



NWE-HEB-4146

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

September 16, 2022

Re: NorthWestern Energy submits Drought Impact Study and response to comments

Dear Secretary Bose:

NorthWestern Energy (NorthWestern) notified the Commission on July 23, 2021 that due to drought and snow conditions combined with the requirement to provide pulse flows to the lower Madison River, the elevation of Hebgen Reservoir could not be maintained at the elevation required by Article 403 of the Project 2188 license. Specifically, the reservoir was not maintained between 6,530.26 and 6,534.87 feet (normal full pool) from June 20 through October 1. The notification letter included a record of consultation and approval to deviate from the reservoir elevation requirements of Article 403 from the United States Fish and Wildlife Service (USFWS), the United States Forest Service (USFS), the Bureau of Land Management (BLM), the Montana Department of Fish, Wildlife and Parks (MTFWP), and the Montana Department of Environmental Quality (MDEQ).

FERC responded to NorthWestern via letter dated September 10, 2021. FERC determined NorthWestern's notification of the planned deviation was consistent with the requirements of Article 403 of the license. However, given the length of time the Hebgen Development would be operated below the requirement in Article 403, it directed NorthWestern to file a request for a temporary variance of Article 403 within 60 days.

On November 9, 2021, and supplemented on November 12, 2021, NorthWestern filed a request for temporary variance of Article 403 of the Project License. The variance request included an analysis of the effects on Project resources and correspondence from the resource agencies supporting the variance request.

On May 19, 2022, FERC issued an order modifying and approving the temporary variance of Article 403. The order granted NorthWestern's variance request, subject to modifications. FERC determined that NorthWestern complied with the articles of the license order when operating its Project during the period of the variance. However, given the effects on the fishery, recreation, and other resources, FERC required NorthWestern prepare a Drought Impact Study (Study) in consultation with the USFS, BLM, USFWS, MTFWP, MTDEQ, and the public.

NorthWestern prepared the Study, included as Attachment I, and provided 30 days for resource agency and the public to comment. NorthWestern received five comments on the Study included in Attachment II. The comments submitted are summarized below along with NorthWestern's response:

1. Montana State Historic Preservation Office (SHPO) inquired if any cultural resource studies were completed during the drafting of Hebgen in 2021.

NorthWestern's Response: Cultural surveys were not completed when Hebgen was below the recreation level in 2021. The reservoir was maintained at an elevation within the range authorized during the non-recreation season. So, the operations were not exposing any shorelines that aren't exposed on a recurring basis.

2. Kirkwood Marina Staff (Yvonne) questioned why the Study did not include 2022.

NorthWestern's Response: The Drought Impact Study was drafted in response to FERC's order approving our variance to draft Hebgen below the summer elevation in 2021. The order directed the development of the study and was specific on what it was to cover which included the timeline leading up to when the drafting occurred through the fall of 2021.

3. Lyndy Caine from Firehole Ranch commented with her appreciation of the suggestions included in the report. Ms. Caine specifically agreed with setting flow levels low in October and was in support of that idea. She also questioned why NorthWestern set the winter flows in 2020-2021 at 900-950 cfs as those levels were above the 84-year average.

NorthWestern's Response: NorthWestern included how the winter flows are established in the report. The winter flow set in 2020-2021 was 900-940 cfs. This flow volume is below the average outflow (1,255 cfs) of the five years of identified with similar June, July, and August inflows. The mean of daily mean flows over the period of record (1938-2022) below Hebgen at the USGS gage 06038500¹ during the first 10 days of October ranged from 1,130-1200 cfs. The flow established by NorthWestern in October of 2020 of 936 cfs was below average for the period of record.

4. Montana Trout Unlimited (MTU) comments acknowledged the significance of the scope of challenges presented to all water users in 2021 and commended FERC for requiring the Drought Impact Study. MTU expressed support for the decision reached to draft Hebgen Reservoir in 2021 and that the biological consequences of an alternate actions would have

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https://waterdata.usgs.gov/mt/nwis/dvstat/?referred_module=sw&site_no=06038500&por_06038500_80803=64994,00060,80803,1938-10-01,2022-08-01&format=html_table&stat_cds=mean_va&date_format=YYYY-MM-DD&rdb_compression=file&submitted_form=parameter_selection_list

been significant. Additionally, MTU supported exploring alternative water management options and the Stakeholder Engagement process. Furthermore, MTU encouraged NorthWestern to continue to build and improve its practices involving the public and interested parties in water management decisions.

NorthWestern's Response: NorthWestern appreciates MTU's feedback and the willingness to participate in the Stakeholder Engagement process. NorthWestern is committed to discussing and listening to Stakeholders suggested operations during drought years.

5. Eileen White, a landowner, recommended NorthWestern expand its monitoring to include ground water. .

NorthWestern's Response: Groundwater monitoring is not part of NorthWestern's FERC approved monitoring program. Groundwater levels in the Madison Valley are affected by many factors such as precipitation, snow melt, withdrawals and subsurface topography, to name a few. Changes to the flow regime below Hebgen Dam would not be expected to solve groundwater concerns.

In addition to preparing the Drought Impact Study, NorthWestern voluntarily initiated a Madison Stakeholder Engagement Process. Following the drafting of Hebgen Reservoir below the summer operating elevation as required by the FERC license, numerous comments on the process to acquire a variance, and after many discussions with interest groups, NorthWestern initiated a Madison Stakeholder Engagement Process in June 2022. The process, which is ongoing, is designed to engage members of the public, resource agencies, and NorthWestern in dialog on how NorthWestern manages Madison River flows and reservoir elevations while balancing competing license obligations at Hebgen and Madison dams during a drought.

The purpose of the process is to gather and exchange information among those directly affected by river flows and reservoir levels, agencies responsible for fisheries and recreation management, and NorthWestern. The benefit of the process will be a greater understanding of issues and challenges of operating during times of limited water availability for those directly affected and agencies.

NorthWestern retained the services of a third-party to facilitate the engagement process. Individuals representing a wide array of interests and experiences including agency representatives, non-government organizations, private recreationists, and private businesses are participating in the process.

The stakeholder group met for the first time June 22, 2022, to kick off the process. The stakeholder group has been and will continue to meet to discuss user's concerns and operating constraints with the goal of improving understanding, communications and common goals among the parties, and potentially identifying different operations to improve conditions during low water years.

Please contact Andrew Welch at Andrew.Welch@NorthWestern.com or (406) 565-7549 with any questions.

Sincerely,



Mary Gail Sullivan

Director, Environmental and Lands

CC:

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Pete Brown, SHPO
Laura Marsh, SHPO
Yvonne, Kirkwood Marina
Lyndy Caine, Firehole Ranch
Clayton Elliot, MTU
Eileen White

Attachment I
Drought Impact Study

Madison Drought Impact Study



September 2022

*Prepared by
NorthWestern Energy*

NorthWestern[®]
Energy

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Introduction

NorthWestern Energy (NorthWestern or Licensee) owns and operates the nine-dam Missouri-Madison Hydroelectric Project 2188 (Project) under a License issued by the Federal Energy Regulatory Commission (FERC or Commission) on September 27, 2000. The Project is located on the Madison and Missouri rivers in Gallatin, Madison, Lewis and Clark, and Cascade counties, Montana. The Project develops hydropower on a 324-mile stretch of the Madison and Missouri rivers. Hebgen and Madison dams are located on the Madison River. The other seven developments (Hauser, Holter, Black Eagle, Rainbow, Cochrane, Ryan, and Morony) are located on the Missouri River. Eight of the nine developments have power generating facilities, while Hebgen Dam, the upstream-most development, is used as a water storage facility.

Project 2188 License Article 403 specifies operating requirements for the nine developments, including minimum flows, pulse flows, ramping rates, and reservoir elevations. Article 403 also required NorthWestern to file for Commission approval a plan to operate the Missouri Madison Project. On April 23, 2001, PPL Montana, LLC, the licensee at the time, filed its Operation Plan for the Missouri Madison Project developments, which included additional details on the requirements included in Article 403. Subsequently, on December 7, 2001, FERC issued an order modifying and approving the Missouri Madison Project Operation Plan¹. The FERC-approved operations plan implementing Article 403 does not include additional requirements. The FERC Order approving the licensee's plan concluded it is nearly "verbatim with article 403," simply requiring the licensee "to operate the nine developments according to article 403 requirements."

Project 2188 license conditions were collaboratively established by the licensee, state and federal resource agencies, stakeholders and FERC in a decade-long relicensing process that involved over 40 entity and individual participants.² The license conditions were developed in accordance with the Federal Power Act's mandate to balance competing resource uses in the public interest.³ These conditions were based on extensive studies, literature review, and public input. Though the license conditions are comprehensive and balance protecting competing resources, the license does not prescribe prioritization of these resources when conditions, such as drought, may jeopardize the balance. However, historically, NorthWestern has operated the Project under guidance from the resource agencies to protect Madison River fisheries because of their biological, recreational, and economic value to the public interest as described in Appendix I.

Among other things, Article 403 requires NorthWestern to maintain the elevation of Hebgen Reservoir between 6,530.26 and 6,534.87 feet (normal full pool elevation) from June 20 through October 1. NorthWestern must operate the Hebgen Development so the reservoir refills to

¹Order Modifying and Approving Missouri Madison Project Operation Plan, Article 403 (97 FERC ¶ 62,203), issued December 7, 2001.

² See *PP&L Montana, LLC*, 92 FERC ¶ 61,261, at pp. 1-2. (2000).

³ See 16 U.S.C. §§ 797(e), 803(a)(1).

approximately its full pool elevation in late June or early July. NorthWestern must maintain the reservoir near its full pool elevation until September 1.

On July 23, 2021, NorthWestern filed with the Commission notice of a planned, temporary deviation at the Hebgen Development beginning on July 22, 2021, through the anticipated end date of October 1, 2021. NorthWestern proposed to maintain the elevation at a level lower than elevation 6,530.26 feet, the minimum summer pool elevation, due to low winter snowpack, which coupled with hot and dry conditions in spring and summer of 2021 resulted in a reduced availability of water in the Madison River drainage and Hebgen Reservoir. The filing included a record of consultation and approval to deviate from the reservoir elevation requirements of Article 403 from the United States Fish and Wildlife Service (USFWS), the United States Forest Service (USFS), the Bureau of Land Management (BLM), the Montana Department of Fish, Wildlife and Parks (MTFWP), and the Montana Department of Environmental Quality (MDEQ). The filing also identified water conservation measures including: (1) utilizing computer based thermal dynamics modeling to provide effective pulse flows while maximizing the conservation of water; and (2) collaborating with local irrigators to voluntarily implement water conservation measures. In addition, NorthWestern implemented a communications plan and coordinated with local, state, and federal resource and recreation managers to keep the public informed of conditions.

On September 10, 2021, Commission staff issued a letter explaining NorthWestern's notification was consistent with the requirements of Article 403 of the license. However, given the length of time (approximately 81 days) that NorthWestern proposed to deviate from the requirements of Article 403, the letter instructed NorthWestern, that in addition to the notice of temporary proposed deviation it had filed, to file a temporary variance request addressing how the change in operations affects its license requirements.

On November 9, 2021, and supplemented on November 12, 2021, NorthWestern filed a request for a temporary variance of Article 403. NorthWestern's temporary variance request states that the Hebgen Development elevation dropped below the minimum required elevation of 6,530.26 feet between July 22 and October 1, 2021, to a low of approximately 6,525.5 feet on October 1, 2021, due to low winter snowpack, minimal inflow, and hot and dry conditions in 2021, all of which combined to reduce the availability of water in the Madison River drainage and Hebgen Reservoir. The variance request included an analysis of the effects on Project resources due to the variance from the reservoir elevation requirement. NorthWestern's variance request also included records of consultation and support from resource agencies.

On May 19, 2022, FERC issued an order modifying and approving the temporary variance of Article 403. The order granted NorthWestern's variance request, subject to modifications. FERC determined that NorthWestern complied with the articles of the license order when operating its Project during the period of the variance. However, given the effects on the fishery, recreation, and other resources from the management of the Project during drought conditions, FERC required NorthWestern prepare a Drought Impact Study.

The goal of this Drought Impact Study is for NorthWestern, resource agencies, interested stakeholders, and the Commission to better understand how NorthWestern managed its Project and whether changes should be made to better protect all resources in the future, while still complying with the requirements of its license. The study examines:

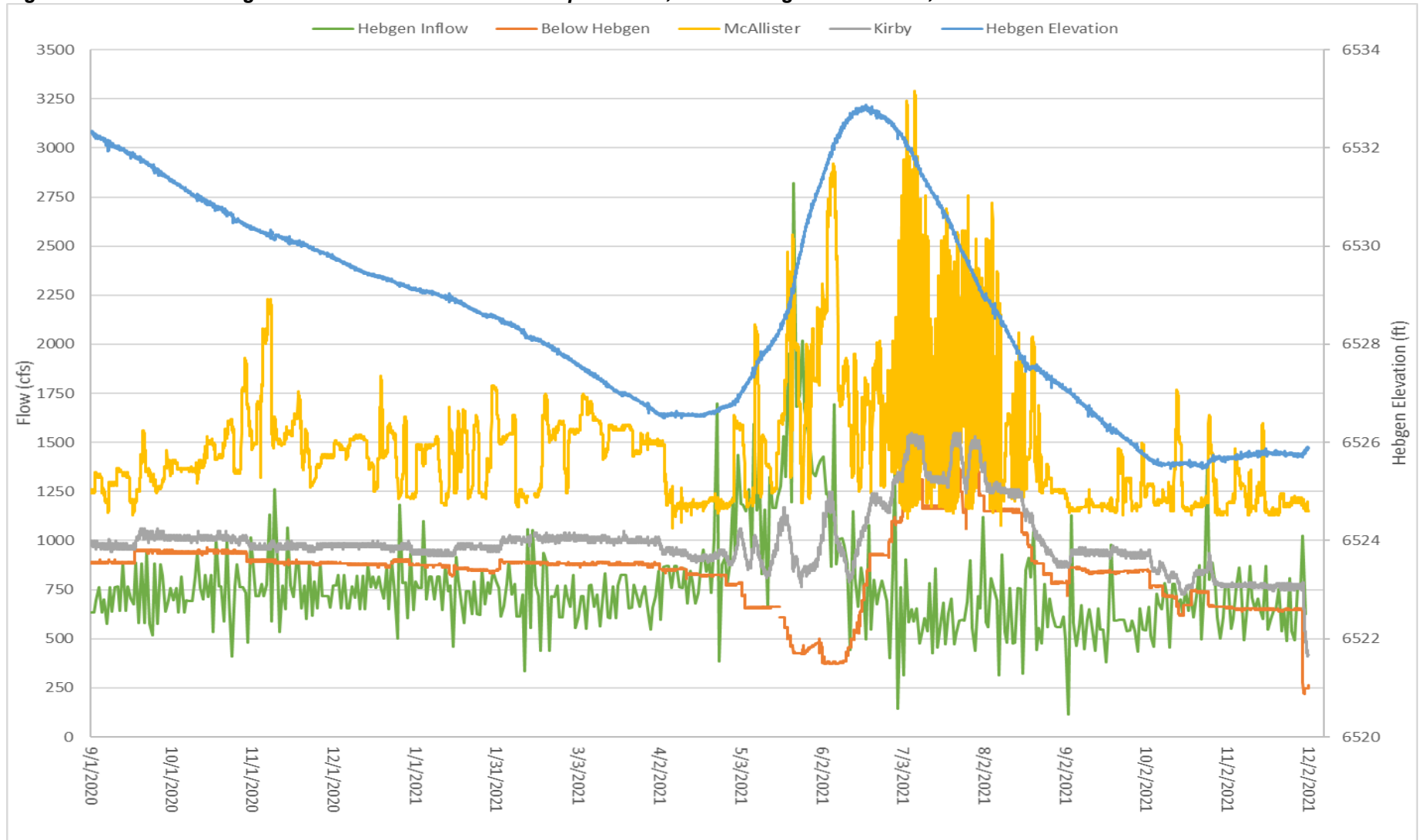
- How NorthWestern operated Hebgen Reservoir from September 1, 2020 through December 1, 2021;
- Whether its operation could have been modified to adhere more closely to the elevation and flow requirements;
- Examine how it analyzed snow forecasts, weather predictions, and climate conditions in advance of the spring melt, and given the actual snow accumulations and weather conditions experienced;
- Whether NorthWestern's use of models, methods, and analyses remain appropriate to avoid future variances;
- Whether any changes it could make in the future, including whether adhering to a single outflow rate established at the start of the winter season remains prudent or whether it would be possible to adjust the outflow rate during the winter season to adapt to observed conditions;
- Examine NorthWestern's public notification methods for communicating drought conditions with the public; and
- Possible methods to maintain public access to recreation resources at the project during a drought.

NorthWestern was directed to prepare the Drought Impact Study in consultation with the USFS, BLM, USFWS, MTFWP, MTDEQ, and the public.

Hebgen Operations September 1, 2020 through December 1, 2021

NorthWestern's Project 2188 FERC License to operate the Hebgen Project includes consideration of recreation on the reservoir, dam safety, flows in the river and natural resource protections. NorthWestern works diligently to meet its FERC obligations and is committed to fulfilling its environmental stewardship responsibilities. However, balancing these interests is challenging in low water years, especially with the uncertainties in long-term weather forecasts and precipitation. The following is the methodology NorthWestern implemented in 2021, as well as in all prior years, to operate the Hebgen development in accordance with Article 403. As depicted in Figure 1, it includes information on how NorthWestern managed Hebgen Reservoir and associated outflows to the Madison River from September 1, 2020 through December 1, 2022.

Figure 1: Flows and Hebgen Reservoir elevations from September 1, 2020 through December 1, 2022⁴.



⁴ <https://waterdata.usgs.gov/mt/nwis/current?type=flow> and NorthWestern data, unpublished.

Article 403 of the License allows NorthWestern to draft Hebgen Reservoir to an approximate elevation of 6,524 feet between September 1 and April 1. At the same time, the license requires that discharge below the dam be reasonably uniform to the extent practical given the variability of inflows to Hebgen. Outflows from Hebgen dam during this time-period provide for the required minimum flows downstream at Kirby (600 cfs) and below Madison Dam (1,100 cfs) in support of the fishery, to maintain winter elevation at Ennis Lake of 4,039 feet, and to minimize the effects from ice gorging downstream near Ennis.

As has been done every year since 2000, NorthWestern starts lowering the elevation of Hebgen Reservoir on or about September 1 by releasing more water from the dam than is coming into the reservoir. To identify how much water to release so that the discharge will be relatively uniform and to comply with license conditions, NorthWestern, reviews inflows to Hebgen over the period of record (1915 to present) and identifies years with similar inflows to current year during June, July, and August. Inflows through the winter from the identified years are summarized and entered along with the current lake elevation into a reservoir elevation spreadsheet (water balance) model to determine outflow and reservoir elevation throughout the winter. This amount is then adjusted to establish the wintertime flow considering National Oceanic and Atmospheric Administration (NOAA) weather and precipitation forecasts, Hebgen Reservoir elevation, and professional judgment based on experience and knowledge of downstream winter conditions. Table 1 provides the June, July, and August inflows in 2020, along with those years NorthWestern identified to have similar inflows, and the associated winter release volumes.

Table 1: Hebgen Reservoir Inflows and Outflows in 2020 and Years with Similar June, July, and August Inflows

Year	Inflow				Oct Outflow
	June	July	August	Average	
1942	1856	853	628	1112	822
1954	1733	894	663	1097	1853
1959	1820	739	706	1088	1587
1989	1628	859	829	1105	1121
2014	1618	863	842	1108	893
2020	1674	884	741	1100	936

The average inflow to Hebgen during years of similar flows⁵ was approximately 1102 cfs. Hebgen outflow was then established to accommodate weather and precipitation forecasts. In the fall of 2020, NOAA predicted⁶ a colder and wetter than normal winter of 2020-2021. Risk of ice gorging and ice flows overtopping a MT Highway 287 near Ennis increases at flows over 950 cfs. To minimize this risk and still maintain relatively stable flows, Hebgen outflows were established for the fall/winter of 2020-2021 at approximately 900-940 cfs. The NorthWestern

⁵ NRCS runoff forecasts are not available during late fall and winter months

⁶ See https://www.cpc.ncep.noaa.gov/products/archives/long_lead/llarc.ind.php.

October 1, 2020 forecast for inflows, outflows, Hebgen storage volume and elevation is provided in Table 2 below.

Table 2: NorthWestern's October 1, 2020 Forecast

Date	% of Natural Flow	Inflow	Outflow	Storage	Elevation
Oct-20	84.94	746	920	166856	6530.45
Nov-20	83.67	736	900	161930	6529.60
Dec-20	88.35	767	900	157795	6528.87
Jan-21	90.21	762	900	153527	6528.11
Feb-21	89.16	729	900	148559	6527.21
Mar-21	89.11	722	900	143037	6526.21
Apr-21	87.76	930	900	143944	6526.37
May-21	105.28	2204	1130	177247	6532.17
Jun-21	99.84	1928	1350	194590	6534.85
Jul-21	93.13	973	1100	190645	6534.25
Aug-21	89.85	773	1100	180494	6532.68
Sep-21	84.41	703	1000	171589	6531.24

Once this winter discharge was established below Hebgen, NorthWestern maintained this flow to comply with Article 403 minimum flows and uniform discharge over the fall and winter months. The flows established are intended to draft Hebgen Reservoir over the winter to make room for snowmelt runoff and high spring inflows and to provide for minimum flows required downstream. The stable flows provided water for the fall brown trout spawn and protected the incubation of the nested eggs throughout the winter months. Brown trout conclude their spawning in November and their eggs are in the gravels until emergence in March. During this incubation period, if flows and associated stage are reduced, potential brown trout fecundity may be reduced from dewatering the redds and exposure of the eggs to freezing conditions or desiccation.

Another important consideration of how Hebgen reservoir levels and outflows are managed is dam safety. NorthWestern must have absolute confidence that outflows from Hebgen are conveyed through the intake and spillway structures instead of overtopping the dam. This plays into how soon, preferably after the spring brown trout egg emergence, NorthWestern can start reducing outflows to refill the reservoir. Additionally, the FERC License (Article 403) requires flows at Kirby not exceed 3500 cfs to protect the integrity of the outlet at Quake Lake. To accomplish this, NorthWestern monitors the accumulating snow through the winter months to plan for inflows to Hebgen and spring runoff. NorthWestern references the four main SNOpack TELEmetry (SNOTEL) sites above Hebgen (Black Bear, Whisky Creek, Madison Plateau, and

West Yellowstone). These sites track the Snow Water Equivalent (SWE) and compares the accumulation to the median for that day.

In early 2021, snowpack across the four sites was slightly below average but was building through the winter as seen in Table 3 below.

Table 3: SNOTEL Snow Water Equivalent for sites above Hebgen Reservoir

SNOTEL SWE Above Hebgen	
Date	Four site average percent of median
1/1/2021	78%
1/15/2021	81%
1/31/2021	86%
2/15/2021	88%
2/28/2021	93%
3/15/2021	91%
3/31/2021	67%
4/15/2021	65%
4/30/2021	64%
5/15/2021	16%
5/31/2021	13%
6/15/2021	0%

Monthly volumetric streamflow runoff forecasts are provided by the Natural Resources Conservation Service (NRCS) beginning in March of each year.⁷ The runoff forecasts are a prediction of the streamflow volume that will flow past a point during a specified season, typically in the spring and summer. These predictions are derived from statistical models based on predictor variables such as SWE and precipitation. Because the water forecasts have a degree of uncertainty, they are presented as a range of values with a probability of occurrence.

Five forecast values are published for each forecast point and each forecast period:⁸

- 95% Chance of Exceedance Forecast:** There is a 95% chance that the actual streamflow volume will exceed this forecast value and a 5% chance that it will be less than this forecast value.

⁷ See <https://www.nrcs.usda.gov/wps/portal/nrcs/mt/snow/products/water+supply/streamflow+forecasts+%28official%29/9380aeb5-f156-4c1d-8d22-9c114ff2dcfe/>.

⁸ See <https://www.nrcs.usda.gov/wps/portal/wcc/home/aboutUs/waterSupplyForecasting/>.

- **70% Chance of Exceedance Forecast:** There is a 70% chance that the actual streamflow volume will exceed this forecast value and a 30% chance that it will be less than this forecast value.
- **50% Chance of Exceedance Forecast:** There is a 50% chance that the actual streamflow volume will exceed this forecast value and a 50% chance that it will be less than this forecast value. Generally, this forecast is the middle of the range of possible streamflow volumes that can be produced given current conditions.
- **30% Chance of Exceedance Forecast:** There is a 30% chance that the actual streamflow volume will exceed this forecast value and a 70% chance that it will be less than this forecast value.
- **10% Chance of Exceedance Forecast:** There is a 10% chance that the actual streamflow volume will exceed this forecast value and a 90% chance that it will be less than this forecast value.

These volumetric runoff water forecasts are the best source of information available for quantifying potential runoff and are widely used in the hydropower industry. NorthWestern relies on them to plan for the volume of water, in thousand acre-feet (KAF), Hebgen may receive during runoff. In addition, as mentioned, NorthWestern must ensure that releases from Hebgen are conveyed through the intake and spillway structures instead of overtopping the dam and that, as required by Article 403, flows at Kirby not exceed 3500 cfs.

In years with SWE near normal (100%), NorthWestern uses the 50% chance of exceedance runoff forecast. In January 2021, with SWE around 80% above Hebgen, NorthWestern decided to use the 70% chance of exceedance forecast to take a more conservative approach to water management. Unfortunately in 2021, as presented in Table 4, the actual runoff (KAF) resulted in less volume than the 95% exceedance resulting in extremely low inflows to Hebgen Reservoir:

Table 4: 2021 NRCS monthly volume runoff forecast for Hebgen Reservoir

		2021 NRCS Monthly Forecast in thousand acre-feet (KAF)					Actual KAF for 2021
		95% Exceedance	70% Exceedance	50% Exceedance	30% Exceedance	10% Exceedance	
March.	Apr-Jul	245	295	325	355	405	227
	Apr-Sep	320	375	415	455	510	301
April.	Apr-Jul	240	285	315	345	390	227
	Apr-Sep	315	370	405	440	495	301
May	May-Jul	178	220	245	270	310	176
	May-Sep	245	370	405	440	415	251
June	Jun-Jul	104	128	144	160	325	92
	Jun-Sep	176	176	235	260	485	167

NorthWestern also works with a consultant, Phil Pharnes,⁹ to provide a separate volume runoff forecast for the Madison upstream of Hebgen Dam. Mr. Pharnes' runoff forecast is comparable to the NRCS 50% exceedance forecasts but also includes a bias value that is based on his professional judgment. Mr. Pharnes' runoff forecast for 2021 is provided in Table 5 below. NorthWestern uses this information to compare to the NRCS volume runoff forecast, and generally uses the average of the two runoff forecasts to inform flow management.

Table 5: The Hebgen Reservoir volume runoff forecast provided by Phil Pharnes.

2021 Phil Pharnes Monthly Runoff Forecast			Bias Number
March	Apr-Jul	306	250
	Apr-Sep	394	
April	Apr-Jul	292	230
	Apr-Sep	377	
May	Apr-Jul	220	180
	Apr-Sep	300	
June	Apr-Jul	224	180
	Apr-Sep	306	

In 2021, NorthWestern took the average of Mr. Pharnes' bias forecast and the 70% exceedance forecast from NRCS. After March, NorthWestern concluded the actual runoff was less than the volume the forecasts were predicting. In response, NorthWestern reduced Hebgen outflows as much as possible while still maintaining minimum flows in the Madison River downstream with the lack of inflow from tributaries below Hebgen.

Once the runoff starts, NorthWestern not only uses the NRCS' and Mr. Pharnes' runoff forecast, but also uses NOAA's daily inflow forecast to evaluate inflows expected within a 10-day period. Table 6 shows an example of NOAA's daily inflow forecast for Hebgen. The forecasts provide an estimated natural flow four-times daily into Hebgen Reservoir for a ten-day period. The forecasts, in a thousand acre-feet for each 6-hour period, are provided Monday through Friday each week.

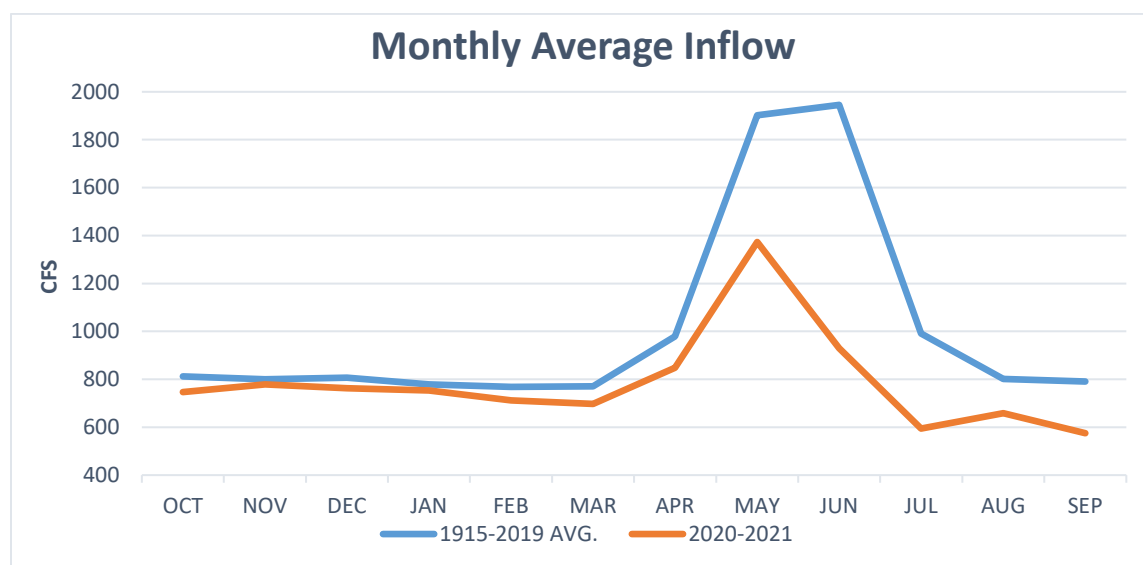
⁹ Phil Pharnes is a retired NRCS Civil Engineer, and business owner of Snowcap Hydrology and Snowcap Photos

Table 6: Example NOAA daily inflow forecast for Hebgen.

Date	Flow Forecast			
	Midnight	6:00 AM	Noon	6:00 PM
30-Jun				1.209
1-Jul	1.192	1.178	1.163	1.150
2-Jul	1.137	1.128	1.116	1.106
3-Jul	1.095	1.088	1.078	1.068
4-Jul	1.058	1.052	1.044	1.036
5-Jul	1.026	1.021	1.012	1.005
6-Jul	0.997	0.993	0.986	0.980
7-Jul	0.974	0.971	0.966	0.961
8-Jul	0.955	0.953	0.948	0.944
9-Jul	0.938	0.937	0.933	0.929
10-Jul	0.922	0.917	0.908	

During most years, snowmelt runoff would supplement river flows enough to allow NorthWestern to reduce outflows from Hebgen in April, following the hatching of brown trout eggs and emergence of fry from the gravels. Reducing outflows combined with runoff and precipitation in the spring causes the reservoir level to gradually increase. During the months of April, May and June 2021, West Yellowstone only received 3.70” of precipitation compared to the normal 7.50” of precipitation during those months¹⁰. Figure 2 shows Hebgen monthly average inflow from 1915-2019 compared to Hebgen monthly average inflow from fall of 2020 through fall of 2021.

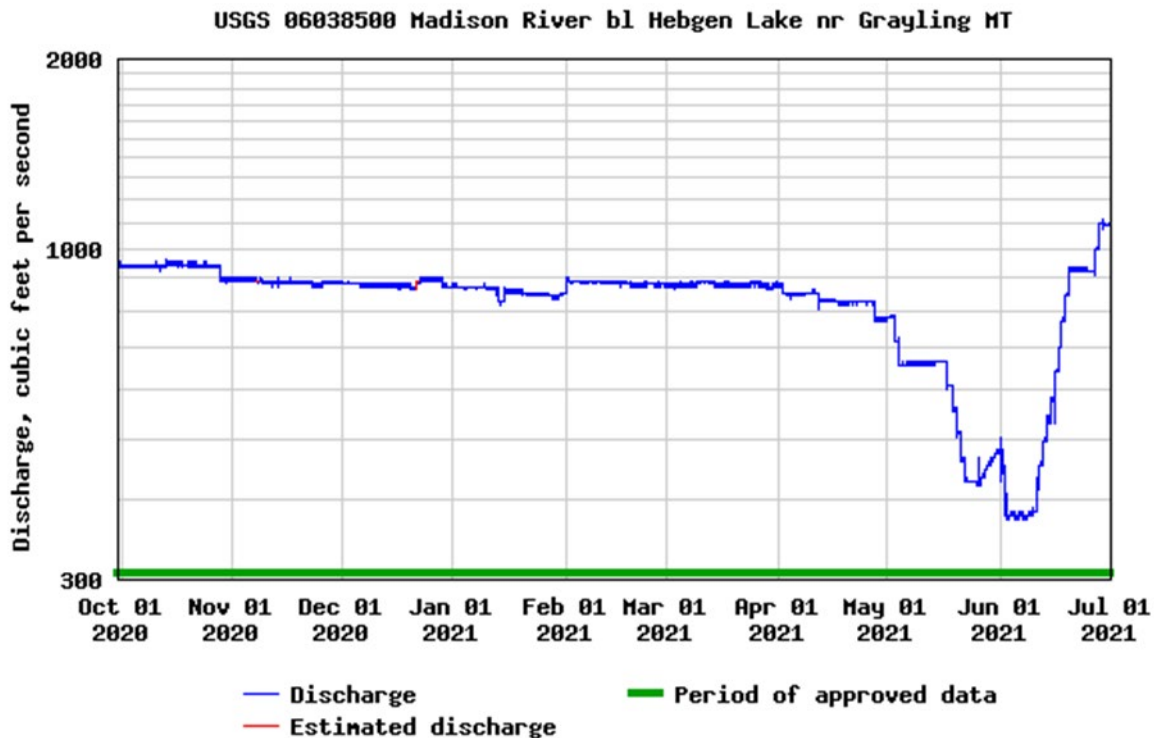
Figure 2: 1915-2019 monthly average inflow compared to 2020-2021 monthly average inflow.



¹⁰ <https://www.weather.gov/wrh/climate?wfo=tfx>

Due to the low precipitation and reduced tributary inflows in 2021, there was not enough runoff to maintain the 1,100 cfs minimum flow below Madison Dam, so NorthWestern could not reduce flows and still comply with the minimum flow requirement. Therefore, NorthWestern was only able to fill Hebgen Reservoir to an elevation of 6532.81 (2.06 feet below full pool of 6534.87 feet). Figure 3 shows Hebgen outflows (Madison River below Hebgen) from the fall of 2020 through spring of 2021.

Figure 3: 2020-2021 Madison River flows below Hebgen Dam.



Another factor influencing release volumes from Hebgen Dam in 2021 was rapidly rising water temperatures in the lower Madison River beginning in early June. License Article 413 requires NorthWestern to implement a Madison River Pulse Flow Plan¹¹. This Plan describes the Decision Support System (DSS) used to maintain maximum daily water temperatures in the lower Madison River at or below 80 °F to protect brown and rainbow trout. Implementation of this plan requires daily pulse flows to be released from Madison Dam. The volume of daily pulses is derived from a thermodynamic model that predicts the volume of water needed to maintain the lower river temperature at or below 80°F. NorthWestern implements these modeled

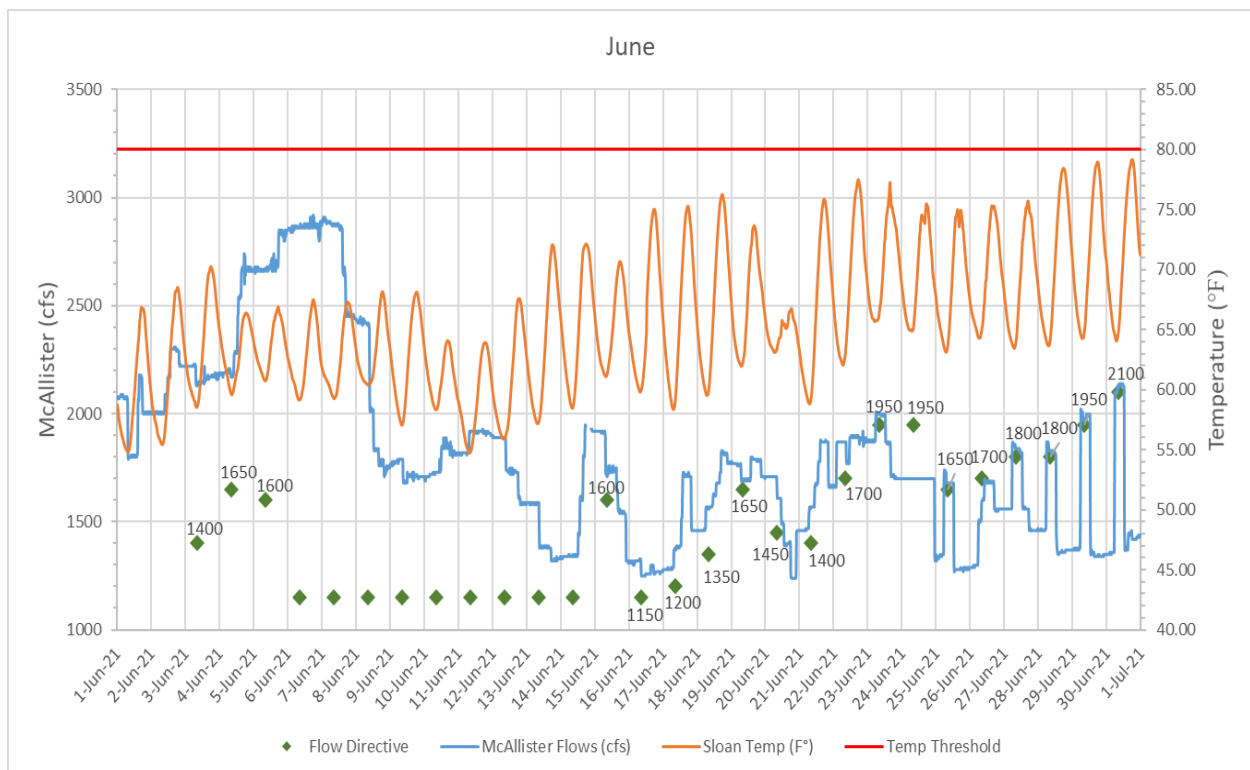
¹¹ See Order Modifying and Approving Madison Pulse Flow Protocol Plan, Article 403, 97 FERC ¶ 62,207 (2001). As required by Article 403, the plan has been updated periodically, most recently in 2015. See Order Modifying and Approving Progress Report And 10-Year Lower Madison River Thermal Decision Support System And Pulse Flow Protocol Plan, Article 413, 151 FERC ¶ 62,158, at P 6 (2015). Per Ordering Paragraph (B), an updated plan will be filed in 2024.

pulse volumes to protect the fishery downstream while conserving water by limiting release volumes to only what is needed. Releases from Hebgen are used to balance the water needed for the daily pulses, to compensate for irrigation withdrawals, and to maintain water levels in Ennis Lake.

Due to this quick rise in lower Madison River temperatures, the first pulse flow directed by the DSS model came on June 3, 2021, which was about three weeks earlier than the first pulse directive in most years. Because of this early rise in temperature and resulting need to start providing pulses to the lower Madison River, and minimal natural spring snowmelt runoff, NorthWestern had to increase outflows from Hebgen Dam in the middle of June in order to provide the water needed for pulses from Madison Dam.

NorthWestern’s DSS directed a total of 64 pulse flow calls days in 2021: 17 pulses in June, 31 in July, and 16 in August. The final pulse call of the season came on August 17, 2021. After August 17, longer, cooler nights eased the threat of any daytime lower river temperature exceedance. Figures 4, 5, and 6 show the pulse flows for each month of the 2021 DSS pulse season. Water temperatures at Sloan Station are in orange, Madison River flow at McAllister (below Madison Dam) is in blue, DSS pulse directives in green, and the 80°F threshold is presented in red.

Figure 4: June 2021 Water Temperature at Sloan Station, Madison River Flow at McAllister, and DSS Flow Directives.



Of the 64 pulse flow calls in 2021, 51 required NorthWestern to increase flows out of Madison Dam to provide the directed volume. The 64 pulse flow calls in 2021 was the highest number of pulses since the inception of the pulse flow program. Table 7 below provides an overview of the DSS program performance from 2009 through 2021.

Table 7: Summary of DSS Performance 2009 through 2021.

Year	Maximum Temp (°F) at Sloan Station	Dates Sloan Station Exceeded 80 °F	Total Duration Above 80 °F	Number of Pulse Calls	Pulse Calls Resulting in Operational Changes
2009	79.9	none	0	8	2
2010	79.2	none	0	2	1
2011	73.5	none	0	0	0
2012	76.5	none	0	0	0
2013	80.2	July 6	0.5 hr	33	22
	80.3	July 26	1.0 hr		
2014	75	none	0	34	7
2015	81.8	7 days: 6/27 - 7/4	22 hrs and 53 mins	17	15
2016	79.6	none	0	26	21
2017	79.5	none	0	36	34
2018	78.5	none	0	36	25
2019	78.0	none	0	32	10
2020	79.2	none	0	42	26
2021	79.2	none	0	64	51
Summary	Range: 73.5 to 81.8	9 days	24 hr 23 min	330	214

Long, hot summer days, minimal precipitation, and lack of tributary flow contributions resulted in frequent, large pulses through the pulse season in order to maintain the lower Madison River below the Article 413 required 80°F threshold. An estimated 2.6 feet of Hebgen Reservoir volume was consumed to provide the 2021 pulses below Madison Dam.

Increased releases from Hebgen Dam were needed in 2021 to support the large, frequent pulses to the lower Madison River also provide benefit to water temperatures in the Madison River downstream of Hebgen Dam and above Ennis Lake. The supplemented volume of water in the upper Madison River effectively limits the thermal heating in this reach, reducing stress to the fishery. Even with the large volume of water released to the upper Madison River in 2021, thresholds established by MFWP to restrict fishing during the most stressful part of the day were exceeded in 2021. Beginning on August 2, 2021, MFWP instituted a hoot owl restriction to the

upper Madison River.¹² Hoot owl restrictions are intended to protect fish that become more susceptible to disease and mortality when conditions, such as low flows and high water temperatures, combine with other stressors, including catch-and-release fishing¹³. Hoot owl restrictions prohibit fishing each day between 2 PM and midnight and may be applied by MFWP when water temperatures exceed 73 degrees for three consecutive days. Without the increased volume provided due to the DSS thermal pulsing, the criteria to implement a hoot owl restriction most likely would have occurred much earlier in the season and would have extended much longer resulting in reduced fishing opportunities in the Madison River.

Following the conclusion of the thermal pulse flows on August 17, 2021, NorthWestern reduced Hebgen releases rapidly to conserve water. Low tributary inflows to the Madison River and irrigation withdrawals limited how low NorthWestern could reduce fall flows. For the remainder of 2021, Hebgen releases were managed to provide Madison River minimum flows downstream at Kirby, below Madison Dam, and to maintain required Ennis Lake elevations.

NorthWestern managed flows from September of 2020 through the fall of 2021 prudently and did not have much for options to change the flow regime while supporting required license conditions and protecting project resources. Setting Hebgen outflows at a lower volume in the fall of 2020 and maintaining the lower flow over the winter may have helped to maintain Hebgen Reservoir at a higher elevation. Unfortunately, at the time the winter flows are established, there was no indication of the coming drought and extremely low late winter and spring inflows to Hebgen Reservoir.

Hebgen outflows could have been established 75 cfs lower than they actually were and still maintained the 1,100 cfs minimum flow at Madison Dam throughout the winter. This alternate flow regime would have resulted in approximately 1.3 feet of Hebgen Reservoir elevation savings. This would not have prevented the drafting of Hebgen below the summer recreation elevation, but would have extended the duration the Reservoir was above the minimum summer elevation by up to two weeks. The minimal inflows, hot weather requiring frequent, large pulses, and minimal tributary flows to support minimum flows downstream would have still led to drafting Hebgen Reservoir below the summer elevation of 6530.26 feet during the first two weeks of August.

Analysis of Tools Used to Inform Hebgen Operations

The decision process for Hebgen water management is dynamic. It is not possible to predict with certainty in March how much snow and rain will come before June nor is it possible to

¹² <https://www.mtpr.org/montana-news/2021-08-03/new-fishing-restrictions-in-effect-across-western-montana> (noting that 'Hoot Owl' restrictions went into effect on August 2, 2021).

¹³ <https://fwp.mt.gov/homepage/news/2022/july/0714-fishing-restriction-in-place-for-lower-madison-river-due-to-high-temps>

quantify the required pulse volumes that will be needed in the summer. NorthWestern uses the best available information and resources to inform its decision on managing water use, dam safety, license obligations, and resource protections at Hebgen.

NorthWestern uses a variety a tools to inform Hebgen Operations, including:

- Comparison of current year to historic years with similar conditions
- Reservoir inflows over the period of record
- Reservoir Elevation Model
- Streamflow runoff forecasts
- SNOTEL, NOAA weather and precipitation forecasts
- NOAA daily inflow forecast
- DSS for water temperatures

In the following section, NorthWestern's will discuss each tool we use to inform Hebgen Operations in detail.

Comparison of Current Year to Historic Years with Similar Conditions

Managing Hebgen Operations as required by Article 403 and the FERC-approved Operations Plan is a balancing act, and some of the conditions can be conflicting. Therefore, we rely on our experience and historical information to help guide decisions. NorthWestern references Operations data including Hebgen inflows, outflows, and reservoir elevation data from the period of record in order to relate currently observed conditions to the historical record. This is a practice widely used by the hydropower industry in order to relate the observed conditions to a historical experience documented through data in order to help guide expectations of future environmental conditions.

For example, when comparing conditions in 2021 to those in 2007, as is shown in Figures 7, 8, and 9, it became apparent that Hebgen inflows, reservoir elevation, and outflows were similar in these two years. The reservoir was not filled that year as well. NorthWestern used the 2007 data to help estimate Hebgen Reservoir elevations in 2021, including the timing on when those elevations may be reduced below the Article 403 summer minimum.

Figure 7: Hebgen inflows in 2007 and 2021.

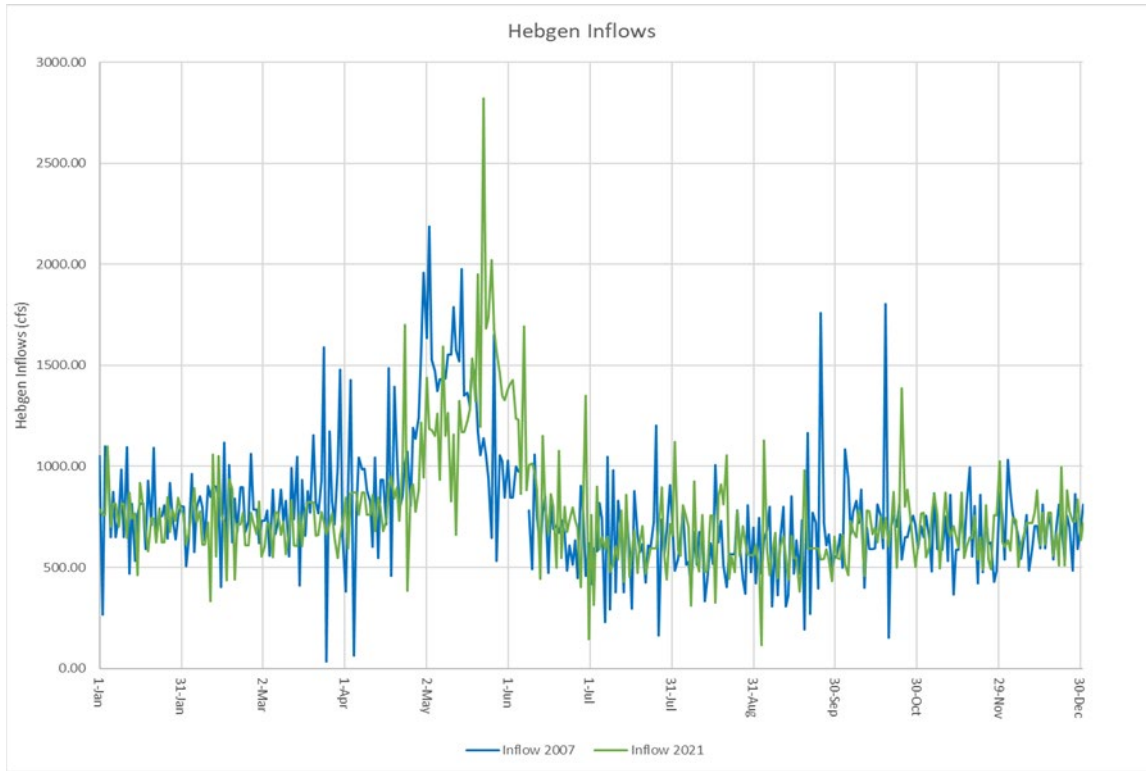


Figure 8: Hebgen Reservoir elevations in 2007 and 2021.

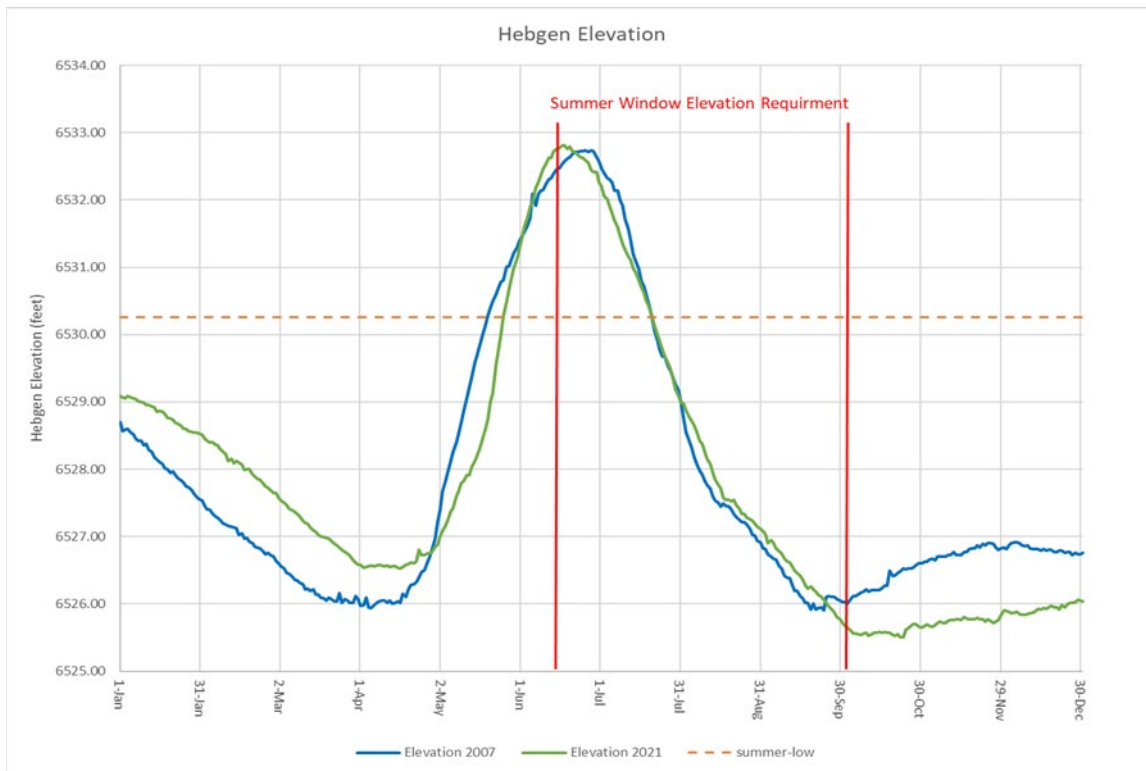
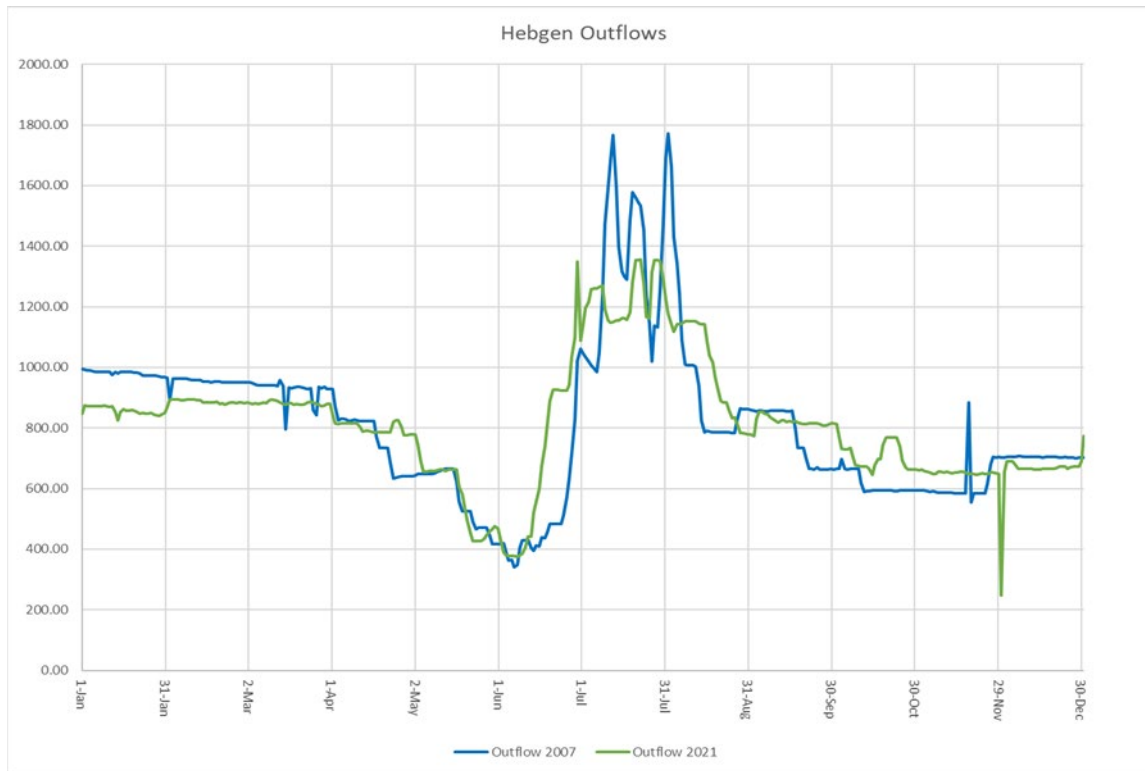


Figure 9: Hebgen Dam releases in 2007 and 2021.



Reservoir Inflows over the Period of Record

NorthWestern runs a forecast on the fifth business day of each month and does a 10-day rolling forecast during spring runoff. From September to February, NorthWestern uses the average of the actual inflows from the previous 3-months and compares them to the 100-year historic monthly average inflow. NorthWestern uses the average of the actual inflows from the previous 3-months to identify five prior years that have similar monthly average inflows for those same 3-months. Once the five years are identified, NorthWestern then looks at the monthly average inflow numbers for each month. Based on observed inflows in the previous 3-months and comparing them to similar years, inflows are predicted using the same trend as the five similar years. Northwestern then uses these five similar years to help forecast inflows for future months. The example below would be forecasting for September forward.

Table 8: Forecasting Inflow for September Forward.

Monthly Average Inflow Forecast												
Year	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1959	1026	1012	866	867	856	803	830	1026	1277	1253	657	614
1954	611	684	736	688	702	710	735	839	1402	1656	784	597
1923	782	876	843	814	805	792	773	1451	1498	1513	857	777
1989	809	804	747	842	757	762	787	900	1366	935	708	692
2014	650	729	760	781	703	745	1018	1423	2044	3467	1437	799
Monthly Avg	776	821	790	798	765	762	829	1128	1517	1765	889	696

Northwestern reruns this process each month to account for weather changes within each month.

Reservoir Elevation Model

After Northwestern establishes the forecasted inflows, they are tracked in a reservoir elevation spreadsheet (water balance) model that allows Northwestern to run scenarios adjusting the outflows to determine the responding reservoir elevations to determine where the Hebgen Reservoir elevation needs to be each month. If the reservoir is higher than desired relative to snowpack and precipitation forecasts, NorthWestern runs scenarios of increased outflows in the model to determine the resulting reservoir elevation at the end of the month. Table 9 below shows an example of the Reservoir Elevation Model. The outflow cells in blue are adjusted by the user to determine the change in storage and reservoir elevation.

Table 9: Forecasting Tool.

<u>Date</u>	<u>% of Natural Flow</u>	<u>Inflow</u>	<u>Outflow</u>	<u>Storage</u>	<u>Elevation</u>
Aug-20				171503	6531.23
Sep-20	86.79	723	886	166613	6530.41
Oct-20	84.88	746	920	161219	6529.48
Nov-20	83.70	736	900	156299	6528.61
Dec-20	88.40	767	900	152176	6527.87
Jan-21	90.17	762	900	147898	6527.09
Feb-21	89.19	729	900	142939	6526.19
Mar-21	89.13	722	900	137421	6525.17
Apr-21	87.74	930	900	138321	6525.34
May-21	105.26	2204	1130	171615	6531.25
Jun-21	99.84	1928	1350	188955	6533.99
Jul-21	93.16	973	1100	185018	6533.39
Aug-21	89.90	773	1100	174881	6531.78

Water balance models are commonly used in hydrology fields to run scenarios in order to inform decision-making processes. NorthWestern's use of the reservoir elevation model allows us to evaluate water management options at Hebgen Reservoir, and informs how those decisions not only relate to reservoir elevations but also to outflows and compliance with our license requirements downstream. The reservoir elevation model tool also allows NorthWestern to identify future conditions. For instance, we can use this tool to help inform potential reservoir elevations based on the forecasted inflows, and to identify management scenarios to avoid compliance deviations, or to minimize deviations, in the future.

Streamflow Runoff Forecasts

NorthWestern develops March through July forecasts very similar to the other months, but instead of using the average inflows from the three previous months, NorthWestern uses the NRCS runoff forecast and the Mr. Pharnes runoff forecast. The forecast volumes NorthWestern uses based on the two, NRCS and Mr. Pharnes, runoff forecasts is then compared to five similar years over the period of record in the data sheet. These volumes are entered into the reservoir elevation model and the same process is followed as before. For example, if NorthWestern used 230 kaf from Mr. Pharnes'/NRCS' April-July runoff forecast for the month of March, 230 kaf would be run through the reservoir elevation model to get 5 similar years. The average March inflows in those five years gives an indication of what inflows would potentially be for current year March. This type of forecasting is standard in the industry and has proven to be effective.

NOAA Daily Inflow Forecast

Once the runoff starts, NorthWestern not only uses the NRCS runoff forecast, but also uses NOAA's daily inflow forecast (May-June) to estimate Hebgen inflows for the 10-day period. Table 10 below is an example of NOAA's daily inflow forecast for Hebgen.

Table 10: Example NOAA daily inflow forecast for Hebgen.

Date	Flow Forecast			
	Midnight	6:00 AM	Noon	6:00 PM
30-Jun				1.209
1-Jul	1.192	1.178	1.163	1.150
2-Jul	1.137	1.128	1.116	1.106
3-Jul	1.095	1.088	1.078	1.068
4-Jul	1.058	1.052	1.044	1.036
5-Jul	1.026	1.021	1.012	1.005
6-Jul	0.997	0.993	0.986	0.980
7-Jul	0.974	0.971	0.966	0.961
8-Jul	0.955	0.953	0.948	0.944
9-Jul	0.938	0.937	0.933	0.929
10-Jul	0.922	0.917	0.908	

NorthWestern determines the average of the four time stamps provided in the daily inflow forecast to get an average daily forecast and multiple that by 1000 to convert the kaf (1000 acre-feet) forecasted units into a daily average cubic feet per second (cfs) inflow. NorthWestern then takes the 10-day inflow numbers and enters them into the Reservoir Elevation Model. This tool allows NorthWestern to estimate Hebgen Reservoir elevation based on outflow volumes. See Table 11 for an example below.

Table 11: Example NOAA Daily Inflow Forecast Used in the Reservoir Elevation Model.

Daily Inflow				
Date	Inflow	Outflow	Storage	Elevation
30-Jun	1209	783.00	192602.50	6534.55
1-Jul	1171	775.00	192930.00	6534.60
2-Jul	1122	789.00	192733.50	6534.57
3-Jul	1082	877.00	193061.00	6534.62
4-Jul	1048	919.00	193323.00	6534.66
5-Jul	1016	915.00	193454.00	6534.67
6-Jul	992	913.00	193126.50	6534.63
7-Jul	968	913.00	193585.00	6534.69
8-Jul	950	913.00	193192.00	6534.64
9-Jul	938	912.00	193061.00	6534.62
10-Jul	916	908.00	193192.00	6534.64

SNOTEL

Throughout the winter months each year, NorthWestern is monitoring all the SNOTEL sites in the Madison Basin for snowpack, snowpack water equivalent and precipitation, NOAA's short-term and long-term weather forecast, along with the Farmers' Almanac and drought monitoring throughout the region.

The data from the SNOTEL sites is used widely by the hydropower industry to track the available water content residing in a watershed. Monitoring the SWE at sites above a reservoir allows for the tracking of gains and losses of total water available in the watershed, and allows water managers to adapt reservoir operations according to the SWE and in consideration of license conditions and dam safety concerns.

Madison DSS for Managing Lower Madison River Water Temperatures

The lower Madison River, located downstream from Madison Dam, is an important recreational trout fishery. In the summer of 1988, a fish-kill of trout and whitefish occurred in this reach of the river during a drought and extreme hot weather when river water temperature reached 82.5 °F. Although the fish-kill did not cause long term damage to the downstream fishery, it prompted the Licensee, resource agencies, conservation groups, and other entities to investigate the possible causes and impacts of elevated water temperatures (above 80 °F, providing some margin below 82.5 °F) on the fishery in the lower Madison River.

Article 413 of the Project 2188 License required NorthWestern to develop a plan for continued thermal monitoring of water temperatures and a pulse flow protocol for the lower Madison River. The FERC approved Madison River Thermal Decision Support System (DSS) protocol was developed in consultation with resource agencies and has operated every summer from 2001 through 2021. The DSS protocol is used, when necessary, to maintain maximum daily water temperature in the lower Madison River at or below 80 degrees Fahrenheit (°F) to protect Brown (Salmo trutta) and Rainbow Trout (Oncorhynchus mykiss).

The DSS monitors weather forecasts and air and water temperatures. Based on those results and forecasts, the DSS employs pulse flows from the Madison Dam whenever lower river temperatures are predicted to exceed 80 °F at Sloan Meteorological Station (Sloan Station).

The DSS program is comprised of two pulse flow predictors: the DSS Physics Model and a Manual Protocol (Table 12), both of which are automated. The DSS provides instructions to NorthWestern's dam operators on flow releases needed to maintain an 80 °F maximum water temperature at River Mile 17 (Sloan Station). Data and graphics are available continuously at www.madisondss.com.

Table 12: 2022 Madison DSS Manual Protocol

2022 Manual Protocol	Tomorrow's Predicted Maximum Air Temperature (°F) and Corresponding Pulse Flow (cfs) (Look up predicted high air temperature for the next day, at Sloan Station near Three Forks, MT)				
Today's Maximum Powerhouse Release Temperature (°F) (Look up river temperature on the Madison DSS website or the USGS McAllister gage on or after 8:30 p.m.)	Air Temp ≥ 77 and < 80	Air Temp ≥ 80 and < 85	Air Temp ≥ 85 and < 90	Air Temp ≥ 90 and < 95	Air Temp ≥ 95
greater or equal to 68 and less than 69	1150	1400	1600	1800	2000
greater or equal to 69 and less than 70	1150	1500	1700	1900	2100
greater or equal to 70 and less than 71	1150	1600	1800	2000	2200
greater or equal to 71 and less than 72	1150	1800	2100	2300	2500
greater or equal to 72 and less than 73	1400	2000	2300	2500	2700
greater or equal to 73 and less than 74	1600	2200	2500	2700	2900
greater or equal to 74 and less than 75	1800	2400	2700	2900	3100
greater or equal to 75	2000	2600	2900	3100	3300

The implementation of the DSS since 2001 has proven the protocol used supports the protection of the lower Madison River fishery while also conserving water. The use of two pulse flow predictors promotes the delivery of a sufficient pulse volume of water while also limiting volumes to only what is needed to maintain water temperatures at or below 80 degrees.

Temperature and flow modeling is a common practice in the hydropower industry and in watershed hydrology applications. The DSS is unique in the way that it was built and developed specifically for managing water temperatures in the lower Madison River. The thermodynamic physics model and the manual protocol were both built on data from that stretch of the Madison River and historical performance of the program. The development of the DSS took numerous years and continues to be improved and updated on an annual basis. There are no other tools available that may perform remotely as well as the Madison DSS does for the Madison River.

Analysis of NorthWestern Operations and Hebgen Reservoir Elevations from 2000-2021

Figure 10 illustrates the lake elevations for the past 21 years. The yellow color on the graph represents the summer elevation timeline (June 20th through October 1st), while the red line in

the middle of the graph represents the summer elevation minimum (6534.87 to 6530.26). Over the past 21 years, Hebgen operations have only fell short of summer elevation 4 years (2003, 2007, 2008, and 2021). In 2008, a Hebgen stop log failure resulted in uncontrolled releases to the Madison River leading to the drafting of Hebgen Reservoir during the month of August.

Figure 10: 2000-2021 Hebgen Lake Elevations.

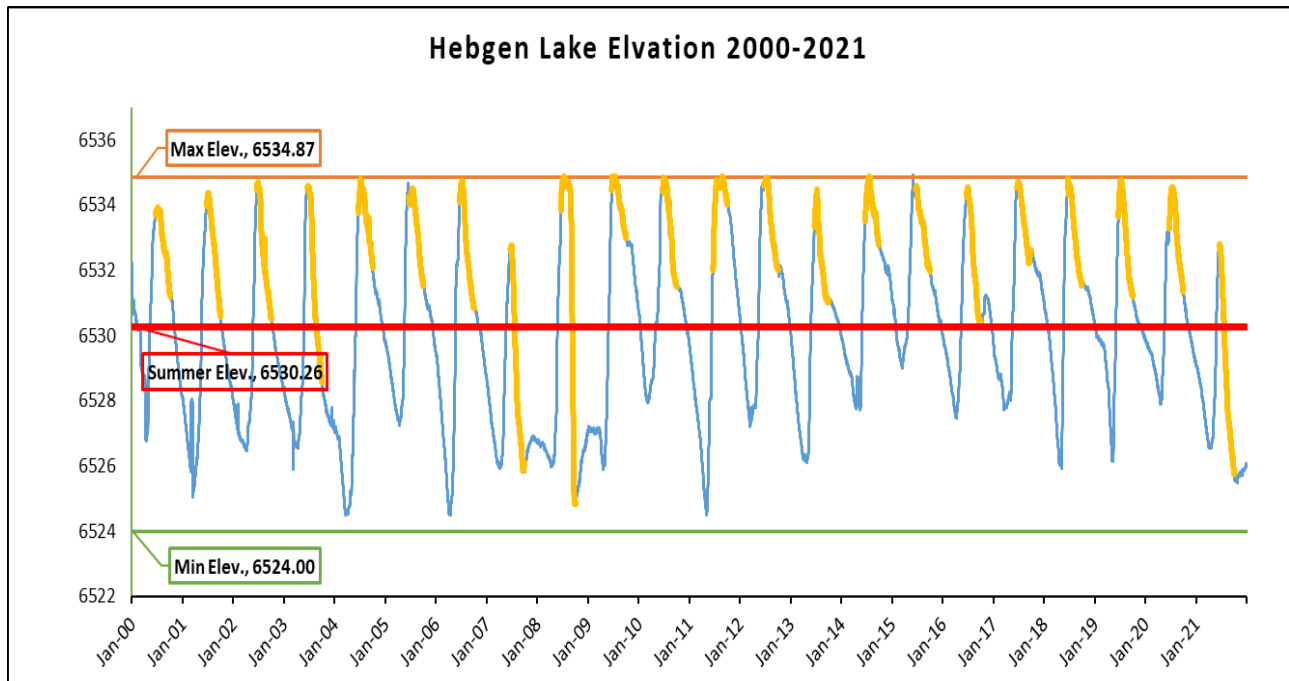


Figure 10 demonstrates that NorthWestern maintained Hebgen Reservoir above the required minimum elevation during the summer in 17 of the 21 years since the issuance of the Project 2188 license. Over these years the environmental conditions influencing water management at Hebgen were varied and included years of drought, years with above normal precipitation, years with no thermal pulses, and years with many thermal pulses. The management of Hebgen releases has proven to be effective most years even when conditions are challenging to ensure compliance with all Article 403 minimum, maximum, flow change, and reservoir elevation requirements.

Alternate Options for Management of Hebgen Operations

NorthWestern's goal is to manage releases from Hebgen Dam in conformance with Article 403 flow and reservoir elevation requirements and manage dam safety considerations, while also focusing on protecting the resources. As discussed above, NorthWestern uses many sources of

available information for water forecasting to inform Hebgen operations. Due to the dynamic nature of the environment and weather, these forecasts can vary from the actual conditions.

NorthWestern's most challenging decision in managing Hebgen outflows is where to establish flows in October that will support brown trout through the winter, while also drafting Hebgen Reservoir to an acceptable level to ensure dam safety and compliance with Article 403 during the spring snowmelt runoff. Weather conditions can change significantly between late September when winter flow decisions are made, and late winter/early spring when the majority of the precipitation is received. This timeframe is when NorthWestern endeavors to provide a stable Madison River flow to protect brown trout spawning and incubation of their eggs in gravels. If weather patterns and precipitation change significantly over this time-period, it can lead to drafting Hebgen Reservoir more or less than desired.

An alternative way to operate is instead of setting a certain flow in October based on the method described above is to set October flows as low as possible to provide minimum flows downstream. That flow would then establish the Madison River elevations at which brown trout spawn their eggs in the gravels. If flows can be as low as possible during this timeframe, this allows NorthWestern to hold flows at this low volume for the duration of the winter. If more precipitation and snowpack is gained later in the winter than what was originally forecasted, NorthWestern has the ability to increase flows to make room in Hebgen Reservoir for spring snowmelt. This would have little effect on the fecundity of the brown trout spawn as long as the minimum water elevation is maintained during the incubation period. The potential risk of this management scenario is related to a potential rain on snow event resulting in large inflows to Hebgen, filling the available Hebgen Reservoir storage and overwhelming the Hebgen intake and spillway capacities to pass this water. If this management scenario was implemented, NorthWestern would diligently follow accumulated snowpack above Hebgen and adjust outflows in response to how much SWE is received.

Another option for managing Hebgen Reservoir elevation and associated outflows over the winter months would be to change outflows based on the SWE accumulated through the winter season. This could lead to an increase in outflows with little impact to Madison River resources. But, if little snowpack is gained through the winter, Hebgen releases could be reduced in order to conserve water. This would result in increased risk of dewatering brown trout eggs and exposure to the air leading to desiccation and freezing conditions resulting in dying off of those eggs. The amount of loss relative to change in river stage is unknown and varies across the differing Madison River channel dimensions downstream but is assumed that the larger the drop in stage, the higher the risk of impacts to the brown trout spawn.

A third option would be to maintain a reduced uniform outflow from Hebgen Dam until brown trout egg incubation ends and the embryos emerge in March. Beginning in April, NorthWestern could reduce flows below the currently required minimums in order to conserve water and fill Hebgen Reservoir. This management would require a temporary modification (like was acquired

in the spring of 2022), a variance from Article 403, or a license amendment permitting the reduced flow.

NorthWestern's Public Notification of 2021 Drought Conditions

During the summer of 2021, NorthWestern communicated frequently with state and federal resource agencies. These communications included the status of the snowpack and lack of available water during the annual Madison Flushing Flow meetings and planning meetings in March (via email on March 29), April (via a meeting on April 14), and May (via a meeting on May 12). NorthWestern kept agency personnel informed on water management the entire summer during personal interactions and through frequent meetings and phone calls.

In addition, NorthWestern staff visited all fly fishing shops from West Yellowstone downstream to Ennis on July 20 to discuss the challenging water year. NorthWestern also issued a press release and placed ads on July 26 and July 28, respectively, noticing Hebgen low water levels.

Due to the COVID-19 pandemic, NorthWestern did not hold a public meeting in West Yellowstone in the summer of 2021 as it normally would. In lieu of a public meeting, however, NorthWestern sent out an informational letter via mail and digitally to the email contact distribution list providing an update to shoreline owners on the low water levels and status of other programs. The email distribution list is a continually evolving list including attendees at public meetings who sign up for communications, resource agency staff, non-government organizations, and other interested stakeholders.

NorthWestern also set up a webpage dedicated to communication of the drought conditions in the Madison River watershed¹⁴. The website was updated through the 2021 season. NorthWestern maintains this website in order to continue to communicate updated water conditions in the Madison River basin.

As detailed in the initial notice of deviation from Article 403 and again the variance request to FERC, NorthWestern consulted with state and federal resource agencies on the conditions and the emergency operation needed to draft Hebgen Reservoir below the Article 403 required minimum elevation. NorthWestern filed the agency-approved deviation report with FERC on July 23, 2021 and the formal variance request on November 9, 2021 and supplemented on November 12, 2021.

¹⁴ <https://www.northwesternenergy.com/clean-energy/hydropower/missouri-madison-hydro-project-2188/madison-river-fisheries/madison-river-drought>

Hebgen Reservoir Public Access during Drought Conditions

Following drought conditions in 2007, which resulted in the drafting of Hebgen Reservoir below the summertime Hebgen elevation requirement of 6,530.26 feet, the licensee at the time, funded an initial engineering assessment to study options for a deep-water lake access on the north shore of Hebgen Reservoir. USFS staff consulted with the licensee in identifying potential sites for a deep-water lake access. Based on this assessment, the licensee prepared preliminary cost estimates for the extension of existing ramps and dredging at the two private marinas on the northeast and northwest reservoir shorelines. The licensee also consulted with the owner of the third private marina on the reservoir regarding interest in ramp extension.

In the fall of 2008, USFS staff completed an engineering feasibility assessment for extending two public ramps on the reservoir and dredging access channels for deep-water access. This assessment indicated that due to the shallow nature of the bays at Rainbow Point and Lonesomehurst, ramps would need to be extended up to 70 feet and access channels ranging from 1100 to 1750 linear feet in length would need to be dredged to assure deep-water access. Following this assessment, the licensee and the USFS concluded that existing ramps on the north shore provided cost-effective options for providing deepwater access. In the fall of 2008, the licensee funded a detailed engineering assessment for extension of the existing Kirkwood boat ramp and dredging of an access channel to the main body of the lake. This engineering assessment provided the cost estimate for a grant application to the River Fund to pursue the project. The project would provide a benefit to public recreation by ensuring continued boating access to Hebgen Reservoir when low water conditions occur in the future and addressed goals of the Missouri-Madison Comprehensive Recreation Plan.

The River Fund board approved the grant application and the Kirkwood boat ramp extension providing boat launching facilities down to a reservoir elevation of 6,526 ft. was constructed in 2010 and 2011. Following the completion of the ramp extension, signs were installed at public boat ramps in other locations on the reservoir to inform boaters of available boat access when low water conditions occur.

NorthWestern maintained the Hebgen summer recreation elevation in all years from the completion of the deep-water ramp in 2011 until 2021. As Hebgen Reservoir was drafted below 6530.26 feet in 2021, the Kirkwood deep water boat ramp provided access to Hebgen Reservoir. As the reservoir levels dropped, it was discovered the channel between the Kirkwood Marina and the main body of Hebgen Lake was shallower than the depth at the boat launch. This limited the full functionality of the Kirkwood Ramp at low water levels.

During the spring of 2022, NorthWestern collaborated with the Kirkwood Marina and the USFS to develop a plan to dredge the channel leading to the Kirkwood Marina allowing for the marina to be usable at lower Hebgen Reservoir elevations. An application was submitted to the River Fund requesting funds to cover the developed plan. The River Fund met and approved the funding request on May 4, 2022. The dredging of the channel was completed in June 2022 resulting in a

deeper channel and boat access to the Kirkwood Marina during times of low Hebgen Reservoir elevations.

Conclusions

NorthWestern works diligently to meet its FERC obligations and is committed to fulfilling its responsibilities at the Hebgen Development. As evidenced by the FERC license requirements, those responsibilities at Hebgen are numerous and complex, and are but one part of the overall management scheme established by FERC's regulation of the Project. NorthWestern's license and regulatory requirements include measures to protect, enhance and mitigate a host of Project resources including the environmental protection,¹⁵ recreation,¹⁶ and dam safety.¹⁷ As the breadth, complexity, and sheer number of requirements demonstrate, NorthWestern, in coordination with federal and state resource agencies, must balance vastly competing priorities in meeting its FERC obligations at the Project. Doing so requires frequent coordination among NorthWestern staff and regular communication with the resource agencies. While extreme weather and flow conditions can disrupt this carefully crafted management regime, and result in occasional license deviations with sometimes negative consequences, the process established by FERC to resolve such deviations takes into consideration the full range of potential impacts as part of its public interest determination.¹⁸

¹⁵ See e.g., Article 404 and Order Modifying and Approving a Water Quality Monitoring Plan Under Article 404, 98 FERC ¶ 62,020 (2002); Article 409 Order Modifying And Approving Madison River Drainage Habitat Enhancement And Restoration Funding Plan, 97 FERC ¶ 62,270 (2001) *order at reh'g*, 98 FERC ¶ 61,300 (2002), Article 412 and Order Modifying and Approving Madison River Protection, Mitigation and Enhancement Plan, 97 FERC ¶ 62,213 (2001); Order Amending and Approving Wildlife and Habitat Monitoring and Enhancement Plan Pursuant to Article 423, 99 FERC ¶ 62,127 (2002); Five-Year Madison and Missouri River Fisheries Protection, Mitigation and Enhancement (PM&E) Plans Pursuant to Articles 408, 409, 412, 414, 416 And 417, 167 FERC ¶ 62,069 (2019).

¹⁶ See e.g., Article 426 and the Order Approving Comprehensive Recreation Plan Under Article 426, 99 FERC ¶ 62,170 (2002); as amended by Order Approving Recreation Plan Amendment, 163 FERC ¶ 62,094 (2018).

¹⁷ See generally 18 C.F.R. Part 12.

¹⁸ See, e.g., *Pacific Gas & Electric Co.*, 176 FERC ¶ 61,082, at P 31 (2021) ("We find that approval of PG&E's temporary variance request would conserve limited water resources at the project, prevent jeopardy of ESA-listed salmonid species in the Eel River, and avoid operational and dam safety impacts associated with critically low-storage levels at Lake Pillsbury...Finally, the proposed variance would avoid any new impacts to Eel River environmental resources while resulting in only temporary, mitigable impacts to aquatic resources in the East Branch Russian River."); *Grand River Dam Auth.*, 152 FERC ¶ 61,129, at P 70 (2015) ("As discussed above, we agree that the proposed temporary variance would have some benefits, including increased water levels, greater access for boaters and other recreationists on Grand Lake, improved boating conditions with fewer groundings during the late summer, and extended recreation season...and improved DO conditions downstream of the project should there be a drought. Further...there would be no significant environmental impacts associated with the proposed variance and relatively little generation lost due to the variance.").

In 2021, NorthWestern was not able to meet all license requirements in the Madison River while also maintaining the FERC required summer operating elevation of Hebgen Reservoir. NorthWestern sought guidance from resource agencies on how to best manage the water shortage. In this instance, similar to historical circumstances, the resource agencies prioritized the biological resources and economic value of the Madison River fishery over maintaining the summer elevation at Hebgen Reservoir. This decision results in supporting the vast majority (85%) of the estimated angler days in the Madison River basin. Of the remaining 15% of angler days, a portion is lost when low Hebgen Reservoir elevations restricting angling use on the water. While the loss of angler days is still significant, no other alternative management scenario would result in increased support of angler days and associated economic impact in the Madison.

NorthWestern fully complied with Article 403 in managing the deviation, NorthWestern fully complied with FERC's direction to request an after-the-fact variance for the deviation, even though inconsistent with prior FERC's handling of Project reservoir elevation deviations and therefore not expected by NorthWestern staff.¹⁹ Thus, NorthWestern has fulfilled its obligations in addressing the Hebgen reservoir elevation deviation.

NorthWestern appreciates the views expressed and shares the frustration caused by recent severe drought conditions and their impacts to the Hebgen Development and Madison River system. Despite the challenging circumstances caused by extreme drought conditions, NorthWestern at all times acted reasonably and in accordance with license obligations. The response plan developed by NorthWestern has been reviewed and endorsed by all federal and state regulatory agencies, after close consultation with NorthWestern. Moreover, NorthWestern has maintained communication with FERC staff and the public to detail the ongoing drought conditions and NorthWestern's response to these conditions.

NorthWestern recognizes that certain members of the recreating public would have preferred a different balancing of the public interest factors in determining how to manage a finite resource during depleting conditions. Nonetheless, NorthWestern maintains that its actions and decisions were reasonable and warranted in light of all resources and license obligations, and this viewpoint is sustained by all federal and state resource agencies with stewardship responsibilities for this Project.

¹⁹ See, e.g., Letter from Thomas LoVullo, FERC, to Jon Jourdonnais, NorthWestern, Project No. 2188-231 (issued June 9, 2017) (finding that NorthWestern's April 7–11, 2017 deviation from Article 403 would not be considered a license violation); Letter from Andrea Claros, FERC, to John Tabaracci, NorthWestern, Project No. 2188-234 (issued Oct. 24, 2017) (finding that NorthWestern's September 15, 2017 deviation from Article 403 would not be considered a license violation).

Appendix I – Madison River Angler Use and Economics

Montana Fish, Wildlife and Parks has conducted statewide angling pressure estimates for more than 50 years²⁰. These estimates are the basis for relating angling pressure on lakes and streams, by residents and non-residents, by season and economic importance. Survey data is collected from anglers who fish approximately 1,200 water bodies throughout the state.

Grisak et al. (2012)²¹ detailed the history of economic statistics for Montana angler use. In 1985, MFWP conducted a survey of resident and non-resident anglers to determine what goods and services they purchased during a typical fishing trip. The dollar value of an angler day was based on expenditures for non-durable goods typically purchased per trip such as food, gasoline, bait, lures, outfitter-guide fees and lodging. Durable goods such as boats, waders, fishing rods and vehicles were not included in the calculation because their value is normally amortized over the life of their use. As such, the economic value of an angler day in Montana is conservative because only expenditures for non-durable goods were included. Angler day economic values have been adjusted bi-annually based on estimates of the Consumer Price Index provided by the United States Department of Labor- Bureau of Labor Statistics. In 2013, MFWP repeated the 1985 economic survey to update the dollar value of a typical angler day.

License 2188, Article 413, requires NWE to "...use pulse flows [from Hebgen Lake] when necessary to reduce water temperatures in the lower Madison River for the benefit of fishery resources. Pulse flow project operation reduces the amount of heating that occurs in waters downstream from the project by increasing the volume of water released at certain times from the project. The licensee's pulse flow protocol dictates when pulse flows are released based on downstream water temperatures..." Though intended to benefit fishery resources in the lower Madison River, increasing flows at critical times of the year also benefits fishery resources in the upper Madison River and Ennis Lake.

The four Madison water body sections included in MFWP's angling pressure estimates (Lower Madison River, Ennis Lake, Upper Madison River, and Hebgen Lake) that are affected by NorthWestern's pulse flows are considered to be high quality angling. Both Hebgen Lake and Ennis Lake provide opportunity for trout fishing. Since the issuance of the license, Hebgen Lake averages 40,110 angler days per year (range 24K -49K) (Table 6) and the average rank is the 16th most heavily used fishery in the state (range 9-24) (Table 7). Ennis Lake averages 9,666 angler days per year (range 5.5K-17K) and the average rank is 72 in the state (range 51-100).

²⁰ Montana FWP. 2019. Montana Statewide Angling Pressure 2019 Summary Report. Montana Fish, Wildlife & Parks, Helena.

²¹ Grisak, G., A. Strainer and B. Tribby. 2012. An Evaluation of Walleye in the Missouri River between Holter Dam and Great Falls, Montana. PPL-Montana MOTAC projects 771-09, 771-10, 759-11, 771-11 and Fisheries Bureau Federal Aid Job Progress Report Federal Aid Project Number F-113-R9, R10, R11, R12 Montana Statewide Fisheries Management.

The Madison River - Sec 1 (Lower Madison) is a 40.3 mile reach of river from Three Forks upstream to Ennis Dam. Since the issuance of the license, this section averages about 51,000 angler days per year (range 39K-68K) and the average rank is number 13 (range 9-30). Section 2 (Upper Madison) is a 52.2 mile reach from the mouth of the river at Ennis Lake upstream to Hebgen Dam. This section averages about 137,000 angler days per year (range 86K-212K) and the average rank is number 2 (range 1-4). It ranked as the number one fishery for 5 of 10 survey years (Table 2). The Madison River is the highest economically producing fishery in the state due to a higher than normal use by non-resident anglers and the higher than usual expenditures by non-resident anglers over resident anglers. According to Lewis (2020)²², in 2020, Montana resident river/stream anglers spent \$91.73 per day compared to non-resident river/stream anglers who spent \$710.79 per day. On average non-residents represent 42% of the anglers using sec 1, whereas they represent 75% of the users in sec 2.

Combined, these four fisheries represented over 336,000 angler days in 2020, which is about 11% of the total statewide angling pressure (Table 1). Of the four Madison fisheries MFWP provides estimates for, the Upper Madison, Ennis Lake, and Lower Madison are all supported by flows out of Hebgen, even when Hebgen is drafted below the summer elevation. These three sections below Hebgen Reservoir total about 287,000 angler days, or 85% of the use in the Madison River basin. Recreation on Hebgen Reservoir amounts to 15% of the total angler days.

Table 1: Montana FWP Angler Pressure Estimates for 2001-2020.

	Angler days			
	Lower Madison River (Sec 1)	Upper Madison River (Sec 2)	Hebgen Lake	Ennis Lake
2001	46432	86932	36,862	5,574
2003	44,975	115,342	49,612	9,026
2005	51,737	116,345	44,919	6,022
2007	41,307	106,330	24,742	8,089
2009	53,429	120,910	43,134	15,844
2011	39,719	88,254	38,699	9,211
2013	41,132	134,433	39,864	10,682
2015	51,462	153,932	34,971	17,046
2017	61,641	207,334	43,192	7,819
2019	60,129	172,919	36,436	10,224
2020*	68,474	212,050	48,774	6,794
Average	50,949	137,707	40,110	9,666
*Provisional data				

*2020 estimated statewide angler days were 3,129,595 (Lewis 2020).

²² Lewis, M. 2020. Statewide Estimates of Resident and Nonresident Hunter & Angler Trip Related Expenditures in Montana (2020). HD Program Research Summary No. 48. Montana fish, wildlife & Parks, Helena.

Table 2: Montana FWP Statewide Rank of Select Waters for 2001-2020.

Statewide Rank				
	Lower Madison River (Sec 1)	Upper Madison River (Sec 2)	Hebgen Lake	Ennis Lake
2001	11	4	15	95
2003	12	1	9	68
2005	9	1	12	100
2007	11	1	24	64
2009	11	2	13	51
2011	30	4	14	67
2013	17	3	20	77
2015	10	2	22	46
2017	9	1	13	83
2019	8	1	20	69
2020*	NA	NA	NA	NA
Ave	13	2	16	72
*Provisional data				

**Appendix II – NorthWestern’s Public Notifications of Drought
Conditions in 2021**

Spring 2021 Madison Flushing Flow Meetings

From: [Tollefson, Jordan](#)
To: [Welch, Andrew](#)
Subject: FW: Madison River Flushing Flow Meeting
Date: Thursday, January 20, 2022 5:09:00 PM

From: Tollefson, Jordan
Sent: Friday, April 02, 2021 9:04 AM
To: Welch, Andrew ; Hanson, Jonathan (Jon) ; Stagnoli, Robert "Jake" ; Benski, Chris ; Sullivan, Mary Gail ; Chaffin, Jake - FS ; Chris Boone (ctboone@blm.gov) ; 'Skaar, Donald' ; Travis Lohrenz ; 'Travis Horton' ; 'James Boyd' ; Storrar, Keenan ; Stringer, Allison - FS ; 'Jaeger, Matt' ; 'Duncan, Mike'
Subject: RE: Madison River Flushing Flow Meeting

Thank you everyone for filling out the poll. It looks like the overwhelming favorite meeting time is **April 14th at 1:30 pm**, so I will be sending out a calendar invite shortly. I scheduled a little extra time for the meeting this year so that we can talk about the sediment transport study on the Madison River that will be starting up this spring.

Jordan

From: Tollefson, Jordan
Sent: Monday, March 29, 2021 10:29 AM
To: Welch, Andrew <Andrew.Welch@northwestern.com>; Hanson, Jonathan (Jon) <Jon.Hanson@northwestern.com>; Stagnoli, Robert "Jake" <Robert.Stagnoli@northwestern.com>; Benski, Chris <Chris.Benski@northwestern.com>; Sullivan, Mary Gail <MaryGail.Sullivan@northwestern.com>; Chaffin, Jake - FS <jakechaffin@fs.fed.us>; Chris Boone (ctboone@blm.gov) <ctboone@blm.gov>; 'Skaar, Donald' <dskaar@mt.gov>; Travis Lohrenz <tlohrenz@mt.gov>; Travis Horton <thorton@mt.gov>; James Boyd <james_boyd@fws.gov>; Storrar, Keenan <Keenan.Storrar@mt.gov>; Stringer, Allison - FS <astringer@fs.fed.us>; 'Jaeger, Matt' <mattjaeger@mt.gov>; 'Duncan, Mike' <Mike.Duncan@mt.gov>
Subject: Madison River Flushing Flow Meeting

Hello Madison River Partners,

I would like to put a date on the calendar for our first Madison River flushing flow meeting for 2021, and I'm looking at sometime between April 13th and 15th. Please fill out the Doodle poll using the link below and let me know what your availability is to meet. Currently, we're sitting right around 85% snowpack in the basin, so we might need a little bit of a late season push to get things back up to average.

https://doodle.com/poll/gnfvaq9bnrzqxr2?utm_source=poll&utm_medium=link

Jordan

Jordan Tollefson

Hydro Compliance Professional

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Helena, MT 59601





Madison River Flushing Flow Program

April 14, 2021 – 2021 Madison Flushing Flow Meeting

- To utilize flushing flows to protect and enhance spawning gravel quality in the upper and lower Madison River for salmonids
 - Target criterion was established at 10% fines < 0.84 mm in the upper river (Hebgen Dam to Ennis Lake)
 - Management goal established at 15% fines < 0.84 mm in the lower river (below Madison Dam)



- Storage content in Hegben reservoir plus runoff forecast is sufficient volume of water to provide flush
- Flushing flows would persist for a minimum of 3-days
- Decision to flush is made by NWE in consultation with agencies annually

- Flows must be kept below 3,500 cfs at the Kirby Ranch stream gage to reduce erosion of the Quake Lake outlet
- Hebgen reservoir must be refilled by early summer for recreation and temperature pulse flows
- Flows must not be changed by more than 10% daily
- Minimum flows must be maintained throughout the year

NorthWestern[®]
Energy
Delivering a Bright Future

April 2021 Hebgen Operations

NRCS Volume Runoff Forecast April 1st, 2021

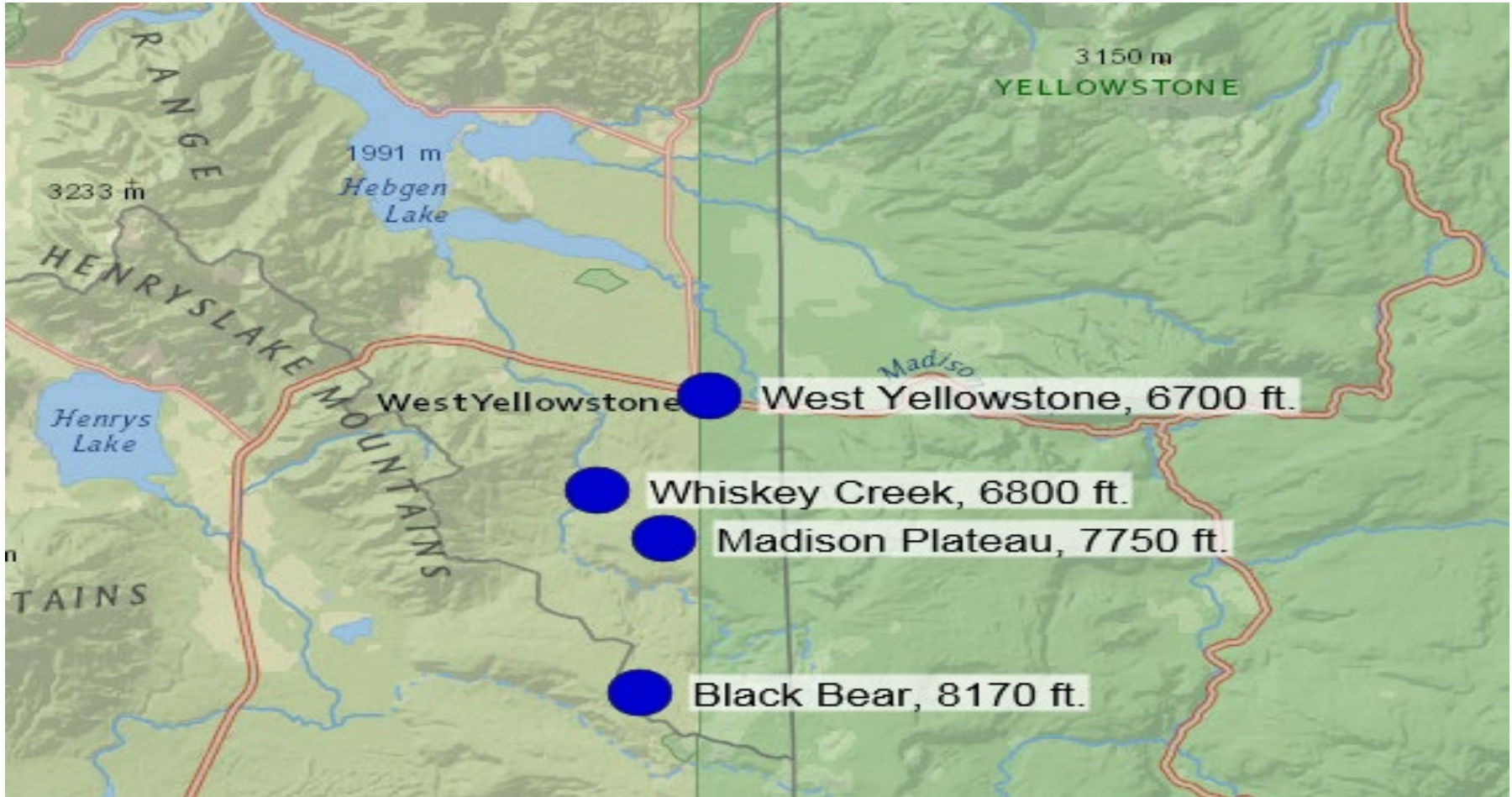
MADISON RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Hebgen Lake Inflow ²								
	APR-JUL	240	285	315	85%	345	390	370
	APR-SEP	315	370	405	86%	440	495	470
Ennis Lake Inflow ²								
	APR-JUL	395	475	530	85%	585	665	625
	APR-SEP	500	600	665	86%	730	830	775

1) 90% and 10% exceedance probabilities are actually 95% and 5%

2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

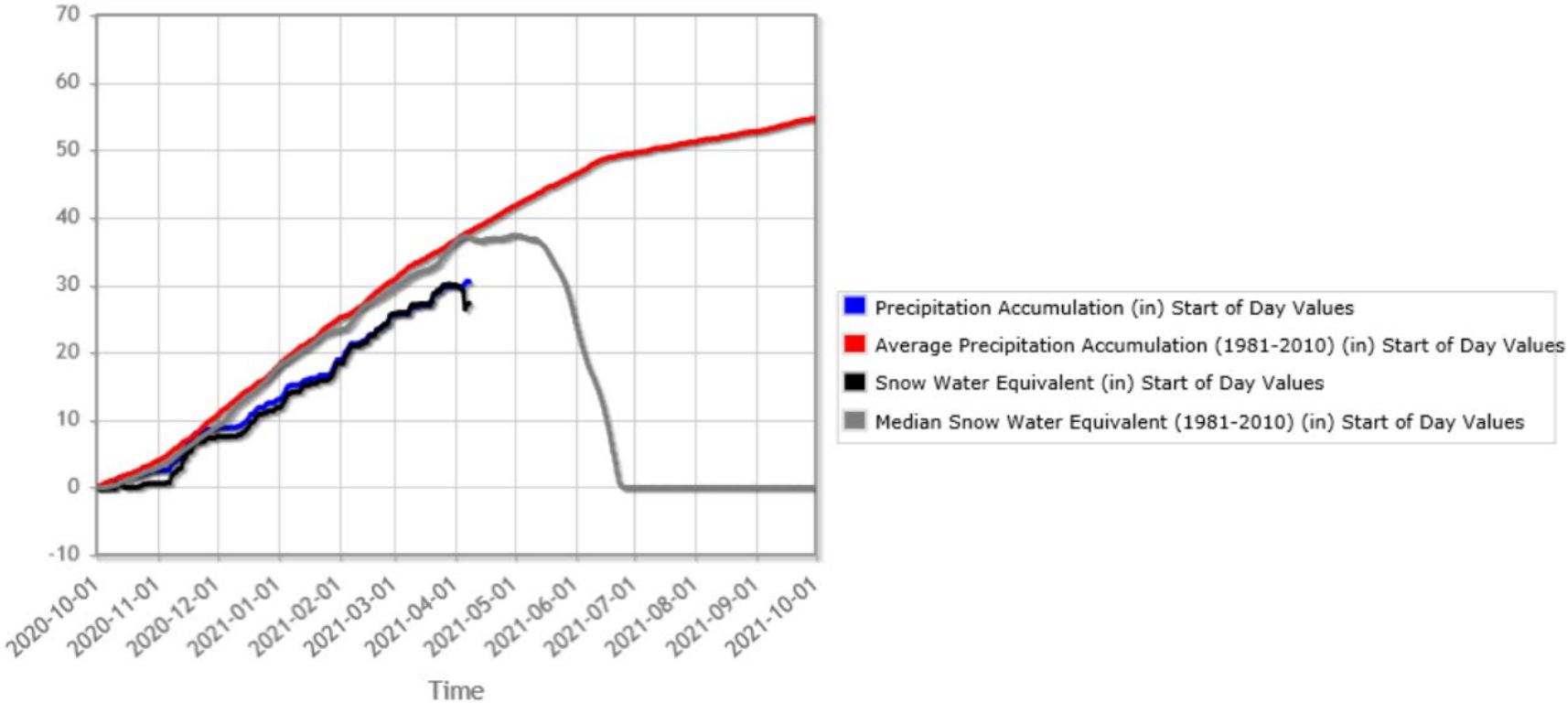
Snotel Sites Above Hebgen





Black Bear Snotel

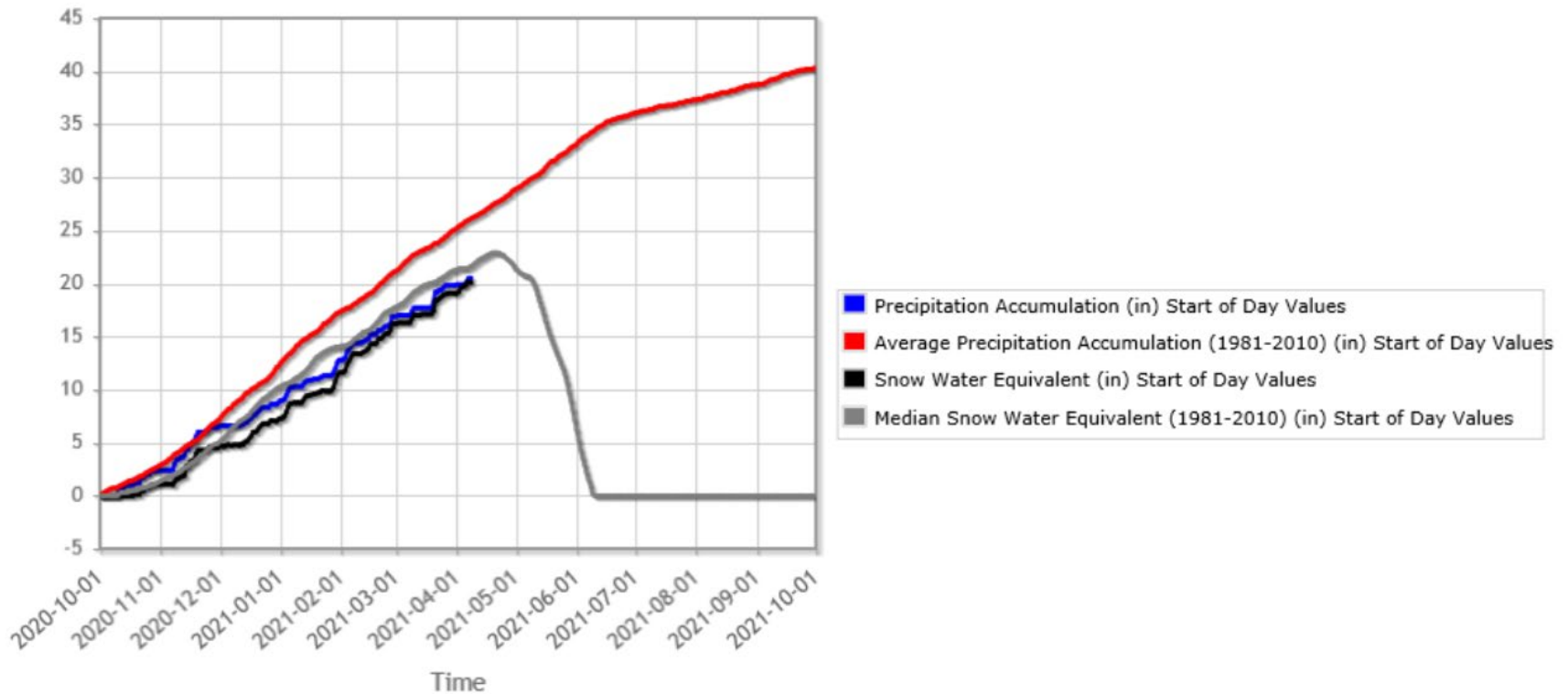
Black Bear (347) Montana SNOTEL Site - 8170 ft Reporting Frequency: Daily; Date Range: 2020-10-01 to 2021-09-30





Madison Plateau Snotel

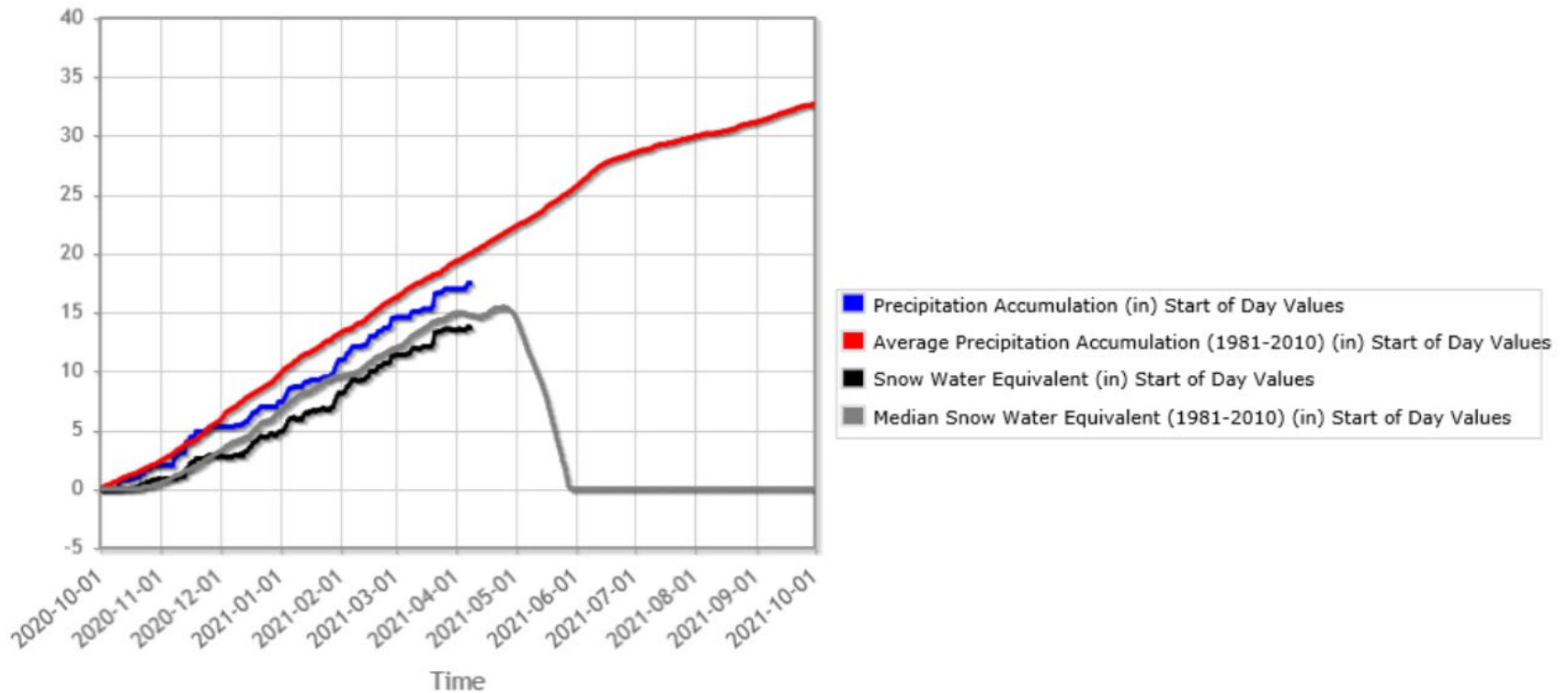
Madison Plateau (609) Montana SNOTEL Site - 7750 ft Reporting Frequency: Daily; Date Range: 2020-10-01 to 2021-09-30





Whiskey Creek Snotel

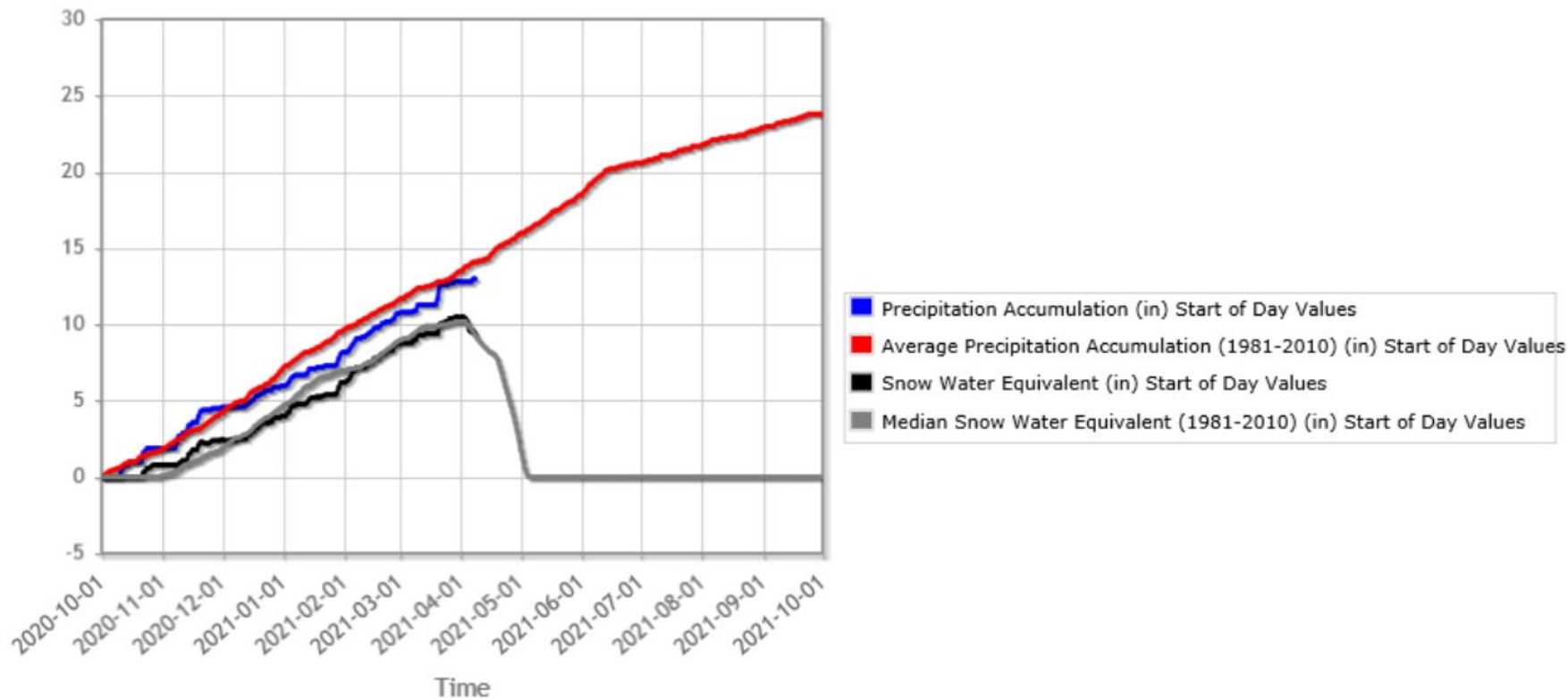
Whiskey Creek (858) Montana SNOTEL Site - 6800 ft Reporting Frequency: Daily; Date Range: 2020-10-01 to 2021-09-30





West Yellowstone Snotel

West Yellowstone (924) Montana SNOTEL Site - 6700 ft Reporting Frequency: Daily; Date Range: 2020-10-01 to 2021-09





Flushing Flow Calculation

	Flushing Flow Calculations																		
	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet
Hebgen Storage March 31:	288,109	308,160	311,159	295,200	301,309	298,800	321,390	304,383	283,745	300,000	284,182	308,937	291,709	283,309	282,763	269,673	297,491	265,603	287,782
April/July 1 Runoff Forecast:	315,000	360,000	390,000	410,000	400,000	330,000	235,000	410,000	325,000	380,000	435,000	250,000	365,000	430,000	310,000	420,000	315,000	390,000	265,000
Total Available Volume:	603,109	668,160	701,159	705,200	701,309	628,800	556,390	714,383	608,745	680,000	719,182	558,937	656,709	713,309	592,763	689,673	612,491	655,603	552,782
Trigger Volume for Flush:	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000
Volume under (-) or over (+):	(79,891)	(14,840)	18,159	22,200	18,309	(54,200)	(126,610)	31,383	(74,255)	(3,000)	36,182	(124,063)	(26,291)	30,309	(90,237)	6,673	(70,509)	(27,397)	(130,218)
		2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
		acre-f	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet
Hebgen Storage April 30:		306,494	293,058	282,873	305,494	311,048	335,516	308,937	283,745	314,269	267,102	326,505	281,782	284,073	292,036	275,456	301,854	271,815	299,018
May 1 Runoff Forecast:		280,000	330,000	355,000	355,000	225,000	154,000	360,000	280,000	300,000	440,000	220,000	340,000	395,000	245,000	345,000	270,000	270,000	260,000
Total Available Volume:		586,494	623,058	637,873	660,494	536,048	489,516	668,937	563,745	614,269	707,102	546,505	621,782	679,073	537,036	620,456	571,854	541,815	559,018
Trigger Volume for Flush:		564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000
Volume under (-) or over (+):		22,494	59,058	73,873	96,494	(27,952)	(74,484)	104,937	(255)	50,269	143,102	(17,495)	57,782	115,073	(26,964)	56,456	7,854	(22,185)	(4,982)
NWE flush (Yes/No)		Yes	NO	YES	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	YES	NO	NO	NO



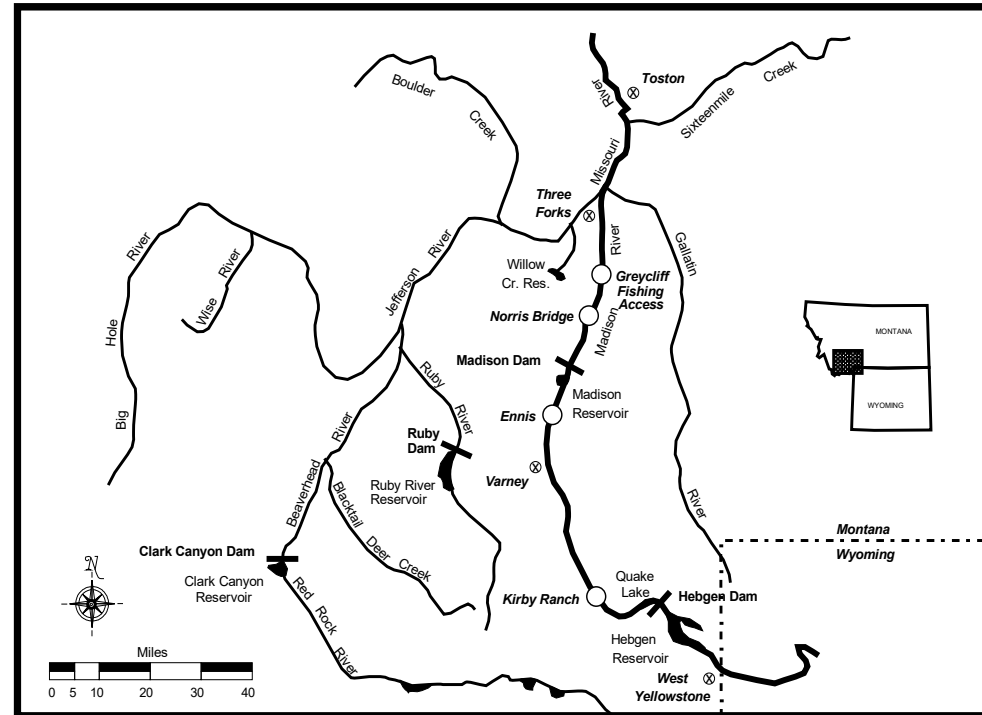
- Draft the Hebgen Reservoir from September through March 31st to a level no lower than 6524.0ft depending on conditions.
- Fill Hebgen Reservoir to 6530.26ft by June 20th & maintain the elevation between 6530.26ft to 6534.87ft until October 1st. Attempt to keep the elevation near full pool from July through Sept 1st.
- Outflow from Hebgen Reservoir no less than 150cfs. Outflow from Madison Dam no less than 1100cfs. Maintain flows as measured at the USGS Kirby gage between 600cfs and 3500cfs.
- Flow changes from Hebgen Reservoir limited to 10% of previous day's flow.
- Provide flushing flows (3 continuous days of 3500cfs flow at Kirby) below Hebgen Reservoir if conditions dictate based upon the May volume runoff forecast and the Hebgen Reservoir content.
- Provide flows from Hebgen for pulse flows in the Madison river below Ennis lake as required



Jake Stagnoli
Resource Coordinator
Northwestern Energy
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Flushing Flow Monitoring Requirements

- Substrate core samples, spring and fall redd counts, and macroinvertebrates are collected at four locations annually
- Two sites were added for sediment core analysis for 2020



Sediment Core Summary

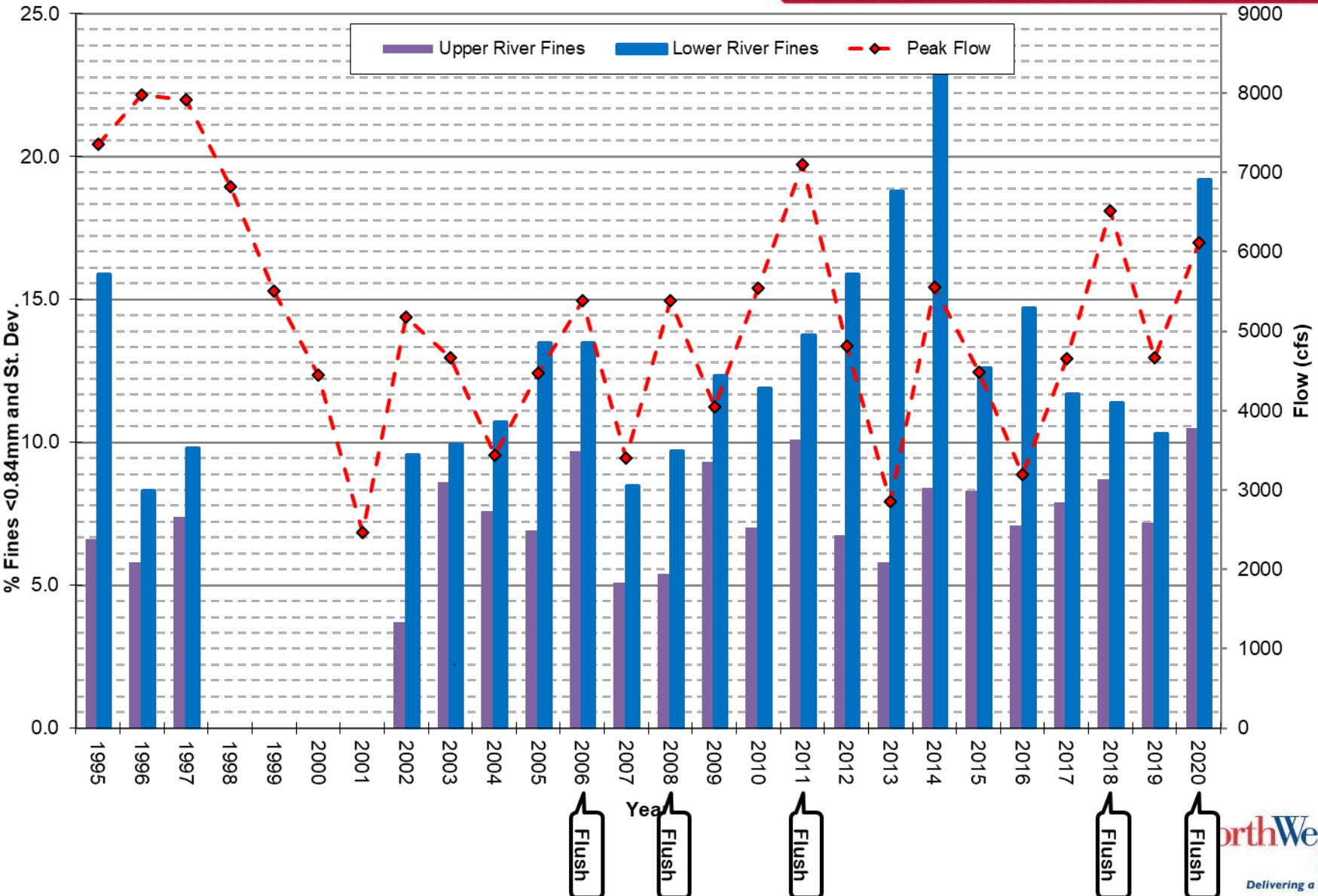
NWE Flushing Flow Program Sediment Core Particle Analysis Results

Year	Upper SD	Lower SD	Upper Fines	Lower Fines	NWE Flush	Peak Flow (McAllister)
1995	4.4	5.4	6.6	15.9		7360
1996	1.2	4.5	5.8	8.3		7980
1997	3.9	4.5	7.4	9.8		7910
1998						6820
1999						5500
2000						4450
2001						2460
2002	1.5	4.1	3.7	9.6	No	5180
2003	3.2	5.7	8.6	10.0	No	4670
2004	2.7	5.2	7.6	10.7	No	3440
2005	4.1	8.0	6.9	13.5	No	4470
2006	3.7	5.0	9.7	13.5	Yes	5390
2007	2.5	4.0	5.1	8.5	No	3400
2008	2.9	4.8	5.4	9.7	Yes	5390
2009	3.2	11.7	9.3	12.4	No	4050
2010	5.3	5.7	7.0	11.9	No	5540
2011	3.4	8.2	10.1	13.8	Yes	7100
2012	7.2	5.4	6.8	15.9	No	4810
2013	2.1	18.7	5.8	18.8	No	2850
2014	3.4	13.7	8.4	22.9	No	5560
2015	6.1	8.3	8.3	12.6	No	4490
2016	4.0	10.2	7.1	14.7	No	3190
2017	2.4	5.7	7.9	11.7	No	4660
2018	2.6	4.8	8.7	11.4	Yes	6510
2019	4.5	11.3	7.2	10.3	No	4670
2020	4.5	6.5	10.5	19.2	Yes	6110

- After the 2020 flushing flow event, % fine sediment increased in both the upper and lower river sites
- No apparent trend with % fine sediment concentrations following a flushing flow event

	Upper SD	Lower SD	Upper Fines	Lower Fines
mean non-flush	3.7	8.4	7.1	13.1
mean flush	3.4	5.9	8.9	13.5

Sediment Core Summary



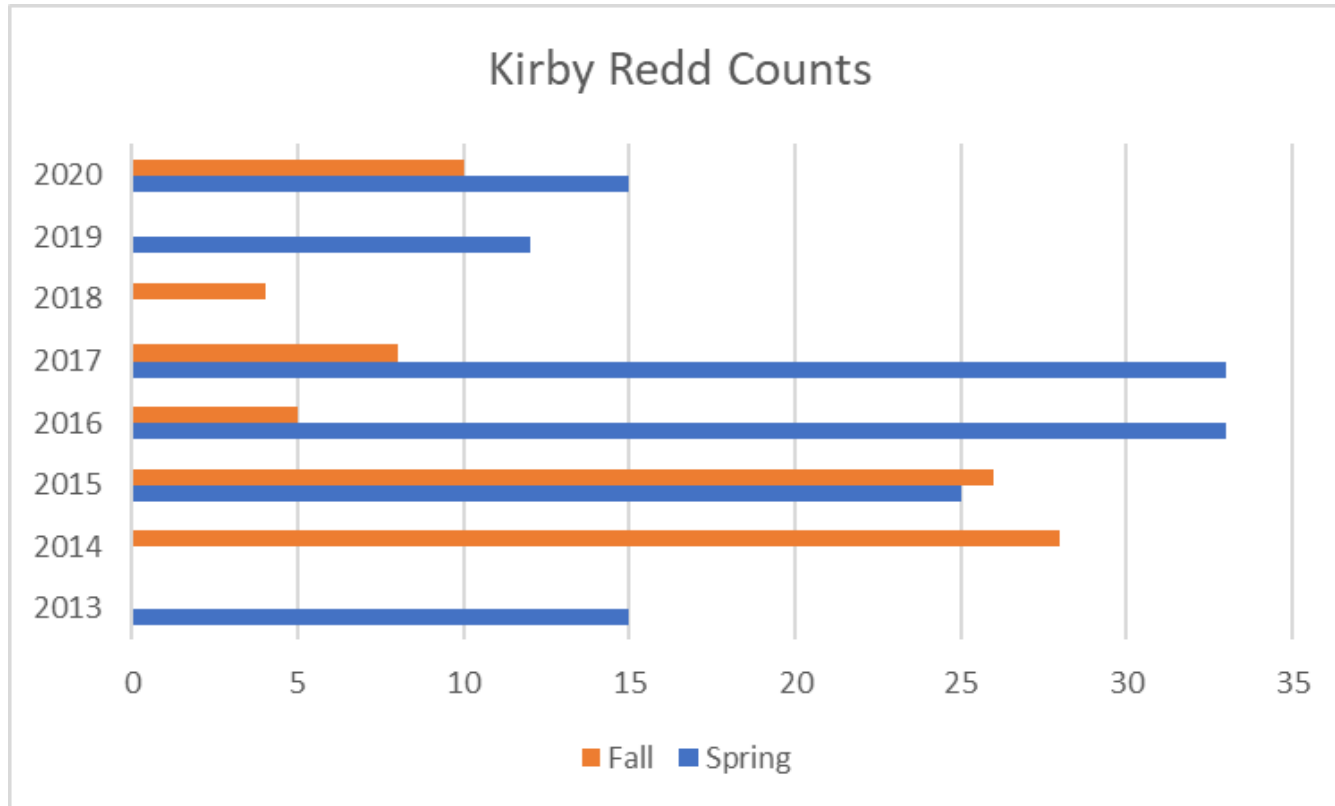
2020 Additional Sediment Monitoring Sites

		2020 Madison Core Results								
		Burnt Tree								
	Sample #	1	2	3	4	5	Stand Dev	Mean	Median	
	Sieve Size									
% Finer	6"	100.0	100.0	100.0	100.0	100.0	0.00	100.00	100.00	
	5"	61.8	100.0	100.0	100.0	100.0	17.08	92.36	100.00	
	4"	61.8	100.0	100.0	100.0	100.0	17.08	92.36	100.00	
	2.5"	54.4	100.0	100.0	86.0	100.0	19.78	88.08	100.00	
	1.25"	49.0	79.0	83.8	61.9	69.3	13.86	68.60	69.30	
	0.625"	38.7	48.5	52.4	39.3	40.8	6.15	43.94	40.80	
	0.375"	29.7	32.3	38.6	28.3	29.7	4.11	31.72	29.70	
	0.3125"	27.0	28.2	35.5	25.4	27.1	3.96	28.64	27.10	
	0.25"	24.2	24.2	31.9	22.7	24.1	3.68	25.42	24.20	
	#4	21.3	19.9	28.0	20.1	21.3	3.35	22.12	21.30	
	#5	19.9	18.1	25.6	19.0	20.4	2.93	20.60	19.90	
	#10	15.7	12.1	19.1	15.7	16.1	2.48	15.74	15.70	
	#20	10.3	5.9	12.6	10.4	8.5	2.50	9.54	10.30	
	#35	5.9	4.0	9.3	6.8	4.3	2.15	6.06	5.90	
	#230	0.0	0.1	0.2	0.5	0.1	0.19	0.18	0.10	
Grain Sizes (mm)	D _{15.9}	2.0604	3.1573	1.3227	2.0922	1.9474	0.6606	2.1160	2.0604	
	D ₂₅	6.8191	6.6669	3.8006	7.6928	6.7949	1.4850	6.3549	6.7949	
	D ₅₀	47.7521	16.4883	14.8793	22.5697	20.4978	13.3896	24.4374	20.4978	
	D ₇₅	137.5672	28.8019	25.8618	45.8175	36.0418	46.8943	54.8180	36.0418	
	D _{84.1}	143.1553	36.4671	32.003	59.8311	44.2159	45.97	63.13	44.22	
Geom. Mean Diam. (mm)	D _g	17.174	10.730	6.506	11.188	9.279	3.917	10.975	10.730	
Sorting Coeff. (mm)	S _o	4.492	2.078	2.609	2.440	2.303	0.974	2.784	2.440	
Fredle Index (mm)	F _i	3.824	5.162	2.494	4.581	4.029	0.998	4.018	4.029	
% Finer	6.4 mm	24.3	24.3	32.0	22.8	24.2	3.7	25.5	24.3	
	0.84mm	10.2	5.8	12.6	10.4	8.4	2.5	9.5	10.2	



2020 Additional Sediment Monitoring Sites

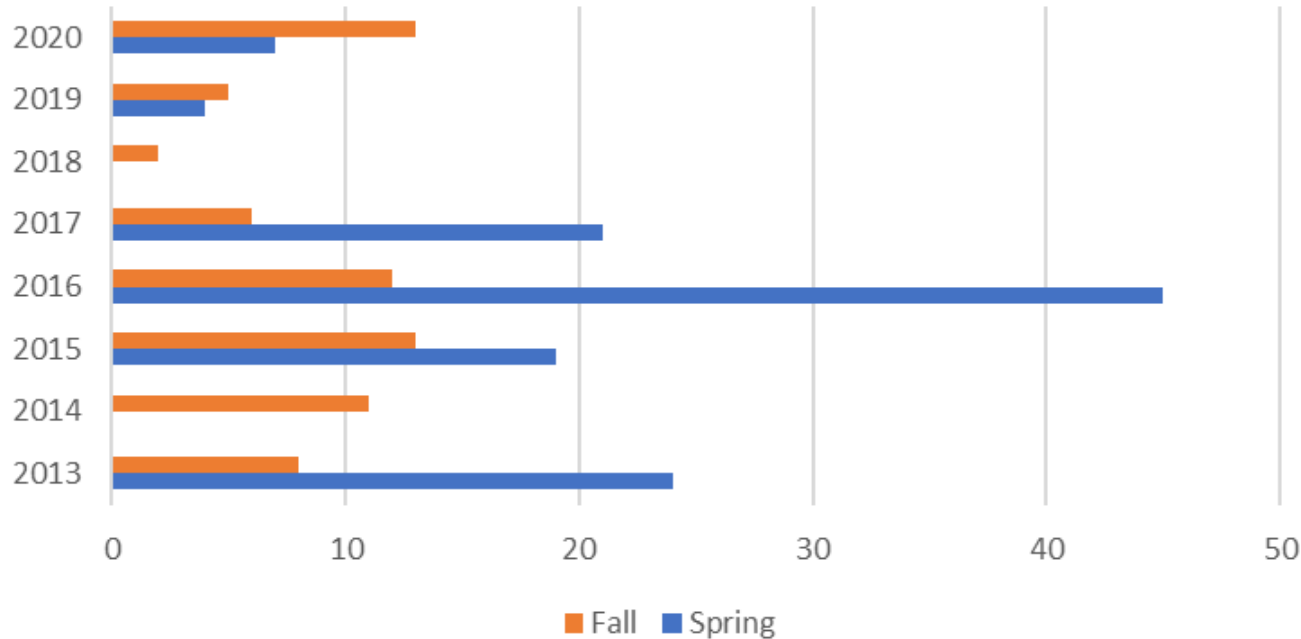
		2020 Madison Core Results							
		Channels Ranch							
	Sample #	1	2	3	4	5	Stand Dev	Mean	Median
	Sieve Size								
% Finer	6"	100.0	100.0	100.0	100.0	100.0	0.00	100.00	100.00
	5"	100.0	79.1	100.0	69.8	100.0	14.38	89.78	100.00
	4"	100.0	79.1	100.0	69.8	80.8	13.50	85.94	80.80
	2.5"	91.4	76.3	91.4	58.9	76.1	13.48	78.82	76.30
	1.25"	75.1	51.8	68.6	49.7	59.5	10.85	60.94	59.50
	0.625"	46.1	36.0	43.8	37.9	37.7	4.38	40.30	37.90
	0.375"	28.3	26.4	30.8	27.9	28.9	1.60	28.46	28.30
	0.3125"	25.0	23.4	27.7	25.2	26.8	1.67	25.62	25.20
	0.25"	21.7	20.5	26.1	22.3	24.3	2.22	22.98	22.30
	#4	18.3	17.5	21.4	19.6	21.7	1.85	19.70	19.60
	#5	16.9	15.9	20.1	18.2	20.7	2.04	18.36	18.20
	#10	12.7	11.6	16.0	14.2	15.8	1.92	14.06	14.20
	#20	7.5	5.7	9.1	8.8	7.6	1.34	7.74	7.60
	#35	3.8	2.2	4.5	5.1	5.5	1.30	4.22	4.50
	#230	0.0	0.0	0.1	0.1	0.3	0.12	0.10	0.10
Grain Sizes (mm)	D _{15.9}	3.4494	4.0018	1.9821	2.7502	2.0153	0.8868	2.8398	2.7502
	D ₂₅	7.9333	8.7755	5.8734	7.8254	6.7433	1.1308	7.4302	7.8254
	D ₅₀	17.3518	29.9927	19.1850	33.0349	24.2040	6.7477	24.7537	24.2040
	D ₇₅	31.6960	60.5775	37.6701	132.9497	60.1538	40.3594	64.6094	60.1538
	D _{84.1}	44.0124	134.811	49.0802	140.629	106.7517	46.13	95.06	106.75
Geom. Mean Diam. (mm)	D _g	12.321	23.227	9.863	19.666	14.668	5.446	15.949	14.668
Sorting Coeff. (mm)	S _o	1.999	2.627	2.533	4.122	2.987	0.792	2.854	2.627
Fredle Index (mm)	F _i	6.164	8.840	3.895	4.771	4.911	1.925	5.716	4.911
% Finer	6.4 mm	21.8	20.6	26.2	22.4	24.4	2.2	23.1	22.4
	0.84mm	7.4	5.6	9.0	8.8	7.5	1.4	7.7	7.5



- Spring redd counts were higher than 2018 and 2019, but lower 2015-2017
- Fall redd counts have been improving since 2016, but not as high as 2014-2015



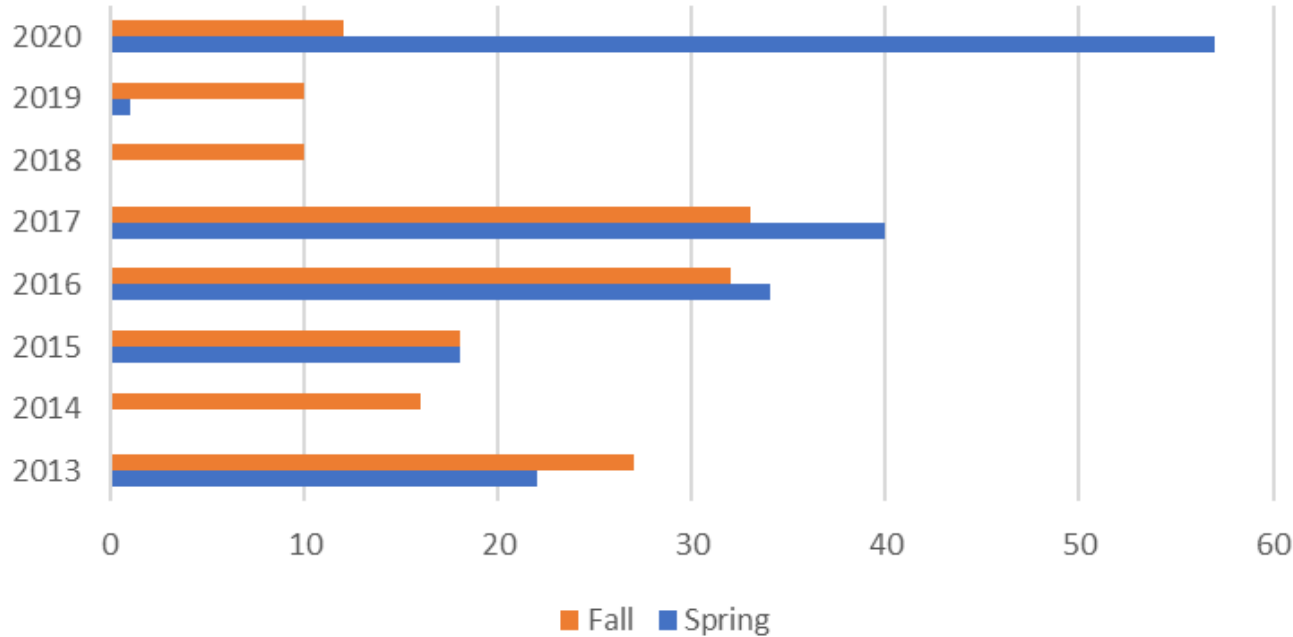
Ennis Redd Counts



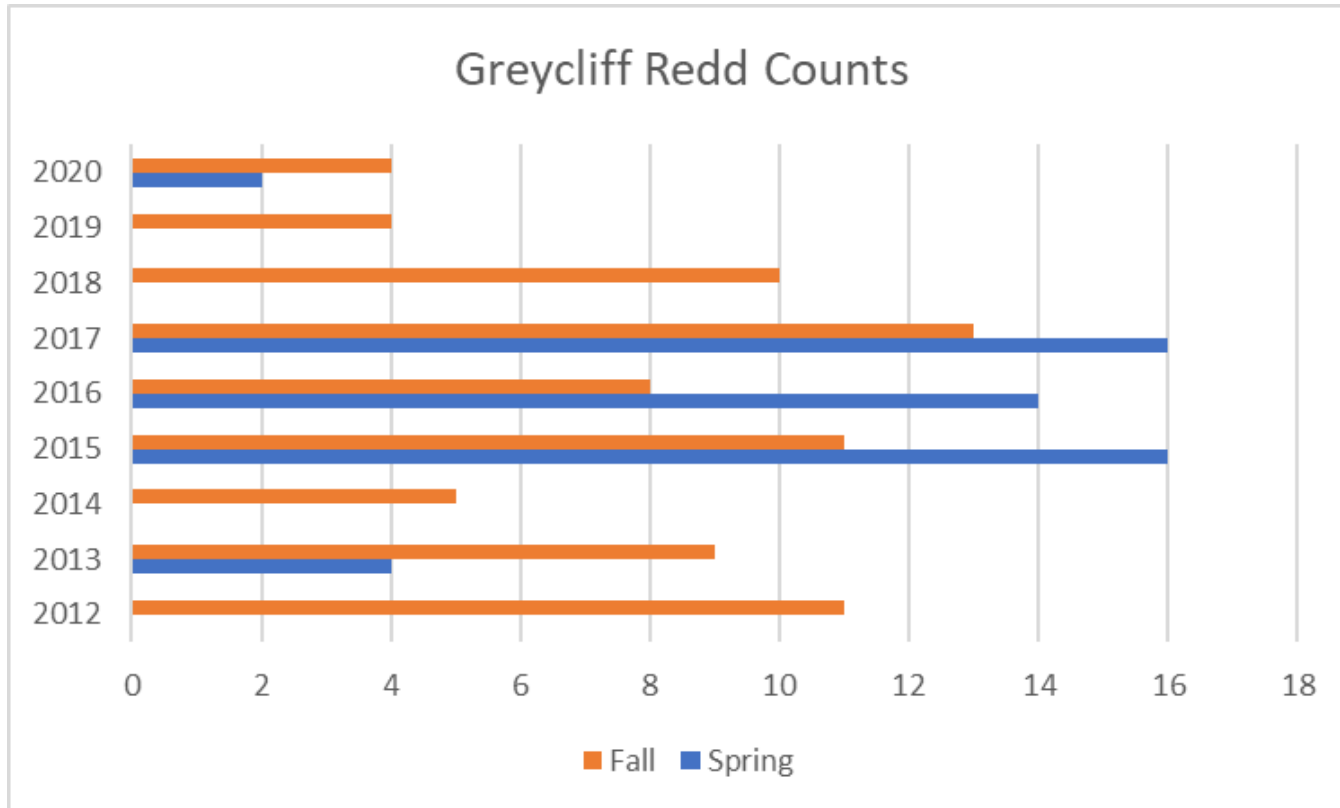
- Spring redd counts were higher than 2018 and 2019, but below average
- Fall redd counts have been improving and were highest since 2015



Norris Redd Counts



- Spring redd counts were highest since pre-2013
- Fall redd counts were below average but slightly improved from 2018-2019



- Spring redd counts are well below average
- Fall redd counts appear to be on a downward trend

Figure 1. Average Macroinvertebrate Density Estimates for the Madison & Missouri River sites for August 2020 and 2009-2019 (mean \pm 1 SD).

Macroinvertebrates

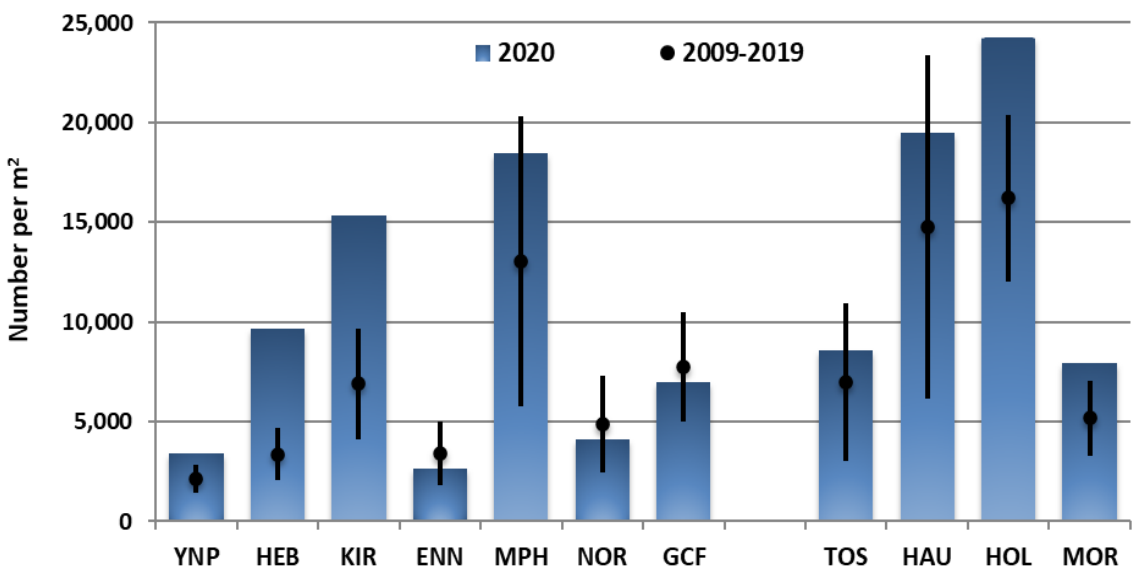


Figure 2. Mean macroinvertebrate taxa richness for Madison & Missouri River Sites for August 2020 and 2009 to 2019 (mean \pm 1 SD).

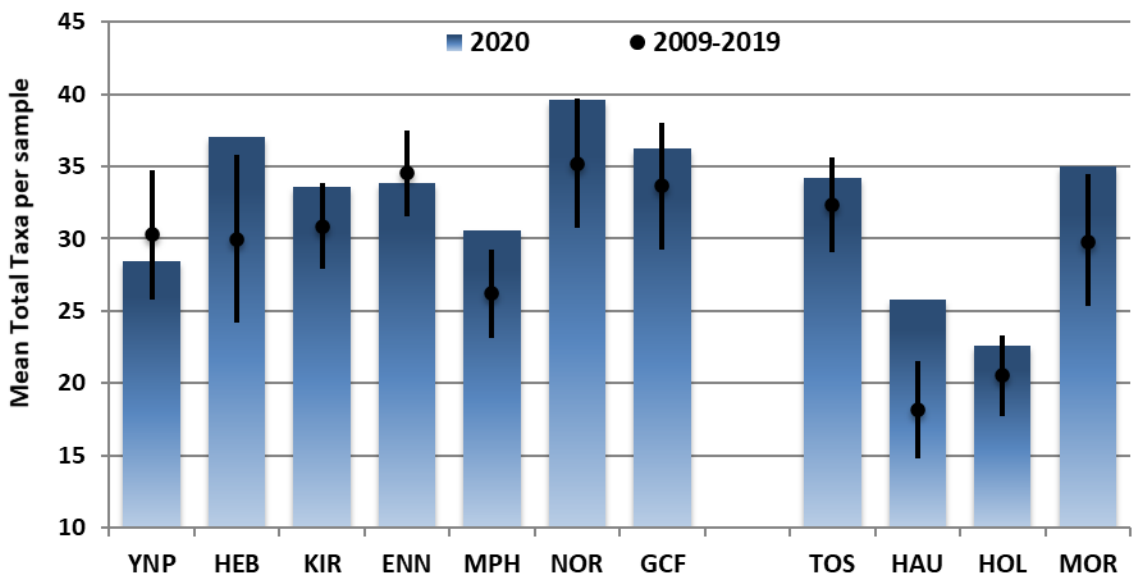


Figure 3. Mean number of EPT taxa for Madison & Missouri River Sites for August 2020 and 2009 to 2019 (mean \pm 1 SD).

Macroinvertebrates

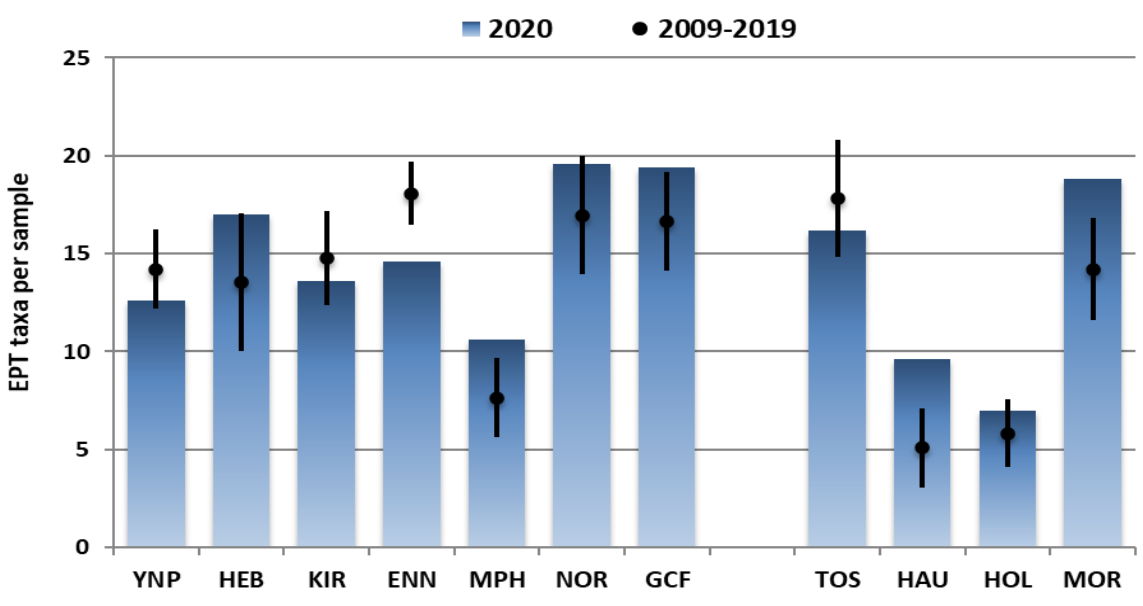


Figure 5. Relative % of EPT taxa for Madison & Missouri River Sites for August 2020 and 2009 to 2019 (mean \pm 1 SD).

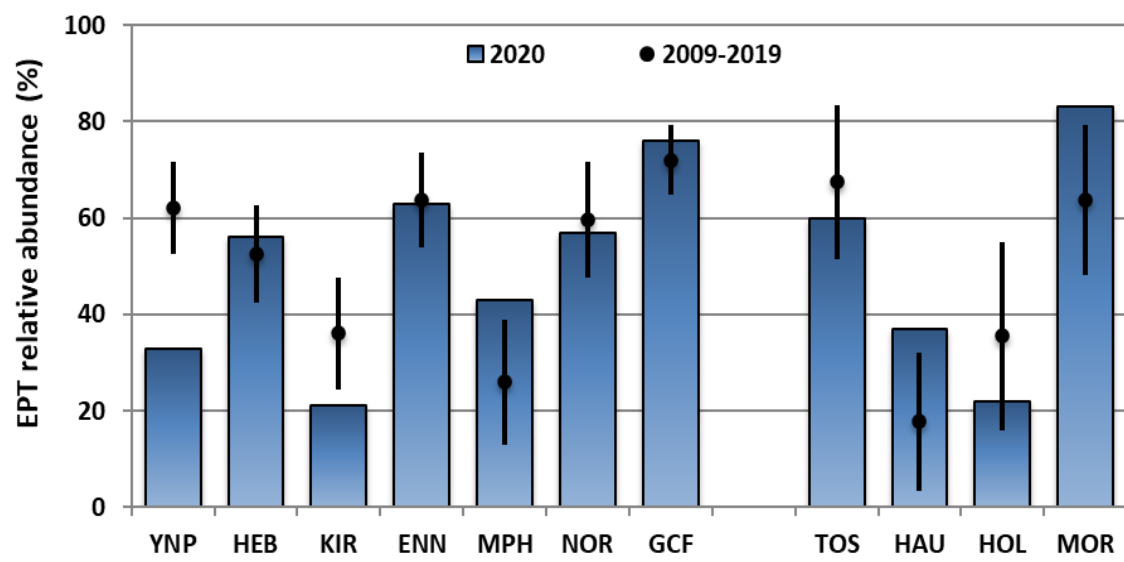
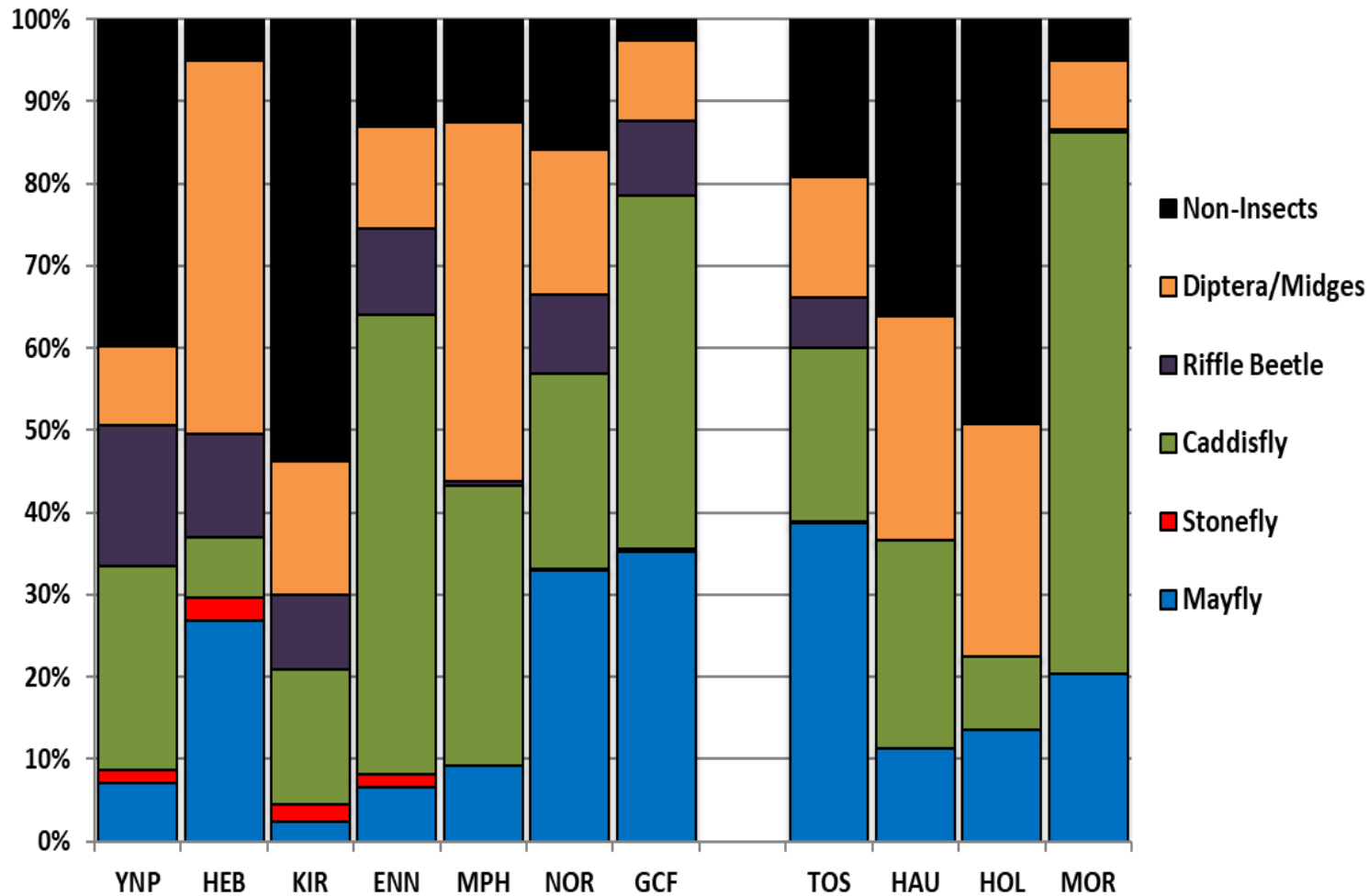


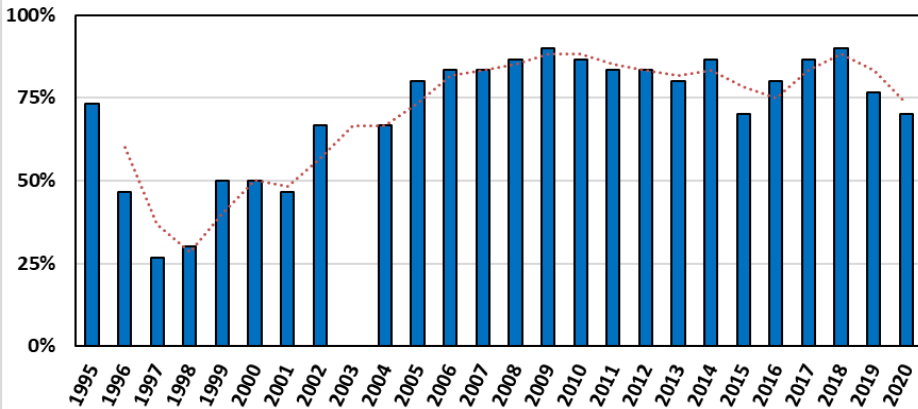


Figure 4. Relative abundance (%) of major macroinvertebrate groups at Madison/Missouri River sites, August 2020

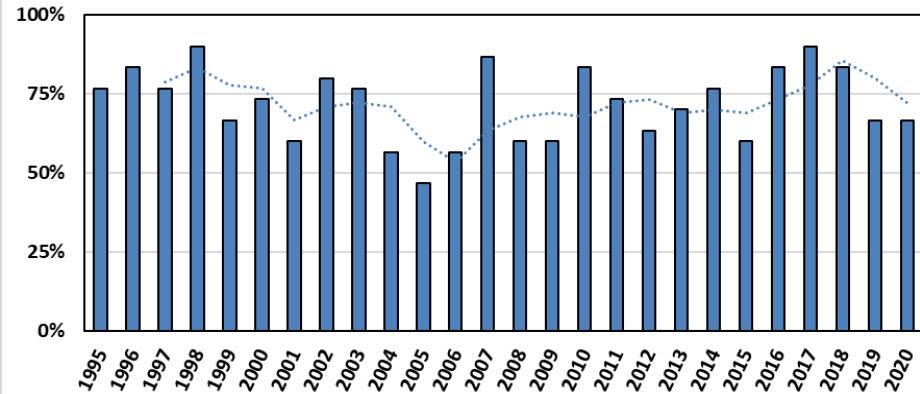


Upper River Macroinvertebrates

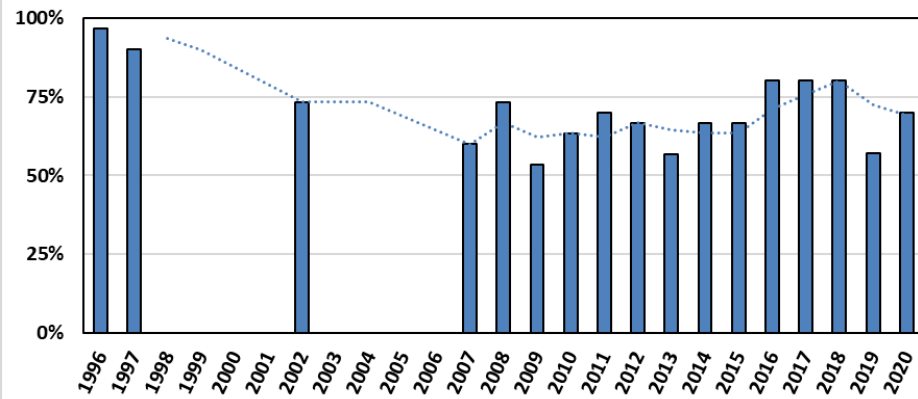
Bioassessment Scores for the Madison River in Yellowstone National Park from 1995-2020. Dotted line is moving average.



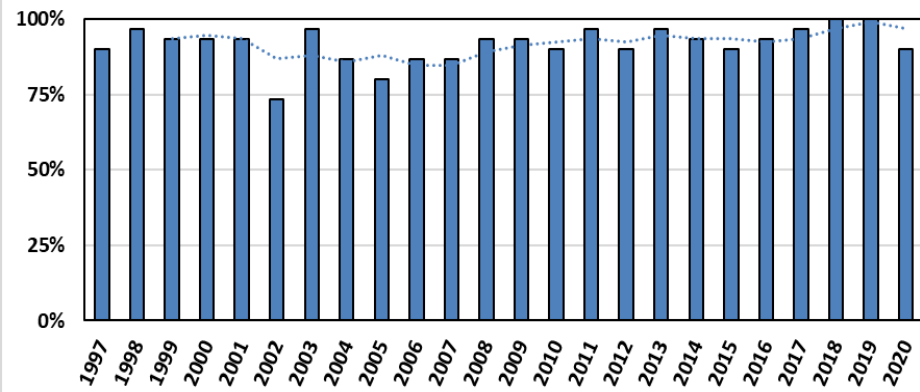
Bioassessment Scores for the Madison River below Hebgen Dam from 1995-2020.



Bioassessment Scores for the Madison River at Kirby Ranch from 1996-2020

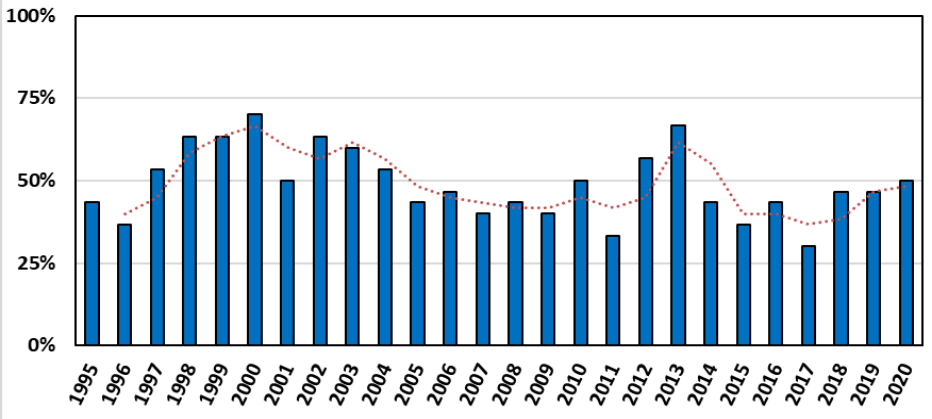


Bioassessment Scores for the Madison River at Ennis Campground from 1997-2020. Dotted line is the moving average.

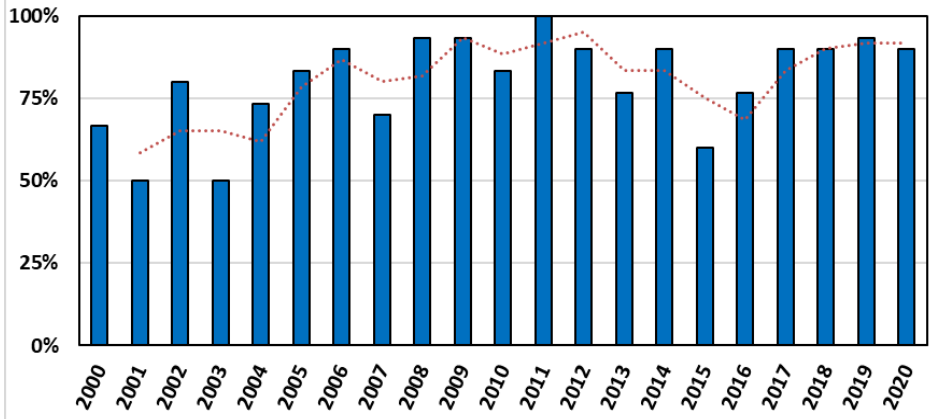


Lower River Macroinvertebrates

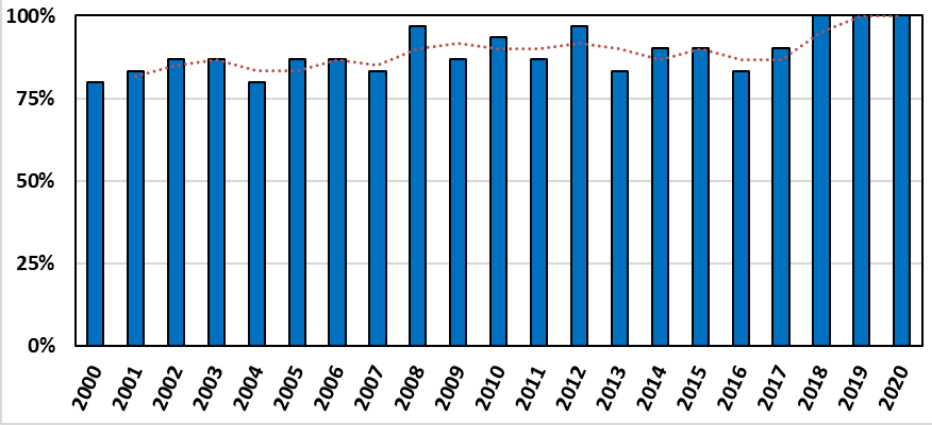
Bioassessment Scores for the Madison River below the Powerhouse (Ennis Reservoir) from 1995-2020



Bioassessment Scores calculated for the Madison River at Norris from 2000-2020



Bioassessment Scores for the Madison River at the Grey Cliff FAS from 2000-2020





- Purpose of this study is to:
 - Assess the current availability or potential supply of suitable spawning substrate
 - Mapping
 - Field Verification
 - Pebble Counts
 - Field Evaluation of Scour Elements
 - Evaluate sediment transport capacity and storage pattern at the reach-scale
 - Four monitoring reaches to align with FWP fisheries monitoring reaches
 - Survey the streambed in each reach
 - Evaluate sediment mobility
 - Develop shear stress rating curves
 - Evaluate the potential to increase the quantity of suitable habitat via flushing flows, alteration of channel morphology, and installation of disturbance-inducing restoration elements

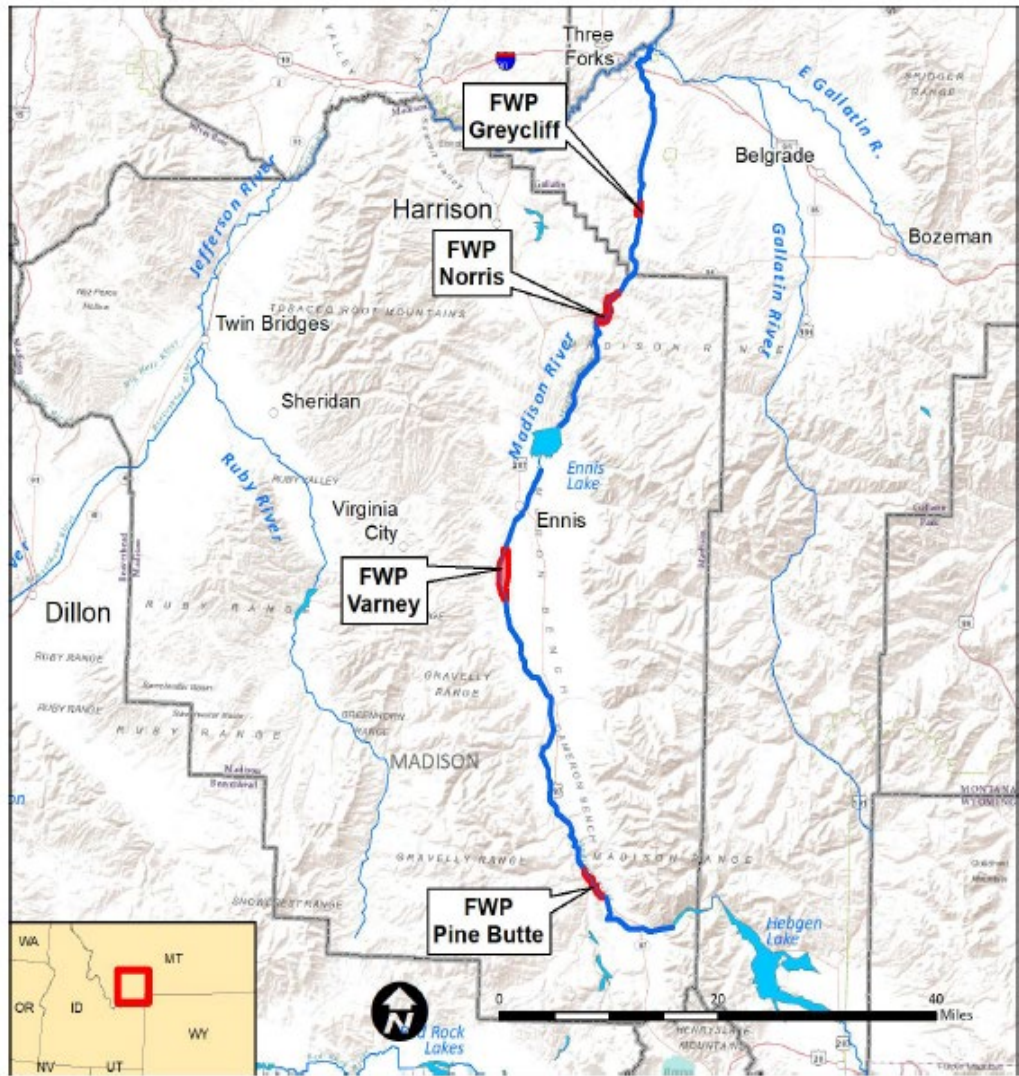


Figure 3-1. Project Study Reach Locations



Table 5-1 Proposed Project Schedule

Work Task	Start	Finish				
Task 1	Assess the current availability or potential supply of suitable spawning substrate in various reaches.					
Task 1.1	March 1, 2021	April 30, 2021				
Task 1.2	May 1, 2021	July 1, 2021				
Task 1.3	July 1, 2021	July 31, 2021				
Task 1.4	July 1, 2021	July 31, 2021				
Task 1.5	August 1, 2021	August 31, 2021				
Task 2	Evaluate how the current flow regime relates to reach-scale sediment transport capacity and storage patterns.					
Task 2.1	July 1, 2021	July 31, 2021				
Task 2.2	July 1, 2021	July 31, 2021				
Task 2.3	August 1, 2021	August 31, 2021				
Task 2.4	August 1, 2021	August 31, 2021				
Task 3	Evaluate the potential to increase the quantity of suitable spawning habitat via flushing flows, alteration of channel morphology, and installation of disturbance-inducing restoration elements.					
Task 3.1	September 1, 2021	October 15, 2021				
Task 3.2	September 1, 2021	October 15, 2021				
Task 3.3	September 1, 2021	October 15, 2021				
Task 4	Summarize Results					
Draft Report	August 1, 2021	November 1, 2021				
Final Report	November 15, 2021	December 1, 2021				



Due to the current water forecast, it is unlikely that we will meet the trigger values of Hebgen storage + runoff forecast to do a flushing flow this year, but we will still plan to have a follow-up meeting in early May to make a final decision on this once the May water forecast comes out.

Questions?

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May 2021 Hebgen Operations

NRCS Volume Runoff Forecast April 1st, 2020

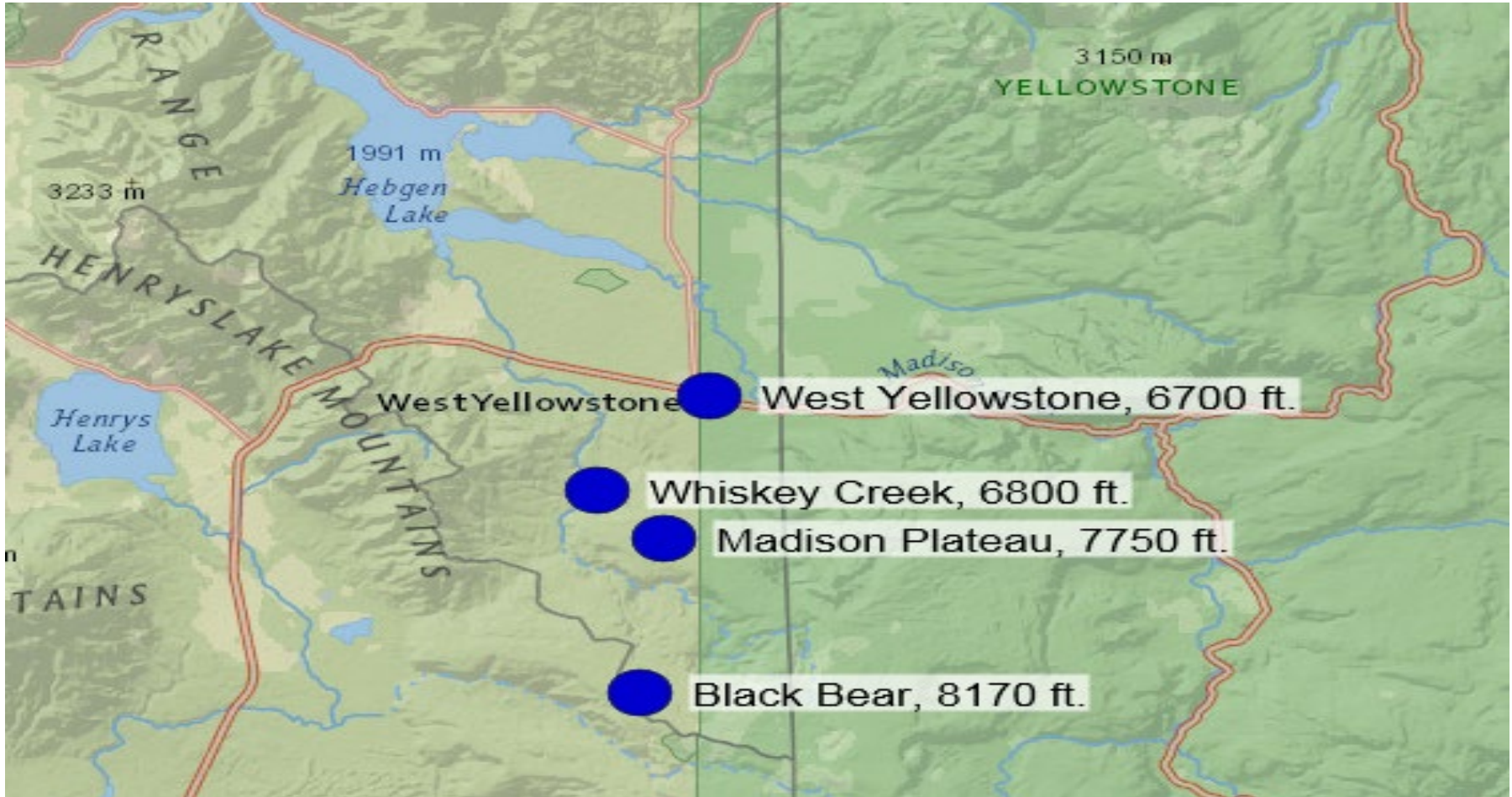
MADISON RIVER BASIN	Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
Hebgen Lake Inflow²								
	MAY-JUL	178	220	245	80%	270	310	305
	MAY-SEP	245	295	330	81%	365	415	405
Ennis Lake Inflow²								
	MAY-JUL	280	350	400	75%	450	520	530
	MAY-SEP	380	465	525	77%	585	670	680

1) 90% and 10% exceedance probabilities are actually 95% and 5%

2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions

3) Median value used in place of average

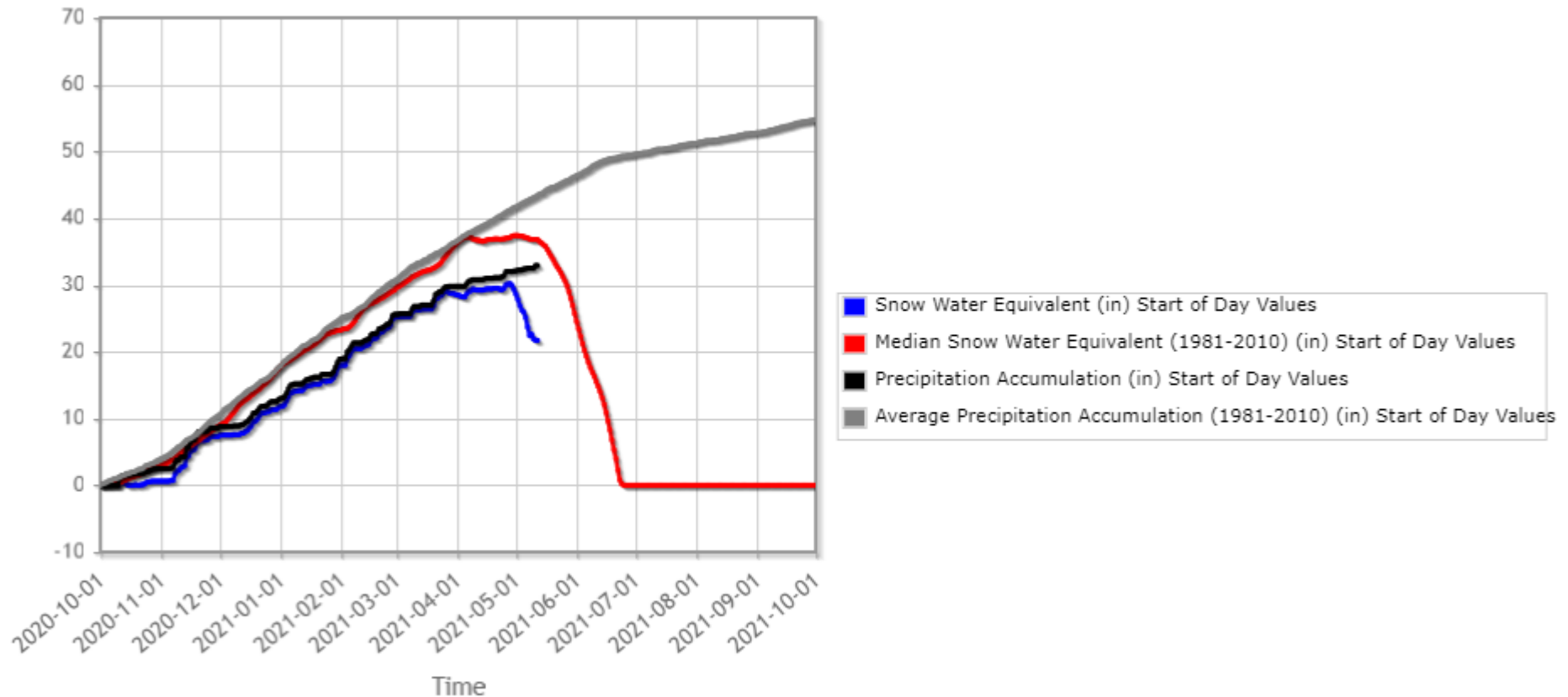
Snotel Sites Above Hebgen





Black Bear Snotel

Black Bear (347) Montana SNOTEL Site - 8170 ft Reporting Frequency: Daily; Date Range: 2020-10-01 to 2021-09-30

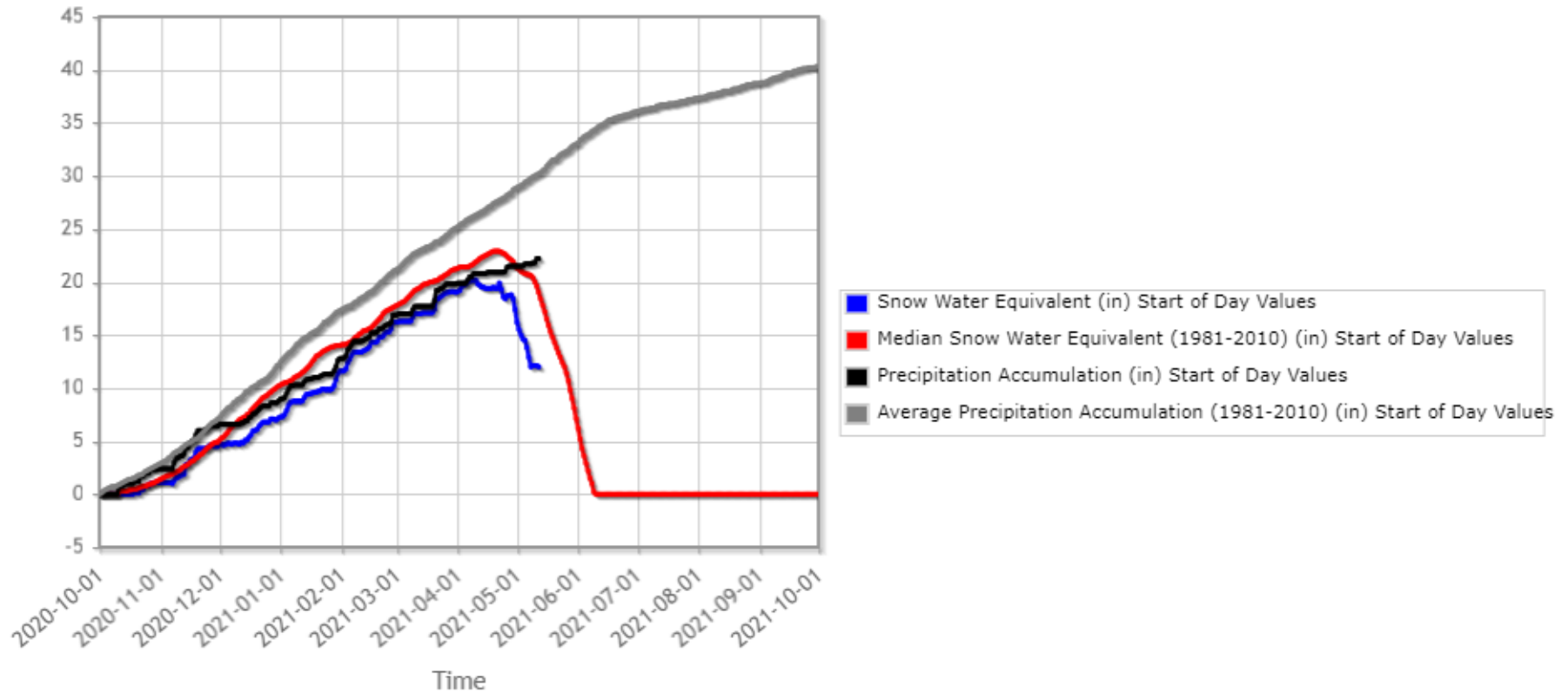


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Madison Plateau Snotel

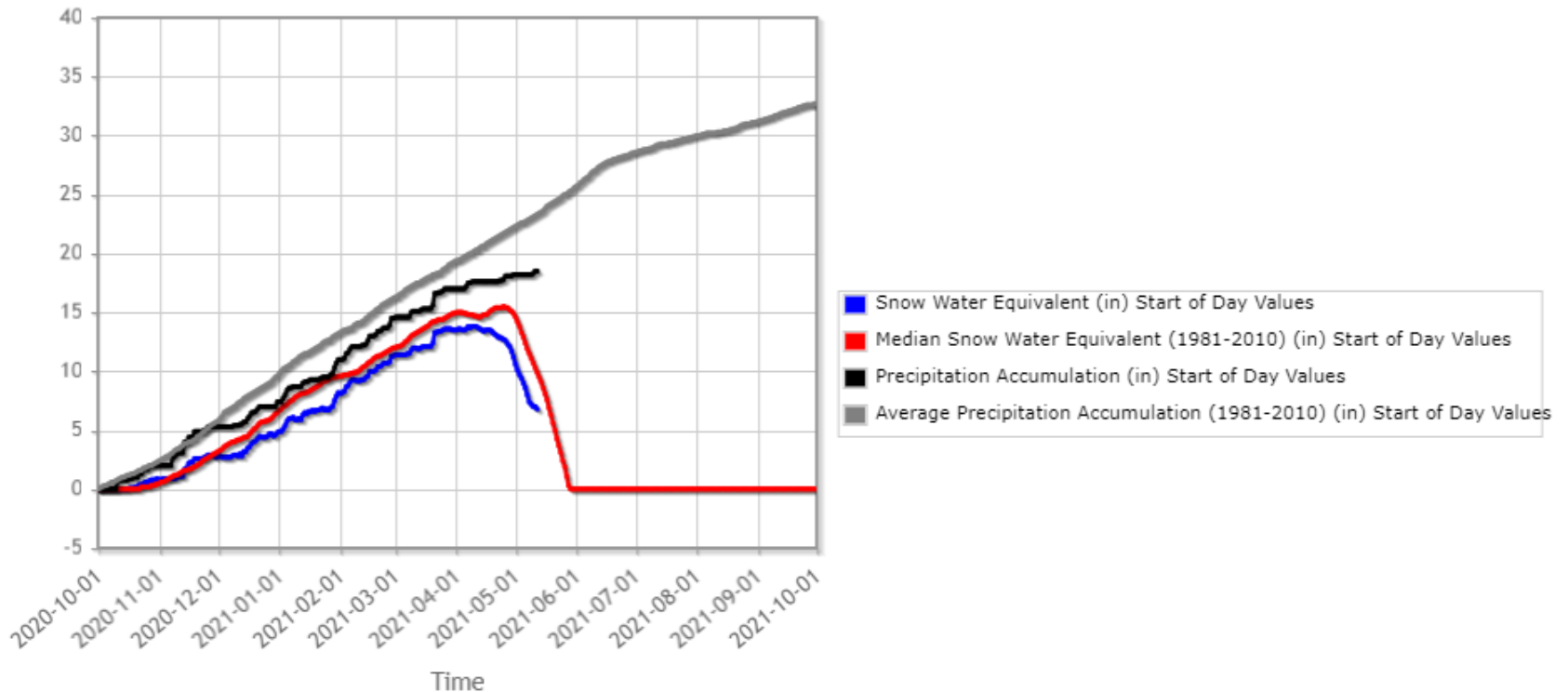
Madison Plateau (609) Montana SNOTEL Site - 7750 ft Reporting Frequency: Daily; Date Range: 2020-10-01 to 2021-09-01





Whiskey Creek Snotel

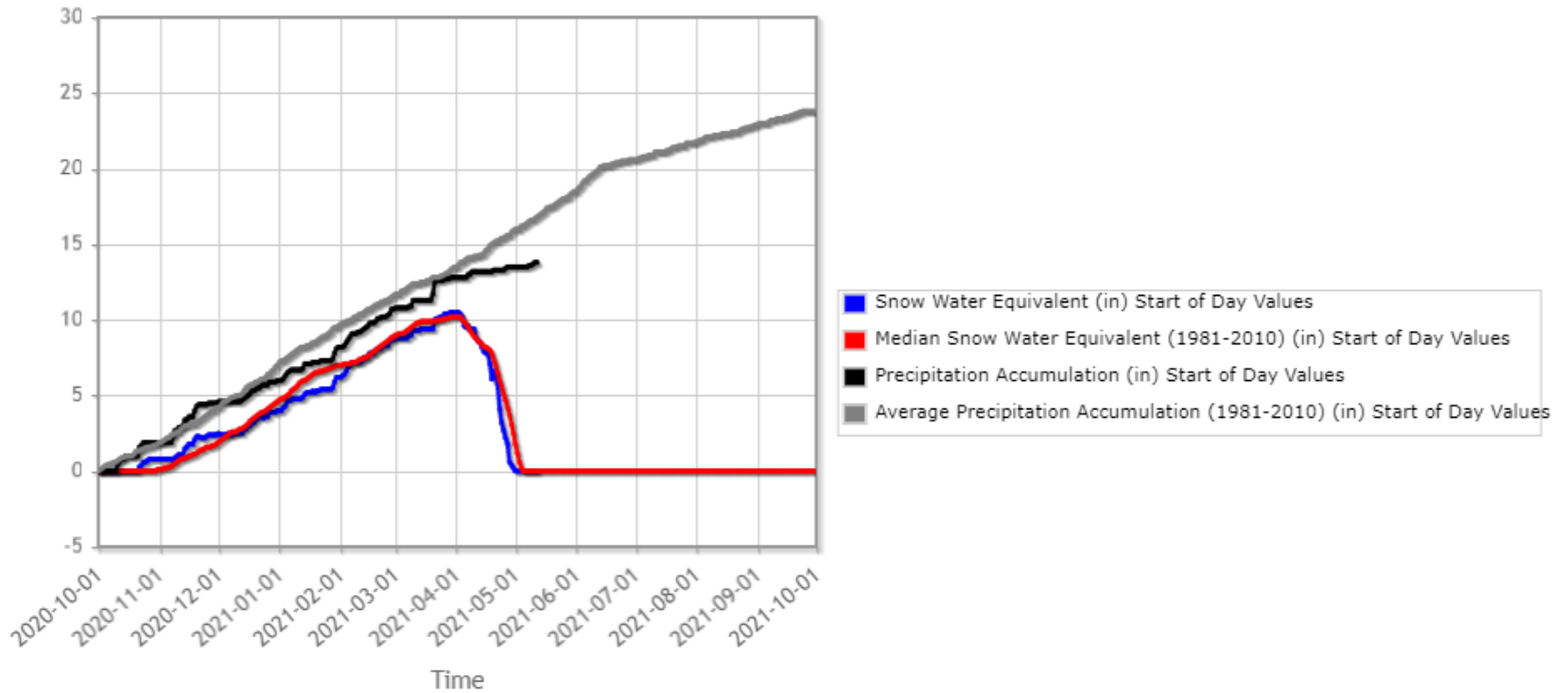
Whiskey Creek (858) Montana SNOTEL Site - 6800 ft Reporting Frequency: Daily; Date Range: 2020-10-01 to 2021-09-30





West Yellowstone Snotel

West Yellowstone (924) Montana SNOTEL Site - 6700 ft Reporting Frequency: Daily; Date Range: 2020-10-01 to 2021-09



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Flushing Flow Calculation

	Flushing Flow Calculations																			
	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	
	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet
Hebgen Storage March 31:	288,109	308,160	311,159	295,200	301,309	298,800	321,390	304,383	283,745	300,000	284,182	308,937	291,709	283,309	282,763	269,673	297,491	265,603	287,782	
April/July 1 Runoff Forecast:	315,000	360,000	390,000	410,000	400,000	330,000	235,000	410,000	325,000	380,000	435,000	250,000	365,000	430,000	310,000	420,000	315,000	390,000	265,000	
Total Available Volume:	603,109	668,160	701,159	705,200	701,309	628,800	556,390	714,383	608,745	680,000	719,182	558,937	656,709	713,309	592,763	689,673	612,491	655,603	552,782	
Trigger Volume for Flush:	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000	683,000
Volume under (-) or over (+):	(79,891)	(14,840)	18,159	22,200	18,309	(54,200)	(126,610)	31,383	(74,255)	(3,000)	36,182	(124,063)	(26,291)	30,309	(90,237)	6,673	(70,509)	(27,397)	(130,218)	
	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	
	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	acre-feet	
Hebgen Storage April 30:	290,727	306,494	293,058	282,873	305,494	311,048	335,516	308,937	283,745	314,269	267,102	326,505	281,782	284,073	292,036	275,456	301,854	271,815	299,018	
May 1 Runoff Forecast:	245,000	280,000	330,000	355,000	355,000	225,000	154,000	360,000	280,000	300,000	440,000	220,000	340,000	395,000	245,000	345,000	270,000	270,000	260,000	
Total Available Volume:	535,727	586,494	623,058	637,873	660,494	536,048	489,516	668,937	563,745	614,269	707,102	546,505	621,782	679,073	537,036	620,456	571,854	541,815	559,018	
Trigger Volume for Flush:	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	564,000	
Volume under (-) or over (+):	(28,273)	22,494	59,058	73,873	96,494	(27,952)	(74,484)	104,937	(255)	50,269	143,102	(17,495)	57,782	115,073	(26,964)	56,456	7,854	(22,185)	(4,982)	
NWE flush (Yes/No)	No	Yes	NO	YES	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	YES	NO	NO	NO	



- Draft the Hebgen Reservoir from September through March 31st to a level no lower than 6524.0ft depending on conditions.
- Fill Hebgen Reservoir to 6530.26ft by June 20th & maintain the elevation between 6530.26ft to 6534.87ft until October 1st. Attempt to keep the elevation near full pool from July through Sept 1st.
- Outflow from Hebgen Reservoir no less than 150cfs. Outflow from Madison Dam no less than 1100cfs. Maintain flows as measured at the USGS Kirby gage between 600cfs and 3500cfs.
- Flow changes from Hebgen Reservoir limited to 10% of previous day's flow.
- Provide flushing flows (3 continuous days of 3500cfs flow at Kirby) below Hebgen Reservoir if conditions dictate based upon the May volume runoff forecast and the Hebgen Reservoir content.
- Provide flows from Hebgen for pulse flows in the Madison river below Ennis lake as required



Jake Stagnoli
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Northwestern Energy
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Press Release and Newspaper Ads Noting Low Water Levels

From: Black, Jo (Jo Dee) <JoDee.Black@northwestern.com>
Sent: Monday, July 26, 2021 1:17 PM
Subject: FOR IMMEDIATE RELEASE: Drought conditions mean lower water levels at Hebgen Reservoir required to protect Madison River fisheries

Drought conditions mean lower water levels at Hebgen Reservoir required to protect Madison River fisheries

Butte, Mont. – July 26, 2021 – Current drought conditions, the result of low snowpack, low spring precipitation and recent hot, dry weather have led to challenging low water conditions in the Madison River system. These conditions are resulting in lower water levels at Hebgen reservoir to protect fisheries on the lower Madison River.

Water releases from Hebgen Reservoir feed Ennis Reservoir to support pulsed flow releases out of Madison Dam. The pulsed flow releases protect the lower Madison River from reaching lethal temperatures to fish. Hot, dry weather in June and July have required almost daily pulses. Pulsed flows have so far successfully kept river water temperatures at safe levels this summer.

The pulse flows are calculated using a model that helps determine the volume of water to be released, allowing for the conservation of water while maintaining safe water temperatures in the lower Madison River.

Forecasts and modeling were closely followed by NorthWestern Energy to capture as much water as possible this spring, but limited snowpack and spring precipitation prevented Hebgen Reservoir from filling fully. Very hot temperatures began the end of June requiring water releases from Hebgen reservoir to maintain safe temperatures in the Madison River for the fish population, which includes rainbow and brown trout.

“These low water years are especially challenging to meet all the needs of the various stakeholders on the Madison River system,” NorthWestern Energy Director of Hydro Operations Jeremy Clotfelter said. “There simply is not enough water to go around. The cooperation and flexibility of all really help to protect and maintain the long-term health of the river system, which is our priority. ”

Current water levels at Hebgen Lake and flows and water temperatures are available at <http://madisondss.com/page/dashboard.php>. NorthWestern Energy updates the webpage daily.

Property owners in the Hebgen Lake area and recreationalists who use the reservoir should anticipate low water levels through the end of the year.

“NorthWestern Energy’s stewardship responsibilities of the river resources include balancing the many interests of multiple stakeholders,” said Clotfelter.

Low flows typically affect the amount of electricity generated but this year, NorthWestern Energy’s Madison Hydroelectric plant is off-line for a planned major upgrade and will not be back in service until spring 2022.

NorthWestern Energy is working with the Federal Energy Regulatory Commission, Montana Fish Wildlife & Parks, the U.S. Forest Service, the U.S. Fish & Wildlife Service and other stakeholders.

Follow us on Facebook or on Twitter (@NWEinfo).

About NorthWestern Energy (Nasdaq: NWE)

NorthWestern provides electricity and / or natural gas to approximately 743,000 customers in Montana, South Dakota, and Nebraska. We have generated and distributed electricity in South Dakota and distributed natural gas in South Dakota and Nebraska since 1923 and have generated and distributed electricity and distributed natural gas in Montana since 2002. More information on NorthWestern is available on the company's website at www.northwesternenergy.com.

Media Contacts:

Jo Dee Black

866-622-8081

jodee.black@northwestern.com

Wildfire watch

Marked growth, but some containment for Southwest Montana blazes

By KYLENE PALMER
news@madisonian.com

Hot, dry conditions paired with firefighting crews have recently made marked progress battling the Grass Fire in southwestern Madison County, as neighboring Alder Creek and Trail Creek continue to not grow.

Incident command reports from crew leaders highlight the upcoming cooler temperatures and higher humidity levels predicted for the area and hopes are high progress will continue to be made.

Backcountry Overlook National Forest is continually re-evaluating closures based upon fire behavior, weather, and proximity to land uses. Fire-evacuated areas pose a significant safety hazard which must be mitigated before an area can be reopened to the public.

BLIND CREEK, fire restrictions and eight restrictions remain in effect. Closure details are posted on the RCDF website at <https://www.rcdf.gov/alerts.html> alerts notices and statewide fire restrictions are available at <http://www.mdnf.usd.gov>.

GOOSE FIRE - 12 MILES SOUTH-SOUTHEAST FROM ENNIS, MONT.

Firefighters continue to make progress on the 70% contained, 1,916-acre Grass Fire. The fire grew only 21 acres between July 26 to 27.

As of July 26 contained, transferred to a Type-3 incident management organization with a total of 160 firefighters.

Containment efforts are now focused on the western flank of the fire with continued mop-up and search for hot spots on the grounds at two helicopter sites.

from the air dropping buckets of water on areas of western hot. Full containment is estimated for mid-October, 2021.

ALDER CREEK AND CHRISTENSEN FIRES - SEVEN TO EIGHT AIR MILES FROM WISE RIVER, MONT.

The 4,507-acre Alder Creek Fire was 30% contained by July 26. Over 180 firefighting crews are assigned to the blaze, which according to Governor Greg Gianforte on July 21 is a top priority nationally due to its threat to structures. Full containment is estimated for Nov. 1, 2021.

Nextly, the Christensen Fire ignited on July 16 and was at 43% containment as of July 26.

On the 29th the Backcountry Center Sheriff's Office issued a Stage 2 Evacuation Order for residences on the southeast side of Highway 43 from Alder Creek Road north to Tucker Bridge. All other existing evacuations will remain in effect.

TRAIL CREEK FIRE - 18 MILES WEST OF WISDOM, MONT.

Just under 110 firefighting personnel are assigned to this 31,124-acre wildfire which was ignited by lightning on July 8. Full containment is estimated for Nov. 1, 2021.

By the 18th the fire had crossed the continental divide with approximately 15 acres spreading into Idaho. Crews were working to bury the fire out of the Idaho-Challis National Forest and protect the community of Gibsonsville, Idaho. Among other tasks crews continue to assist the Big Hole Fire District and nearby control tower air sector.

While Highway 43 remains open, a portion of the Continental Divide Trail as well as the Big Hole National and several area campgrounds remain closed.



A photo of smoke in the Wise River area near where the Alder Creek Fire is being fought. PHOTO COURTESY LINDSEY BARCOCK



Low water levels at Hebgen reservoir due to drought conditions.

To protect lower Madison River fisheries by maintaining safe river temperatures, NorthWestern Energy is releasing water from the Hebgen reservoir.

Property owners in the Hebgen Lake area and recreationalists who use the reservoir should anticipate low water levels through the end of the year.

- Be aware of shallow water around docks that may make loading and unloading boats difficult.
- Use extra caution navigating the shallow reservoir.
- Check current water levels and flows and river temperatures at madsonres.com.
- Keep an eye out for algae blooms that look like pea soup or spilled paint. If an algae bloom is observed, report it at hub.mt.gov.

Thank you for helping us protect the long-term health of the river system!

NorthWestern
Energy
Delivering a Bright Future

VOLUNTEER SPOTLIGHT

RED CROSS: Emergency need for donors
Shortage continues this summer due to increased demand for blood

Interviewed by MATTHEW OCHSNER

"The American Red Cross has an emergency need for filtering blood and blood storage. Blood donations continue to be critical to meet hospital demand and the public is urged to make an appointment to give now."

The Red Cross has been distributing about 126,000 blood products to hospitals across the U.S. compared to that time last year. The Red Cross needs to collect more than 1,800 additional blood donations each day to meet the current hospital demand and end the severe blood shortage. Donors of all blood types are needed, especially type O, which stands as just a one-day supply right now.

Donors who give now will help attack the shortage as we wrap down the summer season. Schedule an appointment to give blood by using the Red Cross Blood Donor App, visiting RedCrossBlood.org, calling 1-800-RED-CROSS (1-800-755-2677) or emailing the Blood Donor 911 on any Alexa Echo device.

In most cases, those who have received a COVID-19 vaccine can donate. However, knowing the name of the manufacturer of the vaccine they received is

important in determining donor eligibility.

About blood donation

To donate blood, individuals need to bring a blood donor card or driver's license or two other forms of identification that are required at check-in. Individuals who are 17 years of age to most states (18 with parental consent where allowed by state law), weigh at least 110 pounds and are in generally good health may be eligible to donate blood. High school students and other donors 18 years of age and younger also must meet certain height and weight requirements.

Donors can also save up to 15 minutes at the blood drive by completing a RapidRise™ With RapidRise™, donors complete the pre-donation reading and

health history questionnaire online, on the day of donation, from a mobile device or computer. To complete a RapidRise™, follow the instructions at RedCrossBlood.org/RapidRise or use the Red Cross Blood Donor App.

Blood drive safety

The Red Cross has updated its pandemic safety protocols in alignment with the Centers for Disease Control and Prevention and Occupational Safety and Health Administration. Fully vaccinated individuals, including staff and donors, no longer need to wear masks or socially distance. Unvaccinated individuals continue to be required to wear masks and socially distance. Donors are asked to schedule an appointment prior to arriving at the drive.



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Low water levels at Hebgen reservoir due to drought conditions.

To protect lower Madison River fisheries by maintaining safe river temperatures, NorthWestern Energy is releasing water from the Hebgen reservoir.

Property owners in the Hebgen Lake area and recreationalists who use the reservoir should **anticipate low water levels through the end of the year.**

- Be aware of shallow water around docks that may make loading and unloading boats difficult.
- Use extra caution navigating the shallow reservoir.
- Check current water levels and flows and river temperatures at madisondss.com.
- Keep an eye out for algae blooms that look like pea soup or spilled paint. If an algae bloom is observed, report it at hab.mt.gov.

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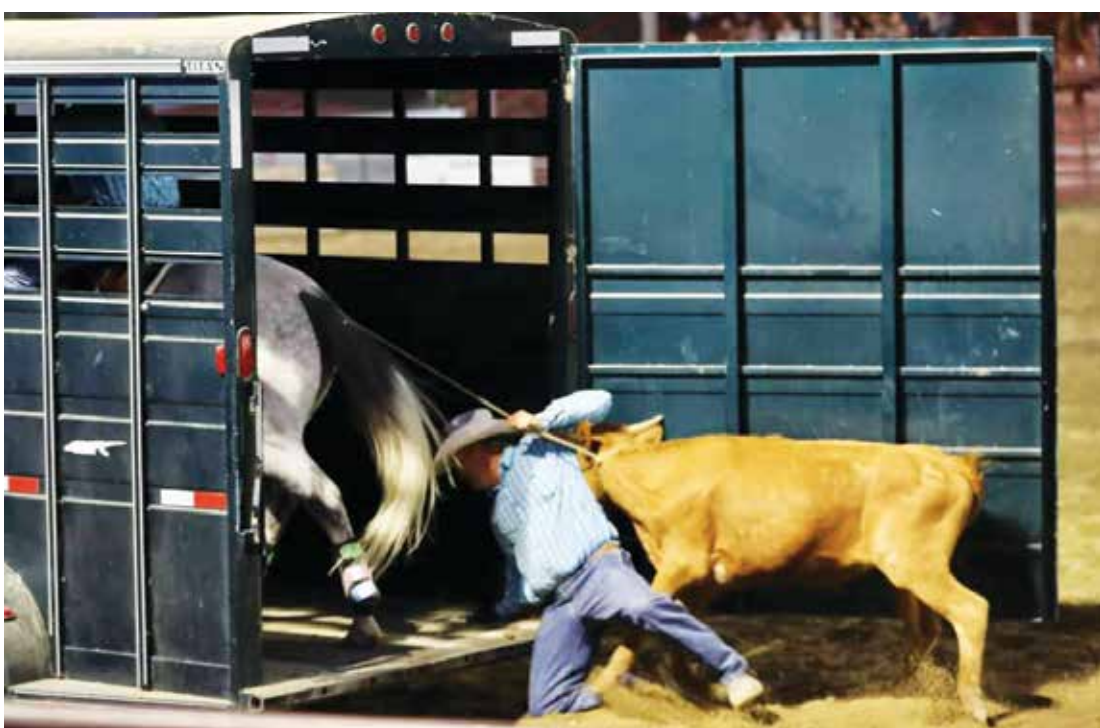


PHOTO COURTESY MARK LAROWE

THEY CALL THIS THING A RODEO

*I suppose, there's a better way to make a livin'
To make money so I could live in luxury
But the life behind a desk in a building
Would be like a prison sentence to me.*

- Chris Ledoux, singer/songwriter and hall of fame rodeo champion



Hank Bevan in trailer loading event at the 2020 ranch rodeo. PHOTO COURTESY DANA ESCOTT



PHOTO COURTESY MARK LAROWE



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Lot 6A Virginia City Ranches \$199,900 MLS#354747



Creek, Trees (Aspens, Junipers, & Firs), Spring, Views, and under ground power....everything that Buyers are looking for on this 18.388 acres located just minutes from downtown Ennis. End of the road privacy and lots of elbow room. Tuck in if you decide to build near the creek or choose a multitude of other buildings sites....whatever fits your desires. Bring your animals (saddle up and head for the hills) or enjoy the wildlife that frequents the property. Covenants run with the land but the HOA is not currently active. There is an RID with Madison County for \$100 per year that can be added to your taxes to help maintain the roads. A Buyer may purchase both Lot 6A (MLS #354747 listed at \$199,000 along with Lot 7 (MLS #354748 listed at \$179,000) for \$350,000 for both.

Lot 7 Virginia City Ranches \$179,000 MLS#354748

Almost 20 privately owned acres bordering a full section of State Ground....bring your hiking boots or your horse and come play! Creek, trees massive mountain views, privacy and lots of elbow room just 7 miles west of Ennis, Montana, this property could be the perfect spot for your new home. Underground power is on the eastern boundary between lots 7 & 6A. You can purchase Lot 7 - MLS #354748 - listed at \$179,000 along with Lot 6A - MLS #354747 - listed at \$199,000 both for \$350,000.



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BOZEMAN TRAIL DEDICATION



(LEFT) The Virginia City Preservation Alliance recently dedicated a new commemorative sign marking the point at which the historic Bozeman Trail ended at the edge of Virginia City. The sign is located at the approximate terminus point where the Bozeman Trail entered Virginia City; a point now just beyond the present-day center softball field fence line. Between 3-5,000 emigrants travelled over the Trail between 1864-1869, in the hope of finding a new—and more prosperous—life for themselves. PHOTO COURTESY PAT JACOBS



(RIGHT) Chris Munson shows off some beautiful biscuits cooked up during the Chuckwagon Cookoff in Virginia City. He shared with the folks celebrating the Bozeman Trail signage dedication. PHOTO COURTESY PAT JACOBS

Thank you Ennis



The Ennis Arts Association (EAA) wants to thank the Ennis community for their amazing support of the 25th Annual Madison Valley Arts Festival which was held at Peter T's Park on Main Street on Saturday July 31. The wind and rain that appeared around 3:30 p.m. put a damper on the event and so the EAA Members Raffle drawing took place a bit earlier than planned. And the winners are:

Donna Erickson, Helena, won the Bison Gourd by Margie Reck.

Lori Humphrey, Bozeman, won 'Tatanka Sunbath' a framed giclee by Carleton McCambridge.

Barbara Roger, Ennis, won the Felted Hobbit by Jennifer Doney.

Donna LaBelle, Ennis, won the Pottery Bowl by Barbara Bunge.

Trish Shepherd, Mission Viejo, CA, won the Quilt by Kathy Olkowski, donated by Barbara Gillispie.

Susan Barney, Ennis, won the Quilt by Kathy Olkowski, donated by Barbara Gillispie.

Thank you to all the people who purchased raffle tickets, attended the festival and bought art items! Many thanks to 1st Interstate Bank, Madison Valley Bank, Ennis Chamber of Commerce and The Pharmacy for their support of the raffle display and ticket sales. Thank you Madison Valley Bank for the use of Peter T's Park which is the perfect and most picturesque venue. Thank you to all the juried artists, Tune Tangles, Ennis City Ramblers, The Li'l Hogpit food truck, the Presbyterian Ladies Bake Sale and all the volunteers for helping to make our 25th Annual Madison Valley Arts Festival a huge success. Proceeds from the festival will allow us to give back to the community with donations to the Ennis Science Fair, Madison County Fair, two Madison County Scholarship Recipients, Shakespeare in the Schools Program, and the Madison Valley Public Library. Thank you!! Learn more about the EAA here: <https://ennisarts.org/>



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wirestock

Cattle maintenance in a drought takes ingenuity, perseverance and caution

Submitted by REBECCA COLNAR

Stockmen throughout much of the West are dealing a “grand slam” of tough events—severe drought, grasshoppers, fire and extreme heat. Trying to keep cattle healthy and well fed when there isn’t much hay or grass around, as well as keeping your business afloat, has called for hard decisions and creativity. The Montana Farm Bureau Federation has put together a resource page on their website where producers can find links for help. This includes everything from the Montana Department of Agriculture’s Hay Hotline to the Managing Drought Risks on the Ranch Guide through MSU Extension.

Visit www.mfbf.org for drought resources.

According to Cory Parsons, CHS nutritionist, who spoke to Park County Farm Bureau during their drought summit, said the key is to put pencil to paper and figure out the nutrient requirements of your cows.

“Remember, there are different nutrient requirements for different cattle at each stage of their lives,” Parsons said. “See what you can do to both balance your checkbook and then see what you have to pull together with grains, hay and other commodities. Be sure to do a feed analysis and see how much protein your cows need.”

Parsons explained that often ranchers will feed dry distiller

grains, beet pulp and barley sprouts to supplement protein intake, but this year, even those supplemental feed stuffs aren’t readily available. The other challenge is the labor and equipment needed to make feed changes. If you’re not set up with a cake feeder to feed cake and store cake, you need to get creative. Do you have the labor to do it?

“The ethanol plants aren’t running like they were, people aren’t drinking as much beer so there is less barley in production, and when feedstuff like beet pulp or DDGs are available, they are expensive and everyone is in competition for them,” Parsons cautioned. “I’ve seen some wheat fields in windrows, waiting to be baled. A lot of people are going to be culling

at least some of their animals. It’s important to pregnancy test early, then get the open cows shipped down the road quickly. I reiterate, when you buy protein, buy it on a unit basis. Run a cost of feed analysis.”

MSU Extension researchers have written articles, given drought tours, and posted booklets on dealing with the drought. Dr. Megan Van Emon, USDA-ARS, Fort Keogh, echoed Parsons regarding feed alternatives.

“It’s critical to get a feed analysis, as some feeds are highly variable in nutrient content. Currently, there are non-traditional feedstuffs being fed such as wheat midds and straw, as well as grazing cereal grains,”

said Van Emon. However, one needs to use caution. “Corn, barley and wheat are highly digestible in the rumen and could potentially lead to acidosis or bloat if fed at too high level in the diet too quickly. Adapt cattle to grains over a period of time to allow the rumen to adapt to the new feedstuff. If feeding or grazing cereal grains or weeds, get nitrate tests done. Many weeds, like kochia, and cereal grains accumulate nitrates and are especially high this year due to drought. Most local Extension Agents have the ability to test for nitrates using the Nitrate Strip Test, which is a quantitative measurement, meaning that an approximate concentration of nitrates in the sample can be provided.”

“We have been asked about feeding cattails, which are very thick stemmed and not eaten well. They should be ground and mixed with other hay to improve intake of them, but remember, they have little nutrient content,” Van Emon added. Although there is talk about feeding hemp, it has not been approved as a cattle feed and should not be fed.

She urged ranchers to discuss feeding options with Extension agents or beef cattle nutritionists to make sure they’re meeting nutrient demands of the herd.



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\$130,000 MLS#360314

5+/- acres with power on County maintained road, lots of recreational opportunities & Madison Range Views.

Lots 28 & 29 Stagecoach Trail
\$199,500 MLS#360154

10+/- acres bordering the National Fish Hatchery, Madison Range & River views, already split into 5-acre parcels.



238 Slide Rock Road
\$619,900 MLS 357608

20 +/- bordering Forest Service, 2 BR/2 BA off grid home, less than 4 miles to the Madison River.



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July 26, 2021 Letter to Hebgen-Madison Recreationists



July 26, 2021

Dear Hebgen-Madison Recreationists,

NorthWestern Energy intends to revert back to an in-person informational meeting of the Hebgen-Madison Recreation Advisory Group in summer 2022. In the meantime, please find current information for 2021 in this letter regarding:

- Current recreation projects in the Hebgen area;
- Hebgen Reservoir and Madison River operations forecast;
- Hebgen area fisheries project updates and status;
- Hebgen toxic algae program update;
- Aquatic invasive species management update.

Recreation Projects

In 2021, River Fund grants and NorthWestern Energy matching funds provided nearly \$182,000 in funding for projects that will enhance public recreation in the Hebgen-Madison Region. These projects include installation of a new vault toilet at Romsett Beach, purchase and installation of a new courtesy dock at the Rainbow Point boat launch, repairs and upgrades to the Hebgen Dam Day Use Site, replacement of the boat ramp at Warm Springs Access Site, and revegetation of an area at the confluence of the Jefferson and Madison rivers. These projects – sponsored by the US Forest Service, Bureau of Land Management, and Montana Fish, Wildlife & Parks - will enhance public access to the waterway and associated recreation sites well into the future.

Operations Forecast

NorthWestern Energy did not have enough snowpack to provide a flushing flow this year. Like the majority of Montana, the Madison Basin was low on snowpack and received very little precipitation in April, May and June, which made filling Hebgen Lake to its full pool elevation (6534.87') challenging and unattainable. Due to these conditions, the elevation of Hebgen Lake will be lower than normal this summer, especially with the unseasonably warm June temperatures, the hot and dry summer weather, and the need for pulse flows earlier in the year than normal. The elevation of Hebgen Reservoir dropped below the summer minimum elevation of 6530.26 feet on July 22 and will remain below this elevation through the end of the summer. NorthWestern received approval from resource agencies for this deviation from normal operations and notified FERC.

Weather in the Madison Basin is forecasted to be warmer and precipitation lower than normal going forward. Thermal pulse flows are being conducted to maintain adequate water temperatures to protect the

fishery in the lower Madison River. Hebgen Lake outflows are managed to balance Ennis Lake elevation as it fluctuates with daily pulse flows from Madison Dam, while keeping flows above 1,100 cfs below Madison Dam. All flows are being routed through the bypass channel between Madison Dam and the Madison power house to accommodate construction to replace all four generating units at the Madison plant. The area near the Madison dam and power house is open to the public, but the public should exercise caution while accessing the area during the ongoing construction. Construction activities are scheduled to complete early in the spring of 2022.

Fisheries from Montana Fish, Wildlife, and Parks

Montana Fish, Wildlife & Parks (FWP) completed annual gill netting efforts on Hebgen Lake in 2021. Those efforts indicated that rainbow trout gill net catches fell just below the 20-year average. However, the average length of rainbow trout caught was almost 17", which is greater than the long-term average. The number and average length of brown trout captured increased in 2021. The number of brown trout captured was above the 20-year average while the average length of brown trout was almost 18". A summary of the creel data collected on Hebgen Reservoir will be completed this fall.

Native species conservation continues to be a priority in the Madison River valley. In an effort to reestablish Arctic grayling populations in the Madison River drainage, FWP increased egg production to over 100,000 grayling eggs in both Moore's and Black Sands spring creeks in 2021. Those efforts will continue for several years to help bolster juvenile recruitment and hopefully lead to self-sustaining populations. FWP and its partners have begun formalizing a westslope cutthroat conservation strategy for the Madison watershed, which will help prioritize future conservation efforts. Completion of the Wall Creek barrier is expected later this summer and final planning and approval of reintroduction efforts in Tepee Creek are expected later this year.

Except for rainbow trout in the Varney Section, estimated abundances of brown and rainbow trout greater than 6" remained below the 20-year averages in the upper Madison River in 2020. In the Pine Butte Section, 2020 sampling yielded an estimate of 2,152 rainbow trout per mile, which was similar to 2019. However, brown trout declined in Pine Butte to 1,367 brown trout per mile, which represents a decrease of about 15% from the 2019 abundance. Primarily because of the highest abundance of age-1 fish observed in over 20 years, rainbow trout abundance (2,401 trout/mile) in the Varney Section nearly tripled from 2019 to 2020. Estimated abundance of brown trout in the Varney Section remained relatively stable for the fourth consecutive year at 1,339 fish/mile, which is 82% of the 20-year average for that reach. In the Norris Section, brown trout abundance decreased to a 20-year low of 459 fish/mile in 2021. Most concerning was the near lack of brown trout smaller than 11" captured in the Norris section in 2021. Rainbow trout abundance was 1,414 fish/mile, which was similar to 2018 but below the 20-year average for the Norris section. A hoot owl restriction on the Madison River below Ennis Dam went into effect June 25th and will remain in effect until August 15th or later.

Toxic Algae

In 2020, algae blooms were observed in Hebgen Lake in the Grayling Arm at Corey Springs and at Rainbow Point in mid-late August. Field testing and laboratory analysis showed that Anatoxin-*a*, an algal toxin, was present at both locations, but highest at Rainbow Point. The high levels of Anatoxin-*a* prompted the Gallatin County Health Department to close shoreline access to swimming and recreating at Rainbow Point on August 29th to protect public health. The area remained closed to recreation through September 16th, and the closure was lifted after follow-up sampling showed an absence of Anatoxin-*a*.

Algae blooms have already been reported in the Grayling Arm of the reservoir in July 2021, with preliminary field testing showing a detection of Anatoxin-*a* at Corey Springs on July 21st. Follow-up testing in this area is planned until the algae bloom subsides. Please use caution when recreating in the Grayling Arm of the reservoir and limit swimming for humans and pets while there is a visible algae bloom.

Weekly monitoring is continuing in 2021, in coordination with the Gallatin County Health Department, the Montana Department of Environmental Quality, the US Forest Service, and Montana Fish, Wildlife, & Parks. If an algae bloom is observed, please visit the State of Montana's Harmful Algae Bloom (HAB) website at <http://hab.mt.gov> to report the bloom.

Aquatic Invasive Species

Watercraft inspection stations are conducting record numbers of inspections in 2021 with boaters eager to get on the water. As of July 20th, more than 65,000 boats have been inspected statewide with 41 found to be fouled by invasive mussels. All non-resident watercraft launching in Montana are required to purchase a vessel AIS Prevention Pass. Please Clean, Drain, and Dry your boats and equipment to protect Montana's water resources. More information on Montana's AIS program can be found at: <http://cleandraindry.mt.gov/>.

If you have questions related to any of these topics or other public recreation issues in the Hebgen-Madison area, please contact me. NorthWestern Energy appreciates your continued interest in and support of public recreation in the Hebgen-Madison area.

Regards,



Andy Welch

Manager, Hydropower License Compliance

Andrew.Welch@NorthWestern.com

○ 406-444-8115

Attachment II
Comments Received on Drought Impact Study

Welch, Andrew

From: Marsh, Laura <Laura.Marsh@mt.gov>
Sent: Tuesday, August 16, 2022 12:54 PM
To: Welch, Andrew
Cc: Brown, Peter
Subject: RE: [EXTERNAL] RE: Drafting of Hebgen Reservoir below 6530.26 before Oct. 1

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The Original Sender of this email is Laura.Marsh@mt.gov.

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If you believe the email to be malicious and/or phishing email, please use the **Report Phish** button.

Hi Andy,

Thanks for the quick response and the clarification! I hope things have calmed down for you guys after the flooding emergencies.

Best,

Laura

Laura Marsh | Compliance Officer

Laura.Marsh@mt.gov

(406) 444-6485

Montana Historical Society, State Historic Preservation Office

1301 E. Lockey | Helena, MT 59620

From: Welch, Andrew <Andrew.Welch@northwestern.com>
Sent: Tuesday, August 16, 2022 10:40 AM
To: Marsh, Laura <Laura.Marsh@mt.gov>
Cc: Brown, Peter <pebrown@mt.gov>
Subject: [EXTERNAL] RE: Drafting of Hebgen Reservoir below 6530.26 before Oct. 1

Morning Laura,

We did not complete any cultural surveys when Hebgen was drafted in 2021. The variance we received was to allow us to draft below the summer recreation elevation but we maintained the reservoir within the range we are allowed to draft to during the winter. So, the operations were not exposing any shorelines that aren't exposed on a recurring basis.
Andy

On August 16, 2022 at 9:24:05 AM MDT, Marsh, Laura <Laura.Marsh@mt.gov> wrote:

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you know the contents are safe.

If you believe the email to be malicious and/or phishing email, please use the **Report Phish** button.

Hi Andy,

Thanks for sending us this. We have no concerns regarding the drought impact study, but out of curiosity, was any monitoring of cultural resource sites done when they may have been exposed due to the lower reservoir levels?

Best,

Laura

Laura Marsh | Compliance Officer

Laura.Marsh@mt.gov

(406) 444-6485

Montana Historical Society, State Historic Preservation Office

1301 E. Lockey | Helena, MT 59620

From: Brown, Peter <pebrown@mt.gov>
Sent: Monday, August 15, 2022 2:10 PM
To: Marsh, Laura <Laura.Marsh@mt.gov>
Subject: FW: Drafting of Hebgen Reservoir below 6530.26 before Oct. 1

From: Welch, Andrew <Andrew.Welch@northwestern.com>
Sent: Thursday, August 11, 2022 4:08 PM
To: 'Shallcross, Alden T' <ashallcross@blm.gov>; Storrar, Keenan <Keenan.Storrar@mt.gov>; Brey, Jason D -FS <jbrey@fs.fed.us>; Watson, Trevor <Trevor.Watson@mt.gov>; 'Chris Boone (ctboone@blm.gov)' <ctboone@blm.gov>; james_boyd <james_boyd@fws.gov>; Jaeger, Matt <mattjaeger@mt.gov>; Duncan, Mike <Mike.Duncan@mt.gov>; 'Brian Thompson - USFS Custer Gallatin (brianthompson@fs.fed.us)' <brianthompson@fs.fed.us>; Hutchinson, Paul N <p45hutch@blm.gov>; 'Eric Sivers ' <esivers@gmail.com>; Brown, Peter <pebrown@mt.gov>; Bush, Jessica <JBush2@mt.gov>
Cc: Sullivan, Mary Gail <MaryGail.Sullivan@northwestern.com>; Jon.Hanson <Jon.Hanson@northwestern.com>; Tollefson, Jordan <Jordan.Tollefson@northwestern.com>; Stagnoli, Robert "Jake" <Robert.Stagnoli@northwestern.com>
Subject: [EXTERNAL] RE: Drafting of Hebgen Reservoir below 6530.26 before Oct. 1

Hebgen/Madison Stakeholders,

First of all, sorry if this is hitting you twice. Jo Dee Black just sent out notice to a large distribution you may have been included on.

On May 19, 2022, FERC granted, with modifications, NorthWestern Energy's variance request for the 2021 Hebgen Reservoir elevation drafting below the summer elevation required by Article 403 of our Project License. The FERC order approving the variance is attached.

FERC determined that NorthWestern Energy complied with the articles of the license order when operating its Project during the period of the variance. However, given the effects on the fishery, recreation, and other resources from the management of the Project during drought conditions, FERC required NorthWestern Energy

prepare a Drought Impact Study. NorthWestern Energy was directed to prepare the Drought Impact Study in consultation with the USFS, BLM, USFWS, MTFWP, MTDEQ, and the public.

NorthWestern drafted a Drought Impact Study as directed and it is available for your review. The document can be found at: [madison-drought-impact-study.pdf \(northwesternenergy.com\) \[northwesternenergy.com\]](#). We will be accepting comments on the document for 30 days on the Drought Impact Study. Please submit your comments via email to me no later than **September 9, 2022**.

Please reach out with any questions you may have.

Regards,
Andy

Andy Welch

Manager, Hydro License Compliance

Andrew.Welch@NorthWestern.com

☎ 406-444-8115

📞 406-565-7549

208 N. Montana Ave

Suite 200

Helena, MT 59601



From: Welch, Andrew

Sent: Monday, January 24, 2022 12:56 PM

To: 'Travis Horton' <thorton@mt.gov>; 'Shallcross, Alden T' <ashallcross@blm.gov>; 'Storrar, Keenan' <Keenan.Storrar@mt.gov>; 'Jason Brey' (jbrey@fs.fed.us) <jbrey@fs.fed.us>; 'Watson, Trevor' <Trevor.Watson@mt.gov>; 'Chris Boone' (ctboone@blm.gov) <ctboone@blm.gov>; 'James Boyd' (james_boyd@fws.gov) <james_boyd@fws.gov>; 'Jaeger, Matt' <mattjaeger@mt.gov>; 'Yoshioka, Marina' <MYoshioka@mt.gov>; 'Martin, Jacob' <jacob_martin@fws.gov>; 'Mike Duncan' (Mike.Duncan@mt.gov) <Mike.Duncan@mt.gov>; 'Cheryl Morris' <cherylmorris@mt.gov>; 'Brian Thompson - USFS Custer Gallatin' (brianthompson@fs.fed.us) <brianthompson@fs.fed.us>; 'Stringer, Allison - FS' <astringer@fs.fed.us>; 'Chaffin, Jake - FS' <jake.chaffin@usda.gov>; 'Hutchinson, Paul N' <p45hutch@blm.gov>; 'Chris McGrath - BLM' (cmcgrath@blm.gov) <cmcgrath@blm.gov>; 'Eric Sivers' <esivers@gmail.com>; 'Pete Brown' (pebrown@mt.gov) <pebrown@mt.gov>; 'Jessica Bush' (JBush2@mt.gov) <JBush2@mt.gov>

Cc: Sullivan, Mary Gail <MaryGail.Sullivan@northwestern.com>; Hanson, Jonathan (Jon) <Jon.Hanson@northwestern.com>; Tollefson, Jordan <Jordan.Tollefson@northwestern.com>; Tabaracci, John <John.Tabaracci@northwestern.com>; Clotfelter, Jeremy <Jeremy.Clotfelter@northwestern.com>; Butcher, Jeremy <Jeremy.Butcher@northwestern.com>; Stagnoli, Robert "Jake" <Robert.Stagnoli@northwestern.com>; Benski, Chris <Chris.Benski@northwestern.com>; Grisak, Grant <Grant.Grisak@northwestern.com>

Subject: RE: Drafting of Hebgen Reservoir below 6530.26 before Oct. 1

Hebgen/Madison Partners,

I wanted to send an update on NorthWestern's request to FERC for a temporary variance from Article 403 of our Project 2188 license for the Hebgen Development.

NorthWestern filed the request for a temporary variance on November 9 and supplemented the filing on November 12, 2021. On December 9, 2021, FERC issued a notice of their acceptance of our application and

Welch, Andrew

From: Welch, Andrew
Sent: Thursday, August 18, 2022 10:45 AM
To: kirkwoodmarina@gmail.com
Subject: FW: [EXTERNAL] Re: NorthWestern Energy accepting comments on Madison Drought Impact Study until Sept. 9, 2022

Hello Yvonne,

The Drought Impact Study was drafted in response to FERC's order approving our variance to draft Hebgen below the summer elevation in 2021. The order directed the development of the study and was specific on what it was to cover which included the timeline leading up to when the drafting occurred through the fall of 2021.

Hope that helps. Feel free to give me a call if you want to discuss further.

Andy

From: Black, Jo (Jo Dee) <JoDee.Black@northwestern.com>
Sent: Thursday, August 18, 2022 10:36 AM
To: Welch, Andrew <Andrew.Welch@northwestern.com>
Subject: FW: [EXTERNAL] Re: NorthWestern Energy accepting comments on Madison Drought Impact Study until Sept. 9, 2022

Andy,

Can you respond to Yvonne?

Thank you, Jo Dee

From: Kirkwood Marina <kirkwoodmarina@gmail.com>
Sent: Thursday, August 18, 2022 10:21 AM
To: Black, Jo (Jo Dee) <JoDee.Black@northwestern.com>
Subject: [EXTERNAL] Re: NorthWestern Energy accepting comments on Madison Drought Impact Study until Sept. 9, 2022

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I don't understand why nothing in this report deals with 2022?

Yvonne

Kirkwood Marina
406.646.7540
kirkwoodmarina@gmail.com

On Thu, Aug 11, 2022 at 3:42 PM Black, Jo (Jo Dee) <JoDee.Black@northwestern.com> wrote:



Aug. 11, 2022

Madison River Basin Stakeholder,

Upon FERC's recommendation, NorthWestern Energy filed a request for temporary variance of Article 403 of our Project 2188 License in 2021. The request was to operate Hebgen Reservoir below the summer recreation elevation of 6530.26 feet in order to provide minimum and pulse flows in the Madison River downstream during the drought conditions observed in 2021.

FERC granted NorthWestern Energy's variance request, subject to modifications. FERC determined that NorthWestern Energy complied with the articles of the license order when operating its Project during the period of the variance. However, given the effects on the fishery, recreation, and other resources from the management of the Project during drought conditions, FERC required NorthWestern Energy prepare a Drought Impact Study. NorthWestern Energy was directed to prepare the Drought Impact Study in consultation with the USFS, BLM, USFWS, MTFWP, MTDEQ, and the public.

NorthWestern Energy prepared the Drought Impact Study and it is available for your review at: <https://northwesternenergy.com/docs/default-source/default-document-library/clean-energy/environmental-projects/missouri-madison-hydro-project/madison-drought-impact-study.pdf>

NorthWestern Energy will accept comments up to Sept. 9, 2022 on the Drought Impact Study. Please submit your comments no later than Sept. 9, 2022, via email to Andrew.Welch@NorthWestern.com.

Feel free to reach out with any questions you may have to Andy Welch at the email above or by phone at 406-444-8115.

Jo Dee Black

Public Relations Specialist

jodee.black@northwestern.com

○ 406-454-7122

● 406-788-1814

P.O. Box 589 | Great Falls, MT 59403

NORTHWESTERN ENERGY MEDIA LINE 866-622-8081



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Welch, Andrew

From: Lyndy Caine <lyndy@fireholeranch.com>
Sent: Friday, September 9, 2022 3:19 PM
To: Welch, Andrew
Subject: [EXTERNAL] Drought study - my response

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Hello Andy,

Thank you for sending the Drought Study and requesting comments.

I am pleased to see your report and some of the suggestions since we, the stakeholders, have not been provided the opportunity to discuss these topics at the stakeholders' meetings yet and therefore have had no input into the document.

Your suggestion "The Alternative Way" on Page 28 in the second paragraph is a very good one. By setting the level low in October NWE has plenty of leeway to adjust as the winter snowpack develops or doesn't. We are very much in support of this idea and look forward to discussing this further in the Sept. 15 stakeholders' meeting.

"An alternative way to operate is instead of setting a certain flow in October based on the method described above is to set October flows as low as possible to provide minimum flows downstream. That flow would then establish the Madison River elevations at which brown trout spawn their eggs in the gravels. If flows can be as low as possible during this timeframe, this allows NorthWestern to hold flows at this low volume for the duration of the winter. If more precipitation and snowpack is gained later in the winter than what was originally forecasted, NorthWestern has the ability to increase flows to make room in Hebgen Reservoir for spring snowmelt."

I found some of the information, angling days and other statistics very interesting. There are a few points I could debate but will save them for the stakeholders' meetings. However, in light of the Company's suggestion about limiting October's flows raises the question about its decision to set the winter flows in 2020-2021 at 900-950 cfs. Those levels were above the 84-year average and the reports did not justify a super winter snow fall. It happened; it caused a great deal of difficulty for a lot of people; and it hopefully will not happen again. To that point we were very pleased by the suggestion on page 28.

I also wanted to thank you and all your staff for the very informative tour of the two dams. It was such a treat to see how the system all works.

Best wishes,
Lyndy



September 9, 2022

Montana Trout Unlimited
P.O. Box 7186
Missoula, Montana 59807

Northwestern Energy
11 E Park Street
Butte, Montana 59701

Submitted via email to: Andrew.Welch@NorthWestern.com

Re: Public Comments on Madison Drought Impact Study

Mr. Welch:

Thank you for the opportunity to provide written comments on the Madison Drought Impact Study (Study) drafted by NorthWestern Energy (NorthWestern) and prepared in compliance with the deviation request from their license from the Federal Energy Regulatory Commission (FERC) in 2021. We have reviewed the Study and wish to express our appreciation for opportunity for the public to review the document. The scope of challenges presented to all water users and our natural resources during the drought conditions of 2021 were truly significant.

Founded in 1964, Montana Trout Unlimited (MTU) is the only statewide grassroots organization dedicated solely to conserving, protecting, and restoring Montana's coldwater fisheries and their habitats. MTU is comprised of 13 chapters across the state and represents approximately 5,000 members and friends. Many of our members are conservation-minded anglers who have an active interest in the ecological health and recreational values of our state's rivers and streams.

The drought conditions experienced across Montana, and in the Madison River watershed in this context, during 2021 were tremendous. MTU worked across the state with resource managers and communities alike to make challenging decisions related to water management that had consequence for wild and native fisheries. We can attest to the difficult nature of those decisions with complex and often competing interests at play. The decisions were never easy or straightforward, and we commend FERC for requiring NorthWestern to complete this drought impact study to better involve the public in understanding the decisions that were made during that time period in the management of water in the Madison River.

First, we support the management decision that was reached by NorthWestern in the summer of 2021 to draw down the Hebgen Reservoir below the summer operating elevation level under the FERC license requirements. The biological consequences of an alternative action that would

have decreased water volumes in the Madison River or available water levels in the Ennis Reservoir causing an abdication of pulsing flows on the lower river would have been significant, if not devastating, to the wild trout fishery of the Madison. We understand that decision came at the expense of other stakeholders' interests, but as an organization committed to conserving, protecting, and restoring coldwater fisheries and their habitats we support the decision.

However, we do appreciate exploring alternative water management options in the future, including the management of winter flows below Hebgen Reservoir, within reason. We know that with climate change and growing water demands, these scenarios are only going to increase in frequency and potentially severity. The Study highlights some options that would be available for future discussions with stakeholders, resource agencies, regulatory agencies, and NorthWestern. We think that discussion is warranted, and MTU is committed to being part of those conversations through the Stakeholder Engagement process that has been commenced by NorthWestern. Ideally, we would be able to find options that would not result in a zero-sum game of some stakeholder's interests coming at the expense of others like they did in 2021.

We do encourage NorthWestern to continue to build and improve its practices and protocols for involving the public and interested parties in water management decisions from the beginning. The very nature of this Study is ex post facto, and we believe that better can be achieved. In fact, that is one reason that we as an organization agreed to serve on the Stakeholder Engagement Team assembled by NorthWestern. We are committed to being part of solution in finding better ways to communicate decisions to the broad range of stakeholders that care deeply about the Madison watershed's world class natural resources. To date, that work has been productive, and we are encouraged by the opportunities for new and better ways to improve the communication between all stakeholders in future water management decisions.

Please do not hesitate to contact us with any questions, or if you need additional information regarding the comments that we have submitted (via email at clayton@montanatu.org or by phone at 406-543-0054). Again, we thank you for the opportunity to provide public comment on this important topic.

Respectfully,



Clayton Elliott
Conservation Director
Montana Trout Unlimited

Welch, Andrew

From: Eileen White <em.white8882@gmail.com>
Sent: Thursday, September 8, 2022 11:16 AM
To: Welch, Andrew
Subject: [EXTERNAL] Drought Impact Study

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Dear NorthWestern Energy and Andrew Welch:

I have read the drought impact study NWE recently performed. I believe that there is a very important and impactful parameter that NWE does not currently monitor, and that should absolutely be taken into account when deciding the levels of CFS released throughout the year.

That parameter is ground water levels, and could be monitored via ground water wells currently along the river channel. Part of the requirements from FERC as it oversees the NWE system of dams are to provide irrigation water, maintain instream flows to a level compatible with a viable fish population, AND aquifer recharging. Without any monitoring of the groundwater levels, how can NWE demonstrate adequate aquifer recharging?

Without recharging the aquifer, I believe that streamside vegetation is negatively impacted. I also believe that stressing the native plants in the riparian areas lends itself to more invasive plant species flourishing, specifically knapweed. From there, fishermen utilizing the highwater mark banks spread this noxious weed up and down the river banks.

We have a series of spring fed ponds that historically rise and flow more abundantly in the spring time. Now, however, with the continued artificial changes in flow in the Madison River from Hebgen Dam, those springs are much less full. Our cottonwood stands alongside the river are also struggling to remain alive. I have two groundwater wells at our historic homestead buildings. When NWE is furiously releasing water from Hebgen Dam during the natural seasonal high water flows of the upper Madison, with West Fork adding its spring runoff, the groundwater is within eight feet of the surface, and we fear for flooding in our basement. In no time, NWE has severely restricted outflow from Hebgen Dam, and we are quickly decreased by a minimum of six feet of water level. I reiterate my suggestion that lack of groundwater monitoring is a significant omission.

I urge FERC and NorthWestern Energy to place aquifer recharging high on the list of parameters to be monitored. This could best be done by monitoring local groundwater wells. It is important.

Sincerely,
Eileen White