miles City, MT on Feb 17, 1962 [11450]	?
Yellowstone	Miles City	C16	3/17/1966		On 17 March 1966 at the USGS Yellowstone River station, at Miles City, Montana, an annual maximum gage height of 11.10 feet was recorded, caused by an ice jam. Discharge 14,000 cfs. -- Keywords: Yellowstone River at Miles City, MT on Mar 17, 1966 [20020722151152]	?
Yellowstone	Miles City	C16	3/1/1968		On 1 March 1968 at the USGS Yellowstone River station, at Miles City, Montana, an annual maximum gage height of 16.43 feet was recorded, caused by an ice jam. Discharge 13,000 cfs. -- Keywords: Yellowstone River at Miles City, MT on Mar 01, 1968 [20020722150724]	?
Yellowstone	Miles City	C16	3/19/1969		As a result of backwater from ice, an annual maximum gage height of 16.11 feet was recorded at the USGS Yellowstone River station at Miles City Montana on 19 Mar 1969. Associated discharge 22,000 cfs. -- Keywords: Yellowstone River at Miles City, MT on Mar 19, 1969 [20020722145750]	?
Yellowstone	Miles City	C16	2/1/1971	Break-up	As reported in the Miles City Star on June 17, 1997, "The next serious flood in Miles City was recorded in February of 1971. Again, ice jams along the Yellowstone River during the February-March runoff and ice-breakup period caused the water to back up and rise on both the Tongue and Yellowstone Rivers. Corps history states that the levee was severely threatened by erosion in the reach immediately upstream from the Burlington Northern Railroad crossing of the Tongue River, where the top of the levee was eroded to about two feet wide from its 9- to 36-foot-wide variance. Again repairs were completed that same year by local interests at a cost unknown, the report states." -- Keywords: Yellowstone River at Miles City, MT on Feb ?, 1971 [11451]	Levee threatened by erosion
Yellowstone	Miles City	C16	3/1/1972	Break-up	As reported in the Miles City Star on June 17, 1997, "The following year [1972], the dike received more damage from ice jams in March. The repair location was recorded at the old Tongue River channel where erosion and undercutting were repaired to the kie's original cross-section, orientation and profile. Repairs also were completed within the year at a cost unknown by local interests." -- Keywords: Yellowstone River at Miles City, MT on Mar ?, 1972 [11452]	Dike damage
Yellowstone	Miles City	C16	3/8/1994		Ice jams on the Yellowstone River near Miles City caused high rising waters to damage a 150-200 foot long section of the city dike. No emergency repairs were needed. -- Keywords: Yellowstone River at Miles City, MT on Mar 08, 1994 [11453]	Miles City dike damaged
Yellowstone	Miles City	C16	2/8/1996	Break-up	According to a NWS River Statement, an ice jam was reported on the Yellowstone River in Miles City, MT on 2/8/96. The jam broke loose on 2/12/96. The jam damaged the gage at Miles City. -- Keywords: Yellowstone River at Miles City, MT on Feb 08, 1996 [11454]	Damaged water gauges

<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
Yellowstone	Miles City	C16	2/18/1997		An ice jam has formed about 2.5 miles Northeast of Miles City near Buffalo Rapids. This jam later backed up below Miles City. Some portions of the Dike were damaged or broken. Some homes have been flooded. The first ice movement was for the 7th Street jam in Miles City. An ice jam was reported on Feb 21, 1997 as moving toward Miles City at 1.5 feet above flood stage. The jam was located near the 7th Street Bridge. Water was seen flowing over the ice. More ice is moving towards the jam and building up towards Miles City. In Laurel, a jam is causing lowland flooding around the 56th Street Bridge area. Another jam has been spotted in Hathaway as well. Flooding was also occurring in Kinsey. The Miles City jam was reported to extend four miles. -- Keywords: Yellowstone River at Miles City, MT on Feb 18, 1997 [11455]	Flooding in low-lands, dike damaged
Yellowstone	Miles City	C17	3/20/1944		On 20 March 1944 the maximum gage height of 21.7 feet was recorded at the USGS station at Yellowstone River, Miles City, Montana due to an ice jam. Period of record 1923, 1928-1970. -- Keywords: Yellowstone River at Miles City, MT on Mar 20, 1944 [20020703093751]	?
Yellowstone	Miles City	C17	1/7/1970	Freeze-up	A minimum annual discharge of 2,290 cfs was recorded at USGS station at Yellowstone River, Miles City, Montana on 7 January 1970, due to freezeup. Gage height 1.31 feet. -- Keywords: Yellowstone River at Miles City, MT on Jan 07, 1970 [20020703093316]	?
Yellowstone	Miles City	C17	2/14/1971		The USGS reported a maximum gage height of 20.59 ft on 14 February 1971, on the Yellowstone River at Miles City, Montana due to an ice jam. Discharge was 45,000 cfs. -- Keywords: Yellowstone River at Miles City, MT on Feb 14, 1971 [20021216125603]	?
Yellowstone	Kinsey	C19	3/5/1994		An ice jam was reported to break on March 5, 1994 near Kinsey (a few miles northeast of Miles City) causing flooding of lowlands in the area along the Yellowstone River. - - Keywords: Yellowstone River at Kinsey, MT on Mar 05, 1994 [1766]	?
Yellowstone	Terry	D1	3/26/1993	Break-up	An ice jam broke 20 miles west of Terry along the Yellowstone River on Mar 26 , 1993. There was also a jam reported where the Powder River flows into the Yellowstone on this date. -- Keywords: Yellowstone River at Terry, MT on Mar 26, 1993 [1773]	?
Yellowstone	Terry	D1	2/9/1996	Break-up	According to NWS Flood Statements an ice jam broke loose in Terry, MT on 2/9/96 and another jam was reported downstream of Terry on the Yellowstone River on 2/10/96. A three-mile ice jam was located between Terry and Fallon and was causing high water. -- Keywords: Yellowstone River at Terry, MT on Feb 09, 1996 [1774]	?



<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
Yellowstone	Fallon	D2	4/1/1943	Break-up	As reported in the Sidney Herald on Thursday, April 1, 1943, "With the break up of the Yellowstone and ice jams going out at Fallon and this side of Glendive, a 13 foot rise in the river at Intake was reported Sunday with the swift current carrying the pack ice down to the junction with the Missouri where it gorged from Buford to Trenton and backed up the water over the lowlands to a depth of from three to five feet. Livestock in the area were moved to higher ground but many of the farmers remained in their homes, taking refuge in the attics and second floors of their homes, and some in the haylofts of their barns. All had been warned before the water reached their farms, but a number remained at their homes regardless. A dozen or more row boats and several motor boats were brought into play evacuating other families from Sunday through Tuesday when the flood reaches its peak to drop three feet that night. While the women and children were taken out, the men stayed at the farms to take care of their livestock which were herded to ground above the flood level. One farmer, Bill Severance built a platform to put his sheep on and saved them without any loss. Glen Cray, Hohhny Beaver and Hank Falkenhagen moved their cattle and other livestock to a sand knoll where they kept them through the worst of the high water, standing in several inches of water for three days without food, according to one report. Other farmers with livestock, in the flood area, resorted to like practices to save their stock and while it is conceded that some livestock losses, in both sheep and cattle were sustained, they were not as serious as expected under the circumstances. Roy Milligan of Miles City spent two days in the area with his plane flying over the flood area to keep contact with the stranded farmers and counted fifty farm homes partly, and in several cases almost entirely submerged. ... It is the worst flood condition that has occurred in the lower valley in history, so far as is known. The ice gorge from Buford to Trenton blocked the escape of the water, but the flood level did drop three feet Wednesday and farmers are getting some of their stock back to their feed yards." -- Keywords: Yellowstone River at Fallon, MT on Apr 01, 1943 [1760]	Severe flooding affecting farmers
Yellowstone	Fallon	D2	2/1/1996	Break-up	A NWS Flood Statement on 2/14/96 stated that ice jams downstream of Fallon were causing lowland flooding. The jam on the Yellowstone River is located between Fallon and Marsh. -- Keywords: Yellowstone River at Fallon, MT on Feb ?, 1996 [1761]	Lowland flooding
Yellowstone	Marsh	D4	3/4/1994	Break-up	Four ice jams between Marsh and Intake carried ice onto roads near Marsh and called for evacuations in Intake. -- Keywords: Yellowstone River at Marsh, MT on Mar 04, 1994 [1769]	Evacuations
Yellowstone	Glendive	D6	3/23/1932		maximum annual gage height of 14.60 feet affected by backwater from ice, reported at USGS gage Yellowstone River at Glendive, on March 23, 1932. This is maximum ice affected gage height of the period 1903-1910, 1932-1934. The maximum open-water event for the same period was 12.7 feet at 118,000 cfs on June 8, 1909. -- Keywords: Yellowstone River at Glendive, MT on Mar 23, 1932 [9123]	?
Yellowstone	Glendive	D6	1/7/1934		maximum annual gage height of 6.83 feet affected by backwater from ice, reported at USGS gage Yellowstone River at Glendive, on January 7, 1934. -- Keywords: Yellowstone River at Glendive, MT on Jan 07, 1934 [9124]	?



<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
Yellowstone	Glendive	D6	1/1/1936		An ice jam was reported on the Yellowstone near Glendive in 1936 flooding the rooftops of buildings in the West Glendive lowlands. Floodstage is 53.65 feet. -- Keywords: Yellowstone River at Glendive, MT on ? ?, 1936 [9125]	?
Yellowstone	Glendive	D6	4/1/1943	Break-up	As reported in the Sidney Herald on Thursday, April 1, 1943, "With the break up of the Yellowstone and ice jams going out at Fallon and this side of Glendive, a 13 foot rise in the river at Intake was reported Sunday with the swift current carrying the pack ice down to the junction with the Missouri where it gorged from Buford to Trenton and backed up the water over the lowlands to a depth of from three to five feet. Livestock in the area were moved to higher ground but many of the farmers remained in their homes, taking refuge in the attics and second floors of their homes, and some in the haylofts of their barns. All had been warned before the water reached their farms, but a number remained at their homes regardless. A dozen or more row boats and several motor boats were brought into play evacuating other families from Sunday through Tuesday when the flood reaches its peak to drop three feet that night. While the women and children were taken out, the men stayed at the farms to take care of their livestock which were hearded to ground above the flood level. One farmer, Bill Severance built a platform to put his sheep on and saved them without any loss. Glen Cray, Hohnny Beaver and Hank Falkenhagen moved their cattle and other livestock to a sand knoll where they kept them throught the worst of the hish water, standing in several inches of water for three days without food, according to one report. Other farmers with livestock , in the flood area, resorted to like practices to save their stock and while it is conceded that some livestock losses, in both sheep and cattle were sustained, they were not as serious as expected under the circumstances. Roy Milligan of Miles City spent two days in the area with his plane flying over the flood area to keep contact with the stranded farmers and counted fifty farm homes partly, and in several cases almost entirely submerged. ... It is the worst flood condition that has occurred in the lower valley in history, so far as is known. The ice gorge from Buford to Trenton blocked the escape of the water, but the flood level did drop three feet Wednesday and farmers are getting some of their stock back to their feed yards." -- Keywords: Yellowstone River at Glendive, MT on Apr 01, 1943 [9126]	Severe flooding affecting farmers
Yellowstone	West Glendive	D6	3/19/1959	Break-up	warm air temperatures caused ice breakup."Flooding started at West Glendive at 2:15 a.m. on 19 [March] when a large ice jam 6 miles above the town broke up and moved downstream to join another jam 1.5 miles below Glendive. At about 2:50 p.m. [NB may be a.m.] the lower jam broke up and by 6 a.m. 19 March the flood waters had generally receded. Peak stage 60.5 feet at USGS gaging station at Glendive (flood stage 54.3 feet). 20 homes and businesses flooded, 28 families evacuated, 40 farmsteads inundated. -- Keywords: Yellowstone River at West Glendive, MT on Mar 19, 1959 [1775]	25K USD

<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
Yellowstone	Glendive	D6	1/1/1969		As reported in Andy Tuthill's Trip Report, 2 Oct, 1997, "In 1969 a major ice jam flood overtopped the Cottonwood Dike (then at 2071 ft MSL) by 6 inches, inundating agricultural land and a few homes. No ice got past the dike in 1969. Sections of Highway 335 both on both approaches to the Cottonwood Grove area were also flooded, including the bildings of Western Oil Well Supply, located to the north of Cottonwood Grove. Downstream, the ice jam was level with the tops of the piers on the Interstate 94 Bridge and a sewage pump station in Glendive was flooded. Art [Art Gehmert, a long time resident of Glendive] remembers finding 12-ft-thick "neatly stacked" ice in his fields and observing shear walls 30-ft-high along the channel edges after the ice jam had released. That year the Cottonwood Dike was raised 4 ft to its present elevation of 2075 ft MSL. This improvement prevented flooding during an ice jam that occurred the following year (1970) and all subsequent floods to date. The 7000-ft-long West Glendive Dike was constructed in 1957. Art Gehmert said that, according to Don Peckman, an engineer involved with the original design of the dike, its top elevation was set at 2072 ft, two ft higher than the record high stage of the 1936 ice jam flood. During the 1969 event, and a more recent ice jam flood in 1994, the peak water elevation came to within ,5 ft of the crest of the dike, Gehmert estimated a rate of stage irse of 1 ft e ery 10 minutes during the 1994 event." -- Keywords: Yellowstone River at Glendive, MT on ? ?, 1969 [9127]	Highway, sewage pump sta., oil well supply flooded
Yellowstone	Glendive	D6	2/21/1982		An ice jam was reported on the Yellowstone near Glendive with a river gage of 60.02 feet on March 21, 1959. Flood stage is 53.65 feet. -- Keywords: Yellowstone River at Glendive, MT on Feb 21, 1982 [9129]	?
Yellowstone	West Glendive	D6	12/29/1992		An ice jam reported on the Yellowstone River near West Glendive is threatening the Bell Street Bridge, the only evacuation route for West Glendive residents. -- Keywords: Yellowstone River at West Glendive, MT on Dec 29, 1992 [1776]	?
Yellowstone	Glendive	D6	3/5/1994		An ice jam was reported on the Yellowstone near Glendive with a river gage of 64.0 feet on March 3, 1994. Flood stage is 53.65 feet. According to the Missouri River Division Datacol, an ice jam caused water and ice to nearly overtop the dike at Glendive on March 4, 1994. An ice jam was reported to break on March 5, 1994 near a ranch 14 miles southwest of Glendive along the Yellowstone River. There were several evacuations due to flooding. The river rose to within 18 inches of the dike. Near River Butte, west of Glendive, the water dropped to 59 feet (6 feet above flood stage). In Hathaway, one rancher lost 60 cattle in the floods. -- Keywords: Yellowstone River at Glendive, MT on Mar 05, 1994 [9130]	Dike nearly overtopped, 60 cattle died,

<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
Yellowstone	Glendive	D6	2/11/1996	Break-up	The MRD Datacol 2/11/96 indicated that ice was piling up along the Bell Street Bridge in Glendive, MT on the Yellowstone River. The jam extended 10 miles upstream with a 4 mile stretch of open water followed by another 6 mile jam. On 2/13/96 a NWS Flood Statement reported that some of the ice was breaking up but the river was still jammed between the Town Street Bridge and the interstate bridge. Flooded fields were also reported. On 2/16/96 the jam was between the Black bridge and the interstate bridge. The jam was still in existence on 2/20/96. The MRD Datacol 3/13/96 stated that there were several ice jams in Glendive, MT on the Yellowstone River. Newspapers reported that an ice jam at the Glendive bridge was causing flooding along the Yellowstone River on Feb 12, 1996. Another report states that two jams are located near Glendive. One was reportedly 10 miles long while the other was 6 miles long each seperated by 4 miles of open water. Hysham had reportedly been flooded with 5 feet of Yellowstone water on a nearby highway on Feb 8. The total damages for February's ice jams in Montana include...\$1.8 million in publically owned facilities, two homes completely destroyed, 197 homes damaged 46 of which had to be evacuated, three deaths and two train derailments. -- Keywords: Yellowstone River at Glendive, MT on Feb 11, 1996 [9131]	Flooding
Yellowstone	Glendive	D6	2/18/1997		An ice jam was reported near the fairgrounds in Glendive. An ice jam near Engle's Island South of Glendive was backing up water in low-lying areas upstream of Ingle's Island. There was a third jam under the Interstate 94 Bridge. Many people South of Glendive were evacuated. An ice jam was reported on the Yellowstone River near Glendive with a river gage of 51.65 feet on March 20, 1997. Notes mention the I-94 bridge. By Mar 24, an ice jam located near the Dawson/Richland County line was reported to be about 6 miles long causing extensive flooding of low-lying areas. -- Keywords: Yellowstone River at Glendive, MT on Feb 18, 1997 [9132]	?
Yellowstone	Glendive	D6	3/9/1998	Break-up	On Monday March 9, 1998 at 750 PM the NWS reported ice jams along the Yellowstone River near Glendive, "Ice jamming has been occurring along the Yellowstone River in the Glendive area creating rapid river rises. Water flowing into some low lying areas has been noticed. This has created an inconvenience for cattle ranchers along the river with no damage to property or structures. Ice jams will likely continue to affect the area through midweek. Forecast high temperatures through the period will moderate some...with teens expected by Wednesday...forcast lows to be in the single digits below zero." On Tuesday, March 10, 1998 at 9:40 PM the NWS reported, "Ice freeze up has been occurring along the Yellowstone River in the Glendive area creating some rapid river rises. Wate flowing into some low lying areas was noticed before the river began freezing again during the last few days." As reported by the NWS on Thursday, March 12, 1998 at 2:49 PM, "River levels along the Yellowstone River near Glendive have fallen over the past few days. Colder weather has resulted in less flow of water along the river in the area. As a result...this has not allowed any immediate concerns of ice jam flooding along the Yellowstone River in the Glendive area." -- Keywords: Yellowstone River at Glendive, MT on Mar 09, 1998 [9133]	Lowland flooding

<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
Yellowstone	Glendive	D6	3/16/2003	Break-up	The NWS reports on March 16: Minor breakup ice jam flooding is occurring on the Yellowstone River at Glendive. Stage is 55.8 feet measured at 7 PM Sunday. The stage exceeded the flood stage of 53.5 feet at 08 AM Sunday. The river is expected to remain above flood stage overnight. -- Keywords: Yellowstone at Glendive, MT on Mar 16, 2003 [20030317110342]	?
Yellowstone	Glendive	D6		Break-up	Yellowstone River at Glendive--1899 Often a search of local historical records reveals ice jam information that is not contained elsewhere. One such example is the Yellowstone River flood at Glendive in April 1899, of which no mention was made in the usual sources. Discussions with local residents led to a search of old newspaper records which indicated that, in fact, twelve people lost their lives, numerous livestock drowned, many homes were washed away, and several spans of the Yellowstone River Bridge were destroyed during this event. These types of historical records can be quite dramatic: according to the newspaper records, when the ice broke and began running on Friday evening, April 7, 1899, nearly the entire population of Glendive gathered to view the huge (nearly one hundred square foot) cakes of ice crush against the ice breaks (rock-filled timber crib structures) built in front of each pier on the Yellowstone River Bridge. Moments before the ice began to move, the water gage on the ice break registered 19 feet, but after the ice began moving the gage rapidly rose to 30 feet. After the ice run, three of the bridge spans had been washed downstream. Witnesses said that had the bridge been five feet higher, and had all of the ice breaks been built as large and as strong as ice break No. 2, the bridge would still be standing. At the time, the Yellowstone River Bridge was the largest wagon bridge in the entire northwest. It was 1750 feet long and included a draw span that was 326 feet long. The bridge, including approaches and ice breaks, cost Dawson County 50,000 dollars to construct, and was estimated to cost at least 20,000 dollars to rebuild (1899 dollars). According to the newspaper account, when the waters started to inundate the land surrounding the Snyder Ranch, Mrs. R.W. Snyder, Miss Nellie Regan, Miss Rose Wybrecht, Mr. Eugene O'Conner, and Mr. Joseph Myers had to decide whether to move to higher ground (the railroad embankment) or to stay at the ranch. When they finally did make their decision to move to higher ground, which was approximately one block from the ranch, it was too late. The icy water was up to their waists before they made it halfway to the railroad embankment. Mr. O'Conner and Mr. Myers tried to assist the women into a tree, but the water and ice made it impossible, so they decided to tie Miss Regan and Miss Wybrecht to the tree with their suspenders so that the women wouldn't be washed downstream. Mr. Myers was able to climb the tree, but Mr. O'Conner and Mrs. Snyder were unable to climb to safety and were washed downstream, never to be found. Miss Regan and Miss Wybrecht were later found dead, still tied to the tree by the suspenders. Mr. Myers, the only ranch survivor, spent seven hours in the tree before he was rescued. The Snyder Ranch lost all of its livestock except two horses, one cow, two chickens, and two dogs. The bodies of the James Sullivan family were found on Sunday, April 9, 1899. All were found in bed except the eldest daughter and one of the younger children, who were found on the	Three bridges destroyed, 12 deaths

<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
					floor. The eldest daughter's skull was crushed. It was presumed that she received the wound from a piece of ice while trying to battle the angry waters. (The above information was edited from the Glendive Independence. The dateline for Saturday, April 8, 1899, appeared on the paper, although it was actually printed on Sunday, April 9, 1899, because of the ice jam.) -- Keywords: Yellowstone River at Glendive, MT on Apr 07, 1899 [20000216100330]	
Yellowstone	Glendive	D6			As reported in Andy Tuthill's Trip Report, 2 Oct, 1997, "The Glendive area has a long history of ice jam flooding and two of these events resulted in loss of life. ... In 1894 three men died while trying to escape floodwaters on the east side of the river, near the present location of the Black Bridge." -- Keywords: Yellowstone River at Glendive, MT on ? ?, 1894 [9121]	Death of 3 men
Yellowstone	Glendive	D6	4/1/1904		maximum annual gage height of 11.9 feet affected by backwater from ice, reported at USGS gage Yellowstone River at Glendive, on April 1, 1904. -- Keywords: Yellowstone River at Glendive, MT on Apr 01, 1904 [9122]	?
Yellowstone	Savage	D11	3/10/1943	Break-up	An ice jam was spotted at the junction of the Missouri and Yellowstone Rivers. The jam extends 15 miles from east of Fairview to the junction of the two rivers. By April 1, the same jam was reported to break up at Fallon along the Yellowstone River. A 13 foot rise in river waters were reported at Intake. -- Keywords: Yellowstone River at Savage, MT on Mar 10, 1943 [1770]	Severe flooding
Yellowstone	Savage	D11	3/4/1994	Break-up	As a result of the ice jam, in "Richland Co. the river looks like big lake east of Savage" (Datacol) *See also Glendive and Marsh same date -- Keywords: Yellowstone River at Savage, MT on Mar 04, 1994 [1771]	?
Yellowstone	Savage	D11	2/13/1996	Break-up	On 2/13/96 a NWS Flood Statement reported that an ice jam on the Yellowstone River had caused flooding near Savage, MT. The jam is located upstream of Savage. The Savage jam went out at about 1330 on the 17th with no problems. -- Keywords: Yellowstone River at Savage, MT on Feb 13, 1996 [1772]	Flooding
Yellowstone	Elk Island	D11	2/16/1996	Break-up	A large ice jam was reported, via NWS on 2/16/96, on the Yellowstone River at Elk Island, MT. -- Keywords: Yellowstone River at Elk Island, MT on Feb 16, 1996 [1758]	Flooding
Yellowstone	Savage	D11	3/18/2003	Break-up	The NWS reports on March 18: Ice jams reported just downstream from Savage. Some county roads have been inundated and barricaded as water flows around the ice jams. Ice jams reported midway between Sidney and Savage have resulted in flooding from around the town of Crane to just downstream of Savage. -- Keywords: Yellowstone at Savage, MT on Mar 18, 2003 [20030319090337]	?
Yellowstone	Sidney	D13	4/3/1917		maximum annual gage height of 11.6 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney, on April 3, 1917. -- Keywords: Yellowstone River at Sidney, MT on Apr 03, 1917 [9141]	?
Yellowstone	Sidney	D13	3/31/1923		maximum annual gage height of 11.0 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney, on March 31, 1923. -- Keywords: Yellowstone River at Sidney, MT on Mar 31, 1923 [9142]	?

<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
Yellowstone	Sidney	D13	1/1/1927		A printout obtained by Andy Tuthill from Richland County, Montana reported a 1927 flood caused by ice jams caused an estimated \$21,400 in rural damages. -- Keywords: Yellowstone River at Sidney, MT on ? ?, 1927 [9143]	21,400 USD estimated rural damages
Yellowstone	Sidney	D13	3/2/1938		maximum annual gage height of 16.66 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney, on March 2, 1938. -- Keywords: Yellowstone River at Sidney, MT on Mar 02, 1938 [9144]	?
Yellowstone	Sidney	D13	3/22/1939		maximum annual gage height of 13.20 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney, on March 22, 1939. -- Keywords: Yellowstone River at Sidney, MT on Mar 22, 1939 [9145]	?
Yellowstone	Sidney	D13	3/25/1943		maximum annual gage height of 18.00 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney, on March 25, 1943. March 29, 1943, C.F.S= 132,000. A printout obtained by Andy Tuthill from Richland county Montana reported a 1943 flood caused by ice jams and snowmelt caused an estimated \$484,800 in rural damages. -- Keywords: Yellowstone River at Sidney, MT on Mar 25, 1943 [9146]	484,800 USD estimated rural damages
Yellowstone	Sidney	D13	1/1/1944		A printout obtained by Andy Tuthill from Richland County, Montana reported two floods during 1944 caused by ice jams, heavy rains, and snowmelt caused an estimated \$86,600 in rural damages. -- Keywords: Yellowstone River at Sidney, MT on ? ?, 1944 [9147]	86,600 USD estimated rural damages
Yellowstone	Sidney	D13	1/1/1946		A printout obtained by Andy Tuthill from Richland County, Montana reported two floods during 1946 caused by ice jams and snowmelt caused an estimated \$50,400 in rural damages. -- Keywords: Yellowstone River at Sidney, MT on ? ?, 1946 [9148]	50,400 USD estimated rural damages
Yellowstone	Sidney	D13	3/22/1947		The maximum gage height of 21.85 feet was recorded on 22 March 1947 at the USGS Yellowstone River station, near Sidney, Montana, caused by backwater from ice. Period of record 1910-1969, except for water year 1932. -- Keywords: Yellowstone River at Sidney, MT on Mar 22, 1947 [20020718141237]	?
Yellowstone	Sidney	D13	1/1/1948		A printout obtained by Andy Tuthill from Richland County, Montana reported that two floods in 1948 caused by ice jams and snowmelt caused an estimated \$11,300 in rural damages. -- Keywords: Yellowstone River at Sidney, MT on ? ?, 1948 [9150]	11,300 USD estimated rural damages
Yellowstone	Sidney	D13	3/8/1949		maximum annual gage height of 18.16 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney, on March 8, 1949. A printout obtained by Andy Tuthill from Richland county, Montana reported a 1949 flood caused by ice jams caused an estimated \$50,500 in rural damages. As reported in the Sidney Herald on March 10, 1948, "A week of flood scare in this valley is receiving relief from reports of the last few hours that a breakup of the ice jam at the junction of the Missouri and Yellowstone is near. The frozen Missouri below that is heaving and cracking and will have to give way to the water pressure soon. This will simultaneously cause a general eruption of the ice jam at the junction which will release the dammed up waters now flooding a large area of the lower valley within the triangle the convergence of the two rivers creates. The ice jam on the Yellowstone as The Herald goes to press Thursday afternoon extends 15 miles from east of Fairview	50,500 USD estimated rural damages

<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
					to the junction." -- Keywords: Yellowstone River at Sidney, MT on Mar 08, 1949 [9151]	
Yellowstone	Sidney	D13	4/4/1950		maximum annual gage height of 12.51 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney on April 4, 1950. -- Keywords: Yellowstone River at Sidney, MT on Apr 04, 1950 [9152]	?
Yellowstone	Sidney	D13	3/27/1951		maximum annual gage height of 11.07 feet affected by backwater from ice, reported at USGS Yellowstone River near Sidney, on March 27, 1951. An ice jam near Sidney on the Yellowstone River forced several families to evacuate, loss of livestock, and an estimated hundreds of thousands of dollars in damages on Mar 29, 1951. The middle span of the Bridge on Highway 14 on the south edge of Sidney gave out. A printout obtained by Andy Tuthill from Richland county, Montana reported a 1951 flood caused by ice jams caused an estimated \$54,100 in rural damages. -- Keywords: Yellowstone River at Sidney, MT on Mar 27, 1951 [9153]	Severe flooding, evacuations, 100,000s USD in damages
Yellowstone	Sidney	D13	4/1/1952	Freeze-up	Two people of Richland County lost a law suit to the county on charges that their negligence was the cause of the flood. Supposedly, the dam they were attending to (Upper Anderson Dam) was neglected and as it gave out it let out tons of chunks of ice and debris which jammed and caused the massive flooding. The county was awarded \$27,473.33 in damages. The flooding occurred on the north side of the river east of Buford and south of Trenton. In a later lawsuit the Andersons won the case. By May 1, the state of Montana was awaiting a \$25 million appropriation for flood relief. maximum annual gage height of 19.7 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney, on March 30, 1952. March 31, 1952 C.F.S= 138,000 A printout obtained by Andy Tuthill from Richland county, Montana reported a 1952 flood caused by ice jams caused an estimated \$44,900 in rural damages. -- Keywords: Yellowstone River at Sidney, MT on Apr 01, 1952 [9154]	44,900 USD estimated rural damages,severe flooding
Yellowstone	Sidney	D13	4/3/1955		maximum annual gage height of 12.33 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney, on April 3, 1955. A printout obtained by Andy Tuthill from Richland county, Montana reported a 1955 flood caused by ice jams caused an estimated \$1,800 in rural damages. -- Keywords: Yellowstone River at Sidney, MT on Apr 03, 1955 [9155]	1,800 USD estimated rural damages
Yellowstone	Sidney	D13	3/26/1956		maximum annual gage height of 15.84 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney, on March 26, 1956. -- Keywords: Yellowstone River at Sidney, MT on Mar 26, 1956 [9156]	?
Yellowstone	Sidney	D13	3/21/1959		Ice was observed and reported jamming on the Yellowstone in the Sidney area between March 18 and March 22, 1959. An ice jam was reported on the Yellowstone near Sidney with a river gage of 19.14 feet on March 21, 1959. Flood stage is 19.0 feet. Bankful is 18.5 feet. A printout obtained by Andy Tuthill from Richland county, Montana reported two floods during 1959 caused by ice jams and snowmelt caused an estimated \$30,000 in rural damages. maximum annual gage height of 19.14 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney, on March 21, 1959. Ice was observed and reported jamming on the	30K USD estimated rural damages



<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
					Yellowstone in the Sidney area between March 18 and March 22, 1959. -- Keywords: Yellowstone River at Sidney, MT on Mar 21, 1959 [9157]	
Yellowstone	Sidney	D13	3/21/1960		maximum annual gage height of 15.1 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney, on March 21, 1960. A printout obtained by Andy Tuthill from Richland county, Montana reported a 1960 flood caused by ice jams caused an estimated \$69,000 in rural damages. -- Keywords: Yellowstone River at Sidney, MT on Mar 21, 1960 [9158]	69K USD estimated rural damages
Yellowstone	Sidney	D13	3/17/1961		maximum annual gage height of 12.60 feet affected by backwater from ice, reported at USGS gage Yellowstone River near Sidney, on March 17, 1961. -- Keywords: Yellowstone River at Sidney, MT on Mar 17, 1961 [9159]	?
Yellowstone	Sidney	D13	4/7/1965		Photographs were taken of an ice jam upstream of Sidney along the Yellowstone on April 7, 1965. -- Keywords: Yellowstone River at Sidney, MT on Apr 07, 1965 [9160]	?
Yellowstone	Sidney	D13	4/7/1965		Photographs were taken of an ice jam upstream of Sidney along the Yellowstone on April 7, 1965. -- Keywords: Yellowstone River at Sidney, MT on Apr 07, 1965 [9139]	?
Yellowstone	Sidney	D13	3/17/1966		On 17 March 1966 at the USGS Yellowstone River station, near Sidney, Montana, an annual maximum gage height of 13.34 feet was recorded, caused by backwater from ice. Discharge 15,000 cfs. -- Keywords: Yellowstone River at Sidney, MT on Mar 17, 1966 [20020718142105]	?
Yellowstone	Sidney	D13	3/26/1969	Break-up	An ice jam east of Sidney flooded 14,000 acres of property causing an estimated \$230,000 in damages. The water level rose to 20.27 feet, the second highest in record as of this date. The highest was in 1965 with a height of 21.30 feet. There were no human casualties, but one-third of the deer on the islands of the river were killed. The ice was observed as being up to 4 feet thick. -- Keywords: Yellowstone River at Sidney, MT on Mar 26, 1969 [9161]	230K USD and 14,000 acres flooded
Yellowstone	Sidney	D13	2/17/1971		The USGS reported a maximum gage height of 21.67 ft on 17 February 1971, on the Yellowstone River near Sidney, Montana due to backwater from ice. Discharge was 50,000 cfs. -- Keywords: Yellowstone River at Sidney, MT on Feb 17, 1971 [20021216130609]	?
Yellowstone	Sidney	D13	3/19/1979		An ice jam was reported on the Yellowstone near Sidney with a river gage of 19.57 feet on March 19, 1979. Flood stage is 19.0 feet. Bankful is 18.5 feet. -- Keywords: Yellowstone River at Sidney, MT on Mar 19, 1979 [9163]	?
Yellowstone	Sidney	D13	2/27/1986		An ice jam was reported on the Yellowstone near Sidney with a river gage of 19.60 feet on February 27, 1986. Flood stage is 19.0 feet. Bankful is 18.5 feet. Photographs were taken of an ice jam upstream of Sidney along the Yellowstone on February 27, 1986. -- Keywords: Yellowstone River at Sidney, MT on Feb 27, 1986 [9164]	?
Yellowstone	Sidney	D13	3/6/1994		An ice jam was reported on March 6, 1994 on the Yellowstone near Sidney with a max gage height of 24.03 ft. One was also recorded at this location on Mar 22, 1947 with a max gage height of 21.85 ft. This jam was at the bridge. Photographs were taken of an ice jam upstream of Sidney along the Yellowstone on March 5, 1994. -- Keywords: Yellowstone River at Sidney, MT on Mar 06, 1994 [9165]	?



<i>River</i>	<i>City</i>	<i>Reach</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
Yellowstone	Sidney	D13	2/13/1996	Break-up	A 2/13/96 NWS Flood Statement and MRD Datacol both reported an ice jam north of the highway 23 bridge near Sidney on the Yellowstone River. The exact formation date is unknown. This jam caused very high water. The jam moved out on 2/13/96. A NWS Flood Statement reported other ice jams occurring upstream and east of Sidney on 2/14/96. -- Keywords: Yellowstone River at Sidney, MT on Feb 13, 1996 [9166]	High water
Yellowstone	Sidney	D13	2/14/1997		An ice jam was reported as part of a USGS memo on the Yellowstone River near Sidney. Gage station no. 06329500. Feb 24 "Clear at Cableway-Ice jam below." Feb 25 "Ice jam below & above gage." Feb 25 "Floating ice chunks. Ice jam just above cableway." Mar 6 "Some floating & shore ice. Ice jam @ bridge on left bank." Mar 20 "Looks like a possible ice jam." Numerous ice jams were reported along the Yellowstone River from Miles City to Sydney. The ice jams continued through March with the largest jam being located at the Montana-North Dakota state line. -- Keywords: Yellowstone River at Sidney, MT on Feb 14, 1997 [9167]	?
Yellowstone	Sidney	D13			A printout obtained by Andy Tuthill from Richland county, Montana reported an 1899 flood caused by a series of ice jams that causes an estimated \$35,200 in rural damages. -- Keywords: Yellowstone River at Sidney, MT on ? ?, 1899 [9140]	35K USD estimated rural damages
Yellowstone	Fairview	D15	2/12/1996	Break-up	On 2/12/96 a NWS Flood Statement reported that an ice jam had formed on the Yellowstone River near Fairview, MT. The MRD Datacol 2/12/96 reported that an ice jam was at the Hwy 10 bridge U/S of the confluence on the Missouri River. Ice jams were also reported near Fairview (reported Fairfax, ND) on the Yellowstone River. Stages were above flood stage at Williston, ND due to the ice. -- Keywords: Yellowstone River at Fairview, MT on Feb 12, 1996 [1759]	?

## B.2. Tributaries

<i>River</i>	<i>City</i>	<i>Date</i>	<i>Jam Type</i>	<i>Description</i>	<i>Damages</i>
Big Horn River	Treasure County	1/3/1997		Ice floes, several miles long, was jamming the Yellowstone River causing evacuations from homes and ranches. Over a foot of water covered Riverfront Park where the Yellowstone's waters surpassed bankful. Ice jams were also reported along the Musselshell River between Lavina and Ryegate (causing minor flooding of U.S. Highway 12) and the Bighorn River which reached its flood stage of 9.0 feet. -- Keywords: Big Horn River at Treasure County, MT on Jan 03, 1997 [79]	?
Big Horn River	Bighorn	1/3/1997		Ice floes, several miles long, was jamming the Yellowstone River causing evacuations from homes and ranches. Over a foot of water covered Riverfront Park where the Yellowstone's waters surpassed bankful. Ice jams were also reported along the Musselshell River between Lavina and Ryegate (causing minor flooding of U.S. Highway 12) and the Bighorn River which reached its flood stage of 9.0 feet. -- Keywords: Big Horn River at Bighorn, MT on Jan 03, 1997 [78]	?

Boulder River	Contact	2/27/1961	Freeze-up		?
Boulder River	Contact	2/15/1962	Freeze-up	USGS water data records reported a minimum discharge for WY 1962 of 16 cfs as a result of a freeze-up event. This event was recorded on the Milk River near Contact, MT on 15 February 1962. The gage height was 1.22 feet. -- Keywords: Boulder River at Contact, MT on Feb 15, 1962 [20050829162113]	?
Clarks Fork	Bridger	11/19/1959	Freeze-up	Freeze-up jam resulting from extremely low air temperatures caused water to rise approximately 10 feet above normal stage. Town used dragline to construct by-pass channel through the ice. -- Keywords: Clarks Fork at Bridger, MT on Nov 19, 1959 [263]	200 acres flooded; 7.5K USD damage
Clarks Fork	Laurel	2/6/1997		An ice jam caused flooding of the Clarks Fork of the Yellowstone River which left a foot of water on Byam Road, south of Laurel. The road was closed from Moser Dome Road to U.S. Highway 212. The bridge over Railroad Creek on Bozeman Trail was closed for a week. -- Keywords: Clarks Fork at Laurel, MT on Feb 06, 1997 [264]	Lowland flooding
Powder River	Moorhead	3/3/1934		maximum annual gage height of 6.58 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on March 3, 1934. -- Keywords: Powder River at Moorhead, MT on Mar 03, 1934 [9087]	?
Powder River	Moorhead	3/2/1936		maximum annual gage height of 15.10 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on March 2, 1936. -- Keywords: Powder River at Moorhead, MT on Mar 02, 1936 [9088]	?
Powder River	Moorhead	3/5/1938		maximum annual gage height of 7.44 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on March 5, 1938. -- Keywords: Powder River at Moorhead, MT on Mar 05, 1938 [9089]	?
Powder River	Moorhead	3/14/1939		maximum annual gage height of 7.72 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on March 14, 1939. -- Keywords: Powder River at Moorhead, MT on Mar 14, 1939 [9090]	?
Powder River	Moorhead	3/3/1940		maximum annual gage height of 7.60 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on March 3, 1940. -- Keywords: Powder River at Moorhead, MT on Mar 03, 1940 [9091]	?
Powder River	Moorhead	3/12/1942		maximum annual gage height of 8.43 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on March 12, 1942. -- Keywords: Powder River at Moorhead, MT on Mar 12, 1942 [9092]	?
Powder River	Moorhead	3/25/1943		maximum annual gage height of 11.19 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead on March 25, 1943. -- Keywords: Powder River at Moorhead, MT on Mar 25, 1943 [9093]	?
Powder River	Moorhead	3/17/1944		maximum annual gage height of 10.10 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on March 17, 1944. -- Keywords: Powder River at Moorhead, MT on Mar 17, 1944 [9094]	?

Powder River	Locate	3/13/1945		maximum annual gage height of 7.25 feet affected by backwater from ice, reported at USGS gage Powder River near Locate, on March 13, 1945. -- Keywords: Powder River at Locate, MT on Mar 13, 1945 [9111]	?
Powder River	Moorhead	3/14/1945		maximum annual gage height of 12.73 feet affected by backwater from ice, reported at USGS Powder River at Moorhead, on March 14, 1945. -- Keywords: Powder River at Moorhead, MT on Mar 14, 1945 [9095]	?
Powder River	Moorhead	2/25/1946		maximum annual gage height of 8.09 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on February 25, 1946. -- Keywords: Powder River at Moorhead, MT on Feb 25, 1946 [9096]	?
Powder River	Moorhead	3/17/1947		maximum annual gage height of 15.64 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on March 17, 1947. -- Keywords: Powder River at Moorhead, MT on Mar 17, 1947 [9097]	?
Powder River	Locate	3/19/1948		maximum annual gage height of 6.92 feet affected by backwater from ice, reported at USGS gage Powder River near Locate, on March 19, 1948. -- Keywords: Powder River at Locate, MT on Mar 19, 1948 [9112]	?
Powder River	Locate	2/27/1950		maximum annual gage height of 6.94 feet affected by backwater from ice, reported at USGS gage Powder River near Locate, on February 27, 1950. -- Keywords: Powder River at Locate, MT on Feb 27, 1950 [9113]	?
Powder River	Moorhead	3/4/1950		maximum annual gage height of 5.33 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on March 4, 1950. -- Keywords: Powder River at Moorhead, MT on Mar 04, 1950 [9098]	?
Powder River	Moorhead	3/27/1951		maximum annual gage height of 9.18 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on March 17, 1951. -- Keywords: Powder River at Moorhead, MT on Mar 27, 1951 [9099]	?
Powder River	Locate	3/29/1951		maximum annual gage height of 5.13 feet affected by backwater from ice, reported at USGS gage Powder River near Locate, on March 29, 1951. -- Keywords: Powder River at Locate, MT on Mar 29, 1951 [9114]	?
Powder River	Locate	3/29/1952		maximum annual gage height of 11.01 feet affected by backwater from ice, reported at USGS gage Powder River near Locate, on March 29, 1952. -- Keywords: Powder River at Locate, MT on Mar 29, 1952 [9115]	?
Powder River	Moorhead	3/13/1953		maximum annual gage height of 8.90 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on March 13, 1953. -- Keywords: Powder River at Moorhead, MT on Mar 13, 1953 [9100]	?
Powder River	Locate	3/14/1953		maximum annual gage height of 8.61 feet affected by backwater from ice, reported at USGS gage Powder River near Locate, on March 14, 1953. -- Keywords: Powder River at Locate, MT on Mar 14, 1953 [9116]	?
Powder River	Moorhead	3/12/1955		maximum annual gage height of 9.83 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on March 12, 1955. -- Keywords: Powder River at Moorhead, MT on Mar 12, 1955 [9101]	?
Powder River	Moorhead	3/21/1956		The maximum gage height of 17.7 feet was recorded on 21 March 1956 at the USGS Powder River station, at Moorhead, Montana, caused by an ice jam. Period of record 1929-1965. -- Keywords: Powder River at Moorhead, MT on Mar 21, 1956 [20020722152423]	?

Powder River	Locate	3/23/1956		maximum annual gage height of 12.3 feet affected by backwater from ice, reported at USGS gage Powder River near Locate, on March 23, 1956. -- Keywords: Powder River at Locate, MT on Mar 23, 1956 [9117]	?
Powder River	Moorhead	3/18/1959		maximum annual gage height of 7.50 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on March 18, 1959. -- Keywords: Powder River at Moorhead, MT on Mar 18, 1959 [9103]	?
Powder River	Locate	3/18/1959		maximum annual gage height of 8.31 feet affected by backwater from ice, reported at USGS gage Powder River near Locate, on March 18, 1959. -- Keywords: Powder River at Locate, MT on Mar 18, 1959 [9118]	?
Powder River	Moorhead	3/19/1960		maximum annual gage height of 7.62 feet affected by backwater from ice, reported at USGS gage of Powder River at Moorhead, on March 19, 1960. -- Keywords: Powder River at Moorhead, MT on Mar 19, 1960 [9104]	?
Powder River	Locate	3/19/1960		maximum annual gage height of 9.10 feet affected by backwater from ice, reported at USGS gage Powder River near Locate, on March 19, 1960. -- Keywords: Powder River at Locate, MT on Mar 19, 1960 [9119]	?
Powder River	Moorhead	2/21/1961		maximum annual gage height of 3.78 feet affected by backwater from ice, reported at USGS gage Powder River at Moorhead, on February 21, 1961. -- Keywords: Powder River at Moorhead, MT on Feb 21, 1961 [9105]	?
Powder River	Locate	3/2/1961		maximum annual gage height of 3.45 feet affected by backwater from ice, reported at USGS gage Powder River near Locate, on March 2, 1961. -- Keywords: Powder River at Locate, MT on Mar 02, 1961 [9120]	?
Powder River	Moorhead	4/1/1965		Due to an ice jam, an annual maximum gage height, of 13.63 feet, was recorded at the USGS Powder River station at Moorhead, Montana on 1 April 1965. Discharge 4000 cfs. -- Keywords: Powder River at Moorhead, MT on Apr 01, 1965 [20020722152919]	?
Powder River	Moorhead	3/12/1966		Due to an ice jam, an annual maximum gage height of 10.85 feet, was recorded at the USGS Powder River station at Moorhead, Montana on 12 March 1966. The annual maximum discharge of 4000 cfs was recorded the following day. -- Keywords: Powder River at Moorhead, MT on Mar 12, 1966 [20020722175310]	?
Powder River	Locate	3/16/1966		Due to backwater from ice, an annual maximum gage height, of 8.25 feet, and annual maximum discharge of 2000 cfs were recorded at the USGS Powder River station near Locate, Montana on 16 March 1966. -- Keywords: Powder River at Locate, MT on Mar 16, 1966 [20020718152349]	?
Powder River	Moorehead	3/15/1967		As a result of backwater from ice, an annual maximum gage height of 11.57 feet was recorded at the USGS Powder River station at Moorhead Montana on 15 Mar 1967. Associated discharge 250 cfs. - - Keywords: Powder River at Moorehead, MT on Mar 15, 1967 [20020723102733]	?
Powder River	Locate	3/1/1968		On 1 March 1968 at the USGS Powder River station, near Locate, Montana an annual maximum gage height of 9.88 feet was recorded, caused by backwater from ice. Discharge 6000 cfs. -- Keywords: Powder River at Locate, MT on Mar 01, 1968 [20020718152733]	?
Powder River	Moorehead	3/6/1968		As a result of backwater from ice, an annual maximum gage height of 8.44 feet was recorded at the USGS Powder River station at Moorhead Montana on 6 Mar 1968. Associated discharge 1450 cfs. - - Keywords: Powder River at Moorehead, MT on Mar 06, 1968 [20020723103053]	?

Powder River	Moorehead	3/19/1969		As a result of an ice jam, an annual maximum gage height of 10.81 feet was recorded at the USGS Powder River station at Moorhead Montana on 19 Mar 1969. Associated discharge 4500 cfs. -- Keywords: Powder River at Moorehead, MT on Mar 19, 1969 [20020723133652]	?
Powder River	Locate	2/15/1971		The USGS reported a maximum gage height of 9.6 ft on 15 February 1971, on the Powder River near Locate, Montana due to an ice jam. Discharge was 7,000 cfs. -- Keywords: Powder River at Locate, MT on Feb 15, 1971 [20021216130356]	?
Powder River	Moorhead	2/16/1971		The USGS reported a maximum gage height of 8.21 ft on 16 February 1971, on the Powder River at Moorhead, Montana due to an ice jam. Discharge was 3,000 cfs. -- Keywords: Powder River at Moorhead, MT on Feb 16, 1971 [20021216125834]	?
Powder River	Broadus	3/5/1994		Large ice jams were reported along the Powder River about 20 miles south of Broadus. -- Keywords: Powder River at Broadus, MT on Mar 05, 1994 [1317]	?
Powder River	Locate	2/11/1996	Freeze-up	"The National Weather Service said ice floes damaged water gauges on the Powder River at Locate." -- Keywords: Powder River at Locate, MT on Feb 11, 1996 [20010717112932]	Damaged water gauges
Powder River	Moorhead	11/21/2003		According to USGS surface water records, the maximum peak stage on the Powder River at Moorhead, Montana was due to backwater from an ice jam. A gage height of 5.18 ft was recorded on 21 November 2003. Daily discharge was approximately 200 cfs. -- Keywords: Powder River at Moorhead, MT on Nov 21, 2003 [20050503112659]	?
Stillwater River	Columbus	1/29/1996		On Jan 27 an ice jam was causing flooding on Route 78 (about one mile south of Columbus) caused by Stillwater Creek water backing up into irrigation canals near the highway. On Jan 29 it was causing 2-3 feet of flooding in some parts of Columbus, MT. Countryman Creek Road at Fireman's Point was closed. On Feb 8 the jam on Stillwater Creek near Columbus flooded 15 cabins in the area . Old Hardin Road between Piccolo and Johnson Lanes was closed. Sourdough and Bridger Creeks, and the Shields River also had ice jams reported. By Jan 30, the Stillwater Creek was back in its banks. The total damages for February's ice jams in Montana include...\$1.8 million in publically owned facilities, two homes completely destroyed, 197 homes damaged 46 of which had to be evacuated, three deaths and two train derailments. -- Keywords: Stillwater River at Columbus, MT on Jan 29, 1996 [1500]	Flooding
Stillwater River	Fireman's Point	2/6/1996	Break-up	NWS River Statements on 2/6/96 and 2/7/96 indicated that an ice jam was present on the Stillwater River near Fireman's Point, MT. -- Keywords: Stillwater River at Fireman's Point, MT on Feb 06, 1996 [1501]	?
Stillwater River	Fireman's Point	1/1/1997		A woman and her son were rescued from raging waters, moving at 4-5 mph, due to an ice jam on the Stillwater River, located near Fireman's Point, south of Columbus. The river was carrying chunks of ice 100 to 200 lbs. each. The two victims were rescued by the Stillwater police once on shore. Five other residences in the Columbus area were affected. -- Keywords: Stillwater River at Fireman's Point, MT on Jan 01, 1997 [1502]	Lowland flooding, river diversion
Tongue River	Miles City	3/20/1947		maximum annual gage height of 9.65 feet, affected by backwater from ice, reported at USGS gage Tongue River at Miles City on March 20, 1947. -- Keywords: Tongue River at Miles City, MT on Mar 20, 1947 [9030]	?

Tongue River	Miles City	3/6/1949		maximum annual gage height of 11.8 feet, affected by backwater from ice, reported at USGS gage Tongue River at Miles City on March 6, 1949. Maximum open water stage 1938-1941, 1946-1963: 11.33 feet (13,300 cfs) on June 15, 1962. -- Keywords: Tongue River at Miles City, MT on Mar 06, 1949 [9031]	?
Tongue River	Miles City	4/2/1950		maximum annual gage height of 6.76 feet, affected by backwater from ice, reported at USGS gage Tongue River at Miles City on April 2, 1950. -- Keywords: Tongue River at Miles City, MT on Apr 02, 1950 [9032]	?
Tongue River	Miles City	3/29/1952		maximum annual gage eheight of 11.7 feet, affected by backwater from ice, reported at USGS gage Tongue River near Miles City on March 29, 1952. Maximum open-water stage during the period 1938-1941, 1946-1963: 11.33 feet (13,300 cfs) on June 15, 1952. -- Keywords: Tongue River at Miles City, MT on Mar 29, 1952 [9033]	?
Tongue River	Miles City	3/23/1956		maximum annual gage height of 9.00 feet, affected by backwater from ice, reported at USGS gage Tongue River at Miles City on March 23, 1956. -- Keywords: Tongue River at Miles City, MT on Mar 23, 1956 [9034]	?
Tongue River	Miles City	3/1/1957		maximum annual gage height of 6.33 feet, affected by backwater from ice, reported at USGS gage Tongue River at Miles City on March 1, 1957. -- Keywords: Tongue River at Miles City, MT on Mar 01, 1957 [9035]	?
Tongue River	Miles City	3/10/1959		maximum annual gage height of 7.3 feet, affected by backwater from ice, reported at USGS gage Tongue River at Miles City on March 10, 1959. -- Keywords: Tongue River at Miles City, MT on Mar 10, 1959 [9036]	?
Tongue River	Miles City	3/19/1960	Break-up	The maximum gage height of 13.27 feet was recorded on 19 March 1960 at the USGS Tongue River station, at Miles City, Montana, caused by an ice jam. Period of record 1938-1942, 1946-1969. -- Keywords: Tongue River at Miles City, MT on Mar 19, 1960 [20020724144612]	?
Tongue River	Miles City	3/19/1960		maximum annual gage height of 12.27 feet, affected by backwater from ice, reported at USGS gage Tongue River at Miles City on March 19, 1960. This is the maximum stage for the period 1938-1941, 1946-1963; the maximum open-water stage was 11.33 feet on June 15, 1962. According to the USGS Surface Water Records, Water Year 1970, this remains the maximum gage height, with period of record extending to 1970. -- Keywords: Tongue River at Miles City, MT on Mar 19, 1960 [9037]	?
Tongue River	Decker	2/6/1963		The USGS gaging station of Tongue River at State line, Montana near Decker recorded a maximum gage height of 10.94 feet on 6 February 1963, and a result of backwater from an ice jam. Period of record 1960-1970. -- Keywords: Tongue River at Decker, MT on Feb 06, 1963 [20020702171938]	?
Tongue River	Miles City	2/6/1963		maximum annual gage height of 7.55 feet, affected by backwater from ice, reported at USGS gage Tongue River at Miles City on February 6, 1963. -- Keywords: Tongue River at Miles City, MT on Feb 06, 1963 [9038]	?
Tongue River	Decker	4/2/1965		On 2 or 3 April 1965, at the USGS Tongue River station near Decker, Montana, an annual maximum gage height of 10.20 feet was recorded, caused by backwater from ice. Discharge 2000 cfs. -- Keywords: Tongue River at Decker, MT on Apr 02, 1965 [20020725152225]	?
Tongue River	Miles City	4/2/1965		Due to an ice jam, the annual maximum gage height, of 11.59 feet, was recorded at the USGS Tongue River station at Miles City, Montana on 2 April 1965. Discharge 1800 cfs. -- Keywords: Tongue River at Miles City, MT on Apr 02, 1965 [20020725150911]	?

Tongue River	Miles City	3/15/1966		As a result of backwater from ice, an annual maximum gage height, of 5.00 feet, was recorded at the USGS Tongue River station at Miles City, Montana on 15 March 1966. Discharge 480 cfs. -- Keywords: Tongue River at Miles City, MT on Mar 15, 1966 [20020725150555]	?
Tongue River	Decker	3/19/1969		On 19 March 1969 at the USGS Tongue River station near Decker, Montana, an annual maximum gage height of 9.86 feet was recorded, caused by backwater from ice. Discharge 4000 cfs. -- Keywords: Tongue River at Decker, MT on Mar 19, 1969 [20020725151741]	?
Tongue River	Miles City	3/19/1969	Unknown	The maximum annual gage height of 11.03 feet was recorded on 19 March 1969 at the USGS Tongue River station, at Miles City, Montana, caused by an ice jam. Discharge 7500 cfs. -- Keywords: Tongue River at Miles City, MT on Mar 19, 1969 [20020724145030]	?
Tongue River	Ashland	3/20/1969	Break-up	As a result of an ice jam, an annual maximum gage height, of 10.31 feet, was recorded at the USGS Tongue River station near Ashland, Montana on 20 March 1969. Discharge 3200 cfs. This was also the maximum gage height for the period of record, 1966-1969. -- Keywords: Tongue River at Ashland, MT on Mar 20, 1969 [20020724113018]	?
Tongue River	Decker	2/15/1971		The USGS reported a maximum gage height of 10.93 ft on 15 February 1971, on the Tongue River near Decker, Montana due to backwater from ice. Discharge was 2,700 cfs. -- Keywords: Tongue River at Decker, MT on Feb 15, 1971 [20021216124927]	?
Tongue River	Miles City	2/15/1971		The USGS reported a maximum gage height of 13.27 ft on 15 February 1971, on the Tongue River at Miles City, Montana due to backwater from ice. Discharge was 7,800 cfs. -- Keywords: Tongue River at Miles City, MT on Feb 15, 1971 [20021216125235]	?
Tongue River	Ashland	2/16/1971		The USGS reported a maximum gage height of 12.1 ft on 16 February 1971, on the Tongue River near Ashland, Montana due to backwater from ice. Discharge was 5,000 cfs. -- Keywords: Tongue River at Ashland, MT on Feb 16, 1971 [20021216125111]	?
Tongue River	Miles City	3/4/1994		Ice jams causing lowland flooding were reported at the mouth of the Tongue River south of Miles City, MT on March 4, 1994. -- Keywords: Tongue River at Miles City, MT on Mar 04, 1994 [9039]	Flooding, structures threatened
Tongue River	Miles City	2/6/1996		An ice jam on the Little Bighorn River near Crow Agency, MT completely flooded four homes and threatened 50-60 others. The jam was located south of Crow Agency near the I-90 interchange with Route 212. I-90 was being flooded though it remained open to traffic. The jam was estimated as 3 football fields long. Other jams were reported along the Yellowstone south of Billings where Jellison and River Roads were being flooded. Another jam near Huntley was causing some flooding along the Yellowstone. Dynamite was used in Laurel to blast other jams on the Yellowstone. In Miles City, a five-mile-long jam blocked the mouth of the Tongue River where it empties into the Yellowstone (it was reported that it was backed up to the I-94 bridge south of Miles City) forcing the evacuation of about 10 families in Clinton. Twenty-nine of Montana's 56 counties reported flooding on this day. Ice jams were also reported between Miles City and Big Timber along the Yellowstone. Approximately, 50,000 sand bags were ordered from Fort Peck, MT. The total damages for February's ice jams in Montana include...\$1.8 million in publically owned facilities, two homes completely destroyed, 197 homes damaged 46 of which had to be evacuated, three deaths and two train derailments. MRD Datacol and NWS Flood Advisories reported an ice jam on the Tongue River in Miles City, MT on 2/9/96. -- Keywords: Tongue River at Miles City, MT on Feb 06, 1996 [9040]	Flooding

Tongue River	Buffalo Rapids	2/19/1997		An ice jam 2.5 miles downstream from the confluence of the Yellowstone River and Tongue River, in Custer County, has caused some low-land flooding near Miles City. At Miles City the river stage was 14.5 feet while the flood stage is 13 feet. Ice jams were also reported near the fairgrounds at Glendive. -- Keywords: Tongue River at Buffalo Rapids, MT on Feb 19, 1997 [1620]	?
Tongue River	Miles City	3/14/2003	Break-up	The NWS reports on March 14: The Tongue River 5 to 15 miles south of Miles City rose rapidly on Friday...likely due to an ice jam. Water was at bankfull and flowing over the top of 12 Mile Dam. Low lying flooding was also occurring with some water flowing over low lying roads. The NWS reports on March 16: an ice jam has formed on the Tongue River where it enters the Yellowstone River near Miles City. Water is rising on the Tongue River and a flood warning has been issued. No other information available. -- Keywords: Tongue at Miles City, MT on Mar 14, 2003 [20030317105650]	?



## Appendix C. Bridges

County	Location	River Mile	Reach	Bridge Length (ft)	Road Name	Year Built	No. of Spans	Type
Park	Gardiner	564.5	PC1	409	US 89	1930	3	Steel Truss - Deck
	Corwin Springs	556.5	PC3	294	County Road 322	1908	1	Steel Truss - Through
	15M S Emmigrant	547.5	PC3	176	County Road 301	1918	1	Steel Truss - Through
	11M SW Emigrant	543.2	PC4	455	US 89	1958	4	Steel Multi Beam - Continuous
	E Emigrant	531.5	PC7	306	County Road 206	1949	4	Steel Multi Beam - Continuous
	3M NE Pray	525.0	PC8	364	County Road 204	1960	4	Steel Multi Beam - Continuous
	1M W Pine Creek	514.5	PC9	374	County Road 203	1990	3	Steel Multi Beam - Continuous
	4M S Livingston (Carters Bridge)	506.5	PC13	285	S 540	1921	3	Masonry Arch
	Livingston	502.5	PC14	730	I 90	1962	4	Steel Girder/Floorbeam
	Livingston	502.5	PC14	730	I 90	1962	4	Steel Girder/Floorbeam
	Livingston (9th Street Bridge)	502.2	PC14	181	County Road 391	1964	6	Concrete Tee Beam
	NE Livingston	499.8	PC15	504	US 89	1934	5	Steel Girder/Floorbeam
	NE Livingston	499.8	PC16	300	Railroad	Unknown	2	Steel Truss - Through
	6M NE Livingston	494.5	PC17	394	US 89	1955	4	Steel Multi Beam - Continuous
	6M NE Livingston	494.5	PC17	320	Railroad (no longer in use)	Unknown	2	Steel Truss - Through
1M N Springdale	479.0	PC21	472	County Road 563	1980	4	Prestressed Beam	
Sweet Grass	6M SW Big Timber	469.5	A2	426	County Road 028	2000	3	Prestressed Beam
	1M N Big Timber	460.7	A4	380	US 191	1938	3	Steel Girder/Floorbeam
	SE Greycliff	448.4	A7	353	County Road 001	1991	3	Prestressed Beam
Stillwater	NW Reedpoint	434.6	A10	505	County Road 005	2000	4	Prestressed Beam - Continuous
	5M SE Reedpoint	428.4	A11	570	Frontage Road 115	1931	3	Steel Truss - Through
	5M SE Reedpoint	428.3	A11	535	Railroad	Unknown	3	Steel Truss - Through
	5.5M E Reedpoint	427.8	A11	558	I 90	1961	4	Steel Girder/Floorbeam
	5.5M E Reedpoint	427.8	A11	583	I 90	1976	4	Steel Multi Beam
Columbus	415.6	A13	576	S 78	1957	4	Steel Girder/Floorbeam	
Yellowstone	1M S Laurel	385.9	A17	513	US 212	1997	5	Steel Multi Beam - Continuous
	SW Billings	378.0	B1	558	Duck Creek Rd	1991	5	Prestressed Beam
	1M S Billings	371.1	B1	861	County Road 416	1972	5	Steel Multi Beam -

County	Location	River Mile	Reach	Bridge Length (ft)	Road Name	Year Built	No. of Spans	Type
								Continuous
	Billings	364.9	B2	945	I 90	1962	4	Steel Girder/Floorbeam
	Billings	364.9	B2	945	I 90	1962	4	Steel Girder/Floorbeam
	Billings (Dick Johnston Bridge)	364.6	B2	568	US 87	1993	5	Prestressed Beam
	Billings	364.6	B2	475	Railroad	Unknown	3	Steel Truss - Through
	Huntley	352.6	B5	1024	Frontage Road 788	1949	8	Steel Girder/Floorbeam
	3M NW Pompey's Pillar	332.4	B7	805	S 568	2001	6	Prestressed Beam
	3M NW Pompey's Pillar	332.4	B7	650	No Longer In Use	1915	3	Steel Truss - Through
	1M N Custer	302.6	B12	567	County Road 310	1964	4	Steel Girder/Floorbeam
Treasure	Myers	286.5	C3	706	County Road 311	1968	4	Steel Girder/Floorbeam
Rosebud	Forsyth	239.7	C10	625	US 12	1958	4	Steel Girder/Floorbeam
	Forsyth (Old Forsyth bridge)	239.5	C10	290	No Longer In Use	1905	1	Steel Truss - Through
	1M W Rosebud	225.0	C11	683	S 446	1970	4	Steel Girder/Floorbeam
Custer	W Of Miles City	189.6	C16	1080	Railroad	Unknown	4	Steel Truss - Through
	3M W Miles City	186.6	C16	800	Fort Keogh Road	Unknown	2	Steel Truss - Through
	Miles City	184.0	C17	971	S 59	1957	4	Steel Girder/Floorbeam
	9M NE Miles City	172.1	C19	1080	County Road 62	1907	4	Steel Multi Beam
Prairie	1M N Terry	137.0	D1	825	S 253	1959	4	Steel Girder/Floorbeam
	4M SW Terry	144.5	D1	1092	County Road 42	1907	4	Steel Multi Beam
	2M E Fallon	126.4	D2	1168	I 94	1978	6	Steel Multi Beam
	2M E Fallon	126.4	D2	1168	I 94	1978	6	Steel Multi Beam
	1M NE Fallon	126.4	D3	1149	Frontage Road 114	1945	4	Steel Truss - Through
Dawson	1/2M SW Glendive	94.6	D5	1325	Railroad	Unknown	6	Steel Truss - Through
	Glendive (Old Bell Street bridge)	93.6	D6	1290	Pedestrian Bridge	1924	6	Steel Truss - Through
	Glendive	93.5	D6	1318	S 200S	1958	8	Steel Girder/Floorbeam
	Glendive	92.2	D6	1973	I 94	1968	10	Steel Girder/Floorbeam
	Glendive	92.2	D6	2013	I 94	1968	10	Steel Girder/Floorbeam
Richland	2M S Sidney	31.1	D13	1102	S 23	1994	5	Steel Multi Beam