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Madison-Hebgen: Stakeholder Engagement Process

June 22, 2022



Welcome

Safety Message

Thank you





• Objectives of this Voluntary Initiative

1. Share information on operating conditions and parameters.
2. Gain a better understanding of concerns and priorities.
3. Identify possibilities to operate better or differently
4. Improve license compliance which is difficult during low water.



• NorthWestern's Commitment

- Listen and learn
- Provide information and be transparent
- Seriously consider concerns or recommendations
- Communicate decisions and outcomes



“When we tug at a single thing in nature, we find attached to it the rest of the world”

John Muir



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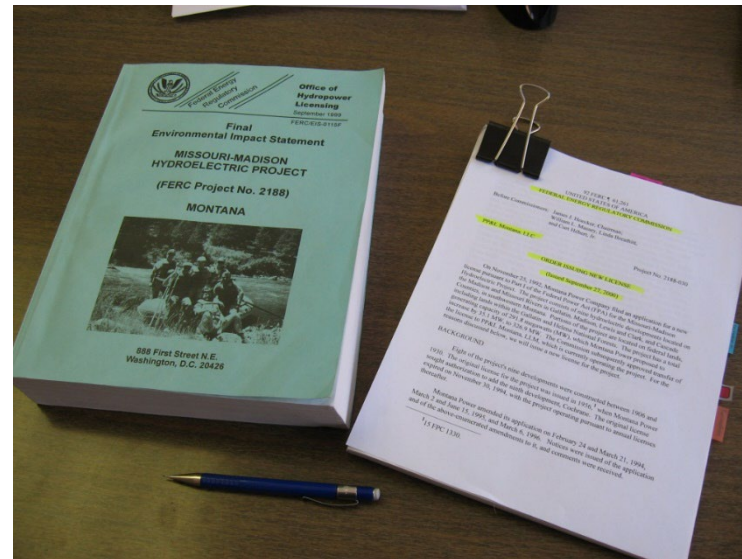
2022 Madison Stakeholder Engagement



- 1. Provide a history of license conditions.**
- 2. Discuss how NorthWestern manages flows.**
- 3. Tools we use to inform our management.**
- 4. Challenges**



- Missouri-Madison Project 2188 includes nine facilities (Hebgen, Madison, Hauser, Holter, Black Eagle, Rainbow, Cochrane, Ryan, & Morony)
- Extends over 500 river miles from West Yellowstone to Fort Benton
- New FERC license issued September 27, 2000
 - Relicensing took about 10 years during the 1990s





- License conditions include significant focus on fish, wildlife, water quality, recreation, cultural, etc.

- Section 4(e) of Federal Power Act:

“In addition to the power and development purposes for which licenses are issued, FERC shall give EQUAL CONSIDERATION to the purposes of energy conservation, the protection, mitigation of damages to, and enhancement of, fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality”

- 2188 license articles (36) describe how we operate the Project
- 403 – reservoir elevation and flow requirements
- 404 – water quality monitoring
- 408 – Madison fisheries PM&E
- 409 – Madison habitat enhancement
- 413 – Lower Madison thermal (DSS) plan
- 419 – Madison flushing flow plan
- 421 – T&E species plan
- 423 – Wildlife plan
- 425 – CRMP
- 426 – Recreation plan





- Hebgen
 - Minimum flow 150 cfs
 - 10% daily allowable flow change
 - Draft Hebgen September – March 31 no lower than 6524 ft
 - Provide a reasonably uniform discharge from Hebgen during this time
 - Refill Hebgen starting April 1. Refill to full (6534.87 ft) by late June.
 - Must manage flow to not overtop Hebgen Dam (Dam safety concerns)
 - Summer Recreation elevation June 20 – Oct 1 above 6530.26ft
 - Provide 3500 cfs for 3 days for flushing flow (when conditions are met)
 - Provide water to balance thermal pulse flows from Madison Dam
 - Manage Hebgen outflows to provide 1,100 cfs minimum below Madison (Ennis Lake)
- Kirby
 - Minimum flow 600 cfs
 - Maximum flow to protect Quake Lake outlet 3500 cfs



Hebgen Dam Operations



Hebgen Inflow
550cfs – 5,500cfs

Reserve flood control volume in lake for spring storms

Fill lake ASAP for lake recreation

Summer thermal pulse flows?

Full Pond
6534.87

June 20 – Oct 1
> 6530.26

Max Draft (winter)
~ 6524

FERC

Environmental / Recreation

Operations

> 1,100 cfs below
Madison Dam

Ennis Lake Elev. Winter: 4839
Summer: 4840-4841

Spring Flushing Flow?
3,500 cfs for 3 days

Kirby Gage

600cfs < FLOW < 3,500cfs

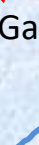
Earthquake Lake



Beaver & Cabin Creeks
50cfs – 1,300cfs

< 10% flow change
per day

Hebgen Gage

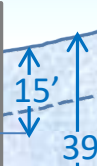


Madison River

Stable flows for river fisheries and recreation

Hebgen Lake

Intake



Spillway

Hebgen Dam

Outlet Pipe





How does NorthWestern manage flows?

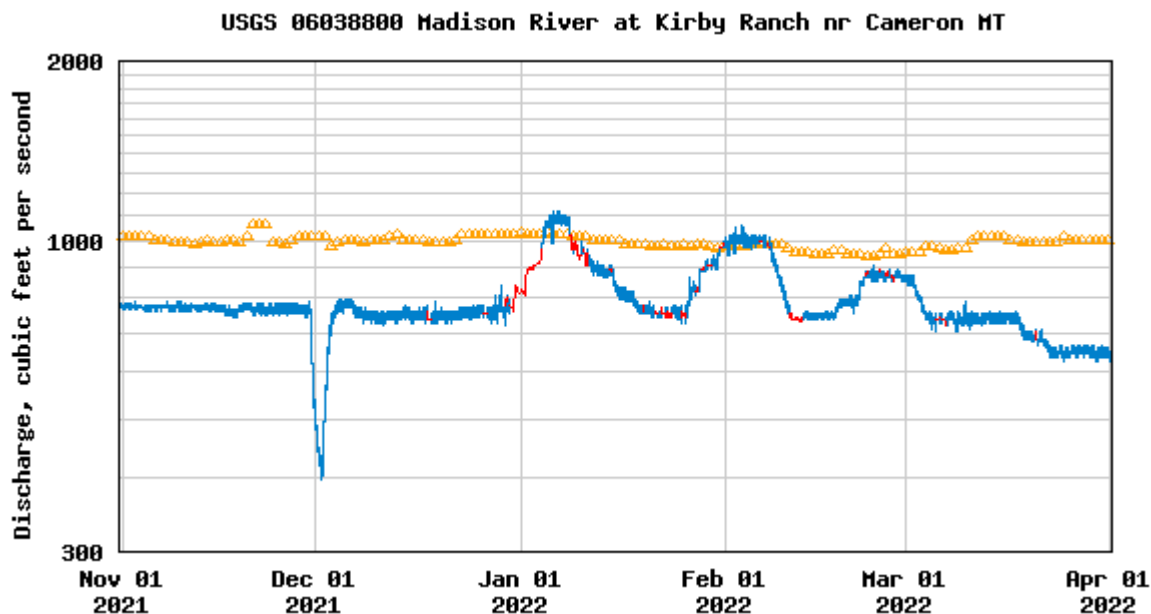
FALL and WINTER

- October 1 – set a uniform flow out of Hebgen
 - Compare previous 3 months inflow data to previous years
 - Identify average releases from those years
 - Adjust based on BPJ and NOAA weather and precipitation forecasts

Or

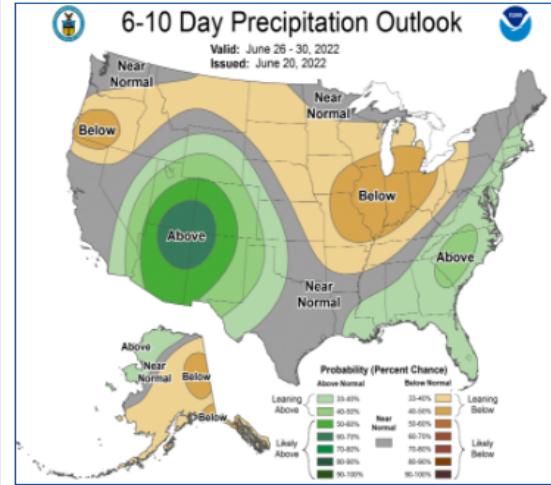
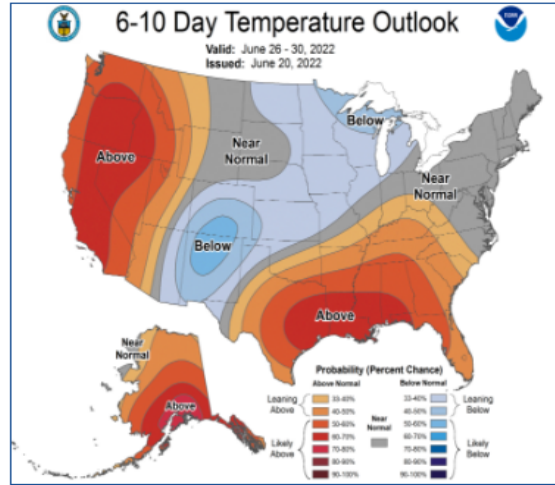
- To provide minimum flows downstream

Flows will be held relatively uniform through April 1 to protect brown trout spawning and redds in the gravels

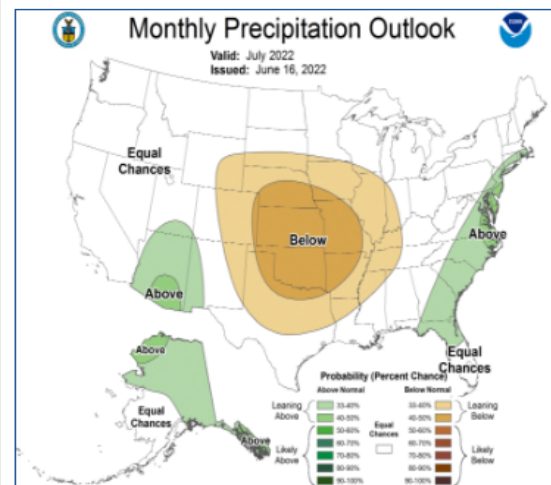
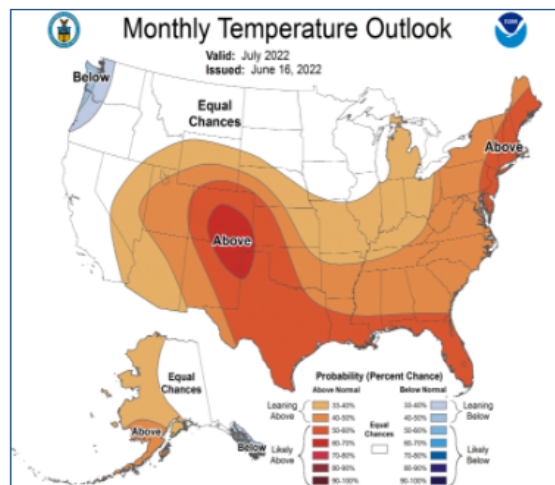




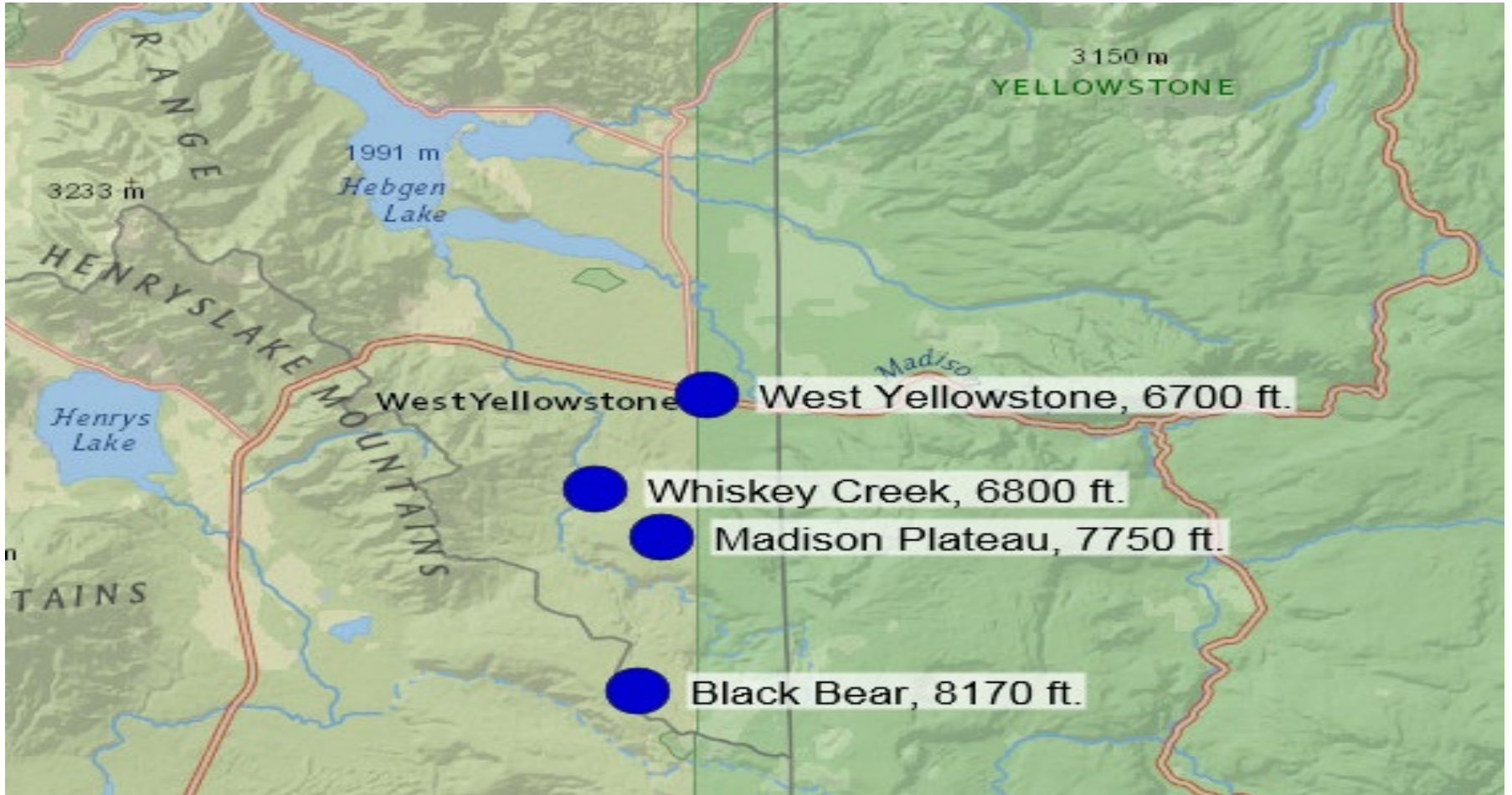
6 to 10 Day Outlook



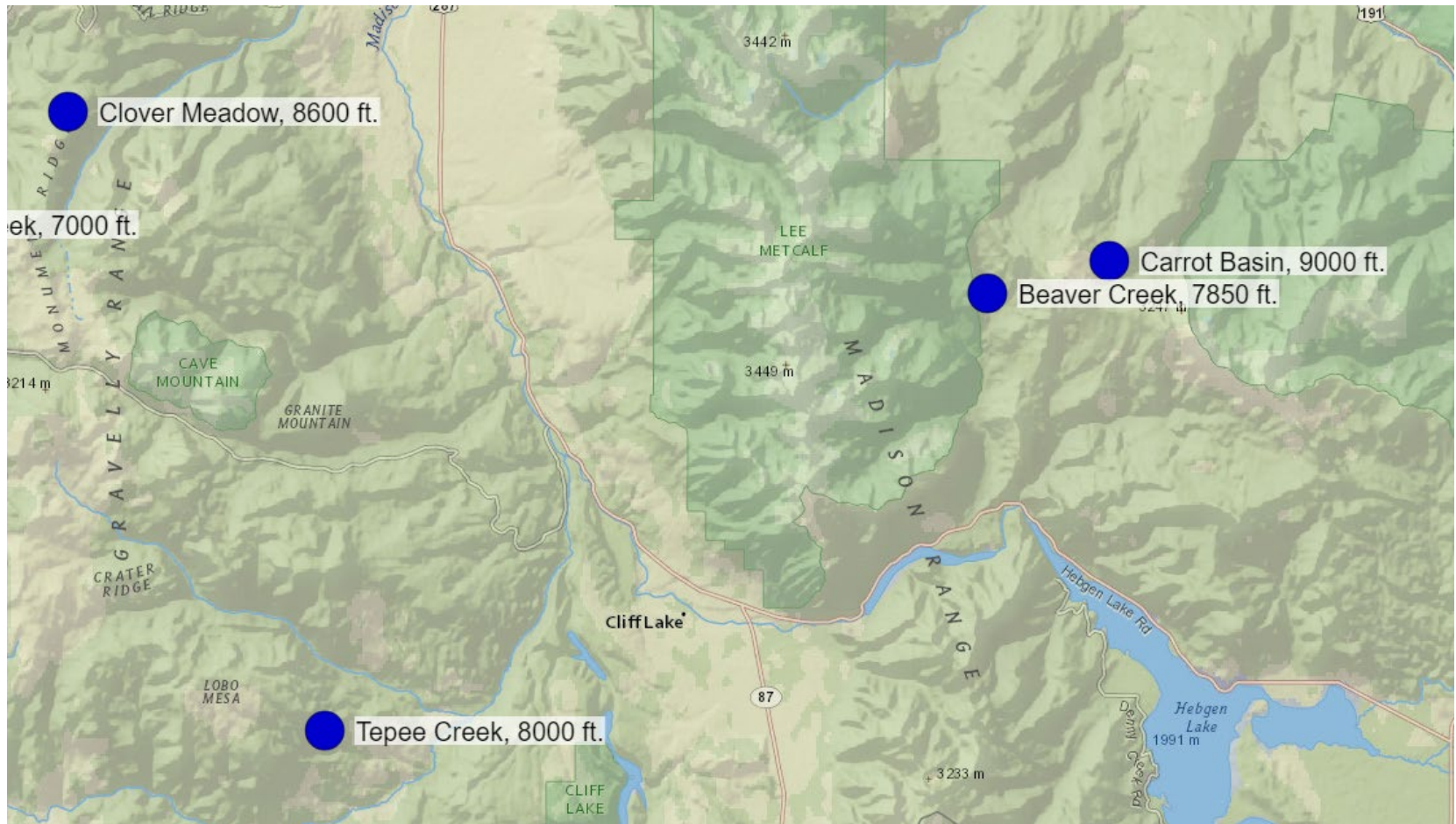
One Month Outlook



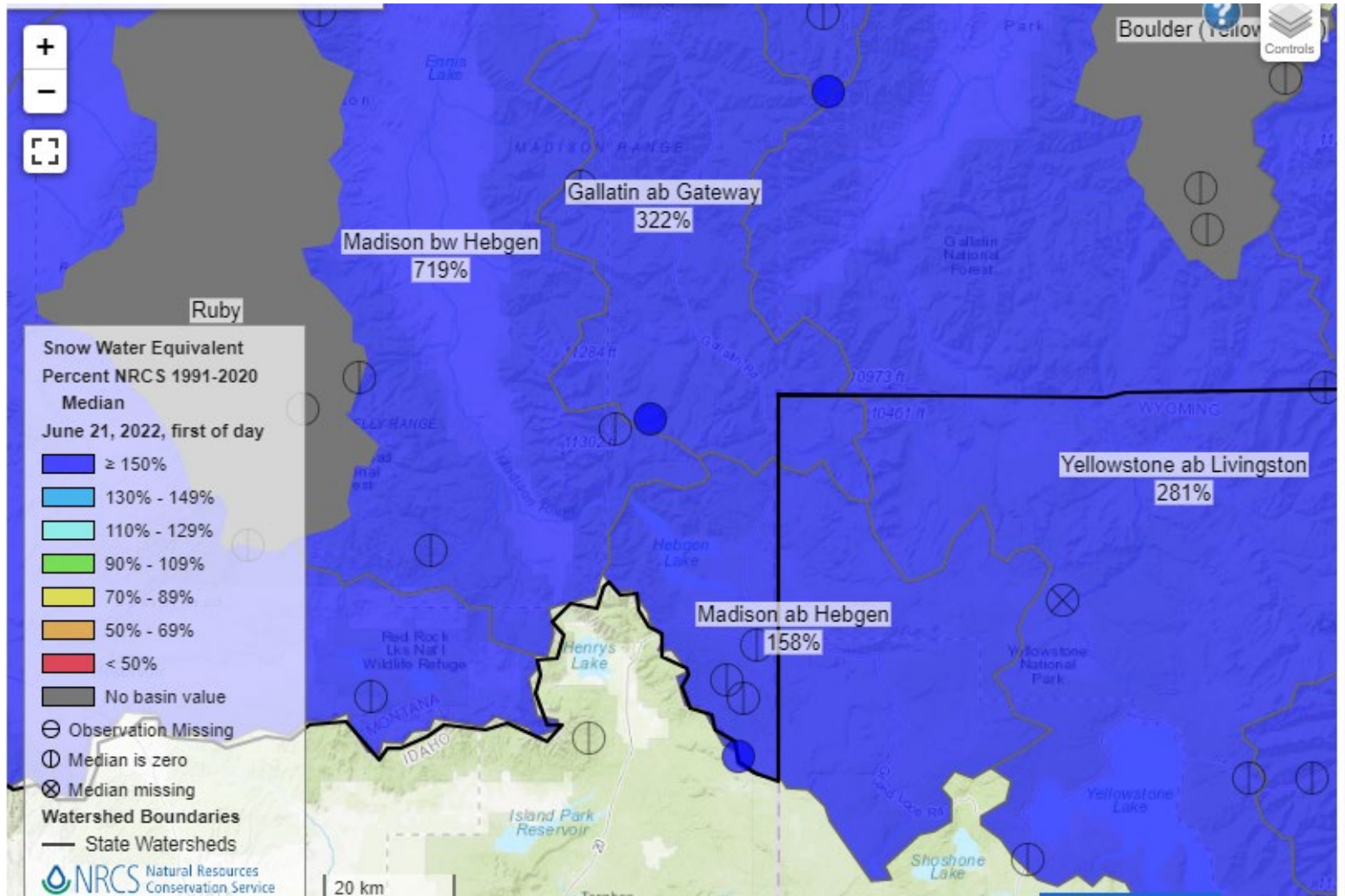
Snotel Sites Above Hebgen



Snotel Sites Below Hebgen



Sub-Basin Percentage of Normal





How does NorthWestern manage flows?

SPRING

- Early April – set releases out of Hebgen
 - 1st priority to manage storage to accommodate inflows (dam safety)
 - NRCS volume runoff forecasts (April – July)
 - Published with 5 values based on percent exceedance
 - NorthWestern chooses percent exceedance by volume in Hebgen and snowpack
 - Drought years choose either 70% or 90%
 - Calculate monthly flows based off NRCS predicted volume
 - NOAA daily inflow forecast (May – June)
 - Focus to fill Hebgen, provide flushing flow, & maintain flows <3500 cfs at Kirby

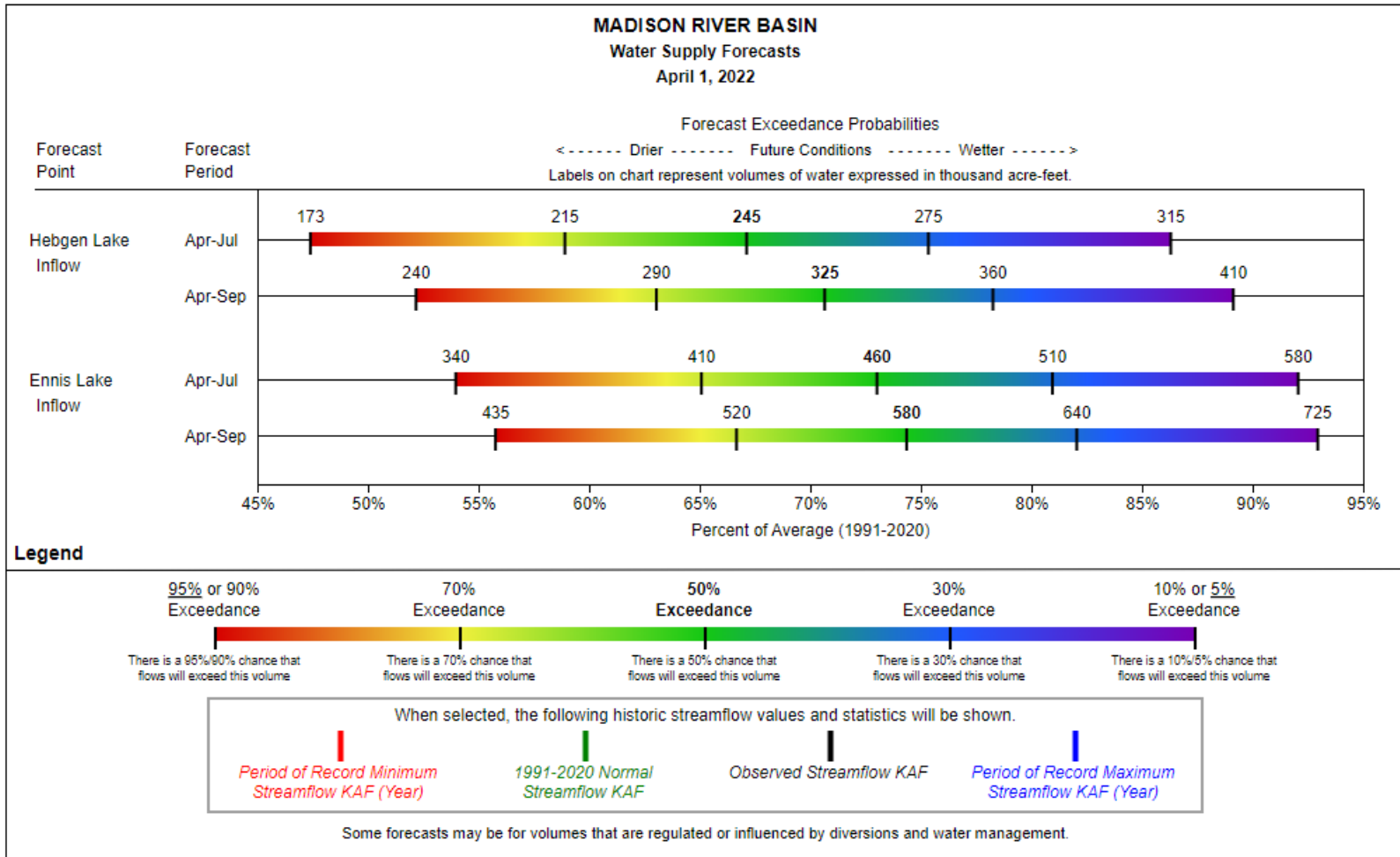
Or

- To provide minimum flows downstream

Attempt to maintain flows at or above April flows to protect rainbow trout spawning and redds in the gravels



NRCS Runoff Forecast





:HEBGEN RES MT - MADISON RIVER HSA - TFX
:LATEST ESTIMATED FLOW 2.10 KCFS AT 1200Z ON 0621

```
.ER HBDM8 20220621 Z DC202206211243/DH18/QIIF/DIH6  
:Flow Fcst /    00Z /    06Z /    12Z /    18Z  
.E1 : 0621 :                                            / 2.058  
.E2 : 0622 : / 2.026 / 2.001 / 1.976 / 1.953  
.E3 : 0623 : / 1.932 / 1.915 / 1.897 / 1.883  
.E4 : 0624 : / 1.871 / 1.867 / 1.865 / 1.868  
.E5 : 0625 : / 1.857 / 1.846 / 1.833 / 1.819  
.E6 : 0626 : / 1.803 / 1.787 / 1.766 / 1.743  
.E7 : 0627 : / 1.718 / 1.696 / 1.672 / 1.648  
.E8 : 0628 : / 1.625 / 1.606 / 1.585 / 1.566  
.E9 : 0629 : / 1.548 / 1.534 / 1.518 / 1.503  
.E10: 0630 : / 1.487 / 1.475 / 1.461 / 1.447  
.E11: 0701 : / 1.432 / 1.421 / 1.406
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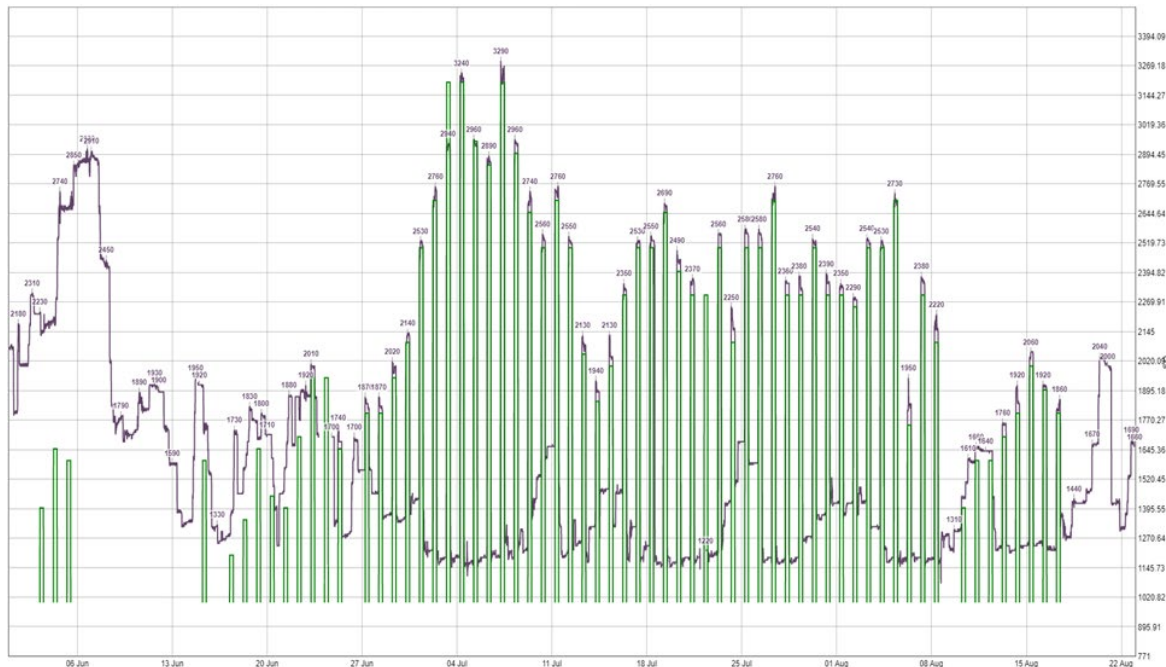
Hebgen				
Date	Inflow	Outflow	Storage	Elevation
1-May	910.00	640.00	141,522	6525.93
2-May	766.00	658.00	141,630	6525.95
3-May	1124.00	689.00	142,065	6526.03
4-May	799.00	689.00	142,175	6526.05
5-May	909.00	689.00	142,395	6526.09
6-May	854.00	689.00	142,560	6526.12
7-May	1078.00	693.00	142,945	6526.19
8-May	1410.00	695.00	143,660	6526.32
9-May	1300.00	695.00	144,265	6526.43
10-May	917.00	697.00	144,485	6526.47
11-May	918.00	698.00	144,705	6526.51
12-May	676.00	676.00	144,705	6526.51
13-May	971.00	641.00	145,035	6526.57
14-May	1025.00	640.00	145,420	6526.64
15-May	640.00	640.00	145,420	6526.64
16-May	1246.00	641.00	146,025	6526.75



How does NorthWestern manage flows?

SUMMER

- Provide Hebgen Outflows to balance needs for thermal pulse program below Madison Dam
 - Pulses from Madison Dam to maintain lower Madison River water temperatures ≤ 80 degrees F
 - Pulse volume different every day – based on thermodynamic model
 - Full pulse volume released daily from 6 AM to noon
 - Reduce flows to near minimum after daily pulse
 - Pulse flows also benefit the upper Madison River temperatures





How does NorthWestern manage flows?

LATE SUMMER/EARLY FALL

- Reduce Hebgen outflows to provide minimum flows downstream
- Flows based on volume in Hebgen Reservoir





Challenges to Water Management

- Drought conditions – not enough water to meet all requirements
- Rapid decline in spring runoff coincides with thermal pulse and irrigation season
- Approximate travel time from Hebgen to Ennis is 24 hours
- Balancing needs to protect redds, provide minimum flows, dam safety, provide thermal pulses, irrigation withdrawal, ideal recreation levels, and to generate power.
- FERC license does not prioritize between flow and reservoir elevation requirements



Questions





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