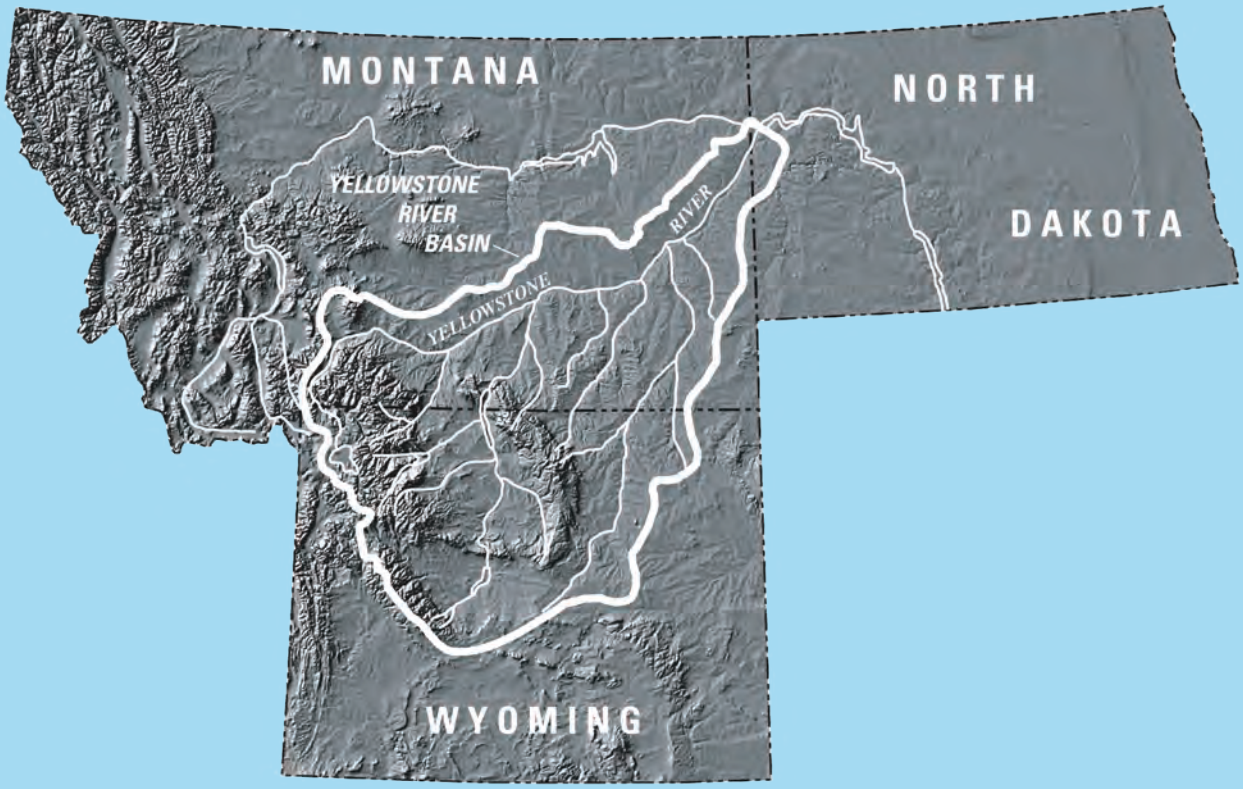
YELLOWSTONE RIVER COMPACT COMMISSION

WYOMING **MONTANA** **NORTH DAKOTA**



SIXTY-FIFTH ANNUAL REPORT
2016

Yellowstone River Compact Commission

Sixty-Fifth Annual Report

2016

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Conversion Factors

Multiply	By	To obtain
	Length	
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
acre	4,047	square meter (m^2)
acre	0.4047	hectare (ha)[1]
acre	0.4047	square hectometer (hm^2)
acre	0.004047	square kilometer (km^2)
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
cubic foot per second per day (ft^3/s-day)	2,447	cubic meter (m^3)
cubic foot per second per day (ft^3/s-day)	0.0002447	cubic hectometer (hm^3)
cubic foot (ft^3)	0.02832	cubic meter (m^3)
acre-foot (acre-ft)	1,233	cubic meter (m^3)
acre-foot (acre-ft)	0.001233	cubic hectometer (hm^3)
acre-foot (acre-ft)	0.000001233	cubic kilometer (km^3)
	Flow rate	
acre-foot per year (acre-ft/yr)	1,233	cubic meter per year (m^3/yr)
acre-foot per year (acre-ft/yr)	0.001233	cubic hectometer per year (hm^3/yr)
acre-foot per year (acre-ft/yr)	0.000001233	cubic kilometer per year (km^3/yr)
cubic foot per second (ft^3/s)	28.32	liter per second (L/s)
cubic foot per second (ft^3/s)	28.32	cubic decimeter per second (dm^3/s)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
feet per year (ft/yr)	0.3048	meter per year
gallons per minute (gal/min)	0.06309	liter per second

[1]The unit hectare is used with the International System of Units (SI), which is in common everyday use throughout the world. See: Taylor, B.E., and Thompson, Ambler, eds., 2008, The International System of Units (SI): U.S. Department of Commerce, NIST Special Publication 330, 92 p., available online at *http://www.nist.gov/pml/pubs/sp330/*.

YELLOWSTONE RIVER COMPACT COMMISSION

3162 BOZEMAN AVENUE

HELENA, MONTANA 59601

Honorable Matthew Mead
Governor of the State of Wyoming
Cheyenne, Wyoming 82002

Honorable Steve Bullock
Governor of the State of Montana
Helena, Montana 59620

Honorable Doug Burgum
Governor of the State of North Dakota
Bismarck, North Dakota 58501

Dear Governors:

Pursuant to Article III of the Yellowstone River Compact, the Commission submits the following sixty-fourth annual report of activities for the period ending September 30, 2016.

Minutes of December 1, 2016

Members of the Yellowstone River Compact Commission convened on December 1, 2016 at 8:30 am in the Beartooth Room of the Pollard Hotel in Red Lodge, MT. In attendance were Mr. Mark Anderson, U.S. Geological Survey (USGS), Chairman and Federal Representative; Mr. Pat Tyrrell, Wyoming State Engineer's Office (WSEO) and Commissioner for Wyoming; Ms. Kimberly Overcast, Montana Department of Natural Resources and Conservation (DNRC) and acting Commissioner for Montana (on behalf of Tim Davis). Also in attendance were Mr. Chris Brown, Wyoming Attorney General's Office; Mr. Loren Smith, Ms. Beth Callaway, and Mr. David Schroeder, WSEO; Mr. Chuck Dalby and Mr. Mark Elison, DNRC; Mr. Clayton Jordan (U.S. Bureau of Reclamation); Mr. Bill Schuh, North Dakota State Water Commission; Mr. Kirk Miller and Mr. Wayne Berkas, USGS.

Mr. Anderson called the meeting to order.

Mr. Tyrrell moved to recognize Ms. Overcast as acting Commissioner for the State of Montana. It was seconded.

Mr. Anderson presented the agenda and asked if there were any additions or corrections to the agenda. A presentation from Mr. Schuh related to water use and fracking in North Dakota and some comments from Mr. Anderson about his tenure on the Commission were added to the agenda.

Ms. Overcast made a motion to approve the agenda. It was seconded.

Mr. Berkas distributed a handout showing the operational cost for Fiscal Year (FY) 2017 and the estimated budgets for FY 2018 through 2020. The handout shows the cost for each streamgage in FY 2017 is $16,230 and the cost to prepare the annual report is $37,000 The total coast for FY 2017 is $118,150.

The breakout of this cost is:
$32.600 for WSEO,
$32,600 for DNRC, and
$52,950 for USGS.

The contributions estimated for FY 2018 through FY 2020 by agency are as follows:

Year	WSE	DNRC	USGS	Total
FY2018	$33,575	$33,575	$54,540	$121,690
FY2019	$34,580	$34,580	$56,180	$125,340
FY2020	$35,615	$35,615	$57,865	$129,095

The estimated cost increases from FY 2018 to FY 2020 assume an increase of 3 percent each year. The cost for each FY will not exceed those listed, but the cost might be less.

Mr. Anderson asked if the Commission could be updated on the legal proceedings of Montana v Wyoming and the Special Master's report.

Mr. Tyrrell noted that no one from the Montana Attorney General's office was present and asked if Mr. Brown would like to comment.

Mr. Brown replied that he would read from a written summary to ensure that the information wasn't mischaracterized. Mr. Brown read that on March 21, 2016, the Supreme Court adopted the Special Master's proposed order establishing Wyoming's years of and amount of liability. In that order the Supreme Court found that Wyoming is not liable for violating the Compact 13 of the 15 years that Montana claimed at trial. Wyoming did violate the Compact in 2004 and 2006 by diverting or storing water under post-1950 rights after Montana made a call in those years. After making adjustments for conveyance losses, the Court found Wyoming is liable to Montana in the amount of 1300 acre-ft in 2004 and 56 acre-ft in 2006. The process is now at the remedies phase of the case. Both States filed summary judgement motions in the spring of 2016 and are awaiting the Special Master's decisions on those motions. Montana is seeking further declaratory relief regarding the nature of the Tongue River Reservoir right and in shorthand, 72,500 acre-ft per year less carryover in storage is what they asserted in their motion in addition to damages, injunction, and costs. Wyoming reasserted its positions that it stated in its exception to the Special Master's report, which was essentially replacement water damages at approximately $15 per acre-ft and asserting no injunction is necessary, and no costs. The Special Master heard oral arguments on those motions on July 27 in Denver and the States are still waiting on the decision. Pending the Special Master's decision on the summary judgement motions, a trial date will be set if necessary.

Mr. Anderson asked if a settlement of the penalty phase was possible.

Mr. Brown replied that an attempt was made, but ultimately the States were unable to reach an agreement.

Mr. Anderson asked Mr. Berkas to present streamflow and reservoir conditions.

Mr. Berkas distributed a handout on streamflow and reservoir conditions through 2016 water year. Streamflow was below average (below average is less than 80 percent of the annual mean) for all sites monitored by the Commission. Annual streamflow at Clarks Fork Yellowstone River at Edgar (adjusted for diversions to White Horse Canal) was 72 percent of average and ranked 6th lowest of 78 years. The annual streamflow at Bighorn River near Bighorn (adjusted for the flow of the Little Bighorn River and change of contents in Bighorn Lake) was 61 percent of average and ranked 24th lowest of 63 years. The annual streamflow at Tongue River at Miles City was 46 percent of average and ranked 8th lowest of 73 years. The annual streamflow at Powder River near Locate was 46 percent of average and ranked 9th lowest of 78 years. Total adjusted streamflow of the four rivers in water year 2016 was 2,932,200 acre-ft, compared to 4,308,700 acre-ft in water year 2015, and 5,300,900 acre-ft in water year 2014.

Reservoir storage, historically monitored and reported for the Commission, decreased in six of the seven reservoirs. Bighorn Lake, Boysen Reservoir, Bull Lake, Pilot Butte Reservoir, Buffalo Bill Reservoir, and Tongue River Reservoir all decreased; while Anchor Reservoir increased compared to water year 2015. The contents and the amounts of decrease are listed in the 2016 annual report. The total usable contents of these reservoirs at the end of water year 2016 was 2,015,000 acre-ft, compared to 2,097,00 acre-ft in water year 2015, and 2,324,00 acre-ft in water-year 2014. Storage in other reservoirs in the four river basins at the end of water year 2016 was 337,000, acre-ft compared to 348,900 acre-ft in water year 2015, and 392,800 acre-ft in water year 2014.

Mr. Miller then presented 2-year flow duration hydrographs for the five Compact sites. These hydrographs can be created using the utility at: http://waterwatch.usgs.gov/index.php?id=sitedur.

Mr. Anderson asked about the reason for the increase of flows at the Bighorn River near Bighorn in May.

Mr. Jordan responded that Yellowtail Dam began releasing around 7,000 cubic ft/sec (cfs) in late May 2016 as a release of past inflow and the reservoir being full due to above average precipitation.

Mr. Tyrrell asked why Tongue River Miles City and Powder River Locate have different periods of records despite both being started in 1939.

Mr. Berkas responded that the Tongue River Miles City gage was not operated in the early 1940's so there is a break in the period of record. Mr. Berkas referred to figure 3 in the YRCC report.

Mr. Dalby asked for an explanation for observing adequate or normal baseflow conditions yet having lower annual runoff.

Mr. Miller responded that there is not an explanation for the sustained baseflows without further investigation.

Mr. Anderson asked Mr. Jordan to provide an update on the Bighorn Lake water supply status.

Mr. Jordan reported that the snowpack was low for the year going into runoff. However, April and May precipitation above Boysen Reservoir changed conditions in the Basin and a near average runoff occurred into Yellowtail from April to July. This runoff was not as sustained as expected and releases from Yellowtail were not decreased early enough to fill the reservoir. The reservoir was about five feet from full after runoff. Inflows were good for the remainder of the year and precipitation events in the Bighorn Mountains during September and October

allowed the reservoir level to rise eight feet. This allowed for a 2,600 cfs (near average) winter release rate from Yellowtail for water year 2017.

Mr. Jordan continued that the Crow Water Right settlement is of importance for the operation of Yellowtail and has potential impacts for the Commission. The Act was passed by Congress on December 8, 2010. On March 30, 2016 an agreement was signed to allocate 300,000 acre-ft of storage in Yellowtail to the Crow Tribe. 150,000 acre-ft is firm storage, with an additional 150,000 acre-ft as supplemental to the Tribe's natural flow right of 500,000 acre-ft. The Crow Water Right has an enforceability date of June 22, 2016.

Mr. Anderson asked if any water rights in Montana, other than the Tribe, were being infringed upon.

Mr. Jordan replied that senior water rights have an equal footing on the natural flow part of the agreement.

Ms. Overcast added that Montana made sure to protect the Compact and all of the existing water rights to ensure the Tribe cannot make a call on those protected rights. Any rights that come after are junior in priority to the Compact. In addition, most of the Basin is closed to applications in those areas.

Mr. Anderson asked if the Tribe has an obligation to develop the water.

Ms. Overcast replied that the Tribes do not have an obligation. Unless the Bureau of Reclamation has made a change to the agreement, a reserved water right has no time period in which it has to be used.

Mr. Schuh asked if 150,000 acre-ft of the 300,000 acre-ft of storage is for sustaining instream flows and the other 150,000 acre-ft is for potential diversion.

Mr. Jordan replied that this is correct.

Mr. Dalby stated that to his recollection, in 2010 the Bureau of Reclamation and the Army Corps of Engineers were in the process of reaching an agreement that allowed encroachment on the flood control pool. For most Federal projects, once the flood control pool is reached the Corps of Engineers has the authority to regulate. This agreement would allow Reclamation to maintain a higher reservoir elevation to allow for flood control and encroach on that flood control pool to improve downstream water supply conditions.

Mr. Dalby asked for clarification and if an agreement had been reached.

Mr. Jordan replied that in 2007 started the Bighorn River System Issues Group. This Group performed preliminary investigations and studies for reallocating a portion of the exclusive flood control pool. The normal flood pool for Yellowtail is 3,640 ft. Above this level is the exclusive flood control pool and finally there is the surcharge pool. The Army Corps of Engineers has the authority for regulating the storage and release from Yellowtail for elevations in the exclusive flood pool. The Group studied different elevations for encroachment and began the process to authorize a change in operations. In 2011, additional storage was needed in the Missouri River Basin and the effort at Yellowtail was discontinued.

Mr. Dalby asked if the Bighorn River System Issues Group is still active.

Mr. Jordan replied that the Group is still active, but in a limited capacity. The decreased role for the Group is the result of a more transparent operation and decision making processing for Yellowtail and an increase in water supply since the early 2000 dry years.

Mr. Dalby stated that he appreciated the Bureau of Reclamation's efforts to increase transparency at Yellowtail.

Mr. Anderson asked Wyoming to address water-year administration.

Mr. Schroeder replied that in general flows were below average and regulation began two to three weeks early for both the Tongue and Powder River Basins.

The Powder River Basin was 56 percent below normal. Clear Creek and Rock Creek went into regulation June 24; French Creek went into regulation June 27; Crazy Woman Creek is an ungaged stream and went into regulation July 22; and Piney Creek went into regulation May 18. Piney Creek went into regulation early due to a call from the Pratt & Ferris No. 1 Ditch calling off the storage in Lake Desmet.

Mr. Schroeder continued that Montana Compact Commissioner Tim Davis issued a call on Wyoming on April 19 to fill Tongue River Reservoir. Wyoming did not regulate anyone off nor observe any diversions, but did prevent a few juniors from turning on and limited dozens of domestic pump users to ½ acre of watering. Wyoming also surveyed and reported the storage amounts of large reservoirs with significant post-1950 storage rights, in case water accrued during the call needed to be released later. Montana lifted the call on May 2 when conditions looked to be improving and the reservoir was set to spill. The reservoir did begin spilling May 13. The Tongue River did not go into further regulation in 2016. The Tongue River was 62 percent of normal. Big Goose Creek started regulation June 27; Little Goose Creek went into regulation June 30; Prairie Dog Creek when into regulation July 22; Wolf Creek went into regulation on July 22.

Mr. Smith stated that conditions in the Bighorn Basin were similar to the Powder and Tongue Basins until April and May. Two separate storms produced over 2 ft of snow each in the Wind River Range above Lander. A snow survey was attempted but not possible. The average runoff on the west slope of the Bighorns from April through September was 53 percent of normal, while the upper end of the Wind Rivers was 165 percent of normal. Most of that was from the late spring storms. Some areas measured 5 to 7 inches of rain out of the May storm. A new peak of record was set on the Little Wind River Riverton of about 11,000 to 12,000 cfs.

Mr. Dalby asked about the area the storm reached.

Mr. Smith replied it was an upslope system so the valleys received some precipitation, but the foothills received the most. The storm backed into the Basin and hung along the Wind River Range and did not move. Lander and the Wind River Reservation flooded. This precipitation is what filled Boysen and allowed Yellowtail more flexibility. The No Wood drainage and lower drainages did not receive as much precipitation. Medicine Lodge and Paint Rock were 45 percent of normal. This storm resulted in regulation in the lower half of the Basin and zero regulation in the upper end. Eight streams went into regulation this year. Bennett Creek went into regulation April 13. Regulation was relaxed during runoff, but a call was made on Bennett Creek on August 22 and it went into regulation until the end of the water year. Greybull River went into regulation April 18, was relaxed during runoff, and restarted June 26. Both the Greybull calls were about a week earlier than normal. Gooseberry Creek was regulated October 1 last year (2015) until the creek froze and then regulation was started again on June 30. Calls were made on Medicine Lodge and Paint Rock about three weeks earlier than normal on June 30. Middle Popo Agie is self-regulating. The WSEO hydrographers collect all the diversion information and provide it to the small ditch companies, which then work with everyone on the system to self-regulate. Little Popo Agie took storage water from Christina Lake this year and no regulation was done on the release. The Reservation was in good shape early on, but they ran out of water later in the year like they normally do. Washakie Reservoir does not hold enough storage and the system is antiquated and in bad shape so water is lost.

Mr. Anderson asked for clarification on the action items, what “going into regulation” means, and the actions taken to perform that regulation.

Mr. Smith replied that a call for regulation is essentially a signed affidavit by a senior appropriator that feels their right is not being met. WSEO hydrographers are sent to that system within 2 days of receiving the call. They take full control of all the diversions on that system, tag them, and regulate them. They monitor the system from that

point on and make sure no one changes any headgates until the call is lifted. They control who gets how much and where based on priority and permits.

Mr. Anderson asked if existing water-right holders receive less water than entitled when in regulation.

Mr. Smith replied that it could happen. Typically, the WSEO delivers what people are entitled, but as you cut down and run out of water you've got to turn junior rights off to satisfy the seniors throughout the system. Sometimes return flows allow juniors downstream to be satisfied that can't be done upstream because of where the returns occur, and field staff makes those adjustments as allowed.

Mr. Schuh asked how many hydrographer/commissioners there are.

Mr. Smith replied that there are 9 in the Bighorn Basin and around 60 statewide.

Mr. Tyrrell added that half the agency is in Cheyenne with the other half in various divisions across the state. Two Divisions are represented at the YRCC (Divisions 2 and 3) and the other two divisions are the North Platte Basin in southeast Wyoming (Division 1), and the Snake, Colorado, and Bear River Basins in southwest Wyoming (Division 4). That is why there are four superintendents. Each has about 8–12 hydrographers except for Division 2, which has slightly fewer.

Mr. Schuh asked how hydrographer/commissioners are assigned.

Mr. Smith replied that they are assigned by district and a district is defined by manageable drainage area.

Mr. Schroeder added that the Tongue and Powder drainages have 5 full-time hydrographers in Division 2.

Mr. Brown stated that during the litigation, it was necessary to look through the annual reports of the Commission to figure out what was going on 20 years ago. With that in mind, he feels it is important to be clear with regard to the call that Montana made through Commissioner Davis on the Tongue River on April 19, 2016. As reported by Superintendent Schroeder, Montana made a call in writing on April 19, which was received by letter dated April 18. In response to the call, and in addition to the actions already described by Superintendent Schroeder, Superintendent Schroeder and Mr. Brown held a publicly noticed meeting in Sheridan on April 21. At that meeting they described to the users in the Tongue River Basin exactly what the hydrology was, what was going on, the call from Montana, and that post-Compact users would be regulated if found diverting. If a Wyoming hydrographer/commissioner regulates a diversion, Wyoming has a statute that requires the hydrographers to place a tag on a diversion that notifies the users that the diversion is under the control of the hydrographer and that under penalty of law, they are not to adjust the diversion. For 2016, Wyoming developed a special tag which notified Wyoming water users of the Montana call and instructed post-1950 users not to divert. This was an effort to prevent post-1950 users from diverting in the first instance considering none were diverting at the time Montana placed its call. In addition, the Commissioners from the States increased communication and developed a way to better interact with one another during a call. Once Wyoming received Montana's call in writing on April 19, Wyoming responded in writing on April 22. In an effort to increase the data available for decision making, Wyoming measured all post-Compact reservoirs on April 1, before Montana made its call. When the call from Montana was made on April 19, Wyoming went back to the post-Compact reservoirs and collected another set of measurements so that any post-1950 storage made after the call date could be determined and released if necessary.

Mr. Tyrrell added that he and Mr. Davis identified the need for strong communication leading up to the call made in 2015. This year communication was opened up early as the snowpack did not look good. The States notified each other of when their public meetings with water users would occur so that the other State could be present at the meeting. The goal was to have more order and more communication than 2015, which was accomplished. The

call was 3 weeks in duration this year instead of 5 weeks and he credits Mr. Davis for being very open. Montana may find information from the Wyoming Governor's Water Strategy update valuable.

Mr. Anderson asked if going through the minutes from past Commission meetings was helpful, if the information needed was found, and is there any implication for how minutes should be recorded now.

Mr. Brown replied that it was useful in that everyone involved in litigation wasn't at the meeting in 1950 and the minutes provided a summary of the topics and issues at the time. Specific to the litigation, both States examined the minutes and they have been used by the Special Master in making decisions. For example, in the 1980s Montana made a call regarding Tongue River Reservoir not filling during that time period. The minutes showed that Montana requested that Wyoming take some action in that regard and the Special Master used this information to make a decision. So the minutes are helpful. Technology has changed with recording these conversations now so the minutes are more comprehensive. They are longer, but it is helpful to flesh out what went on so that our successors 25 years from now have a more complete picture of what was said.

Mr. Anderson asked if the focus of the research was the facts and figures or the rationale for the decisions.

Mr. Brown replied that both were important. The minutes record what was discussed and what the concerns and positions were. This helps us understand the rationales, the policies, and the thinking. The data in the reports is also valuable. What was reported as the capacity of Tongue River Reservoir said 69,400 acre-ft. We know that is not true today. So we looked at the data and the minutes.

Mr. Anderson asked if the documentation process is better now and if there is something we should be doing to make our successors' jobs easier.

Mr. Tyrrell replied that if our successors 20 or 30 years from now find themselves in a similar position of trying to understand the decisions that were made in the past, they will have a much better record to fall back on.

Mr. Anderson stated that not all discussion happens at the annual meeting so it is not recorded. He suggested that if any kind of discussion of historical value occurs outside of the annual meeting, that it should be recounted at the meeting and captured in the minutes.

Mr. Dalby added that the historic minutes are essential for understanding what the Compact means and the historic water supply conditions. He noted that the Special Master relied heavily on what was reflected in the meeting minutes of the water supply conditions, and whether there was evidence in those minutes of Montana having made, what could be interpreted as, a call on Wyoming. Ultimately, the Special Master only found 2004 and 2006 as years where Montana had done that.

Mr. Brown added that the Special Master also found such in 1980, but there was no injury because the reservoir filled that year. This was pieced together from information in the minutes of the Commission and notes that both the former Commissioners of the States had on the subject. So it is important to clearly document what happened, especially since the call letters are not attached to the minutes like they were in 2004 and 2006.

Mr. Anderson commented that he has 8 boxes of the official files of the Yellowstone Compact Commission to give to Mr. Berkas. These documents have all been scanned and these are the original copies.

Ms. Overcast asked how many people were regulated when the call on the Tongue River was made.

Mr. Schroeder replied that there were no active diversions at the time of the call, so no one was physically regulated off, but they were prevented from turning them on.

Ms. Overcast asked how many appropriators are on the Tongue River.

Mr. Schroeder replied that on the mainstem of the Tongue River there are about 2 dozen appropriators, with one appropriator having many pumps. Most of the activity for this call was focused on Big Goose and Little Goose. The District 4 Commissioner, Ms. French, notified domestic pump users in small subdivisions outside of Sheridan of the call and what the conditions were to the call.

Mr. Brown added that there were approximately 60 to 70 people at the public meeting on April 21 that received the instruction to not divert post-1950 rights due to a call from Montana. In addition, tags were placed on diversions that had post-1950 rights to notify those users of the call. Another area of focus was Prairie Dog Creek, in addition to Big Goose and Little Goose Creeks.

Mr. Schroeder noted that Prairie Dog appropriators tend to irrigate early in season so efforts were made to notify them as soon as possible.

Mr. Berkas asked how many post-1950 water rights are on the Tongue River.

Mr. Schroeder replied that he is unsure, but being able to fill Tongue River Reservoir was the purpose of the call. Besides the mountain reservoirs, no diversions were taking place. In an effort to ensure that Wyoming could meet the call, the Compact reservoirs were surveyed to document the amount of storage in place at the time of the call. Monitoring continued on those reservoirs and if Tongue Reservoir did not fill, water could be released from those upper reservoirs at a later date to meet the call. Ultimately Tongue Reservoir was filled and those releases were not necessary.

Mr. Brown added that it is hard to put a precise number on post-1950 water rights because they are very junior rights and a small proportion of the total number of rights in Wyoming. The vast majority of water rights are pre-1950 and the water rights that get a reliable supply of water are typically 1895 rights. The number of post-1950 rights in the Tongue River Basin was calculated as part of the litigation. Other resources include the expert reports from Mr. Dale Book and Mr. Doyle Fritz and the tabulation book for Division 2.

Mr. Dalby noted that the tabulation books are available online.

Mr. Dalby expressed, on behalf of Montana, an appreciation for the effort that Wyoming made during the calls. Montana weighs the effort Wyoming will need to put forth to respond when making calls and does not make calls lightly.

Mr. Anderson asked Montana to address water-year administration.

Ms. Overcast said that Montana appreciated the efforts of Mr. Tyrrell in working with Mr. Davis and allowing clear lines of communication. Montana also appreciates the effort of Wyoming to meet the calls.

Ms. Overcast pointed out that Montana does not have hydrographers on a source. Instead, the State has a provision and statute that allows people to petition the District Court for a Commissioner. Last year many of these petitions were received across the state. Montana Fish, Wildlife, and Parks (MT FWP) made numerous calls. MT FWP rights date back to 1970 and are referred to as Murphy Rights. These rights were the first granted to MT FWP for instream flows and water reservations. These rights are very junior. MT FWP did make call on the Tongue to alert people that the river would have a problem later in the year, this affected people with post-1978 rights. MT FWP also made a call on the Shields River, in the upper part of the Yellowstone Basin in Montana's Park and Meagher Counties. Other calls were made across the state, amounting to the most calls ever issued by MT FWP.

Ms. Overcast described the Yellowstone River fish kill. About 150 miles of the Yellowstone River were closed on August 19 to September 22. A parasite that caused proliferative kidney disease killed an unknown number of

whitefish (estimates are between 100,000 to 300,000). Fish biologists say that the number is high because the population of whitefish in the Yellowstone River is high.

Mr. Anderson asked for an explanation of the river closure.

Ms. Overcast replied that it was a complete closure for recreational use to minimize transfer of the disease to other basins and reduce stress on the fish, which improves chances of survival.

Mr. Schroeder asked if any other species of fish were affected.

Ms. Overcast replied that some rainbow and brown trout were affected, but were more resistant to the disease so numbers were minimal.

Mr. Anderson asked if humans were at risk.

Ms. Overcast replied that humans were not at risk of contracting the parasite. Montana Fish, Wildlife, and Parks created a website to provide information for the public. The Montana tourism and recreation industries suffered from the one month closure.

Ms. Callaway asked if there were specific conditions that allowed the parasite to spread such as water temperature.

Ms. Overcast replied that water temperature is not the cause but does exacerbate the disease. High temperatures and low flows stress the fish.

Mr. Dalby added that Montana Fish, Wildlife, and Parks are conducting studies on other rivers in Montana to see if the parasite has potential to exist elsewhere.

Mr. Jordan noted that the parasite was found on the Bighorn River, but wasn't lethal due to lower water temperatures and higher flows.

Mr. Miller added that the parasite also showed up in Idaho.

Ms. Overcast stated that there was a discussion of the Intake Diversion Dam near Glendive at the Technical Advisory Committee meeting. The diversion dam supplies approximately 40,500 acres of irrigation in Montana and 15,000 in North Dakota. The diversion dam is a rock dam that is rebuilt/shored up every year. Trout are able to scale it, but pallid sturgeon, which are listed as an endangered species, struggle. The Army Corp of Engineers and Bureau of Reclamation worked on alternatives and developed an environmental impact statement (EIS). In draft form the EIS received many comments from conservation groups. The Bureau of Reclamation and Army Corp resubmitted the EIS with some alternatives that used pumps or complete removed the diversion dam. The original proposal of a bypass structure was preferred alternative and made final on October 21. A DNRC engineer visited a scale model in Denver to observe what the bypass could do. Those involved with the project feel that a bypass will work effectively, but conservation groups would like to see the structure removed. There has been no record of decision issued. It is anticipated that once the record of decision comes out, a lawsuit will be filed.

Ms. Overcast continued with a discussion of the Montana Legislature and bills that they are considering. The legislature meets every 2 years and will meet in 2017. The Water Policy Interim Committee has drafted a bill that requires Water Commissioners to go to training. Montana's system is that Water Commissioners are provided after the public petitions the District Court to get one. Montana is required by statute to provide training, but in the past Water Commissioners have not been required to attend the training. Montana sees the importance of this training as water issues continue to develop in the state. Montana is also developing a surface water assessment program

that will be funded with about $250,000 per year by statute. There is currently a groundwater assessment program that is managed by the Montana Bureau of Mines and Geology.

Ms. Overcast stated that combined appropriation has been an interesting issue in Montana. A statute does not require a permit for small wells of 35 gallons a minute or less than 10 acre-ft. A 1987 rule stated that, if in the opinion of the department, multiple apportionments could have been accomplished by a single apportionment; it is considered a combined apportionment. If the combined appropriation is greater than that amount, the statute notes that a permit for these wells is required. The department found it difficult to employ the "in the opinion of the department" clause and changed the rule in 1993 to "if it's manifold". If 2 separate wells are physically manifold in some way, then that is considered combined apportionment. 20 years later that decision was challenged and ruled that it was not a correct application of the statute and the department was ordered to return to the 1987 rule. In the next legislative session there are 2 statutes, one that says "manifold" and one that says "in the opinion". The legislature will decide which will stand.

Mr. Elison commented that the issue of subdivision wells was what brought the manifold rule forward.

Mr. Anderson asked what the proposed legislation would do to a subdivision with 100 wells.

Mr. Elison replied that there is a statute that goes each way. One states that it is manifold and a permit is required and the other reinstates the 1993 rule that says if they are not physically manifold then the wells are exempt.

Mr. Overcast added that the concern with subdivisions is that a high number of wells (60 to 90) could be concentrated in a small area. The effect of those wells would be similar to a single large well in the aquifer and there is no way for people to challenge the small wells because they are exempt. The exemption says if the application is correct and complete, a water right is issued. A permit requires proof of physical availability, legal availability, and that an adverse effect will not be created. The basis of the lawsuit was that the effects are not something that people have the opportunity to challenge what will occur in the aquifer.

Mr. Schuh asked if they are manifolding 60 or 70 wells.

Ms. Overcast replied no. Instead ½ acre lots with individual wells were being created to qualify for the exemption.

Ms. Overcast continued that this has been an issue for Montana for the past 12 to 15 years.

Mr. Schuh asked if Ms. Overcast's opinion was that those wells could be manifold and what was the basis of that opinion.

Ms. Overcast replied if they were manifold the permit process would have been followed to show physical and legal availability of the water and no adverse effect. If they are not manifold, there is no opportunity for the public to be able to look at the impact.

Mr. Schuh asked if the intent is that one of the bills is to protect the individual right and the other is to allow the department to look at the distribution of wells and make a judgement on the requirement of a permit on that basis.

Ms. Overcast replied that is correct.

Mr. Elison added that a subdivision would be allowed to use individual wells but would need to obtain a permit for the quantity of water that would be used by all the wells in combination.

Ms. Overcast stated that the department has received 2 of those types of permits; one for 64 wells and the other for 14 wells.

Mr. Schuh asked if the department is permitting individual wells under 10 acre-ft.

Ms. Overcast replied that the permit application requested 64 points of diversion. So the department is analyzing the entire flow and volume. Ms. Overcast continued that she is anxious see the how the legislature responds as the issue has been ongoing for 12 to 15 years.

Mr. Anderson asked to bring the discussion to a close and to continue with the agenda.

Ms. Overcast stated that the legislature is considering a proposal that if an applicant can get written consent of approval from a prior appropriator, then the department will not look at the water rights that are listed on that letter of consent as part of the physical and legal availability.

Ms. Overcast reported that between December 1, 2015 and December 1, 2016, 33 certificates of small groundwater exceptions for a total of 164 gallons per minute and about 16 acre-ft were issued in the Tongue River Basin above Hanging Woman Creek. 14 certificates were issued on the Tongue River below Hanging Woman Creek for a total of 234 gallons per minute and 40 acre-ft. 1 certificate for 2.15 acre-ft was issued for Rosebud Creek. 2 certificates for a total of 40 gallons per minute and about 3 acre-ft. were issued in the Little Powder River. 9 certificates totaling 127 gallons per minute and 26 acre-ft and 11 stock reservoirs totaling 46 acre-ft were issued in the Powder River below Clear Creek. No other permits have been issued in those basins.

Mr. Elison passed out notes from the April 12th Technical Advisory Committee (TAC) Meeting in Billings and asked if edits to the draft notes are needed and they will be made. A sign-in sheet was attached to the notes. Two points of discussion from that meeting directly apply to the agenda for the YRCC Meeting. Montana issued a call to fill the Tongue River Reservoir the past 2 years. That call was generally ended in less than a month when conditions changed and the reservoir was filled. A smaller committee was created by the TAC to see if there is an appropriate trigger for the call and if better forecasts of flow in the Tongue River can be produced. The other issue discussed was about the Northern Cheyenne Tribe's storage rights in the Tongue River Reservoir and whether or not there was an option to allow them to contract that water upstream of the reservoir into Wyoming. No decision was made at the TAC, but Wyoming was going to run some straw poll cases to evaluate what that situation may look like. Both of these topics will be discussed later in the meeting.

Mr. Anderson asked for an update on the National Weather Service (NWS) and Missouri Basin Forecast Center Response.

Ms. Callaway said that a year ago requests were made to NRCS and NWS for more detailed input on their forecasting procedures and methodologies including parameters, confidence, and timeframe. Cara McCarthy out of Portland NRCS responded in time for the TAC to discuss at the April meeting and a call on July 22. The NWS has since responded and the information they provided will be evaluated in the near future. It is hoped that Stacie Bender with the NWS Salt Lake City office will be part of those discussions.

Ms. Callaway continued that on July 22 the TAC held a conference call including Ms. Callaway, Mr. Schroeder, Mr. Bern Hinckley, Mr. Dalby, Mr. K. Smith, Mr. Hackleman, and Mr. Zukiewicz . The group agreed that the assignment of the meeting was to identify and develop tools to assist in the administration of the Tongue River under the Compact and the Special Master's findings. Working together the group would develop mutually agreed-upon flow forecasting for the state line gage on the Tongue River and provided procedures/recommendations to the Commission for flow forecasting. The group decided that the focus of the forecasting should be on dry years during April through June, as those are the timeframes of concern for the Tongue River and the inflows to the state line and when Tongue River Reservoir is storing water. The discussion then expanded to examine the NRCS's responses, with input from the two states. Mr. Zukiewicz discussed the old methodology and new methodology implemented in 2016. One new regression-based methodology tool is called the Visual Interactive Prediction and Estimation Routines (VIPER) water supply forecasting software. A discussion of pros and cons revealed that this tool does not have climate teleconnection indices. Other available tools were discussed. Mr. Zukiewicz highlighted a NRCS customized tool that was developed for a basin in Idaho that looks at minimum

requirements and could be applicable to the Tongue River and the interests of the Yellowstone Compact Commission. A follow-up discussion was planned for the fall, but fell through.

Mr. Dalby added that one of the big problems with forecasting runoff into the Tongue River Reservoir is that snowpack is a key element but not the only driver adding to forecasting uncertainty. The past 2 years calls were made based on anticipated snowmelt runoff and the spring rain brought considerable moisture into the basin. At this point in time, spring rain events are difficult to predict. The Commission needs to recognize the fact that there is significant uncertainty in runoff forecasting in the Tongue River Basin. Perhaps in the future El Nino, La Nina, Pacific Decadal Oscillation (PDO), and other connections will be better understood and forecasts will improve. For now, the group believes that focusing on improving forecasting for lower water years at the possible expense of predicting high runoff years seems to be a good direction to head.

Mr. Smith asked if valley snow is being considered as it can be a large contributing factor that is unmeasured.

Mr. Dalby replied that the group plans to examine satellite based remote sensing tools that may provide an index of antecedent soil moisture and lower elevation snow fall which is not captured by SNOTEL.

Ms. Callaway added that the current NRCS methodology only uses 3 high elevation SNOTEL sites and that the group will continue to work on the problem moving forward.

Mr. Anderson noted that the USGS recently published a paper in cooperation with the Army Corps of Engineers looking at mountain snowpack in headwater basins. The study did some back-casting and forward-casting of models and determined that if trends continue, winters will be warmer and snowpack will become less of an availability factor.

Ms. Callaway added that the water resource program at the University of Wyoming is concluding a study in place since 2014 entitled, “High Resolution Modeling of Precipitation Snowpack and Streamflow in Wyoming - Quantifying Water Supply Variation in Future Decades.” This study takes work from NCAR and uses the Wyoming Supercomputer Center processing capabilities to develop a 30-year model that simulates observed snowpack and precipitation patterns as well as streamflow and how these parameters are expected to change in the future, up until the 2050s. Ms. Callaway has invited Prof. Bart Geerts to the Wyoming Water Forum to share his research and will relay that information to the TAC at the April meeting.

Mr. Dalby added that a presentation like that may be good to have at the TAC meeting.

Mr. Tyrrell noted that there is a call in number and webinar available for the Wyoming Water Forum and Wyoming will forward that information to the group.

Mr. Anderson asked for an update on Montana’s Statewide Adjudication.

Ms. Overcast distributed handouts and replied that Montana’s adjudication program began in 1973. Originally, a basin by basin approach was initiated. Due to the amount of time required to work through every basin, a change of plan was needed and an application process was started instead. The applications for water rights were due on April 30, 1982. Montana received and has been working on over 220,000 claims since that time. The Billings area has a decree that could be enforceable if an individual petitioned the court for a Commissioner. Other areas on the Yellowstone use the Verification of Rules, which is a verification guide that is not as stringent of a review under the examination. The court has asked DNRC, acting as the technical arm of the Water Court, to reexamine some of these basins. This reexamination is being performed now. The most controversial basin within the Yellowstone Basin is 43D, Rock Creek. This basin does not affect the Yellowstone River Compact Commission. The Water Court is requesting the re-examination to be able to provide a better figure of distribution to Commissioners on a source. Factors like points of diversion, source names, types of diversions, etc. are being examined.

Mr. Anderson asked for an update about the Wyoming Board of Control.

Mr. Tyrrell replied that Wyoming used to adjudicate water rights statewide and/or stream-wide early in the State's history. At this time, the State adjudicates water rights individually. The Wind-Bighorn is currently the only division with a general adjudication in those drainages. The Board of Control meets 4 times a year and adjudicates rights from all 4 divisions.

Mr. Schroeder continued with a report from Division 2. Zero coalbed methane reservoir inspections were performed in water year 2016. While the Division is dealing with the after effects of the play, there were no active inspections of new facilities. 126 surface water inspections were made; 33 reservoirs, 63 stock reservoirs, and 30 surface water diversions (pipelines, domestic pumps, ditches, etc.). 132 safety of dam size reservoir inspections were made. 52 reservoirs and 43 stock reservoirs were adjudicated. 166 stock reservoirs were endorsed, which is a step below adjudication that recognizes the water right. Of the surface water rights; 3 pipelines for reservoir supply, 2 pipeline enlargements for stock or domestic use, 2 ditches for reservoir supply, 4 springs for stock use, 23 stock and domestic pumps, and 1 ditch for irrigation were adjudicated, a total of 35. 23 surface water petitions and 1 groundwater petitions were finalized.

Mr. Tyrrell asked for an explanation of petitions.

Mr. Schroeder replied that many of the water rights in Wyoming are described as territorial rights in blanket descriptions. A petition is required to modify these rights for change of place or use or amended certificates. The most common petition seen is for a change in point of diversion or means of conveyance. For example, the city of Sheridan has grown and has acquired some irrigation rights that they are transferring to municipal use.

Mr. Overcast asked if when a city buys and irrigation right if that creates an issue for the period of use. A typical irrigation right would run March through November, but a municipal right would be used January through December.

Mr. Schroeder replied that there are consumptive use concerns and that as part of the petition, the Board of Control requires and examines a consumptive use report.

Mr. Smith added that WSEO limits the changes to period of use based on the consumptive use report. If a right has 120 days a year that is what will be used. Sometimes the petition will be set up so that things balance out volumetrically at the end of the year, but often times the petition is limited to the historic use period.

Mr. Smith continued with a report of adjudication for Division 3. 55 surface water adjudications were made in 2016. Mostly small domestic pump systems in subdivisions where people want to water their yards inexpensively without running their wells. 48 reservoirs were adjudicated, most of which were small stock reservoirs approximately 20 acre-ft or less. 4 other stock reservoirs were endorsed. Many people prefer their stock reservoirs adjudicated in Division 3, so WSEO issues a certificate and goes through the process. 5 miscellaneous and industrial groundwater proofs were made. 2 instream flow permits on Shell Creek were made on an upstream and downstream segment of the creek. 21 other surface water adjudications require more data and are pending. In general, Division 3 does not have many adjudications or proofs because of the general adjudication. 23 surface water and 10 groundwater petitions, including stock and domestic wells which are typically granted due to general adjudication, were granted this year. The only way to get a new well if the old one fails is to either re-permit it or submit a petition for a change in point of diversion which must be reviewed by the Board.

Mr. Schroeder noted that Division 2 had 166 stock reservoir endorsements and Division 3 had 4 due to coalbed methane reservoirs being transferred from the operator to the landowner.

Mr. Dalby asked if there are remedial actions, such as dam safety or outlet works, that need to take place to convert a coalbed methane reservoir to a stock reservoir.

Mr. Schroeder replied that during the permitting process certain drainages were identified that would require low level outlets to allow for administration. The operator is not allowed to transfer the reservoir to the landowner until that outlet is installed or they can justify that administration is not a concern. Many reservoirs were permitted for a certain capacity during coalbed methane production but have been reduced to 20 acre-ft or less. WSEO also examines the size of the contributing drainage above the reservoir to determine an appropriate size of the reservoir.

Mr. Anderson asked for a report on the 2 oil spills that resulted from pipeline breaks on the Yellowstone River.

Mr. Dalby provided a handout and replied that 20 pipelines cross under the Yellowstone River in Montana. These pipelines range in age from fairly new to 50–60 years old. In the past 5 years, 2 pipelines have ruptured due to streambed scour. The Exxon Mobile pipeline broke in July 2011 and released about 63,000 gallons of Bakken crude during highflows. This created significant environmental and recreational impacts on about an 85-mile stretch of river downstream of the break. Exxon Mobile cooperated with State and Federal agencies in an emergency cleanup effort. State trustees and the Department of Justice's Natural Resource Damage Program negotiated a $12 million settlement in damages that occurred during the spill and subsequent cleanup. An online document provides details of the assessment. The $12 million was divided across different areas of impact, with the majority being directed to mitigation of aquatic resources, such as fish, wildlife, and habitat assessments, that were damaged. In January 2015 Bridger Pipeline Company's Poplar pipeline upstream of Glendive ruptured during the winter. Ice scour is thought to have played a role in the rupture. A limited cleanup effort was conducted due to subfreezing conditions. The State is performing a damage assessment and will negotiate a settlement with the pipeline for cleanup activities. This break directly threatened Glendive's municipal water supply. Actions were immediately taken to prevent contamination of the water supply and develop an alternative supply while the city's diversion and processing were shut down.

Mr. Anderson asked if any regulatory reform has been proposed for depth requirements of pipelines that cross beneath rivers.

Mr. Dalby replied that he believes Federal agencies are in charge of that regulation and is uncertain of any changes, but the new pipeline replacing the Exxon Mobile pipeline is deeper than the older one that failed.

Mr. Dalby added the Yellowstone River Conservation District Council (YRCDC), a group comprised of all the conservation districts along the Yellowstone River, conducted a pipeline hazard assessment of all the pipelines that cross under the Yellowstone River. The YRCDC ranked the 22 pipelines as low, medium, or high hazard risk. The Poplar pipeline was assigned a moderate risk a moderate risk level. In the assessment of the pipelines, the YRCDC noted that many of them are old, the initial depth is unknown, and that for newer pipelines the amount of gravel that remains over the top of them is unknown.

Mr. Anderson noted that the amount of gravel overtop the pipeline is measurable with geophysical instrument capabilities.

Mr. Elison added that the YRCDC created a recommended practice document that describes what they believe to be appropriate setbacks and depths for pipelines crossing under the Yellowstone River.

Mr. Schuh commented that the spills on the Yellowstone River in Montana had a large effect on North Dakota directly and with regards to regulation. The Office of the State Engineer decided that laying a pipeline 8 feet into the bottom sediments of a lake was insufficient. Horizontally drilled pipelines are now required for pipelines crossing underneath waterways in North Dakota.

Mr. Anderson asked if the Yellowstone River oil spills have been cited within the current protest environment that is occurring over the Dakota pipeline.

Mr. Schuh answered the spills have been cited by the Tribe when in negotiations for the amount of water that needs to be allocated. It has come up in several contexts as a major issue in protecting the river.

Mr. Dalby added that contemporary pipeline companies recognize the cost of deep horizontal drilling is much less than the aftermath of an oil spill on a major river. While a pipeline can still fail, there are sensors at each end of a crossing capable of recognizing pressure differences and employing automatic shutdown measures.

Mr. Anderson asked for a report on Bakken fracking activities in North Dakota.

Mr. Schuh distributed a handout and stated that water use for oil production and fracking was 25,000–30,000 acre-ft at its maximum and is currently at 15,000 acre-ft. When development started a flood occurred which provided plenty of water and temporary water permits were issued. 1000 temporary permits were issued in a past year with 600 needing to be analyzed this year. Water availability is becoming scarce in smaller streams and smaller time periods are being permitted. The amount of water used per frack is rising. Initially, 2–3 acre-ft per frack was used and now 10-11 acre-ft, up to 30-60 acre-ft per frack is being reported. The industry has stopped using chemical additives and subsequently requires more water per frack. The current average for water used per frack is 15–20 acre-ft, but the number of fracks is down. There is concern for water availability when production increases during drier years.

Mr. Schuh continued that the North Dakota State Engineer used his emergency authority to use irrigation water for an industrial purpose on a temporary, 1 year-at-a-time, basis. This was done during a flood year to handle flood waters and increase water supply distribution. The continued use of this emergency measure after the flood came under questions of legality and the practice was ended.

Mr. Anderson asked why each frack is using more water.

Mr. Schuh replied that he thinks there are longer links, with more legs so more water is needed. They have also stopped using chemical additives so are using more water at higher pressures. The reason why chemical additives are no longer being used is uncertain, perhaps due to disposal problems.

Mr. Anderson asked for a report on the Wyoming Governor's Water Strategy.

Mr. Tyrrell stated the strategy was released in January 2015 just before Wyoming's economy started to diminish due to the dropping price of coal, oil, and gas. A credible data initiative, the Credible Climate and Streamflow Initiate, was introduced and the WSEO received $280,000 of funding. The WSEO runs 400 sites and this money was used for operations and maintenance for that program.

Mr. Schroeder continued that the timing of the 2015 and 2016 calls from Montana made access to the Tongue River Basin mountain reservoirs with post-Compact storage difficult. As part of this Governor's Water Strategy funding was secured to install reservoir elevation gages on 5 Compact reservoirs; Sawmill Lake, Dome Lake No. 1, Cross Creek Reservoir, Bighorn Reservoir, and Park Reservoir. In addition, instrumentation was installed on Kearney Lake Reservoir in the Powder River Basin. This instrumentation was funded by Kearney Lake Reservoir and installed by WSEO. These installations were completed in the fall and will provide useful information to the Commission and the public about the status of the reservoirs. The information is available online at *http://seoflow.wyo.gov/*.

Mr. Anderson asked if the gages are in real-time.

Mr. Schroeder replied that they record 15 minute values and transmit via the GOES satellite network hourly. The equipment was received in October and installed before the winter snows.

Mr. Dalby asked if a stilling well was used for installing the instrumentation since the reservoirs will be snow and ice-covered.

Mr. Schroeder replied that a pressure transducer was installed near the bottom of the reservoir. The instruments record the stage of the water on top of the transducer which has been correlated to an elevation which is correlated to the active storage. Air temperature is also recorded but is biased as the temperature sensor is inside a black metal box that shelters the equipment.

Mr. Anderson asked if the data is being archived.

Mr. Schroeder replied that the data goes through the WSEO server and is reported on its website. In addition, the recorder is downloaded once a year.

Mr. Smith added that the WSEO database maintains years' worth of streamflow and reservoir elevation data and it is archived.

Mr. Anderson noted that the USGS has a way of accepting record provided from other agencies and that may be an option for the WSEO.

Ms. Callaway continued that the Governor's Water Strategy provided a $70,000 contract that was used to work with INSTAAR, the Institute for Arctic and Alpine Research, at the University of Colorado in Boulder. This money is funding research in the Tongue and the upper North Platte River. The first phase is focusing on the North Platte as there is an existing model boundary in place for that area. This has allowed INSTAAR to process data immediately. The Tongue River analysis has not started so there is nothing to report. Estimated daily snow-water equivalent for 2000 to 2012 will be computed. That data will be broken down into sub-basins and elevation bands to see if a comparison to existing SNOTEL sites is possible. Then elevation bands go down to 4000 feet so an evaluation of the Tongue River should be possible. The data will be provided in table and special form so that further analysis can be performed in GIS. Particular attention is going to be directed to the dry years (2004, 2006, and 2012) in the Tongue River Basin so that the data ties in with forecasting efforts in that drainage.

Mr. Dalby noted that the University of Montana Geosciences have researched upper elevation SNOTEL stations through remote sensing and detailed ground surveys using ground penetrating radar. This research has found that SNOTEL sites may not accurately represent the volumetric accumulation of snow in the surrounding area. In addition much of the runoff in Wyoming and Montana is produced above 9-10,000 feet and there are very few SNOTEL stations at that interval which requires the use of satellite-based sensing tools. The NRCS flow fore-cast models do not use SNOTEL information as an estimate of volumetric snowpack, but instead these data as an empirical indicator variable in a regression equation.

Mr. Tyrrell asked if INSTAAR is backcasting 2000 to 2012 data with MODIS and comparing that data with SNOTEL and the subsequent runoff from those years.

Ms. Callaway replied that is correct.

Mr. Tyrrell asked if the idea is for it to eventually to become a forward looking tool and ultimately being able to look at MODIS in March as an indicator of runoff a month later.

Mr. Callaway replied that she is uncertain.

Mr. Tyrrell noted that the ultimate goal is to use the MODIS layer as a forecasting tool even though backcasting will needed for calibration.

Mr. Anderson added the USGS has a new Associate Director, Don Cline, from the National Weather Service. His goal is to set up a National Hydrologic Model that will accomplish this same idea.

Mr. Anderson asked for an update on the Northern Cheyenne water purchase.

Mr. Brown stated the April Technical Committee discussed a potential arrangement wherein Wyoming water users could take advantage of unused Northern Cheyenne storage water and replacing it if they desired to keep using it during times of a call. Wyoming was to come up with some straw man proposals on how to account and operate that scenario. These proposals have not been formed yet. Mr. Brown has explored similar arrangements in other states to gain an understanding of the provisions that might be included in such an agreement. Examples were found from Arizona and Idaho.

Mr. Brown continued that there has been a proposal made to the Wyoming Water Development Commission to purchase part of the Lake Desmet water right with the thought of using it as replacement water if Montana makes a call. This would require getting water from the Powder River Basin into the Tongue River basin. This proposal is in early stages and may not advance any further.

Mr. Dalby noted that 20–25 years ago a group of Montana water users were exploring the possibility of purchasing water out of Lake Desmet and having it released into the Powder for use in Montana, but may not have progressed far.

Mr. Brown noted that State Engineer Fassett investigated to see if this was a viable option. The result was a large amount of conveyance loss.

Mr. Elison asked if there is a market in Wyoming for post-1950 water from the Northern Cheyenne if it was available.

Mr. Brown replied that he is still researching the issue. Some Wyoming water users have expressed an interest in the scenario if they are shut off because of a call from Montana.

Ms. Overcast asked if the Tribe has been brought into the conversation because Ms. Spang-Gion expressed interest in dealing with Wyoming.

Mr. Brown replied that he has been in contact with the Tribe. Mr. Brown recalled that the first call Mr. Tyrrell made was to Mr. Davis to make sure that Montana approved of exploring this option. In that call, Mr. Davis thought it was worth exploring. The next call Mr. Brown made was to Ms. Jeannie Whiting, attorney for the Northern Cheyenne Tribal Council, who said the Council expressed interest in exploring the purchase. Mr. Brown and Ms. Whiting outlined potential logistical and legal issues that could be associated with the arrangement.

Mr. Anderson recognized Mr. Berkas for his 12 years of service as executive secretary for the Yellowstone River Compact Commission and proposed a resolution (Appendix A).

Ms. Overcast motioned to accept the resolution. Mr. Tyrrell seconded.

Mr. Anderson recognized Mr. Davis for his service to the Commission as Montana's Commissioner and proposed a resolution (Appendix B).

Mr. Tyrrell moved for adoption of the resolution. Ms. Overcast seconded.

Mr. Anderson proposed a resolution (Appendix C) to recognize his service as the Federal Commissioner and Chair of the Commission.

Mr. Tyrrell moved for the adoption of the resolution. Ms. Overcast seconded.

Mr. Berkas noted that Sue Lowry and Carmine LoGuidice have left the service of the Commission and were recognized by resolutions (Appendix D and Appendix E) which were accepted at the Technical Committee Meeting and are now captured in the official minutes.

Mr. Anderson stated that it has been a privilege to serve in his role as Chair of the Commission. The Commission and its visitors have conducted themselves with professionalism. The States play a critical role in the responsibility to manage water. Most of Mr. Anderson's tenure has included ongoing litigation in the Supreme Court and actions of the Special Master and that is coming to an end with a new era beginning of water rights between the States. The Compact is an Act of Congress and is binding. The rule that the Chair of the Commission is not to vote to break a tie was made by someone in the USGS and is based on the idea that the USGS appointee sitting at this Chair is representing the USGS. But that is not what the Compact states. The Compact states that the Federal Chair will be appointed by the Director of the USGS, but it does not say that the Chair has to be a USGS employee or represent the USGS. In the future, if the States choose to use the Commission in a different way to help resolve issues and it is necessary for the Chair to vote, that is a possibility. Many rules, discussions, and consultations would need to happen, but a more effective process could occur if the Chair were allowed to vote.

The next Technical Committee Meeting is April 6, 2017.

The next Annual Yellowstone Compact Commission Meeting is December 7, 2017.

The meeting was adjourned at 12:10pm.

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Patrick T. Tyrrell
Commisioner for Wyoming

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Timothy K. Davis
Commissioner for Montana

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Mark T. Anderson
Chairman and Federal Representative

Appendix A

RESOLUTION of the Yellowstone River Compact Commission
In Appreciation for the Service of
Wayne R. Berkas

WHEREAS, Wayne R. Berkas has served as the Executive Secretary for the Yellowstone River Compact Commission meetings for 12 years; and,

WHEREAS, Wayne's concise and informative presentations on streamflow conditions, reservoir contents, and other data reports have contributed to the knowledge base upon which the Yellowstone Compact Commission makes decisions; and

WHEREAS, his knowledge of Commission's history and operational protocols have contributed to the efficient and orderly conduct of the administration and business of the Yellowstone Compact Commission.

NOW THEREFORE, be it resolved that the Yellowstone River Compact Commission formally honor Mr. Berkas, and express our gratitude to him for his service to the Commission, and wish him well in retirement.

APPROVED, by unanimous action of the Yellowstone River Compact Commission, on this 1st day of December, 2016 at Red Lodge, Montana.

Signed:

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Timothy K. Davis, Montana Commissioner

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Patrick T. Tyrrell, Wyoming Commissioner

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Mark T. Anderson, Chairman and Federal Representative

Appendix B

RESOLUTION of the Yellowstone River Compact Commission
In Appreciation for the Service of
Timothy K. Davis

WHEREAS, the Yellowstone River Compact was entered into by the State of North Dakota, the State of Montana and the State of Wyoming who desired to further interstate comity and to remove all causes of present and future controversy between those states and the persons in those states with respect to the waters of the Yellowstone River and its tributaries, and to provide for an equitable division and apportionment of those waters and to encourage the beneficial use and development thereof; and,

WHEREAS, the Commissioners and advisors of the Yellowstone River Compact Commission recognize that Tim Davis served as Montana Commissioner from June 19, 2013 to November 25th, 2016; and

WHEREAS, Tim Davis honorably represented the State of Montana in his participation in the meetings and deliberations of the Yellowstone River Compact Commission during the years he served as the Montana Commissioner to the Yellowstone River Compact Commission.

NOW, THEREFORE, BE IT RESOLVED that the Yellowstone River Compact Commission does hereby express their gratitude and appreciation for the untiring service and participation rendered by Tim Davis in addressing the many water resource problems that were confronted and addressed by the Commission during Mr. Davis's tenure as Montana Commissioner; and,

BE IT FURTHER RESOLVED that the Commission wishes Tim Davis its best wishes, good health, much satisfaction and enjoyment of life in each and all endeavors he is now and in thefuture may undertake; and,

APPROVED, by unanimous action of the Yellowstone River Compact Commission this 1st day of December, 2016 at Red Lodge, Montana.

Signed:

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Patrick T. Tyrrell, Wyoming Commissioner

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Mark T. Anderson, Chairman and Federal Representative

Appendix C

RESOLUTION of the Yellowstone River Compact Commission
In Appreciation for the Service of
Mark T. Anderson

WHEREAS, Mark Anderson served as Chairman to the Yellowstone River Compact Commission for six and a half years; and,

WHEREAS, the Yellowstone River Compact Commission was established by the Yellowstone River Compact of 1950; and,

WHEREAS, the Yellowstone River Compact was entered into by the State of North Dakota, the State of Montana and the State of Wyoming who desired to further interstate comity and to remove all causes of present and future controversy between those states and the persons in those states with respect to the waters of the Yellowstone River and its tributaries, and to provide for an equitable division and apportionment of those waters and to encourage the beneficial use and development thereof; and,

WHEREAS, the Commissioners and advisors of the Yellowstone River Compact Commission recognize that Mark Anderson retired from the position of Chairman of the Yellowstone River Compact Commission December 31, 2016 after serving in that position since July 2010 and wish to acknowledge him by this resolution.

NOW, THEREFORE, BE IT RESOLVED that the Yellowstone River Compact Commission, at their meeting held in Red Lodge, Montana on December 1, 2016, do hereby express their gratitude and appreciation for the untiring service and participation rendered by Mark Anderson in addressing the many water resource problems that were confronted and addressed by the Commission during Mr. Anderson's tenure as Chairman; and,

BE IT FURTHER RESOLVED that the Commission wishes Mark Anderson its best wishes, good health, much satisfaction and enjoyment of life in whatever endeavors he is now and in the future may undertake; and,

BE IT FURTHER RESOLVED that the Federal Representative and Chairman of the Yellowstone River Compact Commission is hereby directed to send a copy of this Resolution to
Mr. Mark T. Anderson and to the U.S. Geological Survey.

APPROVED, by unanimous action of the Yellowstone River Compact Commission this 1st day of December, 2016 at Red Lodge, Montana.

Signed:

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Timothy K. Davis, Montana Commissioner

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Patrick T. Tyrrell, Commissioner, Wyoming

Appendix D

RESOLUTION of the Yellowstone River Compact Commission
In Appreciation for the Service of
Sue Lowry

WHEREAS, Sue Lowry has served on the Yellowstone River Compact Commission and Technical Committee since 1988, including serving as Wyoming's Commissioner for the last four years; and,

WHEREAS, the Yellowstone River Compact Commission was established by the Yellowstone River Compact of 1950; and,

WHEREAS, the Yellowstone River Compact was entered into by the State of North Dakota, the State of Montana and the State of Wyoming who desired to further interstate comity and to remove all causes of present and future controversy between those states and the persons in those states with respect to the waters of the Yellowstone River and its tributaries, and to provide for an equitable division and apportionment of those waters and to encourage the beneficial use and development thereof; and,

WHEREAS, the Commissioners and advisors of the Yellowstone River Compact Commission recognize that, as Administrator of the Interstate Streams Division at the Wyoming State Engineer's Office, Ms. Lowry's immense knowledge of science, policy, and water resources management affecting the fate of the Yellowstone River and its tributaries in Wyoming has rendered major contributions to the equitable management of the greater Yellowstone Basin.

NOW, THEREFORE, BE IT RESOLVED that the Yellowstone River Compact Commission, at its Technical Committee meeting held in Billings, Montana on April 12, 2016, does hereby express its gratitude and appreciation for Ms. Lowry's dedication to helping the Commission achieve its goals of intergovernmental cooperation during her tenure; and

BE IT FURTHER RESOLVED that the Commission wishes Ms. Lowry good health and much enjoyment of life and recreation in her retirement; and,

BE IT FURTHER RESOLVED that the Federal Representative and Chairman of the Yellowstone River Compact Commission is hereby directed to send a copy of this Resolution to Ms. Lowry and the Governor of the State of Wyoming.

APPROVED, by unanimous action of the Yellowstone River Compact Commission this 12th day of April, 2016 at Billings, Montana.

Signed:

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Timothy K. Davis, Montana Commissioner

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Mark T. Anderson, Chairman and Federal Representative

Appendix E

RESOLUTION of the Yellowstone River Compact Commission
In Appreciation for the Service of
Carmine LoGuidice

WHEREAS, Carmine LoGuidice served on the Yellowstone River Compact Commission Technical Committee for fifteen years; and,

WHEREAS, the Yellowstone River Compact Commission was established by the Yellowstone River Compact of 1950; and,

WHEREAS, the Yellowstone River Compact was entered into by the State of North Dakota, the State of Montana and the State of Wyoming who desired to further interstate comity and to remove all causes of present and future controversy between those states and the persons in those states with respect to the waters of the Yellowstone River and its tributaries, and to provide for an equitable division and apportionment of those waters and to encourage the beneficial use and development thereof; and,

WHEREAS, the Commissioners and advisors of the Yellowstone River Compact Commission recognize that, as Assistant Superintendent and Superintendent of Water Division Two in Wyoming, Mr. LoGuidice's considerable field and data analysis expertise has rendered major contributions to the sound management of water in the greater Yellowstone River Basin and its tributaries in Wyoming.

NOW, THEREFORE, BE IT RESOLVED that the Yellowstone River Compact Commission, at its meeting held in Sheridan, Wyoming on December 3, 2015, does hereby express its gratitude and appreciation for Mr. LoGuidice's dedication to helping the Commission achieve its goals of intergovernmental cooperation during his tenure; and

BE IT FURTHER RESOLVED that the Commission wishes Mr. LoGuidice good health, much satisfaction and enjoyment of life in his retirement; and,

BE IT FURTHER RESOLVED that the Federal Representative and Chairman of the Yellowstone River Compact Commission is hereby directed to send a copy of this Resolution to Mr. LoGuidice.

APPROVED, by unanimous action of the Yellowstone River Compact Commission this 3rd day of December 2015 at Sheridan, Wyoming.

Signed:

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Timothy K. Davis, Montana Commissioner

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Patrick T. Tyrrell, Wyoming Commissioner

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Mark T. Anderson, Chairman and Federal Representative

General Report

Operation and Budget

Work funded by the Yellowstone River Compact Commission, that to date has been primarily concerned with the collection of required hydrologic data, has been financed through cooperative arrangements whereby Montana and Wyoming each bear an equal share of the cost, and the remaining cost is borne by the United States. Salaries and necessary expenses of the State and U.S. Geological Survey representatives to the Commission and the cost to other agencies of collecting hydrologic data are not considered as expenses of the Commission.

The expenses of the Commission during Federal fiscal year 2016 were $116,300, in accordance with the budget adopted for the year.

Estimated budgets for Federal fiscal years 2017, 2018, 2019 and 2020 were tentatively adopted subject to the availability of appropriations. The budgets for the four fiscal years are summarized as follows:

Year	Wyoming State Engineer	Montana Department of Natural Resources and Conservation	U.S. Geological Survey	Total
FY2017	$32,600	$32,600	$52,950	$119,000
FY2018	$33,575	$33,575	$54,540	$121,690
FY2019	$34,580	$34,580	$56,180	$125,340
FY2020	$35,615	$35,615	$57,865	$129,095

Streamflow-Gaging Station Operation

Operation of five streamflow-gaging stations at the measuring sites specified in the Yellowstone River Compact continued in water year 2016 with satisfactory records collected at each station. Locations of streamflow-gaging stations, along with reservoir-content stations, are shown on a map of the Yellowstone River Basin at the end of this report.

The Commission is primarily interested in the streamflow near the mouths of the Clarks Fork Yellowstone River, Bighorn River, Tongue River, and Powder River. Even though the Little Bighorn River is not covered by the Yellowstone River Compact, the compact covers the water in the Bighorn River minus the Little Bighorn River. Thus, the streamflow from the Little Bighorn River is subtracted from the streamflow of the Bighorn River. In addition, the Bighorn River streamflow is adjusted monthly with change in storage of Bighorn Lake. During water year 2016, annual streamflow was below normal[2] at all streamflow-gaging stations, except for the Bighorn River above Tullock Creek, near Bighorn, Mont., minus Little Bighorn River near Hardin, Mont.(06294000), adjusted for change in contents in Bighorn Lake, which was normal. The rank of the annual streamflow, with the lowest annual streamflow having a rank of 1, is displayed in the following table:

Station number	Streamflow-gaging station	Percent of average streamflow for water year 2016[1]	Rank of annual streamflow		Year of lowest annual streamflow (rank equals 1)	Number of years of annual record
			2016 water year	2015 water year		
06208500	Clarks Fork Yellowstone River at Edgar, Mont., minus diversions to White Horse Canal	73	6	43	2001	78
06294500	Bighorn River above Tullock Creek, near Bighorn, Mont., minus Little Bighorn River near Hardin, Mont. (06294000), adjusted for change in contents in Bighorn Lake	85	24	37	2002	63
06308500	Tongue River at Miles City, Mont.	46	8	44	1961	73
06326500	Powder River near Locate, Mont.	46	9	59	2004	78

[1]Average is based on period of record at each station.

[2]The "normal" range defined in this report is 80 to 120 percent of average.

Tabulation of streamflow records for water year 2016 (tables 1–5) and graphical comparisons of statistical distribution of monthly and annual streamflow, and annual departures from mean annual streamflow (figures 1–4) are provided in the section "Summary of Discharge for Yellowstone River Compact Streamflow-Gaging Stations." The tabulated streamflow records do not account for depletions for irrigation and other uses unless otherwise noted.

Diversions

No diversions were regulated by the Commission during water year 2016.

Reservoir Contents

Reservoirs Completed After January 1, 1950

As a matter of record and general information, month-end usable contents data (tables 6–8) and descriptions of these reservoirs are given in the section "Month-end Contents for Yellowstone River Compact Reservoirs[1] Completed after January 1, 1950." Boysen Reservoir, located on the Wind River and operated by the Bureau of Reclamation, began the water year with 591,000 acre-ft in usable contents and ended the water year with 584,800 acre-ft. Anchor Reservoir, located on South Fork Owl Creek and operated by the Bureau of Reclamation, began the water year with an estimated 395 acre-ft in usable contents and ended the water year with 482 acre-ft. Bighorn Lake, a Bureau of Reclamation storage project on the Bighorn River that is the largest in the Yellowstone River Basin, contained 951,800 acre-ft of usable contents at the beginning of the water year and 924,700 acre-ft at the end of the water year.

Reservoirs Existing on January 1, 1950

As a matter of record and general information, month-end usable contents data for the four reservoirs in existence on January 1, l950, upstream from the points of measurement, are given in table 9 in the section "Month-End Contents for Yellowstone River Compact Reservoirs[1] Existing on January 1, 1950." The reservoirs are Bull Lake, Pilot Butte Reservoir, and Buffalo Bill Reservoir operated by the Bureau of Reclamation; and Tongue River Reservoir, operated under the supervision of the Water Resources Division of the Montana Department of Natural Resources and Conservation. These data are pertinent to allocation under Article V, Section C, Item 3 of the Compact.

Annual Contents of Reservoirs

Information on reservoir contents at the end of the current (2016) and previous water years for the 7 reservoirs listed above plus 38 additional reservoirs that have usable contents greater than 1,000 acre-ft was compiled at the request of the Commission. The information is provided in table 10 in the section "Water-Year-End Contents for Yellowstone River Compact Reservoirs[1] or Lakes."

[1]Wyoming disagrees with the term "Compact Reservoirs" as used throughout this annual report. Wyoming's acceptance of this annual report should not be construed as Wyoming's acceptance of the use of that term.

Summary of Discharge for Yellowstone River Compact Streamflow-Gaging Stations

06208500 Clarks Fork Yellowstone River at Edgar, Mont.

LOCATION.—Lat 45°27′56.57″, long 108°50′38.78″ referenced to North American Datum of 1983, in SE ¼ SE ¼ SE ¼ sec. 23, T. 4 S., R. 23 E., Carbon County, Hydrologic Unit 10070006, on right bank 400 ft downstream from county bridge, 0.5 mi east of Edgar, 6 mi upstream from Rock Creek, and at river mile 22.1.

DRAINAGE AREA.—2,034 mi².

PERIOD OF RECORD.—July 1921 to September 1969, October 1986 to present.

REVISED RECORDS.—Water Supply Paper (WSP) 1509: 1924; 1932, maximum discharge. WSP 1729: Drainage area. Water Data Report MT-04–1: Drainage area.

GAGE.—Water-stage recorder. Elevation of gage is 3,460 ft, referenced to the National American Vertical Datum of 1988. Prior to August 31, 1953, nonrecording gage located at same site and elevation.

REMARKS.—Diversions for irrigation include about 41,500 acres, of which about 840 acres lie downstream from the station. In addition, about 6,300 acres of land upstream from the station are irrigated by diversions from the adjoining Rock Creek Basin. **Discharge values and summary statistics given herein have the diversions to White Horse Canal subtracted.**

Table 1. Daily mean discharge for Clarks Fork Yellowstone River at Edgar, Mont. (06208500), minus diversions to White Horse Canal, October 2015 through September 2016.

[Discharge is in cubic feet per second. Abbreviations: acre-ft, acre-feet; e, estimated; Max, maximum; Min, minimum. Symbol: ---, no data]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	238	597	e457	e460	367	348	354	824	1,960	1,020	187	93
2	248	619	e452	e430	360	340	349	765	2,150	1,070	166	94
3	336	659	e438	e460	374	336	339	772	2,540	990	160	104
4	514	683	e505	e503	358	344	355	946	3,020	931	144	113
5	653	684	e555	e506	366	335	407	1,390	3,710	971	138	134
6	571	676	547	e499	387	341	456	1,730	4,530	876	140	117
7	521	654	546	e492	385	344	437	1,860	5,120	768	144	124
8	504	618	571	e478	381	355	400	2,030	5,430	681	137	119
9	503	607	543	e467	375	356	426	2,250	5,680	580	120	117
10	499	623	518	e446	381	338	533	2,520	5,550	540	117	123
11	492	641	510	e439	384	346	542	2,140	5,230	645	112	125
12	491	616	495	e450	386	349	565	1,670	4,440	917	119	159
13	485	591	475	e457	381	354	643	1,460	3,470	838	107	183
14	492	600	500	e464	382	353	791	1,520	2,900	714	109	213
15	484	599	524	e471	380	357	770	1,780	2,660	595	108	239
16	489	594	516	e450	374	347	660	2,040	2,700	508	95	295
17	492	574	452	e440	378	329	585	1,980	2,480	458	93	287
18	493	587	463	e439	378	329	594	1,740	2,270	434	100	275
19	495	568	523	e436	375	332	653	1,960	2,110	352	134	258
20	537	555	e569	e439	370	301	623	2,350	2,160	294	131	297
21	566	550	e527	e432	362	318	646	2,720	2,120	290	136	372
22	619	551	e500	e432	353	344	923	2,990	2,090	275	134	360
23	596	516	e531	e436	342	358	1,180	2,600	2,060	276	111	364
24	594	e510	e531	e436	351	344	1,390	2,120	1,860	262	112	376
25	570	e480	e496	e429	328	332	1,220	1,760	1,630	230	119	416
26	582	e477	e446	e414	351	328	1,200	1,570	1,410	203	120	440
27	596	e483	e400	e418	358	321	1,090	1,510	1,230	199	120	417
28	608	e445	e429	e436	348	318	999	1,610	991	194	114	397
29	608	e416	e478	e467	354	339	927	1,610	893	203	102	385
30	605	e442	e480	422	---	353	826	1,670	870	205	99	374
31	600	---	e480	397	---	355	---	1,920	---	206	96	---
Total	16,081	17,215	15,457	13,945	10,669	10,544	20,883	55,807	85,264	16,725	3,824	7,370
Mean	519	574	499	450	368	340	696	1,800	2,842	540	123	246
Max	653	684	571	506	387	358	1,390	2,990	5,680	1,070	187	440
Min	238	416	400	397	328	301	339	765	870	194	93	93
Acre-ft	31,900	34,150	30,660	27,660	21,160	20,910	41,420	110,700	169,100	33,170	7,580	14,620

SUMMARY STATISTICS

	Water Year 2016	Water Years 1921–2016*
Annual total	273,800	
Annual mean	748	1,029
Annual runoff (acre-ft)	543,000	744,600

*During periods of operation (water years 1921–69, 1987 to current year).

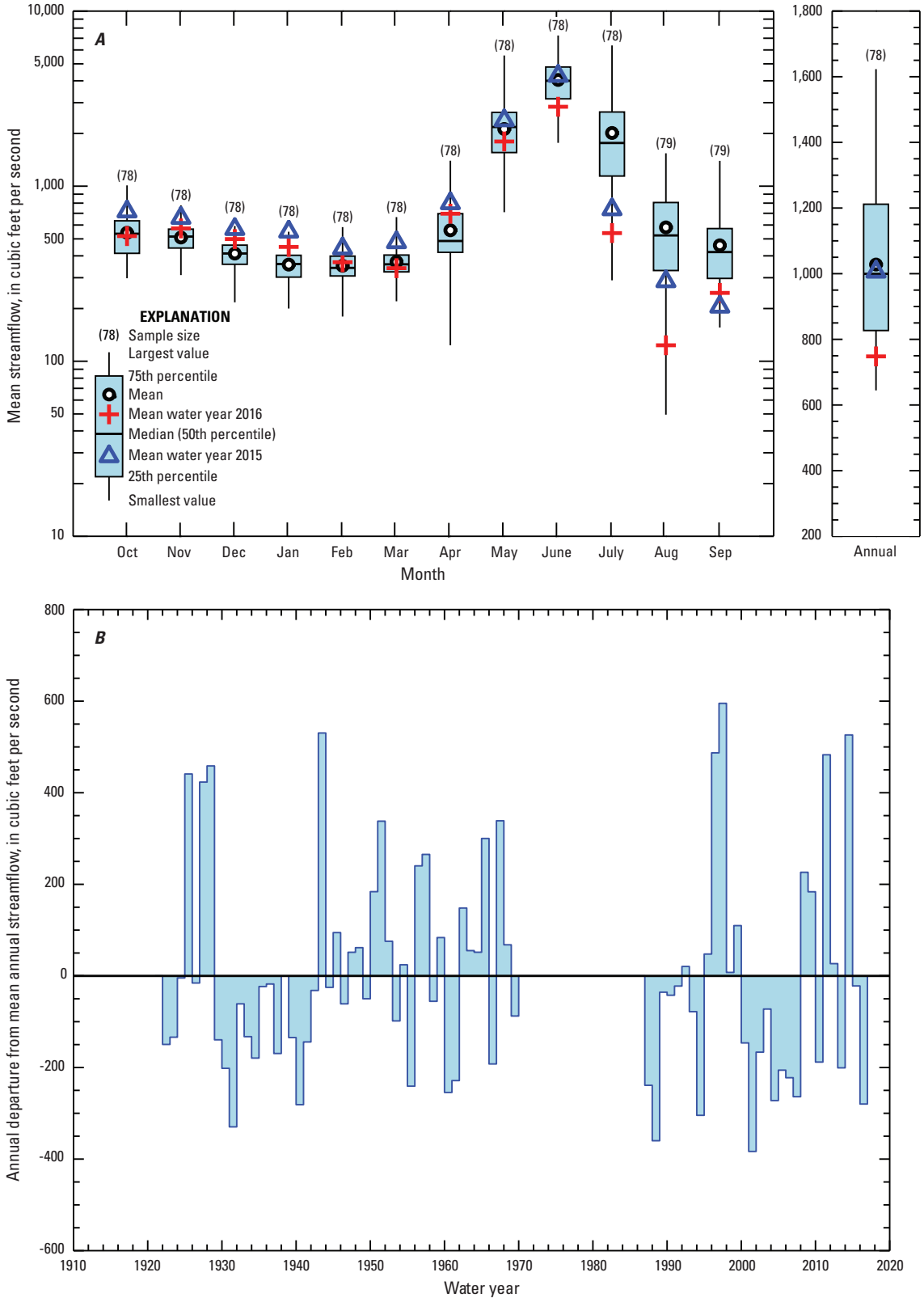

Figure 1. Streamflow data for Clarks Fork Yellowstone River at Edgar, Mont. (06208500), minus diversions to White Horse Canal, water years 1921–2016. *A*, Statistical distribution of monthly and annual streamflow. *B*, Annual departure from the mean annual streamflow.

06294000 Little Bighorn River near Hardin, Mont.

LOCATION.—Lat 45°44′08.47″, long 107°33′26.89″ referenced to North American Datum of 1983, in SE ¼ NE ¼ NE ¼ sec. 19, T. 1 S., R. 34 E., Big Horn County, Hydrologic Unit 10080016, on left bank 50 ft downstream from bridge on Sarpy Road, 0.2 mi upstream from terminal wasteway of Agency Canal, 0.6 mi upstream from mouth, and 2.3 mi east of Hardin.

DRAINAGE AREA.—1,294 mi².

PERIOD OF RECORD.—June 1953 to present.

REVISED RECORDS.—Water Data Report MT-86–1: 1978.

GAGE.—Water-stage recorder. Elevation of gage is 2,882.29 ft, referenced to the National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to October 7, 1953, nonrecording gage located at site 0.4 mi downstream. October 7, 1953 to May 6, 1963, water-stage recorder located at site 0.3 mi downstream. May 6, 1963 to November 6, 1963, nonrecording gage located at site 0.4 mi downstream. All locations had different elevations. November 7, 1963 to August 15, 1976, water-stage recorder located at site 35 ft downstream at present elevation. August 15, 1976 to September 30, 1979, water-stage recorders were located on each bank downstream from Sarpy Road Bridge and were used depending on control conditions.

REMARKS.—Streamflow partly regulated by Willow Creek Reservoir (also known as Lodge Grass Reservoir, capacity 22,900 acre-ft). Diversions for irrigation include 20,980 acres upstream from station. **Discharge values and summary statistics given herein include the streamflow of terminal wasteway of Agency Canal.**

Table 2. Daily mean discharge for Little Bighorn River near Hardin, Mont. (06294000), October 2015 through September 2016.

[Discharge is in cubic feet per second. Abbreviations: acre-ft, acre-feet; e, estimated; Max, maximum; Min, minimum. Symbol: ---, no data]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	121	142	e137	e137	e141	145	179	365	469	48	30	62
2	124	141	e141	e137	e137	143	196	318	460	52	26	41
3	132	139	e145	e137	e133	143	182	271	420	56	22	37
4	139	138	e144	e136	e129	139	165	241	414	58	23	43
5	143	140	e139	e135	e127	136	153	227	441	59	25	49
6	145	145	e135	e135	e127	131	144	219	473	55	21	57
7	143	145	e133	e135	e129	127	138	213	433	64	30	82
8	141	143	e132	e135	e134	125	133	236	431	60	33	101
9	143	140	e132	e134	e139	124	127	238	446	43	47	89
10	151	141	e132	e132	e142	124	123	275	464	42	57	77
11	137	141	e130	e129	e145	121	122	370	446	51	55	78
12	130	140	e125	e126	e144	120	122	372	419	59	52	80
13	127	138	e122	e128	e140	119	123	338	398	59	50	85
14	129	136	e122	e135	e137	118	122	300	367	93	54	92
15	130	137	e121	e136	e135	118	125	292	335	56	49	106
16	130	138	e121	e134	e136	118	123	272	303	51	38	105
17	129	137	e122	e128	e139	118	129	261	286	46	35	98
18	131	139	e123	e123	e145	117	139	255	253	38	49	91
19	135	140	e126	e123	e147	117	164	241	230	33	73	101
20	139	140	e127	e125	e147	117	242	232	212	22	115	92
21	138	145	e129	e133	e147	114	525	268	214	17	141	89
22	140	128	e132	e141	e147	114	360	326	180	24	143	91
23	141	143	e135	e146	151	123	256	383	158	21	124	97
24	141	151	e135	e147	147	126	223	397	141	14	109	132
25	141	150	e132	e145	142	137	263	402	142	16	96	188
26	140	121	e130	e140	140	138	443	411	126	23	95	319
27	141	124	e126	e137	137	136	490	418	120	29	89	259
28	142	e126	e127	e135	144	133	439	412	101	17	75	197
29	144	e132	e130	e137	145	135	443	398	57	13	62	167
30	143	e135	e132	e141	---	142	425	416	52	23	61	150
31	143	---	e135	e141	---	157	---	442	---	35	52	---
Total	4,253	4,155	4,052	4,183	4,053	3,975	6,818	9,809	8,991	1,277	1,931	3,255
Mean	137	138	131	135	140	128	227	316	300	41.2	62.3	108
Max	151	151	145	147	151	157	525	442	473	93	143	319
Min	121	121	121	123	127	114	122	213	52	13	21	37
Acre-ft	8,440	8,240	8,040	8,300	8,040	7,880	13,520	19,460	17,830	2,530	3,830	6,460

SUMMARY STATISTICS

	Water Year 2016	Water Years 1954–2016
Annual total	56,750	
Annual mean	155	274
Annual runoff (ac-ft)	112,600	198,400

06294500 Bighorn River above Tullock Creek, near Bighorn, Mont.

LOCATION.—Lat 46°23′04.54″, long 105°50′43.88″ referenced to North American Datum of 1983, in SE ¼ SE ¼ SE ¼ sec. 4, T. 7 N., R. 47 E., Custer County, Hydrologic Unit 10090102, on right bank 1.5 mi south of Miles City and at river mile 2.3.

DRAINAGE AREA.—5,397 mi². Area at site used prior to October 4, 1995, 5,379 mi².

PERIOD OF RECORD.—April 1938 to April 1942, April 1946 to present. Published as "near Miles City" April 1938 to April 1942. Not equivalent to records published as "near Miles City" May 1929 to October 1932. April 1946 to October 4, 1995, at site 2.5 mi upstream from present site. Streamflows at present site are equivalent with streamflows at site operated from 1946. Monthly discharge only for some periods, published in Water Supply Paper (WSP) 1309.

REVISED RECORDS.— WSP 1729: Drainage area.

GAGE.—Water-stage recorder. Elevation of gage is 2,360 ft, referenced to the North American Vertical Datum of 1988. April 1938 to April 1942, nonrecording gage located at site 8 mi upstream from present site at different elevation. April 1946 to September 30, 1963, located at elevation 1.00 ft higher than present site. October 4, 1995, gage was moved 2.5 mi downstream.

REMARKS.— Streamflow is regulated by Tongue River Reservoir (station 06307000) with usable contents of 79,070 acre-ft, and many small reservoirs in Wyoming with combined capacity about 15,000 acre-ft. Diversions for irrigation include about 100,800 acres upstream from station.

Table 3. Daily mean discharge for Bighorn River above Tullock Creek, near Bighorn, Mont. (06294500), October 2015 through September 2016.

[Discharge is in cubic feet per second. Abbreviations: acre-ft, acre-feet; e, estimated; Max, maximum; Min, minimum. Symbol: ---, no data]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	2,760	3,120	2,550	2,560	2,650	2,560	2,530	3,200	8,290	2,270	2,220	2,050
2	2,960	3,170	2,570	2,580	2,650	2,580	2,590	3,040	8,170	2,290	2,110	2,070
3	2,980	3,000	2,550	2,580	2,620	2,600	2,530	2,950	8,020	2,300	2,050	2,080
4	3,050	2,700	2,510	2,570	2,610	2,600	2,470	2,870	7,970	2,240	2,070	2,120
5	3,080	2,710	2,530	2,570	2,600	2,590	2,450	2,830	7,960	2,230	2,150	2,180
6	3,100	2,730	2,540	2,590	2,590	2,580	2,420	2,980	8,040	2,200	2,120	2,090
7	3,080	2,760	2,550	2,610	2,600	2,590	2,370	3,120	7,950	2,240	2,240	2,080
8	2,970	2,780	2,580	2,600	2,610	2,580	2,310	3,120	7,660	2,180	2,220	2,130
9	2,820	2,800	2,600	2,600	2,610	2,590	2,370	3,150	7,530	2,120	2,180	2,220
10	2,840	2,760	2,630	e2,600	2,630	2,590	2,350	3,340	7,290	2,140	2,260	2,140
11	2,870	2,630	2,630	2,590	2,640	2,500	2,330	4,010	7,000	2,390	2,220	2,090
12	2,900	2,640	2,610	2,590	2,660	2,320	2,300	4,810	7,000	2,400	2,220	2,120
13	2,960	2,660	2,600	2,590	2,670	2,320	2,200	4,990	7,030	2,370	2,210	2,240
14	2,920	2,680	2,630	2,610	2,670	2,330	2,270	4,740	7,010	2,370	2,180	2,350
15	2,810	2,700	2,670	2,620	2,680	2,330	2,350	4,650	6,660	2,380	2,100	2,400
16	2,880	2,720	2,600	2,620	2,700	2,330	2,480	4,620	6,100	2,390	2,000	2,380
17	2,960	2,740	2,610	2,620	2,690	2,320	2,530	4,810	5,540	2,390	1,990	2,360
18	3,030	2,760	2,570	e2,620	2,710	2,320	2,600	5,070	4,970	2,350	2,120	2,350
19	3,130	2,680	2,600	2,590	2,700	2,320	2,810	5,320	4,540	2,230	2,390	2,340
20	3,090	2,520	2,610	2,590	2,680	2,310	3,300	5,890	4,430	2,200	2,460	2,350
21	2,880	2,520	2,600	2,610	2,640	2,310	3,570	6,450	4,230	2,230	2,330	2,400
22	2,910	2,510	2,640	2,610	2,610	2,300	3,390	7,410	3,950	2,320	2,270	2,500
23	2,970	2,550	2,640	2,610	2,600	2,280	3,060	8,100	3,560	2,330	2,170	2,520
24	3,030	2,590	2,640	2,620	2,590	2,070	3,010	8,190	3,190	2,320	2,180	2,630
25	3,100	2,630	2,610	2,630	2,580	2,110	3,200	8,380	2,910	2,300	2,300	2,830
26	3,160	2,550	e2,600	2,630	2,570	2,100	3,330	8,520	2,610	2,250	2,250	2,820
27	3,100	2,470	e2,600	2,630	2,580	2,080	3,390	8,500	2,380	2,260	2,220	2,680
28	2,970	2,490	e2,580	2,630	2,590	2,070	3,400	8,470	2,330	2,260	2,130	2,570
29	2,990	2,490	e2,550	2,650	2,570	2,120	3,410	8,400	2,260	2,250	2,060	2,550
30	3,020	2,530	2,550	2,670	---	2,200	3,350	8,400	2,230	2,250	2,020	2,500
31	3,080	---	2,550	2,660	---	2,280	---	8,400	---	2,260	2,110	---
Total	92,400	80,590	80,300	80,850	76,300	73,180	82,670	168,730	168,810	70,710	67,550	70,140
Mean	2,981	2,686	2,590	2,608	2,631	2,361	2,756	5,443	5,627	2,281	2,179	2,338
Max	3,160	3,170	2,670	2,670	2,710	2,600	3,570	8,520	8,290	2,400	2,460	2,830
Min	2,760	2,470	2,510	2,560	2,570	2,070	2,200	2,830	2,230	2,120	1,990	2,050
Acre-ft	183,300	159,900	159,300	160,400	151,300	145,200	164,000	334,700	334,800	140,300	134,000	139,100

SUMMARY STATISTICS

	Water Year 2016	Water Years 1945–2016
Annual total	1,112,000	
Annual mean	3,039	3,668
Annual runoff (ac-ft)	2,206,000	2,657,000

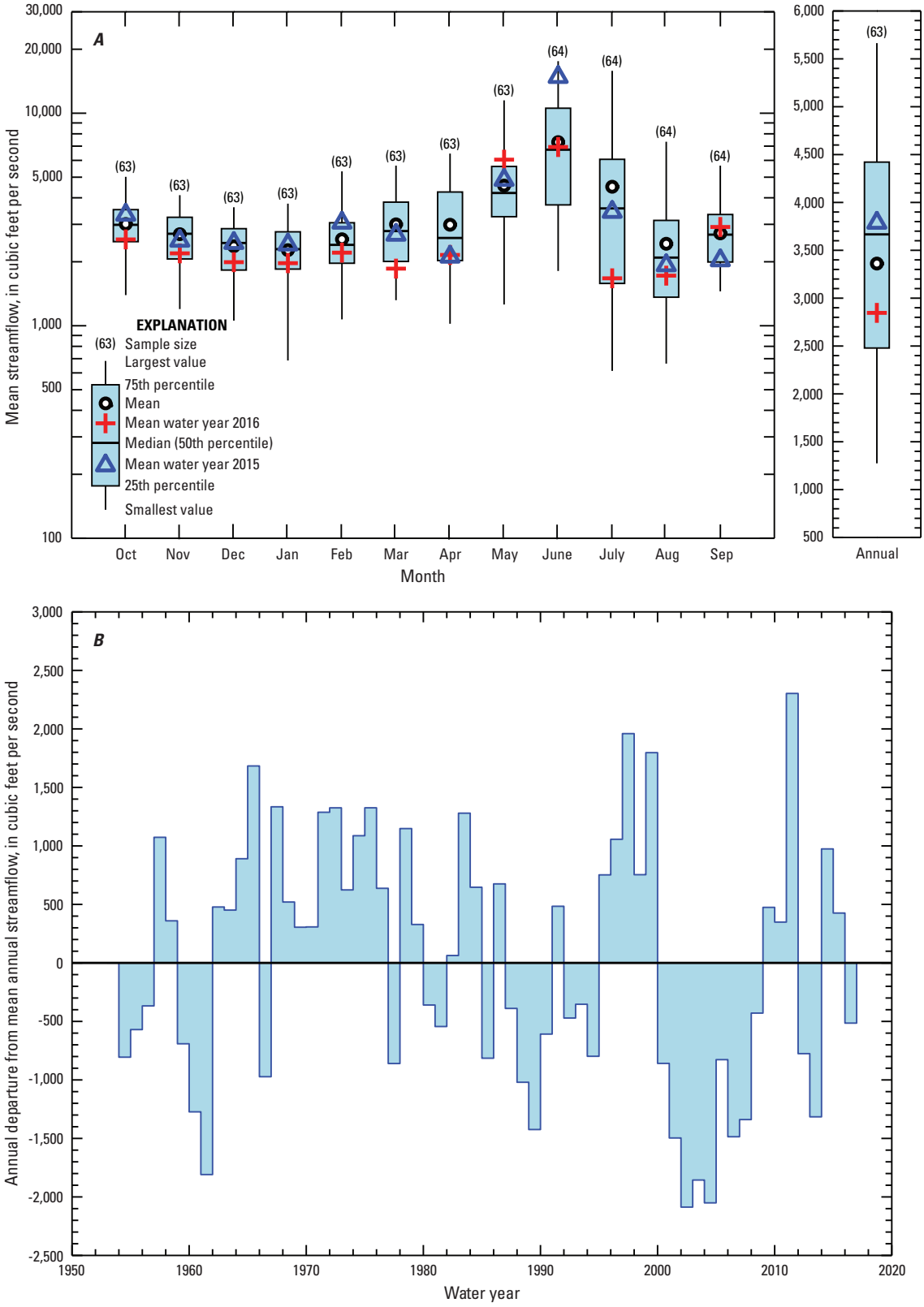

Figure 2. Streamflow data for Bighorn River above Tullock Creek, near Bighorn, Mont. (06294500), minus Little Bighorn River near Hardin, Mont. (06294000); adjusted for change in contents in Bighorn Lake, water years 1954–2016. *A*, Statistical distribution of monthly and annual streamflow. *B*, Annual departure from the mean annual streamflow.

06308500 Tongue River at Miles City, Mont.

LOCATION.—Lat 46°23′04.54″, long 105°50′43.88″ referenced to North American Datum of 1983, in SE ¼ SE ¼ SE ¼ sec. 4, T. 7 N., R. 47 E., Custer County, Hydrologic Unit 10090102, on right bank 1.5 mi south of Miles City and at river mile 2.3.

DRAINAGE AREA.—5,397 mi². Area at site used prior to October 4, 1995, 5,379 mi².

PERIOD OF RECORD.—April 1938 to April 1942, April 1946 to present. Published as "near Miles City" April 1938 to April 1942. Not equivalent to records published as "near Miles City" May 1929 to October 1932. April 1946 to October 4, 1995, at site 2.5 mi upstream from present site. Streamflows at present site are equivalent with streamflows at site operated from 1946. Monthly discharge only for some periods, published in Water Supply Paper (WSP) 1309.

REVISED RECORDS.—WSP 1729: Drainage area.

GAGE.—Water-stage recorder. Elevation of gage is 2,360 ft, referenced to the North American Vertical Datum of 1988. April 1938 to April 1942, nonrecording gage located at site 8 mi upstream from present site at different elevation. April 1946 to September 30, 1963, located at elevation 1.00 ft higher than present site. October 4, 1995, gage was moved 2.5 mi downstream.

REMARKS.—Streamflow is regulated by Tongue River Reservoir (station 06307000) with usable contents of 79,070 acre-ft, and many small reservoirs in Wyoming with combined capacity about 15,000 acre-ft. Diversions for irrigation include about 100,800 acres upstream from station.

Table 4. Daily mean discharge for Tongue River at Miles City, Mont. (06308500), October 2015 through September 2016.

[Discharge is in cubic feet per second. Abbreviations: acre-ft, acre-feet; e, estimated; Max, maximum; Min, minimum. Symbol: ---, no data]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	157	157	192	e190	e150	178	120	160	542	52	54	105
2	165	156	195	e190	e150	175	120	142	525	22	49	108
3	178	159	205	e190	e150	171	124	122	502	15	45	102
4	191	195	214	e190	e160	167	120	101	492	25	44	146
5	231	198	216	e190	e151	164	118	91	451	44	49	298
6	175	195	223	e180	e168	162	123	93	422	42	46	280
7	166	194	204	e170	e168	159	119	93	408	47	37	214
8	161	193	211	e160	e174	155	113	77	397	41	28	179
9	160	191	219	e150	e174	148	108	78	430	42	36	189
10	164	190	232	e150	e186	144	100	104	470	53	65	168
11	164	190	e228	e170	e189	143	100	209	505	66	57	156
12	177	188	e200	e170	e214	141	93	341	647	81	33	141
13	191	187	e200	e170	e225	140	92	246	609	103	23	132
14	193	187	e200	e170	e235	137	90	164	693	118	17	133
15	198	187	e210	e170	e222	136	103	138	661	86	20	135
16	206	186	e210	e130	e270	134	117	151	668	85	16	136
17	213	187	e210	e120	e299	131	104	190	586	91	13	134
18	216	185	e210	e130	E353	130	114	247	515	119	34	138
19	220	172	e210	e150	373	131	141	337	477	112	80	139
20	225	207	e210	e150	343	130	182	347	402	106	178	154
21	221	136	e214	e150	269	128	148	323	349	78	182	159
22	210	132	e210	e150	232	123	136	326	290	75	194	160
23	196	149	e200	e160	217	120	129	341	209	68	148	167
24	191	197	e190	e160	198	120	142	353	173	48	117	241
25	183	168	e170	e160	193	123	398	420	142	43	110	970
26	182	107	e160	e160	186	124	234	473	110	52	111	606
27	178	89	e160	e160	176	123	182	497	90	63	123	368
28	167	116	e160	e150	179	121	224	483	74	81	129	259
29	150	122	e170	e150	177	119	311	471	61	88	141	213
30	159	165	e180	e150	---	118	206	493	59	68	134	201
31	158	---	e190	e150	---	118	---	520	---	55	108	---
Total	5,746	5,085	6,203	4,990	6,181	4,313	4,411	8,131	11,959	2,069	2,421	6,531
Mean	185	170	200	161	213	139	147	262	399	66.7	78.1	218
Max	231	207	232	190	373	178	398	520	693	119	194	970
Min	150	89	160	120	150	118	90	77	59	15	13	102
Acre-ft	11,400	10,090	12,300	9,900	12,260	8,550	8,750	16,130	23,720	4,100	4,800	12,950

SUMMARY STATISTICS

	Water Year 2016	Water Years 1938–2016*
Annual total	68,040	
Annual mean	186	418
Annual runoff (acre-ft)	135,000	293,500

*During periods of operation (April 1938 to April 1942, April 1946 to water year 2016).

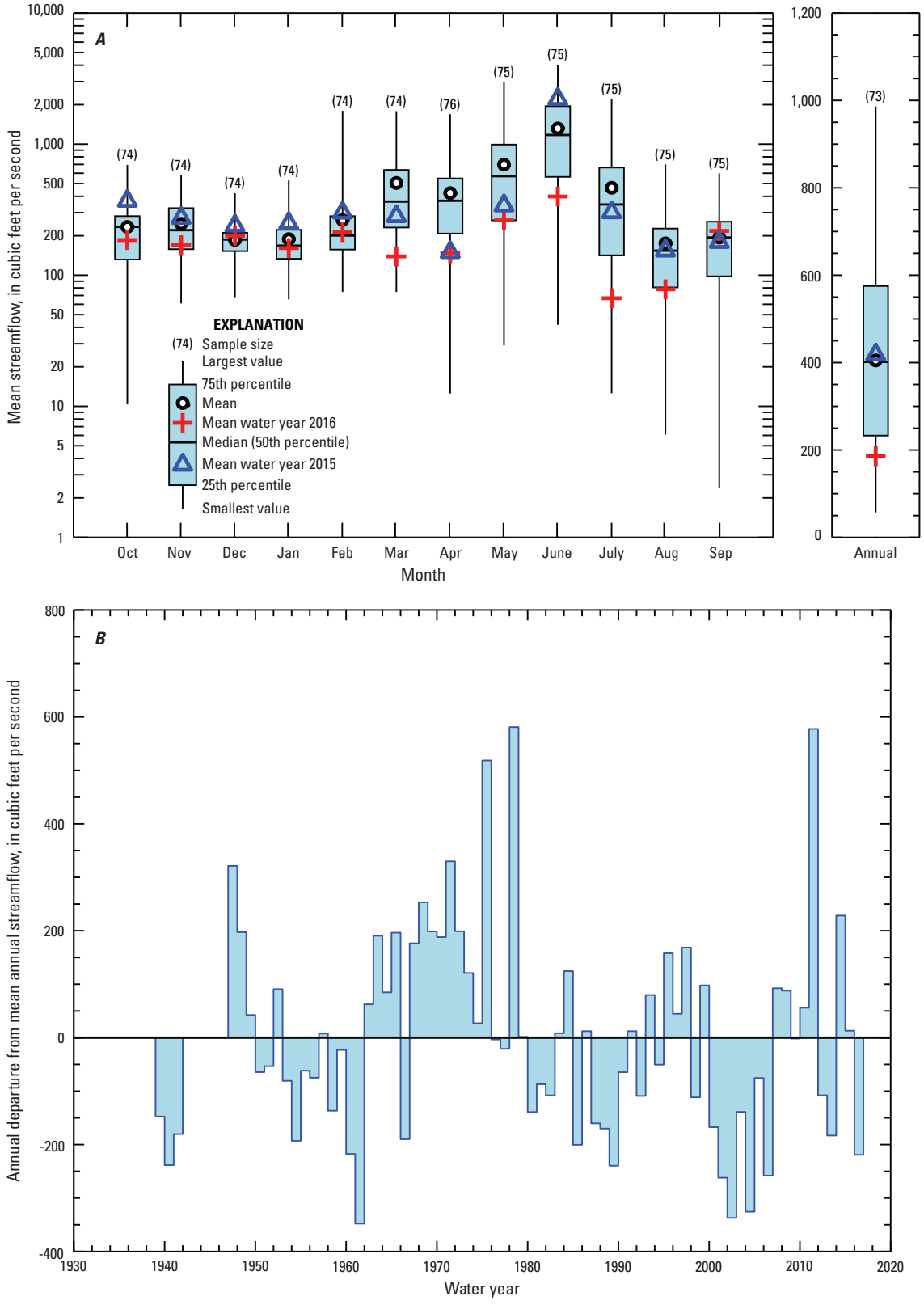

Figure 3. Streamflow data for Tongue River at Miles City, Mont. (06308500), water years 1938–2016. *A*, Statistical distribution of monthly and annual streamflow. *B*, Annual departure from the mean annual streamflow.

06326500 Powder River near Locate, Mont.

LOCATION.—Lat 46°25′45.97″, long 105°18′37.19″ referenced to North American Datum of 1983, in SW ¼ SW ¼ SE ¼ sec. 23, T. 8 N., R. 51 E., Custer County, Hydrologic Unit 10090209, on left bank at downstream side of bridge on U.S. Highway 12, 0.1 mi west of Locate, and 25 mi east of Miles City, and at river mile 29.4.

DRAINAGE AREA.—13,060 mi^2.

PERIOD OF RECORD.—March 1938 to present.

REVISED RECORDS.— Water Supply Paper (WSP) 926: 1939. WSP 1309: 1938–39, maximum discharge. WSP 1729: Drainage area. Water Data Report MT-04–1: Drainage area.

GAGE.—Water-stage recorder. Elevation of gage is 2,384.79 ft, referenced to the National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to July 11, 1947, nonrecording gage located at bridge 1.5 mi upstream, and July 11, 1947 to September 30, 1965, water-stage recorder located at site near upstream bridge at different elevation. October 1, 1965 to October 4, 1966, nonrecording gage, and October 5, 1966 to March 21, 1978, water-stage recorder located at present site and elevation. March 22, 1978 to April 23, 1981, water-stage recorder located 1.5 mi upstream at different elevation, April 24 to August 20, 1981, water-stage recorder located at present site and elevation, and August 21, 1981 to September 30, 1981, water-stage recorder located 1.5 mi upstream at different elevation. October 1, 1981 to April 5, 1995 water-stage recorder located at site 1.5 mi downstream at different elevation. April 7, 1995 to present, water-stage recorders located on each bank and used depending on control conditions.

REMARKS.—Some regulation occurs by three reservoirs in Wyoming with combined usable contents of 36,800 acre-ft. Diversions for irrigation include about 101,800 acres upstream from station.

Table 5. Daily mean discharge for Powder River near Locate, Mont. (06326500), October 2015 through September 2016.

[Discharge is in cubic feet per second. Abbreviations: acre-ft, acre-feet; e, estimated; Max, maximum; Min, minimum. Symbol: ---, no data]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	161	220	e176	e158	e183	523	e306	871	561	e61	e8.4	e22
2	155	226	e176	e167	e183	531	e305	1,090	517	e73	e19	e21
3	178	224	e176	e177	e187	505	e320	1,020	464	e69	e15	e18
4	167	224	e172	e183	e190	454	e325	937	463	e45	e17	68
5	163	214	e165	e183	e192	458	e314	824	449	e42	e17	249
6	155	213	e163	e178	e201	434	e328	801	456	e39	e14	161
7	139	222	e156	e181	e212	404	e326	756	412	e36	e15	e102
8	139	227	e158	e181	e225	409	335	695	347	e31	20	e179
9	141	228	e165	e164	e247	e406	e334	673	e337	e28	e18	e101
10	134	215	e167	e157	e256	391	e312	633	359	e32	e17	e60
11	134	220	e167	e156	e263	382	293	696	e364	e26	e16	e44
12	144	220	e161	e165	e263	378	e290	641	377	e23	e16	e36
13	195	239	e158	e172	e263	e367	e290	990	618	e22	e18	e34
14	230	256	e156	e172	e264	e359	290	984	720	e21	e21	e32
15	224	260	e154	e167	e285	e432	293	1,010	690	e19	e18	e32
16	209	249	e148	e156	e302	e336	263	904	626	e19	e17	e32
17	200	259	e134	e161	e319	e334	263	796	579	e17	e16	e29
18	198	249	e132	e171	e326	e328	272	718	551	e16	e15	e28
19	209	264	e139	e190	e326	320	331	659	498	e14	e19	e26
20	201	266	e149	e192	e333	312	310	631	465	e14	e41	e26
21	205	244	e152	e194	e348	e312	320	608	399	e14	e30	e24
22	195	239	e154	e196	e365	e309	334	858	336	e12	e24	e23
23	187	246	e154	e196	e384	e302	344	805	286	e12	e20	e31
24	202	254	e154	e201	e428	e299	397	707	e211	e11	e18	64
25	213	254	e156	e207	e467	e300	430	694	e167	e11	e20	404
26	211	123	e147	e207	e485	308	368	716	e132	e11	e22	313
27	197	137	e143	e206	e497	e319	376	681	e114	e11	e23	e208
28	213	149	e141	e201	e508	e328	578	643	94	e13	e25	e145
29	226	165	e141	e196	e523	e317	1,110	612	e82	e14	e24	e125
30	220	e172	e145	e190	---	e303	1,040	548	60	e12	e23	301
31	217	---	e152	e185	---	e302	---	501	---	e9.9	e24	---
Total	5,762	6,678	4,811	5,610	9,025	11,372	11,397	23,702	11,734	777.9	610.4	2,938
Mean	186	223	155	181	311	367	380	765	391	25.1	19.7	97.9
Max	230	266	176	207	523	531	1,110	1,090	720	73	41	404
Min	134	123	132	156	183	299	263	501	60	9.9	8.4	18
Acre-ft	11,430	13,250	9,540	11,130	17,900	22,560	22,610	47,010	23,270	1,540	1,210	5,830

SUMMARY STATISTICS

	Water Year 2016	Water Years 1939–2016
Annual total	94,410	
Annual mean	258	564
Annual runoff (acre-ft)	187,300	408,700

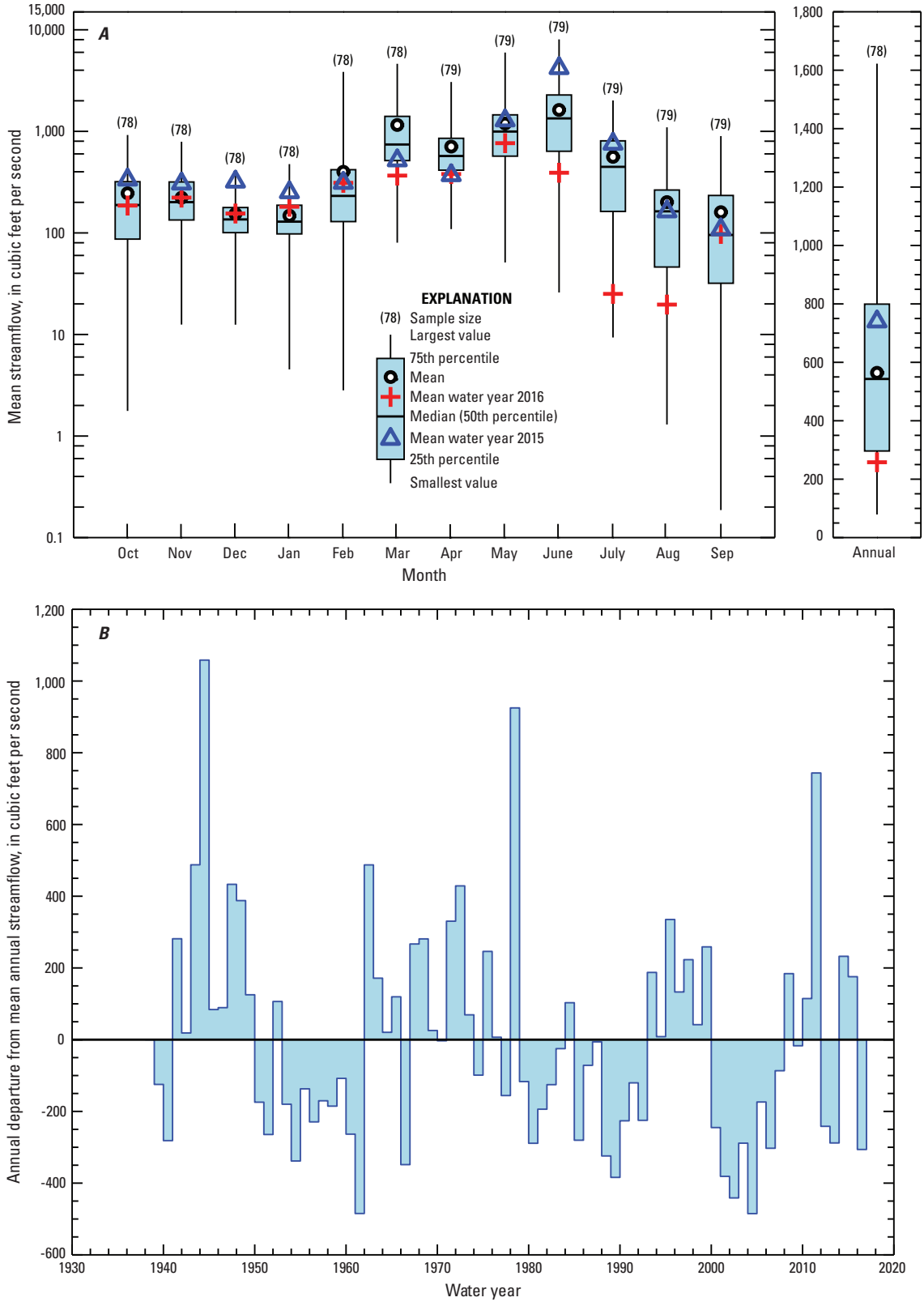

Figure 4. Streamflow data for Powder River near Locate, Mont. (06326500), water years 1939–2015. *A*, Statistical distribution of monthly and annual streamflow. *B*, Annual departure from the mean annual streamflow.

Month-End Contents for Yellowstone River Compact Reservoirs[1] Completed after January 1, 1950

06258900 Boysen Reservoir, Wyo.

LOCATION.—Lat 43°25′00″, long 108°10’37″ referenced to North American Datum of 1927, in NW ¼ NW ¼ sec. 16, T. 5 N., R. 6 E., Fremont County, Hydrologic Unit 10080005, at dam on Wind River and 13 mi north of Shoshoni, Wyo.

DRAINAGE AREA.—7,700 mi^2.

PERIOD OF RECORD.—October 1951 to present (month-end contents only).

GAGE.—Water-stage recorder. Datum of gage is referenced to the National Geodetic Vertical Datum of 1929 (levels by Bureau of Reclamation).

REMARKS.—Reservoir is formed by rock-fill dam completed in October 1951. Storage began October 11, 1951. The elevation at the top of dead pool (outlet and penstock invert pipe) is 4,657.00 ft. and contents of 40,080 acre-ft. The elevation at the top of inactive contents is 4,685.00 ft. and contents 219,200 acre-ft. The elevation of the top of the joint use pool (top of spillway gate) is 4,725.00 ft. and contents of 741,600 acre-ft. Top of exclusive flood control is 4,732.20 ft and contents of 892,200 acre-ft. Top of Crest of dam is at elevation 4,758.00 ft. Water used for power production, flood control, irrigation, and recreation.

COOPERATION.—Elevations and contents table furnished by Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.—Maximum daily contents, 922,400 acre-ft, July 6, 1967, elevation, 4,730.83 ft; minimum daily contents since normal use of water started, 235,700 acre-ft, March 18, 1956, elevation, 4,684.18 ft., capacity table then in use.

Table 6. Month-end contents for Boysen Reservoir, Wyo.

[Symbol: --, no data]

Date	Water-surface elevation, in feet	Usable contents, in acre-feet	Change in usable contents, in acre-feet
September 30, 2015	4,719.01	591,000	--
October 31	4,718.33	579,400	-11,600
November 30	4,717.94	572,800	-6,600
December 31	4,717.25	561,400	-11,400
January 31, 2016	4,716.28	545,700	-15,700
February 29	4,716.00	541,100	-4,600
March 31	4,716.30	546,000	4,900
April 30	4,717.89	572,000	26,000
May 31	4,719.60	601,200	29,300
June 30	4,724.19	685,800	84,500
July 31	4,721.55	636,200	-49,600
August 31	4,719.15	593,400	-42,800
September 30, 2016	4,718.65	584,800	-8,600
2016 water year			-6,200

[1]Wyoming disagrees with the term “Compact Reservoirs” as used throughout this annual report. Wyoming’s acceptance of this annual report should not be construed as Wyoming’s acceptance of the use of that term.

06260300 Anchor Reservoir, Wyo.

LOCATION.—Lat 43°39′50″, long 108°49′27″ referenced to North American Datum of 1927, in sec. 26, T. 43 N., R. 100 W., Hot Springs County, Hydrologic Unit 10080007, at dam on South Fork Owl Creek, 2 mi downstream from Middle Fork, 3 mi southeast of Anchor, and 32 mi west of Thermopolis, Wyo.

DRAINAGE AREA.—131 mi^2.

PERIOD OF RECORD.—November 1960 to present (month-end contents only).

GAGE.—Water-stage recorder. Datum of gage is referenced to the National Geodetic Vertical Datum of 1929 (Bureau of Reclamation bench mark).

REMARKS.—Reservoir is formed by concrete-arch dam completed in 1960. The elevation of the dead pool (invert of river outlet) is 6,343.75 ft. and contents of 66 acre-ft. The top of the active conservation pool is 6,441.0 ft. and contents of 17,230 acre-ft. Water is used for flood control, recreation, and irrigation of land in Owl Creek Basin.

COOPERATION.—Elevations and contents table furnished by Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.—Maximum daily contents, 9,250 acre-ft., July 3, 1967, elevation, 6,418.52 ft; no contents on many days some years.

Table 7. Month-end contents for Anchor Reservoir, Wyo.

[Symbol: --, no data]

Date	Water-surface elevation, in feet	Usable contents, in acre-feet	Change in usable contents, in acre-feet
September 30, 2015	6,361.23	395	--
October 31	6,362.32	440	45
November 30	--	--	--
December 31	--	--	--
January 31, 2016	--	--	--
February 28	--	--	--
March 31	--	--	--
April 30	6,367.96	722	--
May 31	6,398.87	4,200	3,478
June 30	6,403.51	5,060	860
July 31	6,360.82	379	-4,683
August 31	6,360.65	373	-6
September 30, 2016	6,363.29	482	109
2016 water year			87

06286400 Bighorn Lake near St. Xavier, Mont.

LOCATION.—Lat 45°18′27″, long 107°57′26″ referenced to North American Datum of 1927, in SW ¼ SE ¼ sec. 18, T. 6 S., R. 30 E., Big Horn County, Hydrologic Unit 10080010, in block 13 of Yellowtail Dam on Bighorn River, 1.3 mi upstream from Grapevine Creek, 15.5 mi southwest of St. Xavier, and at river mile 86.6.

DRAINAGE AREA.—19,626 mi².

PERIOD OF RECORD.—November 1965 to present (month-end contents only). Prior to October 1969, published as "Yellowtail Reservoir." Records of daily elevations and contents on file at the U.S. Geological Survey, Wyoming-Montana Water Science Center in Helena, Mont.

GAGE.—Water-stage recorder located in powerhouse control room. Elevation of gage is 3,296.5 ft, referenced to the National Geodetic Vertical Datum of 1929 (levels by Bureau of Reclamation).

COOPERATION.—Elevations and contents table furnished by Bureau of Reclamation.

REMARKS.—Reservoir is formed by thin concrete-arch dam; construction began in 1961 and was completed in 1967. Storage began November 3, 1965. The elevation of the dead pool is 3296.50 ft., contents of 17,720 acre ft. The top of the inactive conservation pool is 3,547.00 ft., contents of 469,900 acre-ft. The elevation of spillway crest is 3,593.00 ft. The top of the exclusive flood pool (top of gates) is 3,657.00 ft., contents of 1,279,000 acre-ft. The top of the surcharge pool is 3,660.00 ft., contents of 1,332,000 acre-ft. All elevations are referenced to the National Geodetic Vertical Datum of 1929. Water is used for power production, flood control, irrigation, and recreation.

EXTREMES FOR PERIOD OF RECORD.—Maximum daily contents, 1,365,000 acre-ft, July 6, 1967, elevation, 3,656.43 ft; minimum daily contents since first filling, 519,400 acre-ft, March 11, 2003, elevation 3,572.81 ft.

Table 8. Month-end contents for Bighorn Lake, Mont.

[Symbol: --, no data]

Date	Water-surface elevation, in feet	Usable contents, in acre-feet	Change in usable contents, in acre-feet
September 30, 2015	3,635.71	951,800	--
October 31	3,634.05	933,600	-18,200
November 30	3,631.98	912,400	-21,200
December 31	3,628.89	883,600	-28,800
January 31, 2016	3,625.29	852,700	-30,900
February 28	3,623.39	836,400	-16,300
March 31	3,620.24	813,300	-23,100
April 30	3,617.11	791,000	-22,300
May 31	3,624.65	847,500	56,500
June 30	3,634.93	943,100	95,600
July 31	3,631.55	908,200	-34,900
August 31	3,628.93	883,900	-24,300
September 30, 2016	3,633.20	924,700	40,800
2016 water year			-27,100

Month-End Contents for Yellowstone River Compact Reservoirs[1] Existing on January 1, 1950

The extent, if any, to which the use of reservoirs in this section may be subject to Compact allocations was not determined. As a matter of hydrologic interest, the month-end usable contents in acre-ft of four reservoirs are given in table 9. Three of the reservoirs (Bull Lake, Pilot Butte Reservoir, and Buffalo Bill Reservoir) are in the Bighorn River Basin, Wyoming, and data on contents were furnished by the Bureau of Reclamation. The usable contents of Buffalo Bill Reservoir were increased in 1992 from 456,600 acre-ft to 644,500 acre-ft (listed as 646,565 acre-ft by Bureau of Reclamation). The Tongue River Reservoir in Montana is operated under the supervision of the Water Resources Division of the Montana Department of Natural Resources and Conservation, who furnished the water-level data and the reservoir-contents table. The usable contents of Tongue River Reservoir increased from 68,040 acre-ft to 78,360 acre-ft in 1999.

Table 9. Month-end contents for Yellowstone River Compact reservoirs[1] existing on January 1, 1950.

Date	Usable contents, in acre-feet[2]			
	06224500 Bull Lake	Pilot Butte Reservoir	06281500 Buffalo Bill Reservoir	06307000 Tongue River Reservoir
September 30, 2015	62,960	12,740	430,800	46,910
October 31	68,640	25,360	415,700	45,840
November 30	69,950	25,060	423,400	49,310
December 31	70,500	24,980	424,700	48,240
January 31, 2015	70,600	24,910	426,600	49,470
February 28	70,380	27,450	428,100	53,550
March 31	70,620	24,740	432,700	57,580
April 30	76,380	27,620	449,300	69,040
May 31	109,300	27,380	509,100	80,140
June 30	149,200	27,360	624,900	74,690
July 31	117,400	14,010	570,400	55,650
August 31	60,550	7,510	481,000	44,020
September 30, 2016	37,570	4,750	421,300	41,680
Change in contents during water year	-25,390	-7,990	-9,500	-5,230

[1]Wyoming disagrees with the term "Compact Reservoirs" as used throughout this annual report. Wyoming's acceptance of this annual report should not be construed as Wyoming's acceptance of the use of that term.

[2] Pre-compact water rights and post-compact water rights for these reservoirs are presented in the table, "Water-year-end contents for Yellowstone River Compact reservoirs or lakes."

Water-Year-End Contents for Yellowstone River Compact Reservoirs[1] or Lakes

Month-end usable contents for additional reservoirs of interest to the Yellowstone River Compact is listed in table 10. Anchor Reservoir was built to have a usable contents of 17,410 acre-ft., but sinkholes within the area contained by the dam prevent filling the reservoir to the designed volume, and at present, only 9,252 acre-ft. has been adjudicated.

Table 10. Water-year-end contents for Yellowstone River Compact reservoirs[1] or lakes.

[Contents are in acre-feet. Reservoirs or lakes are listed in alphabetical order by drainage basin. Abbreviation: e, estimated. Symbol: --, no data or not available]

Reservoir or lake name	Pre-compact 1950 water right	Post-compact 1950 water right	Total permitted water right	Total contents[2]	Usable contents[3] on Sept. 30, 2016	Usable contents[3] on Sept. 30, 2015	Change in usable contents[4]
Clarks Fork Yellowstone River Basin							
Cooney Reservoir[5,6]	28,230	0	28,230	28,230	13,990	18,380	-4,390
Glacier Lake[5,6]	4,200	0	4,200	4,200	--	--	--
Bighorn River Basin							
(Lake) Adelaide Reservoir[7,9]	1,449	3,315	4,764	4,760	428	675	-247
Anchor Reservoir[8,9,10]	0	9,252	9,252	[11]17,160	482	395	87
Bighorn Lake[8,9,10]	0	1,116,000	1,116,000	[12]1,021,000	924,700	951,800	-27,100
Boysen Reservoir[8,9,10]	757,851	0	757,851	[11]741,600	584,800	591,000	-6,200
Buffalo Bill Reservoir[8,9,10]	456,640	187,940	644,580	[11]646,600	421,300	430,800	-9,500
Bull Lake[8,9,10]	151,951	0	151,951	[11]152,500	37,570	62,960	-25,390
Christina Reservoir[9,13]	3,860	0	3,860	3,860	260	55	205
Corral Reservoir[9,13]	0	1,027	1,027	1,030	711	676	35
Diamond Creek Dike Reservoir[9,13]	0	18,378	18,378	18,380	237	388	-151
Enterprise Reservoir[9,13]	1,494	204	1,698	1,700	28	12	16
Fairview Extension Reservoir[9,13]	791	620	1,411	1,410	1,410	1,200	210
Greybull Valley Reservoir[9,13]	0	33,169	33,169	33,170	9,340	9,030	310
Harrington Reservoir[9,13]	315	887	1,202	1,200	1,200	800	400
Lake Cameahwait Reservoir[9,13]	0	6,683	6,683	6,680	6,680	6,680	0
Lake Creek Reservoir[9,13]	1,373	0	1,373	1,370	460	655	-195
Lodge Grass Reservoir[14]	22,900	0	22,900	22,900	13,900	15,320	-1,420
Lower Sunshine Reservoir[9,13]	0	58,748	58,748	58,750	35,700	36,720	-1,020
Newton Reservoir[9,13]	4,525	0	4,525	4,520	556	305	251
Perkins and Kinney Reservoir[9,13]	1,202	0	1,202	1,200	704	1,040	-336
Pilot Butte Reservoir[8,9]	34,600	0	34,600	[11]33,720	4,750	12,740	-7,990
Sage Creek Reservoir[9,13]	440	2,345	2,785	2,780	2,700	2,680	20
Shell Reservoir[9,13]	1,949	0	1,949	1,950	269	112	157
Shoshone Lake Reservoir[9,13]	4,560	5,181	9,741	9,740	0	0	0
Upper Sunshine Reservoir[9,13]	52,988	0	52,988	52,990	29,150	38,010	-8,860
Teapot Reservoir[9,13]	1,578	0	1,578	1,580	0	0	0
Ten Sleep Reservoir[9,13]	3,509	0	3,509	3,510	3,510	3,240	270
Wiley Reservoir[9,13]	689	331	1,020	1,020	1,020	1,020	0
Worthen Meadow Reservoir[9,13]	0	1,504	1,504	1,500	1,350	1,190	160

Table 10. Water-year-end contents for Yellowstone River Compact reservoirs[1] or lakes.—Continued

[Contents are in acre-feet. Reservoirs or lakes are listed in alphabetical order by drainage basin. Abbreviation: e, estimated. Symbol: --, no data or not available]

Reservoir or lake name	Pre-compact 1950 water right	Post-compact 1950 water right	Total permitted water right	Total contents[2]	Usable contents[3] on Sept. 30, 2016	Usable contents[3] on Sept. 30, 2015	Change in usable contents[4]
Powder River Basin							
Cloud Peak Reservoir[13,15]	3,398	173	3,570	4,620	0	0	0
Dull Knife Reservoir[13,15]	0	4,345	4,345	5,000	546	1,430	-884
Healy Reservoir[13,15]	0	5,140	5,140	6,500	2,900	3,920	-1,020
Kearney Reservoir[13,15]	1,854	4,470	6,324	7,500	0	2,120	-2,120
Lake DeSmet[13,15]	37,515	197,472	234,987	235,000	194,200	201,900	-7,700
Muddy Guard Reservoir[13,15]	0	2,336	2,336	2,340	855	1,240	-385
Posy No. 1 Reservoir[13,15]	0	1,537	1,537	1,540	765	1,190	-425
Tie Hack Reservoir[13,15]	1,647	788	2,435	2,440	2,260	2,330	-70
Willow Park Reservoir[13,15]	4,457	0	4,457	6,470	1,810	1,670	140
Tongue River Basin							
Bighorn Reservoir[13,15]	2,749	1,875	4,624	5,760	210	643	-433
Dome Reservoir[6,15,16]	1,843	188	2,031	2,030	649	441	208
Park Reservoir[13]	7,347	3,015	10,362	10,360	3,470	4,390	-920
Sawmill Lakes Reservoir[13,15]	0	1,275	1,275	1,830	749	749	0
Tongue River Reservoir[5,6]	72,510	6,561	79,071	79,070	41,680	46,910	-5,230
Twin Lakes Reservoir[13,17]	1,180	2,232	3,412	4,040	2,830	2,280	550

[1]Wyoming disagrees with the term "Compact Reservoirs" as used throughout this annual report. Wyoming's acceptance of this annual report should not be construed as Wyoming's acceptance of the use of that term.

[2]Includes dead storage and rounded to the tens of acre-foot.

[3]Excludes dead storage, except for contents provided by Wyoming State Engineer's Office which are permitted water rights and may include dead storage.

[4]Change in usable contents is derived from subtracting the previous water year's usable contents from the current water year's usable contents.

[5]Reservoir managed by the State of Montana.

[6]Usable contents by year are provided by Montana Department of Natural Resources.

[7]Usable contents by year are provided by Wyoming State Engineer's Office.

[8]Reservoirs managed by Bureau of Reclamation.

[9]Permitted capacity and total contents data from http://waterplan.state.wy.us/plan/bighorn/2010/techmemos/Task3F.pdf.

[10]Usable contents by year are provided by Bureau of Reclamation.

[11]Top of active conservation pool.

[12]Top of joint use pool.

[13]Private reservoirs permitted and accounted by the State of Wyoming.

[14]Lodge Grass Reservoir (Willow Creek Dam), Managed and reported by Bureau of Indian Affairs

[15]Permitted capacity and total contents data from http://waterplan.state.wy.us/plan/powder/2002/techmemos/storage.

[16]Data are combined contents of Dome Lake and Dome Lake Reservoir.

[17]Data are combined contents of Twin Lakes Number 1 and Twin Lakes Number 2.

RULES AND REGULATIONS FOR ADMINISTRATION OF THE YELLOWSTONE RIVER COMPACT

A compact, known as the Yellowstone River Compact, between the States of Wyoming, Montana, and North Dakota, having become effective on October 30, 1951, upon approval of the Congress of the United States, which apportions the waters of certain interstate tributaries of the Yellowstone River which are available after the appropriative rights existing in the States of Wyoming and Montana on January 1, 1950 are supplied, and after appropriative rights to the use of necessary supplemental water are also supplied as specified in the Compact, is administered under the following rules and regulations subject to the provisions for amendment revision or abrogation as provided herein.

Article I. Collection of Water Records

A. It shall be the joint and equal responsibility of the members of the States of Wyoming and Montana to collect, cause to be collected, or otherwise furnish records of tributary streamflow at the points of measurement specified in Article V (B) of the Compact, or as near thereto as is physically or economically feasible or justified.

1. Clarks Fork

The gaging station known as Clarks Fork near Silesia, Montana and located in NW1/4 SE1/4 sec. 1, T. 4 S., R. 23 E., shall be the point of measurement for the Clarks Fork.

2. Bighorn River (exclusive of Little Bighorn River)

The gaging station known as the Bighorn River above Tullock Creek, near Bighorn, Montana, and located in SE1/4 SE1/4 NE1/4 sec. 3, T. 4 N., R. 34 E., shall temporarily be the designated point of measurement on that stream. The flow of the Little Bighorn River as measured at the gaging station near Hardin, Montana, and located in SE1/4 NE1/4 NE1/4 sec. 19, T. 1 S., R. 34 E., shall be considered the point of measurement for that stream, except that if or when satisfactory records are not available, the records for the nearest upstream station with practical corrections for intervening inflow or diversion shall be used.

3. Tongue River

The gaging station known as the Tongue River at Miles City, Montana, and located in NE1/4 NE1/4 SE1/4 sec. 23, T. 7 N., R. 47 E., shall temporarily be the point of measurement for that stream.

4. Powder River

The gaging station known as the Powder River near Locate, Montana, and located in NW1/4 SW1/4 sec. 14, T. 8 N., R. 51 E., shall temporarily be the designated point of measurement for that stream.

B. Records of total annual diversion in acre-feet above the points of measurement designated in the Compact for irrigation, municipal, and industrial uses developed after January 1, 1950, shall be furnished by the members of the Commission for their respective States, at such time as the Commission deems necessary for interstate administration as provided by the terms of the Compact. Providing that if it be acceptable to the Commission, reasonable estimates thereof may be substituted.

C. Annual records of the net change in storage in all reservoirs, not excluded under Article V (E) of the Compact, above the point of measurement specified in the Compact and completed after January 1, 1950, and the annual net change in reservoirs existing prior to January 1, 1950, which is used for irrigation, municipal, and industrial purposes developed after January 1, 1950, shall be the primary responsibility of the member of the Commission in whose State such works are located; providing such data are not furnished by Federal agencies under the provisions of Article III (D) of the Compact, or collected by the Commission.

Article II. Office and Officers

A. The office of the Commission shall be located at the office of the Chairman of the Commission.

B. The Chairman of the Commission shall be the Federal representative as provided in the Compact.

C. The Secretary of the Commission shall be as provided for in Article III of these rules.

D. The credentials of each member of the Commission shall be placed on file in the office of the Commission.

Article III. Secretary

A. The Commission, subject to the approval of the Director of the United States Geological Survey, shall enter into cooperative agreements with the U.S. Geological Survey for such engineering and clerical services as may reasonably be necessary for the administration of the Compact. Said agreements shall provide that the Geological Survey shall:

1. Maintain and operate gaging stations at or near the points of measurement specified in Article V (A) of the Compact.

2. Assemble factual information on stream flow, diversion, and reservoir storage for the preparation of an annual report to the Governors of the signatory States.

3. Make such investigations and reports as may be requested by the Commission in aid of its administration of the Compact.

B. The Geological Survey shall act as Secretary to the Commission.

Article IV. Budget

A. At the annual meeting of each even-numbered year or prior thereto, the Commission shall adopt a budget for operation during the ensuing biennium beginning July first. Such budget shall set forth the total cost of construction, maintenance and operation of gaging stations, the cost of engineering and clerical aid, and other necessary expenses excepting the salaries and personal expenses of the Commissioners. On odd-numbered years revisions of the budget shall be considered.

B. It shall be the obligation of the Commissioners of the States of Montana and Wyoming to endeavor to secure from the Legislature of their respective States sufficient funds with which to meet the obligations of this Compact, except insofar as provided by the Federal government.

Article V. Meetings

An annual meeting of the Commission shall be held each November at some mutually agreeable point in the Yellowstone River Basin for consideration of the annual report for the water year ending the preceding September 30th, and for the transaction of such other business consistent with its authority; provided that by unanimous consent of the Commission the date and place of the annual meeting may be changed. Other meetings as may be deemed necessary shall be held at a time and place set by mutual agreement, for the transaction of any business consistent with its authority.

No action of the Commission shall be effective until approval by the Commissioners for the States of Wyoming and Montana.

Article VI. Amendments, Revisions and Abrogations.

The Rules and Regulations of the Commission may be amended or revised by a unanimous vote at any meeting of the Commission.

Gary Fritz
Commissioner for Montana

George L. Christopulos
Commissioner for Wyoming

ATTESTED:

L. Grady Moore
Federal Representative

Adopted November 17, 1953
Amended December 16, 1986

RULES FOR THE RESOLUTION OF DISPUTES OVER THE ADMINISTRATION OF THE YELLOWSTONE RIVER COMPACT

December 19, 1995

Section I. General Framework

According to Article III(F) of the Yellowstone River Compact,

"In case of the failure of the representatives of Wyoming and Montana to unanimously agree on any matter necessary to the proper administration of this compact, then the member selected by the director of the United States Geological Survey shall have the right to vote upon the matters in disagreement and such points of disagreement shall then be decided by a majority vote of the representatives of the states of Wyoming and Montana and said member selected by the director of the United States geological survey, each being entitled to one vote."

Section II. Purpose and Goal

A. The purpose of these rules is to clarify and more fully develop the dispute resolution process outlined in Section I.

B. The goal of the dispute resolution process outlined in these rules is to encourage joint problem solving and consensus building. It consists of three phases -- unassisted negotiation, facilitation, and voting.

C. Any agreement reached through this process is binding on Montana, Wyoming, and the United States Geological Survey (USGS).

D. Either state can initiate the dispute resolution process defined in Sections IV, V, and VI, and the other state is obligated to participate in good faith. The states agree that the issues pursued under this dispute resolution process shall be both substantive and require timely resolution.

Section III. Consensus

A. In the process of administering the Yellowstone River Compact, the representatives from Montana and Wyoming agree to seek consensus.

B. For purposes of this rule, consensus is defined as an agreement that is reached by identifying the interests of Montana and Wyoming and then building an integrative solution that maximizes the satisfaction of as many of the interests as possible. The process of seeking consensus does not involve voting, but a synthesis and blending of alternative solutions.

Section IV. Unassisted Negotiation

A. In all situations, the representatives from Montana and Wyoming shall first attempt to seek consensus through unassisted negotiation. The federal representative will not serve as chairperson in the unassisted negotiation process.

B. During a negotiation process, the representatives from Montana and Wyoming shall identify issues about which they differ, educate each other about their needs and interests, generate possible resolution options, and collaboratively seek a mutually acceptable solution.

C. To help facilitate negotiations, the representatives from Montana and Wyoming in cooperation with the USGS agree to share technical information and develop joint data bases. Other data sources may also be used.

D. The USGS shall serve as technical advisor in the two-state negotiations.

Section V. Facilitation

A. If the representatives from Montana and Wyoming are not able to reach consensus through unassisted negotiation, they shall each identify, articulate, and exchange, in writing, the unresolved issues.

B. The representatives from Montana and Wyoming shall then jointly appoint a facilitator to assist in resolving the outstanding dispute. If the representatives from Montana and Wyoming cannot identify a mutually acceptable facilitator, the representative appointed by the USGS shall appoint a facilitator.

C. A facilitator, for purposes of this rule, is defined as a neutral third party that shall help the representatives from Montana and Wyoming communicate, negotiate, and reach agreements voluntarily. The facilitator is not empowered to vote or render a decision.

D. The facilitator shall assist the representatives from Montana and Wyoming in developing appropriate ground rules for each facilitated session including establishing a deadline for completion of the facilitation process, setting an appropriate agenda, identifying issues, collecting and analyzing technical information, developing options, packaging agreements, and preparing a written agreement. The facilitator reserves the right to meet privately with each representative during the facilitation process.

Section VI. Voting

A. If, and only if, the representatives from Montana and Wyoming are unable to reach consensus with the assistance of a facilitator, then a dispute may be settled by voting.

B. The representatives from Montana and Wyoming, along with the representative appointed by the director of the USGS, are each entitled to one vote.

C. If the USGS representative does not vote in accordance with Article III, then the director of the USGS will select, with concurrence from Wyoming and Montana, a neutral third party to vote.

D. If the representative appointed by the director of the USGS is not involved in the steps outlined in Sections IV and V, each state shall have the opportunity to present appropriate information to that representative. This information may be presented through both oral presentations and written documents. All information will be shared with the other state.

   The representative of the USGS may also consult the facilitator referenced in Section V in an attempt to resolve any disputes.

E. The USGS shall pay the expenses of the representative appointed by the director of the USGS.

F. Points of disagreement shall be resolved by a majority vote.

Section VII. Funding

A. The USGS will pay one-half and the states of Montana and Wyoming shall each pay one-quarter of the expenses of the facilitator, which shall not exceed $10,000, unless agreed to by both states and the USGS.

Section VIII. Amendments

A. These rules may be amended or revised by a unanimous vote of the Commission.

Section IX. Execution

These rules for the resolution of disputes over the administration of the Yellowstone River Compact are hereby executed on the date indicated below.

Gary Fritz
Commissioner for Montana

Gordon W. Fassett
Commissioner for Wyoming

William F. Horak
Federal Representative

July 22, 1996
Date

RULES FOR ADJUDICATING WATER RIGHTS ON INTERSTATE DITCHES

Article I. Purpose

The purpose of this rule is to determine and adjudicate, in accordance with the laws of Montana and Wyoming, those pre-Compact (January 1, 1950) water rights diverting from the Powder, Tongue, Bighorn and Clarks Fork Rivers and their tributaries where the point of diversion is in one State and the place of use is in the other State which have not yet been adjudicated.

Article II. Authority

In accordance with the Yellowstone River Compact, the State of Montana and the State of Wyoming, being moved by consideration of interstate comity, desire to remove all causes of present and future controversy between the States and between persons in one State and persons in another State with respect to these interstate ditches. Article III (E) of the Compact provides the Yellowstone River Compact Commission with the authority "...to formulate rules and regulations and to perform any act which they may find necessary to carry out the provisions of this Compact...."

Article III. Definitions

The terms defined in the Yellowstone River Compact apply as well as the following definitions:

1. "Acre-feet" means the volume of water that would cover 1 acre of land to a depth of 1 foot.

2. "Cfs" means a flow of water equivalent to a volume of 1 cubic foot that passes a point in 1 second of time and is equal to 40 miners inches in Montana.

3. "Interstate Ditches" shall include ditches and canals which convey waters of the Bighorn, Tongue, Powder, and Clarks Fork Rivers and their tributaries across the Wyoming-Montana State line where the water is diverted in one State and the place of use is in the other State.

4. "Department of Natural Resources and Conservation," hereafter called the "Department," means the administrative agency and Department of the Executive Branch of the Government of Montana created under Title II, Chapter 15, MCA which has the responsibility for water administration in that State.

5. "Water Court" means a Montana District Court presided over by a water judge, as provided for in Title III, Chapter 7, MCA.

6. "State Engineer" shall be the current holder of the position created by the Wyoming Constitution as Chief Water Administration Official for the State of Wyoming.

7. "Board of Control," hereinafter called the "Board," is defined as the constitutionally created water management agency in Wyoming composed of the four Water Division Superintendents and the State Engineer.

8. "Superintendent" is the member of the Board who is the water administration official for the Water Division where the interstate ditch is located. (The two Water Divisions in the Yellowstone River drainage are Water Division Numbers Two and Three.)

9. "Date of Priority" shall mean the earliest date of actual beneficial use of water, unless evidence and circumstances pertaining to a particular claim establish an earlier date.

10. "Point of Diversion" is defined to be the legal land description by legal subdivision, section, township, and range of the location of the diversion structure for an interstate ditch from a natural stream channel.

11. "Place of Use" is defined to be the legal land description (legal subdivision, section, township, and range) of the lands irrigated by an interstate ditch.

12. "Person" is defined as an individual, a partnership, a corporation, a municipality or any other legal entity, public or private.

13. "Claimant" is defined as any person claiming the use of water from an interstate ditch as herein defined.

Article IV. Procedures

The procedures for determining and adjudicating water rights associated with interstate ditches shall be categorized as follows: (A) Where the point of diversion is in Wyoming and place of use in Montana, and (B) Where the point of diversion is in Montana and place of use in Wyoming.

A. Wyoming Procedure

1. The Yellowstone River Compact Commission will provide a claim form to be completed by the claimant that will describe the location and point of diversion and land being irrigated, the priority date claimed, method of irrigation and such other information required to describe the claim. (A sample form for this purpose is attached.)

2. The Yellowstone River Compact Commission will send the claim form to water users on the interstate ditches.

3. Water users will complete the claim form and file it with the Yellowstone Compact Commission, which, when found to be correct and complete, will be forwarded to the Board for verification.

4. Upon receipt of the form, the Board shall forward it to the appropriate Superintendent, who, in cooperation with the Department, will validate the information including the use that has been made of the water, the number of acres and location of lands being irrigated, the priority date, and all other relevant information. The Superintendent and the Department will utilize aerial photography and other information to have prepared a reproducible map showing the location of the ditch system, lands irrigated, point of diversion, etc., of the claim.

5. After the validation procedure, the Superintendent will hold a hearing, after appropriate notice and advertisement, at which time the claimant shall describe, in detail, the use that has been made of the water and the lands that are being irrigated, establish a priority date, etc. Costs incurred in advertising shall be paid by the claimant. If a single hearing is held to consider several claims, the costs of advertising shall be shared equally among the claimants. Anyone who opposes the claim shall appear and state the reasons, if any, for opposition to the claim. If there is no opposition to the claim, cost incurred in holding the hearing shall be paid by the claimant. If protestants do appear and oppose the claim, hearing costs will be paid 50 percent by the claimant and 50 percent by the protestant, or if there is more than one protestant, the remaining 50 percent shall be shared equally among the protestants.

6. At the conclusion of the hearing, the Superintendent shall forward the record to the Yellowstone River Compact Commission with his findings and recommendations. The Yellowstone River Compact Commission will make the

determination of the amount of the right, the location, and the priority date, and then send the record to the Board.

7. The Board shall review the record and integrate it into its water rights system. Upon entry of the record by the Board, the information shall be forwarded to the Department and the Chairman of the Yellowstone River Compact Commission.

8. Upon the entry of the right into the Board's records, it will have the following attributes:

   a. The right will be a Wyoming water right with a priority date as established by this procedure.

   b. The amount of the right will be determined as provided by Wyoming law.

B. Montana Procedure

1. The Yellowstone River Compact Commission will provide a claim form to be completed by the claimant that will describe the location and point of diversion and land being irrigated, the priority date claimed, method of irrigation and such other information required to describe the claim.

2. The Commission will send the claim form to water users on the interstate ditches.

3. Water users will complete the claim form and file it with the Yellowstone River Compact Commission, which, when found to be correct and complete, will be forwarded to the Department for verification.

4. Upon receipt of the form, the Department, in cooperation with the Wyoming State Engineer's Office, will validate the information, including the use that has been made of the water, the number of acres and location of lands being irrigated, the priority date, and all other relevant information. The appropriate Superintendent and the Department will utilize aerial photographs and other information to have prepared a reproducible map showing the location of the ditch system, land irrigated, point of diversion, etc., of the claim.

5. The Department will then forward the record to the Yellowstone River Compact Commission with its findings and recommendations. Upon approval by the Commission, the record shall be submitted to the Montana Water Court for adjudication. A duplicate record will be forwarded to the Wyoming State Engineer's Office, the Board, and the Chairman of the Yellowstone River Compact Commission upon adjudication.

6. Upon adjudication of the right by the Montana Water Court, it will have the following attributes:

   a) The right will be a Montana water right with a priority date as established by this procedure.

   b) The amount of the right will be determined as provided by Montana law.

Article V. Exclusions

A. These rules recognize the limitation in Article VI of the Yellowstone River Compact regarding Indian water rights.

B. These rules shall not be construed to determine or interpret the rights of the States of Wyoming and Montana to the waters of the Little Bighorn River.

Article VI. Claim Form Submission Period

All claims must be submitted to the Yellowstone River Compact Commission, c/o District Chief, United States Geological Survey, 821 E. Interstate, Bismarck, ND 58501, within 90 calendar days after the claimant has received the claim form from the Commission. The blank claim form will be sent certified mail to the water user and the submission period of 90 calendar days will begin with the next day following receipt of the form, as evidenced by the certified mail receipt card. For good cause shown in writing, an extension of time beyond the 90 days for submittal may be obtained from the Commission.

YELLOWSTONE RIVER COMPACT COMMISSION

WYOMING

GORDON W. FASSETT
STATE ENGINEER
HERSCHLER BUILDING
4TH FLOOR EAST
CHEYENNE, WYOMING 82002
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UNITED STATES

WILLIAM F. HORAK
CHAIRMAN
U.S. GEOLOGICAL SURVEY
821 E. INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58501
(701) 250-4601

MONTANA

GARY FRITZ
ADMINISTRATOR, WATER RESOURCES DIVISION
DEPT. OF NATURAL RESOURCES & CONSERVATION
1520 EAST SIXTH AVENUE
HELENA, MONTANA 59620
(406) 444-6603

YELLOWSTONE RIVER COMPACT COMMISSION

CLAIM FORM FOR INTERSTATE DITCHES

1. Name of ditch or canal: _____

2. Source of water supply: _____

   Tributary of _____

3. Name of claimant: _____

   Address _____

   City _____ State _____Zip Code _____

   Home Phone No. _____ Business Phone No. _____

4. Person completing form: _____

   Address _____

   City _____ State _____Zip Code _____

   Home Phone No. _____ Business Phone No. _____

5. Method of irrigation: _____

6. Point of diversion: County _____ State _____

   Headgate located in the ___¼ ___¼, Section ____, T.___R.____

   (a) Description of headgate: (Briefly describe the materials and general features, date constructed or last known work, general condition.) _____

   _____

   _____

(b) Describe water measuring device: _____

_____

_____

(c) If the point of diversion is in Montana:

1. What flow rate has been claimed?

_____ ☐ cubic feet per second

☐ gallons per minute

☐ miner's inches

2. What volume of water has been claimed?

_____ acre-feet

7. Dimensions of ditch at headgate: Width at top (at waterline) _____ feet; width at bottom _____ feet; side slopes (vertical:horizontal) _____:_____; depth of water _____ feet; grade _____ feet per mile.

8. Place of use and acres irrigated: County_____ State ____ Give legal subdivisions of land owned by you on which water is being used (acres claimed): An example field is shown in the first line.

T.	R.	SEC.	NE¼				NW¼				SW¼				SE¼				TOTAL
			NE¼	NW¼	SW¼	SE¼	NE¼	MW¼	SW¼	SE¼	NE¼	NW¼	SW¼	SE¼	NE¼	NW¼	SW¼	SE¼	
58N	95W	18			25.1											10.2			35.3

9. Describe any additional uses of water claimed from the ditch: _____

10. Date of first beneficial use of water (priority date) on lands described above for _____ Ditch is _____ (mo/day/yr) and shall be the same for all lands claimed on this form.

11. Has irrigation water been diverted onto all lands shown in the above tabulation each year since completion of works?__ If not, state exceptions and reasons therefore: _____

_____

_____

12. Attach documentary evidence or affidavits showing your ownership or control of the above lands, as well as the historic use of water on these lands. _____

_____

_____

13. What permit or claim numbers have been assigned to known records filed with either the Wyoming State Engineer's Office or the Montana Department (DNRC) for irrigating the above lands? _____

_____

_____

14. Have personnel in the Wyoming State Engineer's Office or the Montana Department (DNRC) been contacted to obtain the information given in No. 13? ( ) Yes ( ) No

15. Describe any flumes or pipelines in the ditch conveyance system: _____

_____

_____

16. Describe ordinary annual period of use: _____ to _____
(mo/day) (mo/day)

_____.

17. Attach copies of aerial photographs, U. S. Geological Survey maps or other such documents showing the ditch and lands irrigated that give evidence to this claim and may be useful to the Commission.

* * * * * * * * * *

State of _____)
) SS
State of _____)

I, _____, having been duly sworn, depose and say that I, being of legal age and being the claimant of this claim for a water right, and the person whose name is signed to it as the claimant, know the contents of this claim and the matters and things stated there are correct.

_____

_____

Subscribed and sworn before me, this ____day of _____, 19__.

_____
Notary Public

Residing at: _____

My commission expires: _____

Errata from the Sixty-Fourth Annual Report 2015

2015 Table 2

Revision of annual runoff (ac-ft) for period of record.

Table 2. Daily mean discharge for Little Bighorn River near Hardin, Mont. (06294000), October 2014 through September 2015.

[Discharge is in cubic feet per second. Abbreviations: acre-ft, acre-feet; e, estimated; Max, maximum; Min, minimum. Symbol: ---, no data]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	195	169	e140	e130	e200	e210	208	221	1,830	289	147	114
2	195	170	e150	e140	e220	e210	201	232	1,690	248	137	114
3	195	170	e160	e150	e210	e210	201	232	1,630	249	127	119
4	193	169	e150	e140	e210	214	200	241	1,610	242	123	124
5	193	168	e150	e160	e210	224	199	250	1,410	229	137	128
6	191	167	e150	e170	e210	241	201	273	1,250	221	151	144
7	193	167	e150	e170	e220	253	200	295	1,130	228	141	154
8	193	166	e150	e180	e230	261	198	344	1,060	239	139	157
9	184	167	e150	e180	e230	257	194	356	935	211	135	158
10	182	175	e150	e170	e220	268	191	340	856	198	137	157
11	179	176	e150	e190	e210	276	192	332	849	186	134	155
12	185	173	e150	e180	e210	276	194	298	1,000	171	129	151
13	185	139	e150	e180	e210	270	193	270	891	161	126	147
14	189	e140	e150	e180	e210	264	185	241	793	149	121	147
15	192	e140	e150	e190	e210	264	192	244	732	142	118	153
16	186	e150	e140	e200	e210	251	206	271	691	141	111	152
17	183	e160	e140	e210	e210	241	229	371	684	158	113	141
18	180	e160	e150	e210	e210	241	241	511	674	174	122	148
19	180	e170	e150	e210	e210	239	244	518	633	165	127	156
20	178	e180	e150	e210	e210	235	248	491	597	156	128	161
21	176	e190	e150	e210	e210	228	224	445	536	150	129	155
22	175	e180	e150	e210	e200	221	198	417	485	142	102	155
23	174	e180	e150	e200	e190	217	187	405	465	129	115	150
24	173	e170	e150	e200	e200	215	185	409	438	122	117	131
25	174	e170	e150	e200	e210	215	200	444	410	130	118	125
26	174	e170	e150	e200	e220	219	214	632	380	130	118	121
27	172	e160	e140	e210	e210	217	219	970	368	129	116	120
28	169	e160	e130	e200	e200	213	222	1,060	345	135	115	117
29	170	e160	e130	e200	---	210	226	1,050	327	139	123	116
30	168	e160	e120	e200	---	206	236	1,320	310	153	120	118
31	169	---	e120	e200	---	206	---	1,860	---	151	119	---
Total	5,645	4,976	4,520	5,780	5,900	7,272	6,228	15,340	25,010	5,467	3,895	4,188
Mean	182	166	146	186	211	235	208	495	834	176	126	140
Max	195	190	160	210	230	276	248	1,860	1,830	289	151	161
Min	168	139	120	130	190	206	185	221	310	122	102	114
Acre-ft	11,200	9,870	8,965	11,460	11,700	14,420	12,350	30,430	49,600	10,840	7,725	8,307

SUMMARY STATISTICS

	Water Year 2015	Water Years 1954–2015
Annual total	94,220	
Annual mean	258	276
Annual runoff (ac-ft)	186,900	199,700

2015 Table 10

Revision of superscript denotations for Bureau of Reclamation reservoirs, and of Pilot Butte usable contents and change in usable contents.

Table 10. Water-year-end contents for Yellowstone River Compact reservoirs[1] or lakes.

[Contents are in acre-feet. Reservoirs or lakes are listed in alphabetical order by drainage basin. Abbreviation: e, estimated. Symbol: --, no data or not available]

Reservoir or lake name	Pre-compact 1950 water right	Post-compact 1950 water right	Total permitted water right	Total contents[2]	Usable contents[3] on Sept. 30, 2015	Usable contents[3] on Sept. 30, 2014	Change in usable contents[4]
Clarks Fork Yellowstone River Basin							
Cooney Reservoir[5,6]	28,230	0	28,230	28,230	18,380	16,520	1,860
Glacier Lake[5,6]	4,200	0	4,200	4,200	--	--	--
Bighorn River Basin							
(Lake) Adelaide Reservoir[7,9]	1,449	3,315	4,764	4,760	675	3,480	-2,805
Anchor Reservoir[8,9,10]	0	9,252	17,412	[11]17,230	395	498	-103
Bighorn Lake[8,9,10]	0	1,116,000	1,116,000	[12]1,021,000	951,800	1,004,000	-52,200
Boysen Reservoir[8,9,10]	757,851	0	757,851	[11]741,600	591,000	626,700	-35,700
Buffalo Bill Reservoir[8,9,10]	456,640	187,940	644,580	[11]646,600	430,800	510,200	-79,400
Bull Lake[8,9,10]	151,951	0	151,951	[11]152,500	62,960	104,000	-41,040
Christina Reservoir[9,13]	3,860	0	3,860	3,860	55	3,860	-3,805
Corral Reservoir[9,13]	0	1,027	1,027	1,030	676	764	-88
Diamond Creek Dike Reservoir[9,13]	0	18,378	18,378	18,380	388	345	43
Enterprise Reservoir[9,13]	1,494	204	1,698	1,700	12	352	-340
Fairview Extension Reservoir[9,13]	791	620	1,411	1,410	1,200	1,320	-120
Greybull Valley Reservoir[9,13]	0	33,169	33,169	33,170	9,030	17,490	-8,460
Harrington Reservoir[9,13]	315	887	1,202	1,200	800	800	0
Lake Cameahwait Reservoir[9,13]	0	6,683	6,683	6,680	6,680	6,680	0
Lake Creek Reservoir[9,13]	1,373	0	1,373	1,370	655	655	0
Lodge Grass Reservoir[14,15]	22,900	0	22,900	22,900	15,320	15,940	-620
Lower Sunshine Reservoir[9,13]	0	58,748	58,748	58,750	36,720	48,520	-11,800
Newton Reservoir[9,13]	4,525	0	4,525	4,520	305	347	-42
Perkins and Kinney Reservoir[9,13]	1,202	0	1,202	1,200	1,040	1,200	-160
Pilot Butte Reservoir[8,9]	34,600	0	34,600	[11]33,720	15,390	21,910	-6,520
Sage Creek Reservoir[9,13]	440	2,345	2,785	2,780	2,680	2,780	-100
Shell Reservoir[9,13]	1,949	0	1,949	1,950	112	640	-528
Shoshone Lake Reservoir[9,13]	4,559	5,181	9,740	9,740	0	1,500	-1,500
Upper Sunshine Reservoir[9,13]	52,988	0	52,988	52,990	38,010	46,550	-8,540
Teapot Reservoir[9,13]	1,578	0	1,578	1,580	0	0	0
Ten Sleep Reservoir[9,13]	3,509	0	3,509	3,510	3,240	3,510	-270
Wiley Reservoir[9,13]	689	331	1,020	1,020	1,020	1,020	0
Worthen Meadow Reservoir[9,13]	0	1,504	1,504	1,500	1,190	1,230	-40

Table 10. Water-year-end contents for Yellowstone River Compact reservoirs[1] or lakes.—Continued

[Contents are in acre-feet. Reservoirs or lakes are listed in alphabetical order by drainage basin. Abbreviation: e, estimated. Symbol: --, no data or not available]

Powder River Basin							
Cloud Peak Reservoir[13,16]	3,398	173	3,571	4,620	0	3,570	-3,570
Dull Knife Reservoir[13,16]	0	4,345	4,345	5,000	1,430	1,240	190
Healy Reservoir[13,16]	0	5,140	5,140	6,500	3,920	4,920	-1,000
Kearney Reservoir[13,16]	1,854	4,470	6,324	7,500	2,120	1,300	820
Lake DeSmet[13,16]	37,515	202,612	240,127	235,000	201,900	206,600	-4,700
Muddy Guard Reservoir[13,16]	0	2,335	2,335	2,340	1,170	1,240	-70
Posy No. 1 Reservoir[13,16]	0	1,537	1,537	1,540	1,190	962	228
Tie Hack Reservoir[13,16]	1,647	788	2,435	2,440	2,330	2,440	-110
Willow Park Reservoir[13,16]	4,457	0	4,457	4,460	1,670	646	1,020
Tongue River Basin							
Bighorn Reservoir[13,16]	2,749	1,875	4,624	4,620	643	1,440	-797
Dome Reservoir[6,16,17]	1,843	188	2,031	2,090	441	1,320	-879
Park Reservoir[9,16]	7,347	2,143	9,490	10,360	4,390	4,570	-180
Sawmill Lakes Reservoir[13,16]	0	1,258	1,258	1,280	749	645	104
Tongue River Reservoir[5,6]	79,070	0	79,070	79,070	46,910	54,980	-8,070
Twin Lakes Reservoir[13,18]	1,180	2,217	3,397	3,400	2,470	2,280	190

[1]Wyoming disagrees with the term "Compact Reservoirs" as used throughout this annual report. Wyoming's acceptance of this annual report should not be construed as Wyoming's acceptance of the use of that term.

[2]Includes dead storage.

[3]Excludes dead storage.

[4]Change in usable contents is derived from subtracting the 2014 usable contents from the 2015 usable contents.

[5] Reservoir managed by the State of Montana.

[6]Usable contents by year are provided by Montana Department of Natural Resources.

[7]Usable contents by year are provided by Wyoming State Engineer's Office.

[8]Reservoirs managed by Bureau of Reclamation.

[9]Permitted capacity and total contents data from http://waterplan.state.wy.us/plan/bighorn/2010/techmemos/Task3F.pdf.

[10]Usable contents by year are provided by Bureau of Reclamation.

[11]Top of active conservation pool.

[12]Top of joint use pool.

[13]Private reservoirs permitted and accounted by the State of Wyoming.

[14]Lodge Grass Reservoir (Willow Creek Dam), Managed by Bureau of Indian Affairs

[15]Usable contents by year are provided by Bureau of Indian Affairs.

[16]Permitted capacity and total contents data from http://waterplan.state.wy.us/plan/powder/2002/techmemos/storage.

[17]Data are combined contents of Dome Lake and Dome Lake Reservoir.

[18]Data are combined contents of Twin Lakes Number 1 and Twin Lakes Number 2.

LOCATION MAP

YELLOWSTONE RIVER COMPACT COMMISSION

YELLOWSTONE RIVER BASIN

EXPLANATION

▲ COMPACT STREAMFLOW-GAGING STATION

◧ COMPACT RESERVOIR-CONTENT STATION

06260300 STATION NUMBER

0 10 20 30 40 MILES

0 10 20 30 40 KILOMETERS