

Predicted Hydrology for 2023 Spring/Summer

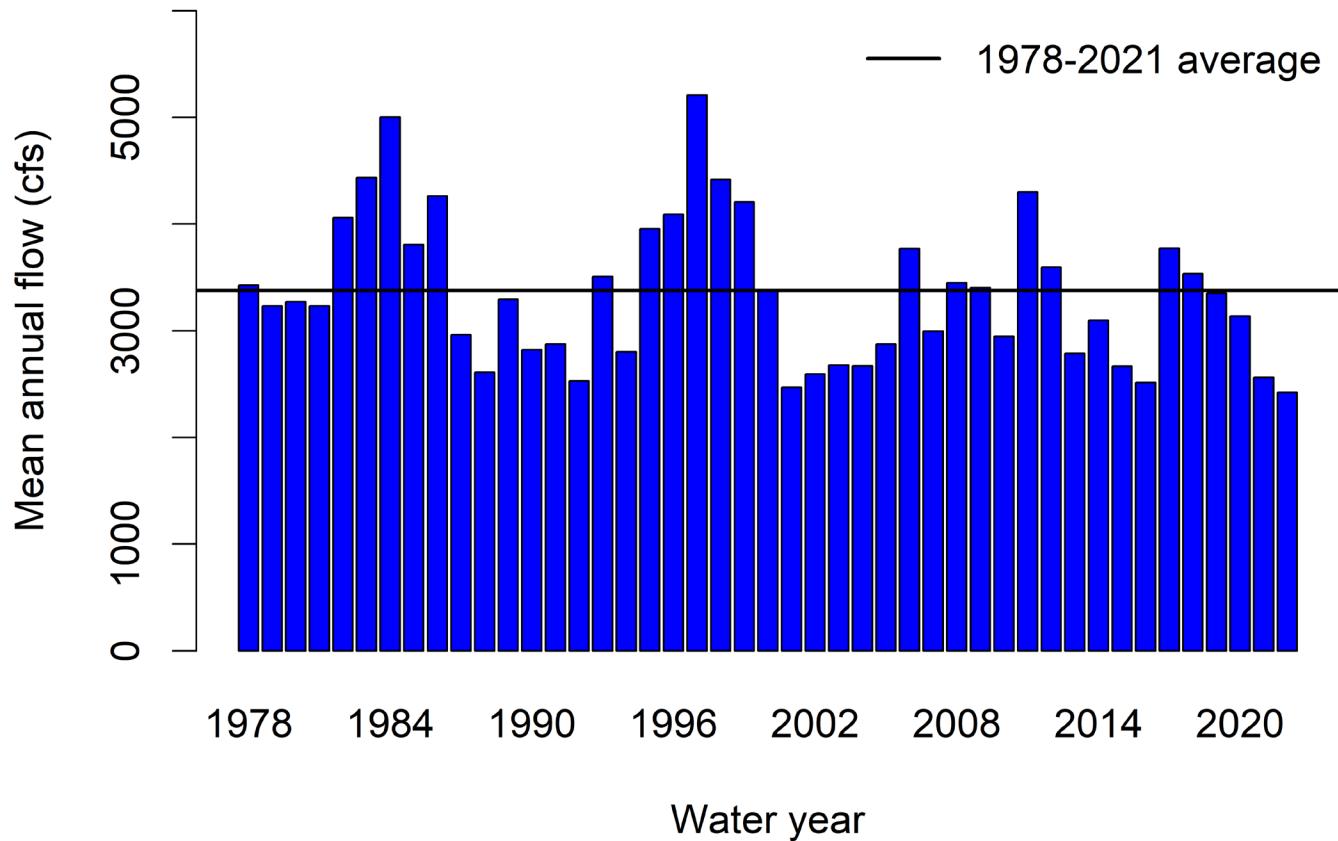


Henry's Fork Watershed Council, May 17 2023

Outline

- Drought recovery
- Current climatic conditions
- Winter reservoir management
- Late-April managed freshet
- Natural flow predictions
- Irrigation-season model
- Model results

Mean natural flow, Watershed total (Upper HF + FR + TR)



Water year 2022:

Lowest water supply in 1978-present record; 73% of average

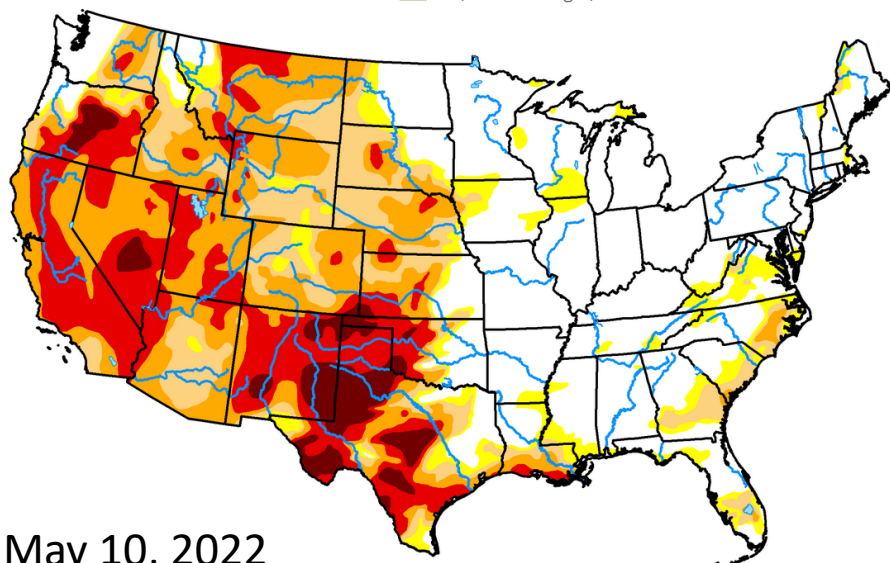
Comparison Slider

[Home](#) > [Maps](#) > Comparison SliderArea type: Area: Left: Right:

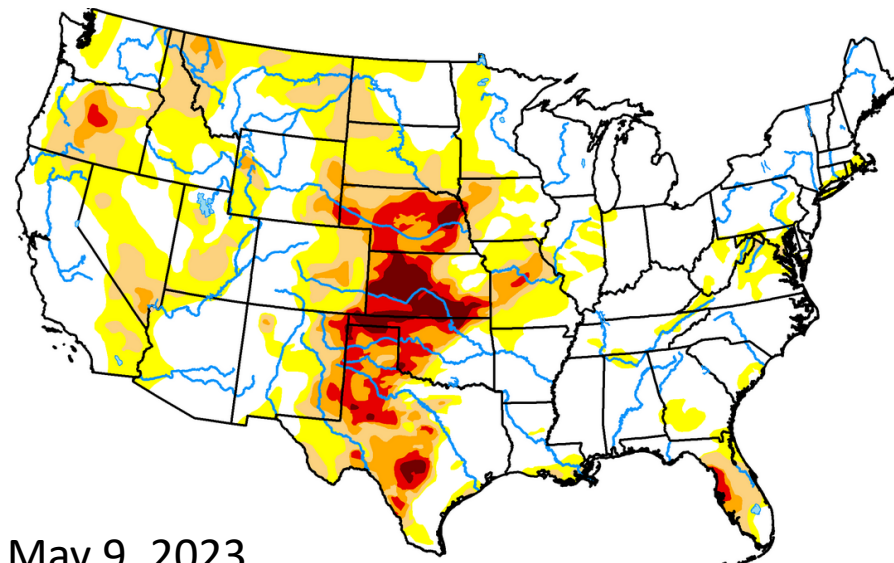
Drought Classification

☐ None
☐ D0 (Abnormally Dry)
☐ D1 (Moderate Drought)
☐ D2 (Severe Drought)

☐ D3 (Extreme Drought)
☐ D4 (Exceptional Drought)
☐ No Data

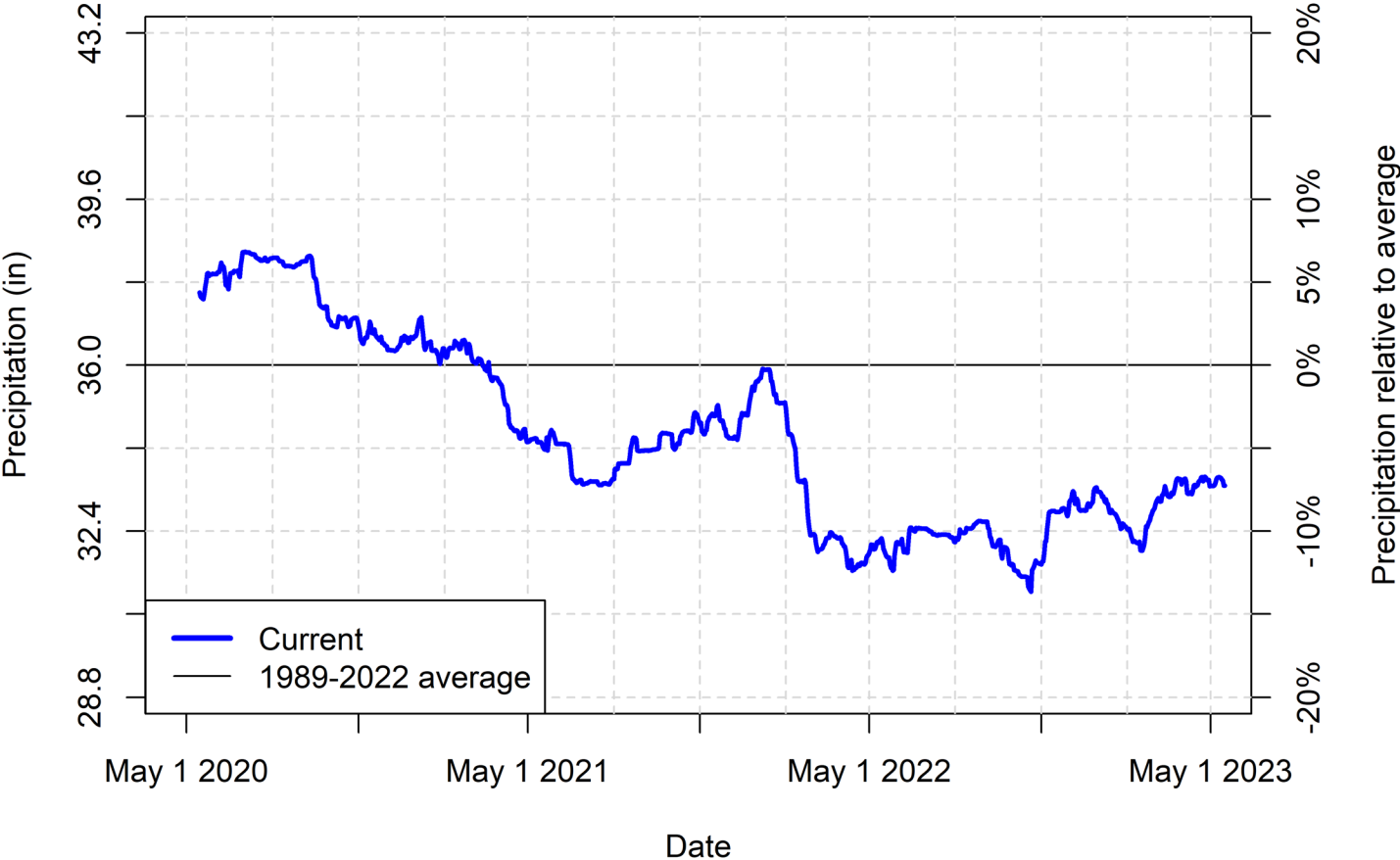


May 10, 2022

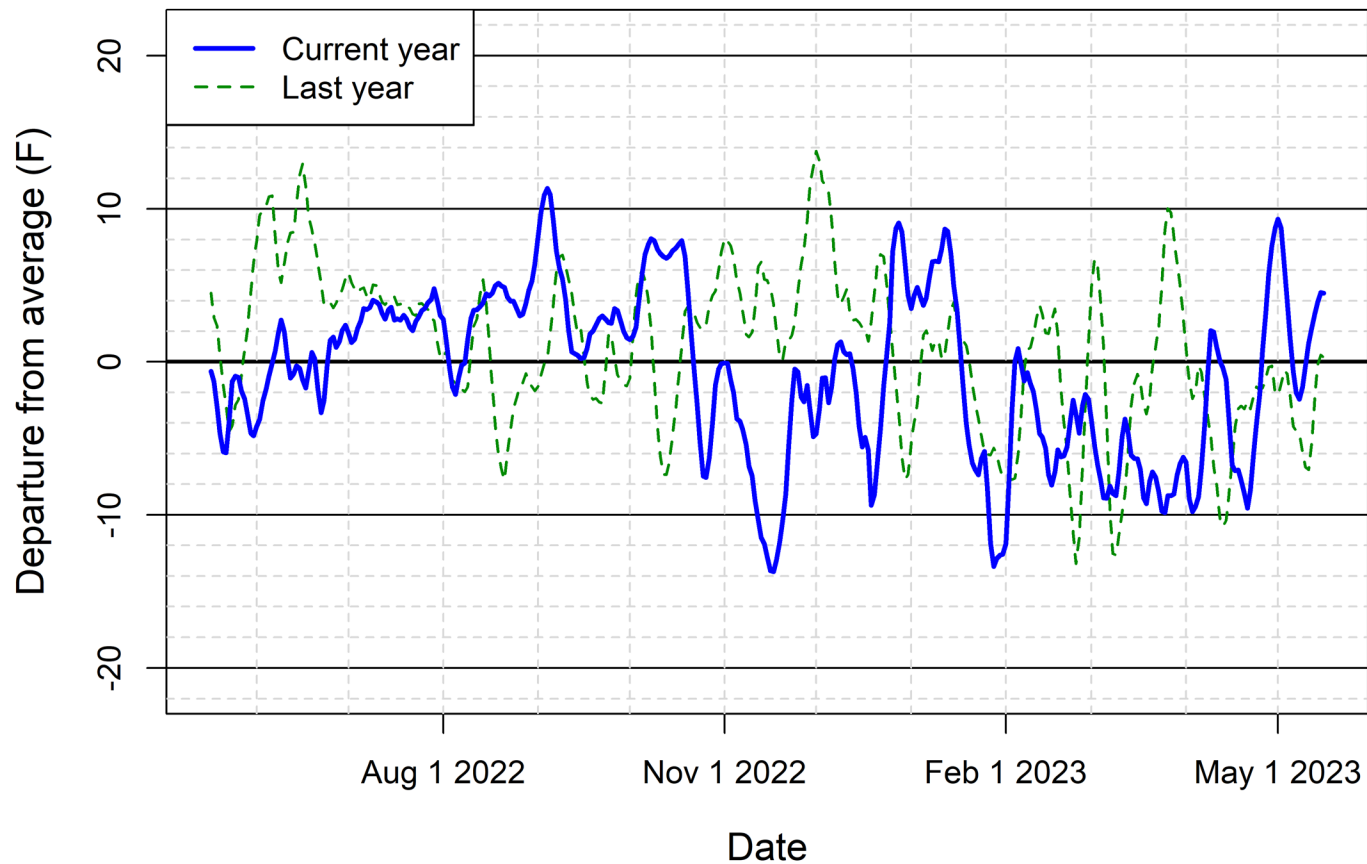


May 9, 2023

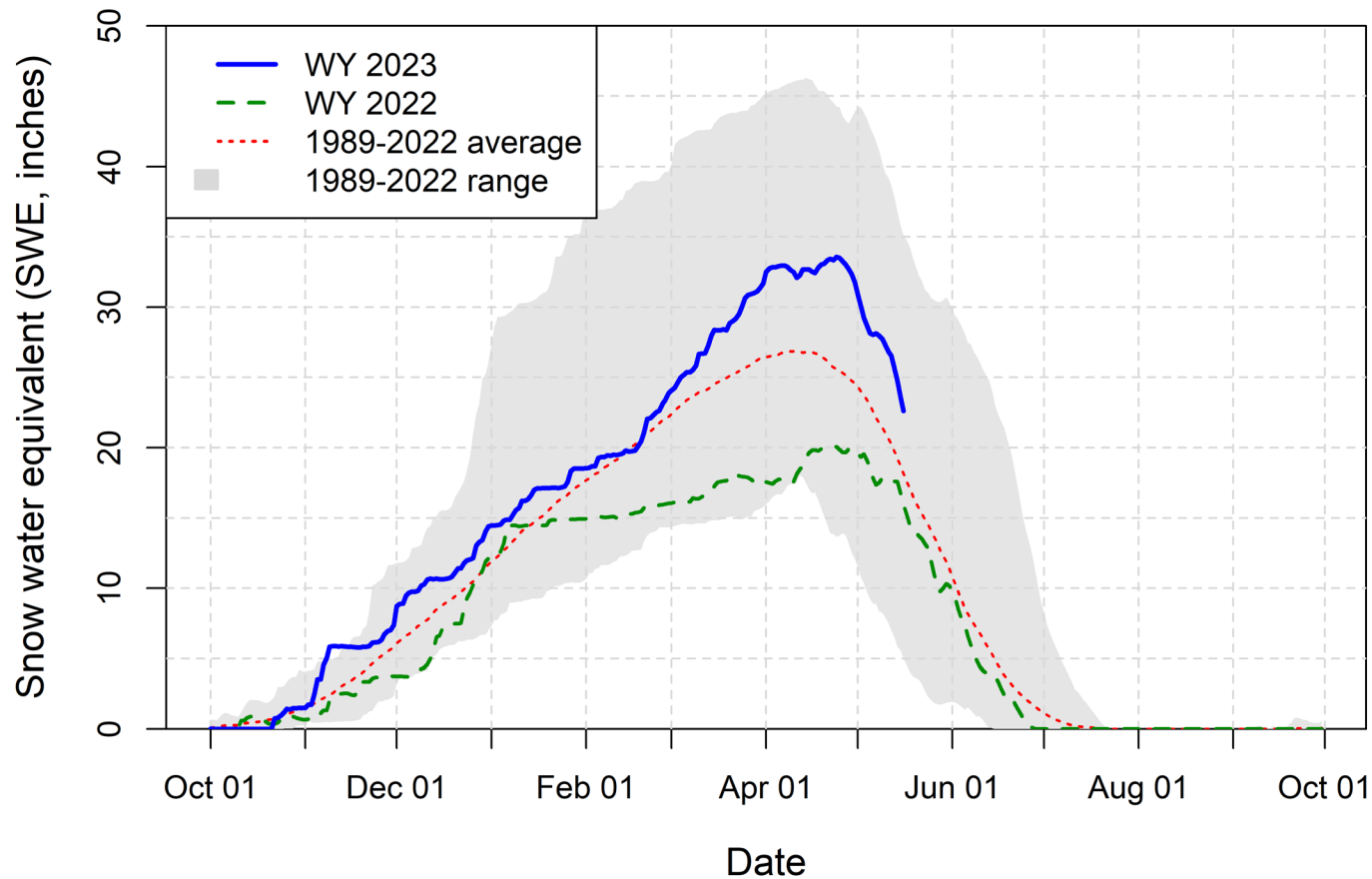
Three-year Average Annual Watershed Precipitation



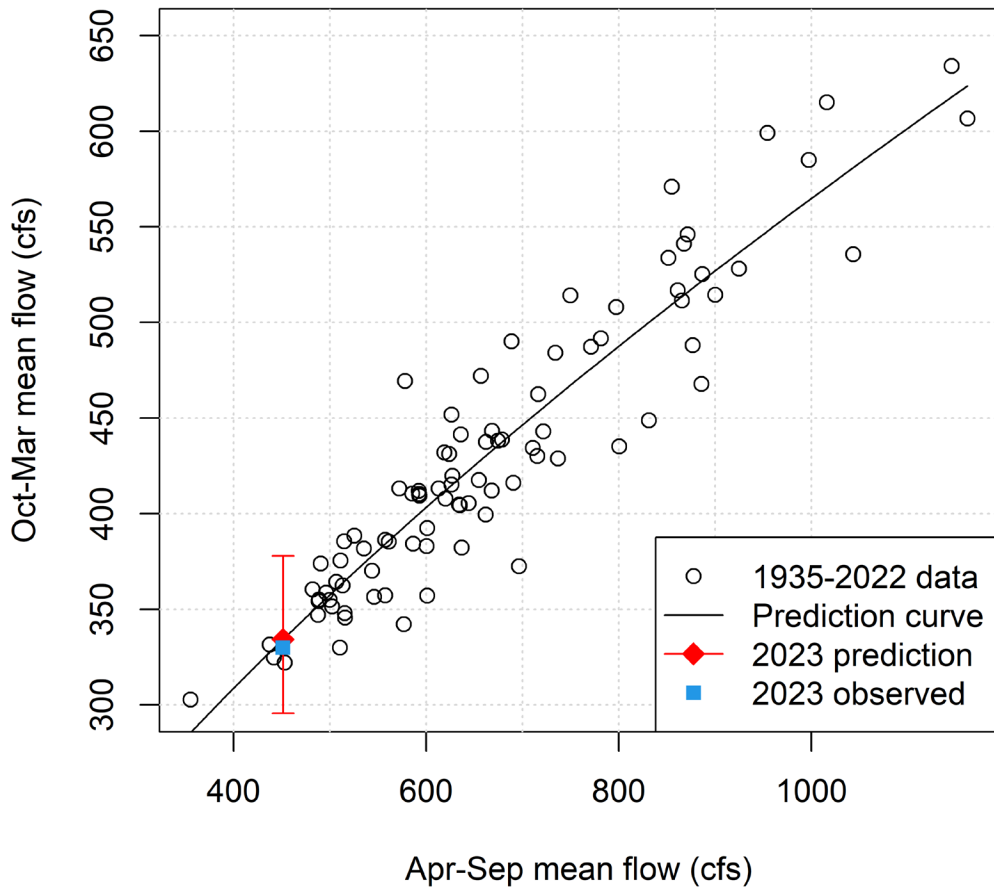
HF Watershed 7-day Temperature, Departure from 1989-2022 Average



Henry's Fork Watershed Mean SWE Accumulation May 17 2023



Oct-Mar Henry's Lake to Island Park inflow

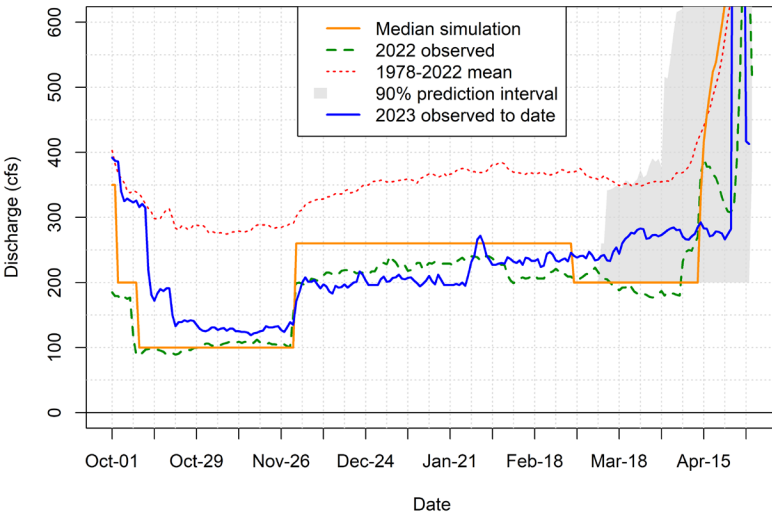


Winter inflow 2023:

4th lowest in 90-year record.

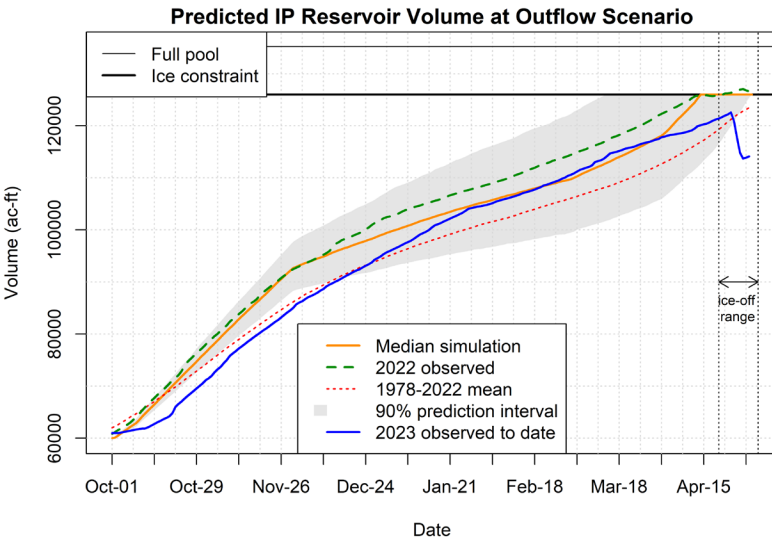
1. 1935
2. 2022
3. 2016
4. 2023
5. 2004

Island Park Reservoir Outflow



Winter Island Park Reservoir Management

- Slow start to fill
- Caught up to expectation in late January
- Late-winter precipitation allowed freshet



Basic IPR Sediment Dynamics

- Pre-1992 inputs: Henry's Lake Outlet, 1988 fire erosion
- Sediment in old river channel evacuated during fall 1992
- Since 1992: we *think* sediment input is lower due to grazing BMPs, restoration, and less variable HLO flows on HL Flat + forest growth
- Data show: reservoir-bottom sediment on West End mobilized by wave action & transported by density currents to dam late summer/fall
- More data: little sediment currently in old river channel
- And more data: sediment export from reservoir into river is high when:
 - Outflow is high
 - Outflow passes through USBR gates vs. power plant
 - Gates are opened for the first time each season



Typical mid-summer condition:

- Turbidity = 3-5 NTU* at power plant
- Turbidity = 8-10 NTU at gates

*NTU = Nephelometric turbidity units



Extreme event: 20 NTU September 2020

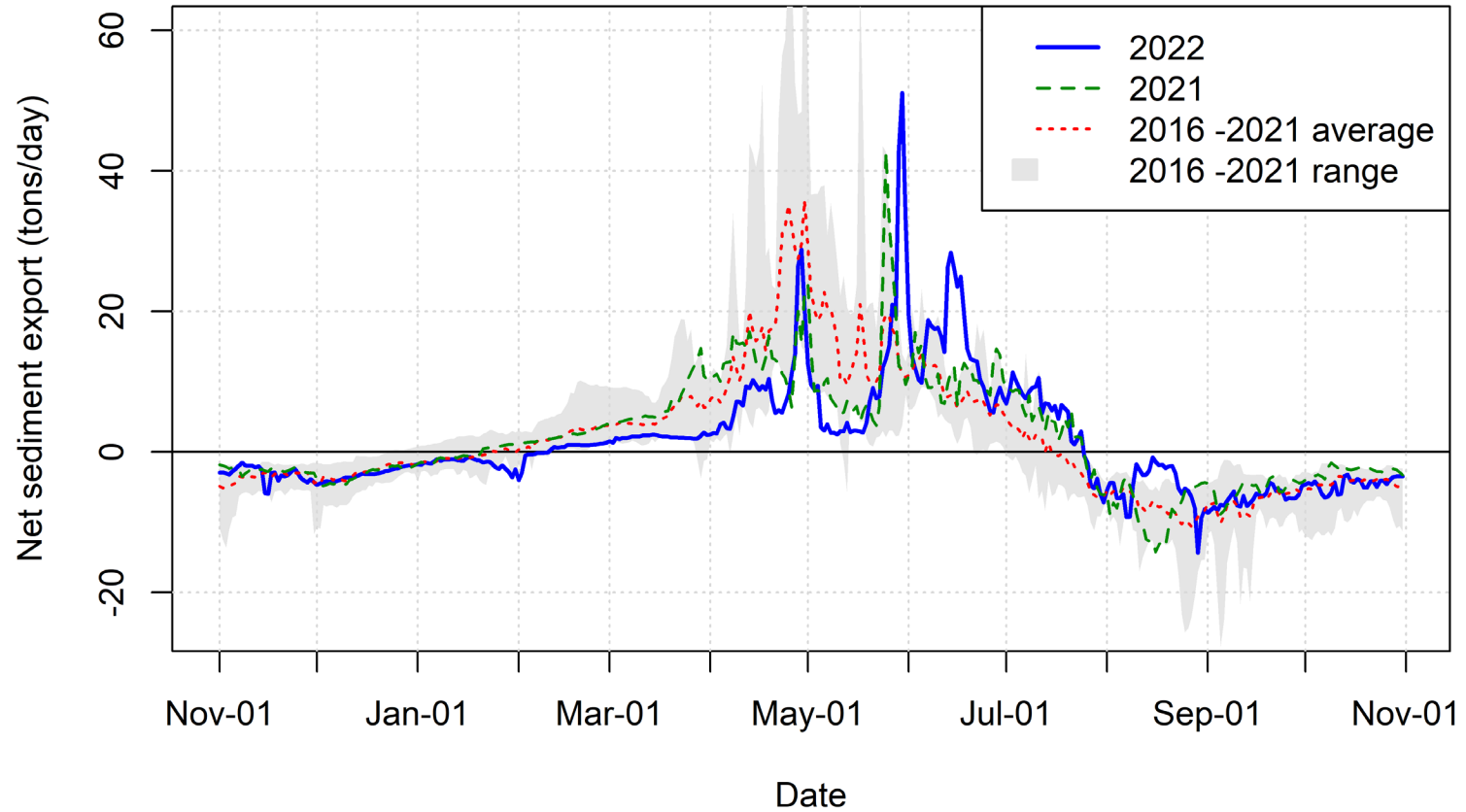
Sediment Dynamics in the River: Aquatic vegetation (macrophytes) drives the bus



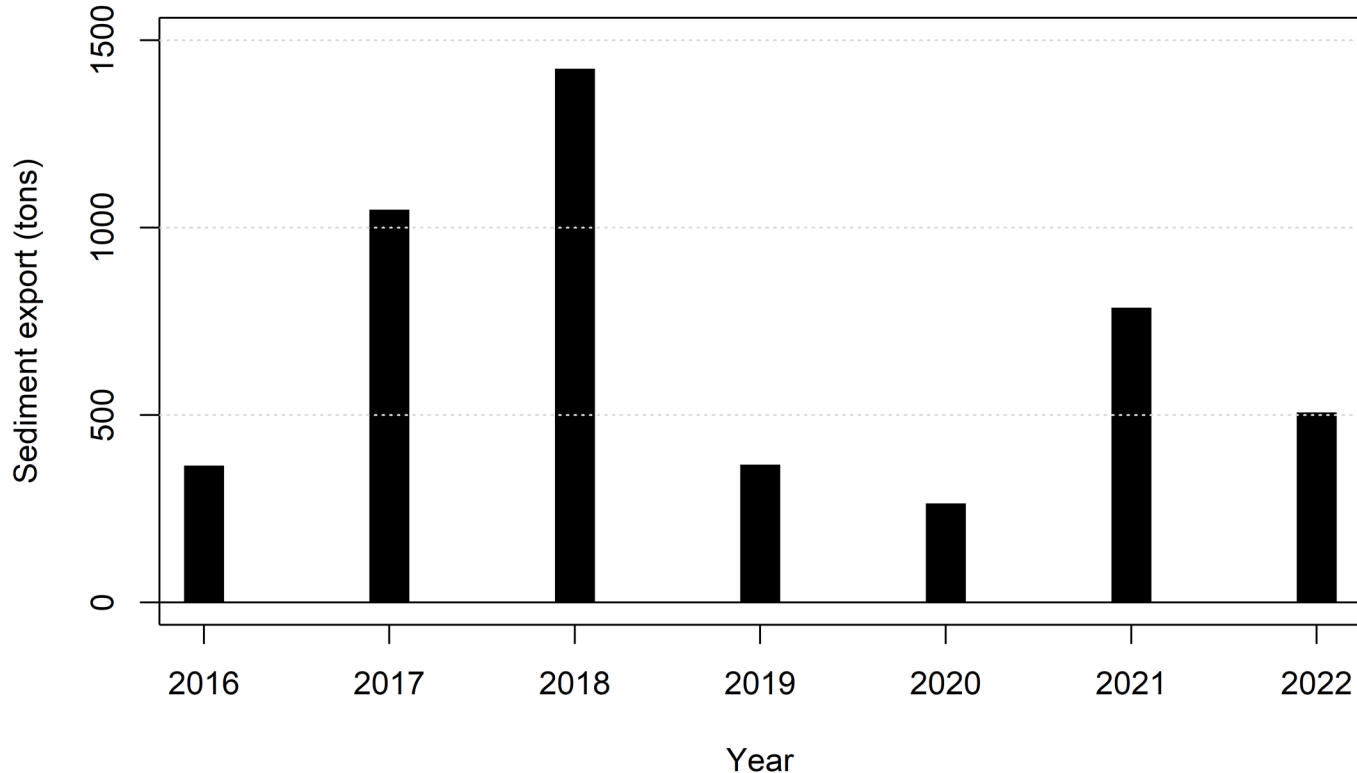
Plants present July-February

Sediment is trapped by plants when present and can be scoured when they are absent.

IP to Pinehaven Sediment Budget



Net Sediment Export from IP to Pinehaven

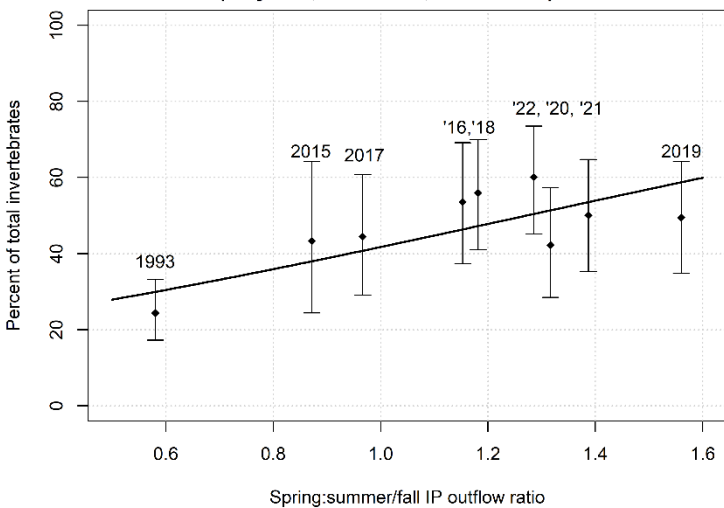


Average export:
680 tons/year

Context: 1992
event exported
50-100K tons

If half of that was
deposited in the
river, 37-74 years
will be required to
move it all out.
We're in year 31.

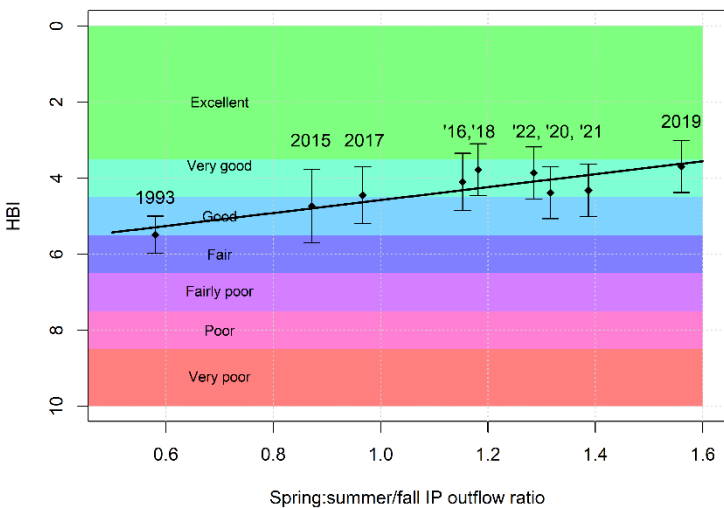
Percent EPT (mayflies, stoneflies, caddisflies) vs. Freshet Flow



Percent of total insects made up of mayflies, stoneflies, and caddisflies increases when ratio of springtime flow to summer/fall flow is higher.

NOTE: Very low value in spring 1993, following fall 1992 event.

HBI vs. Freshet Flow



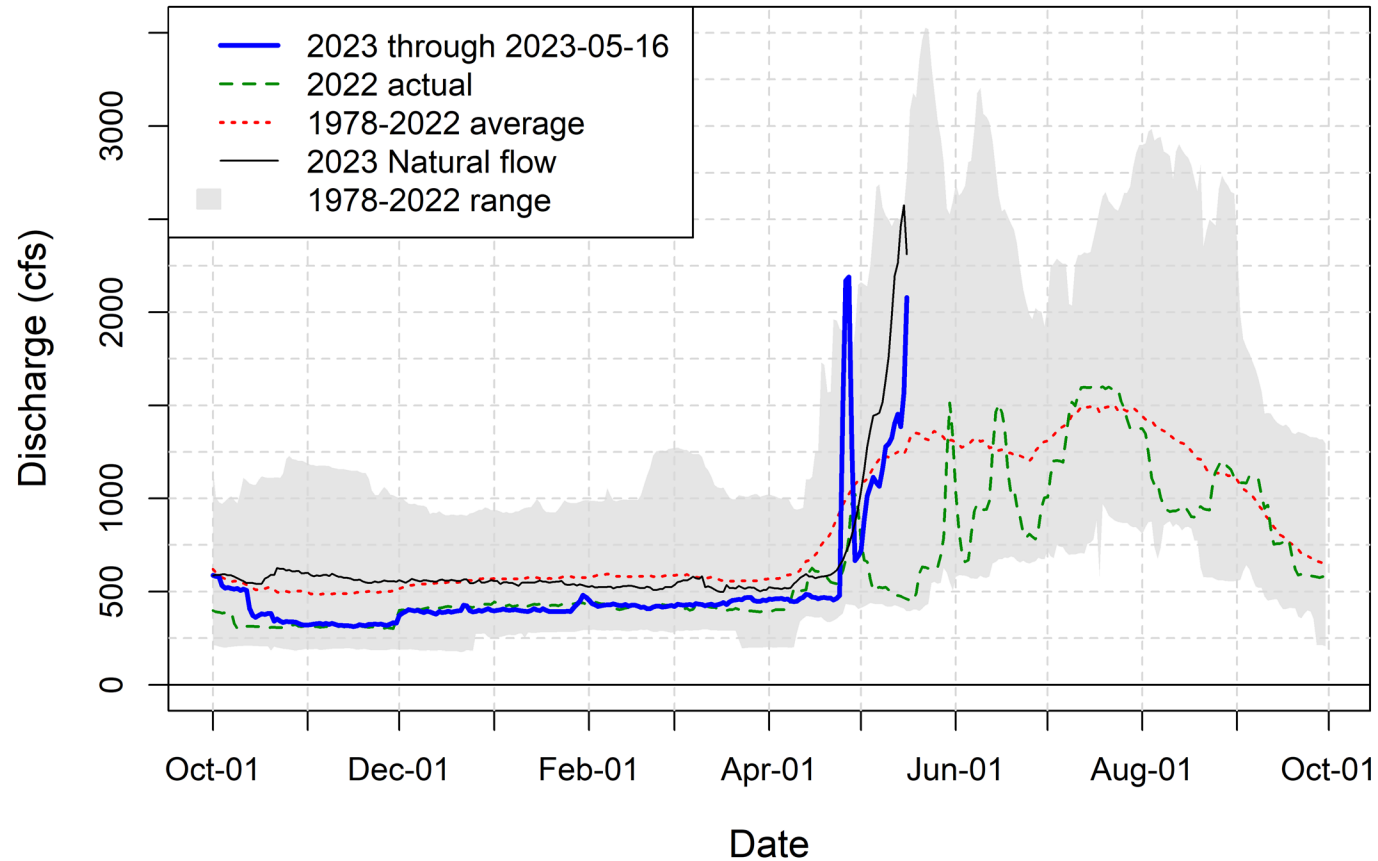
Same for biotic integrity, as indicator of overall habitat quality.

Highest quality in March of 2019 and 2018.

Freshet operations at Island Park Dam

Year	Type	Dates	Duration of peak flow	Peak flow (at IP Dam)
1990s	Planned; not implemented	March-Apr	>9 hours	2400 cfs
2011	Planned; not implemented	April 19-24	48 hours	2800 cfs
2018	Incidental but monitored	May 23-29	134 hours	1692 cfs
2019	Planned and implemented	April 29-May 2	72 hours	1781 cfs
2020	Planned and implemented	April 29-May 4	117 hours	1803 cfs
2023	Planned and implemented	April 25-28	69 hours	2000 cfs

Total Regulated Flow in Box Canyon





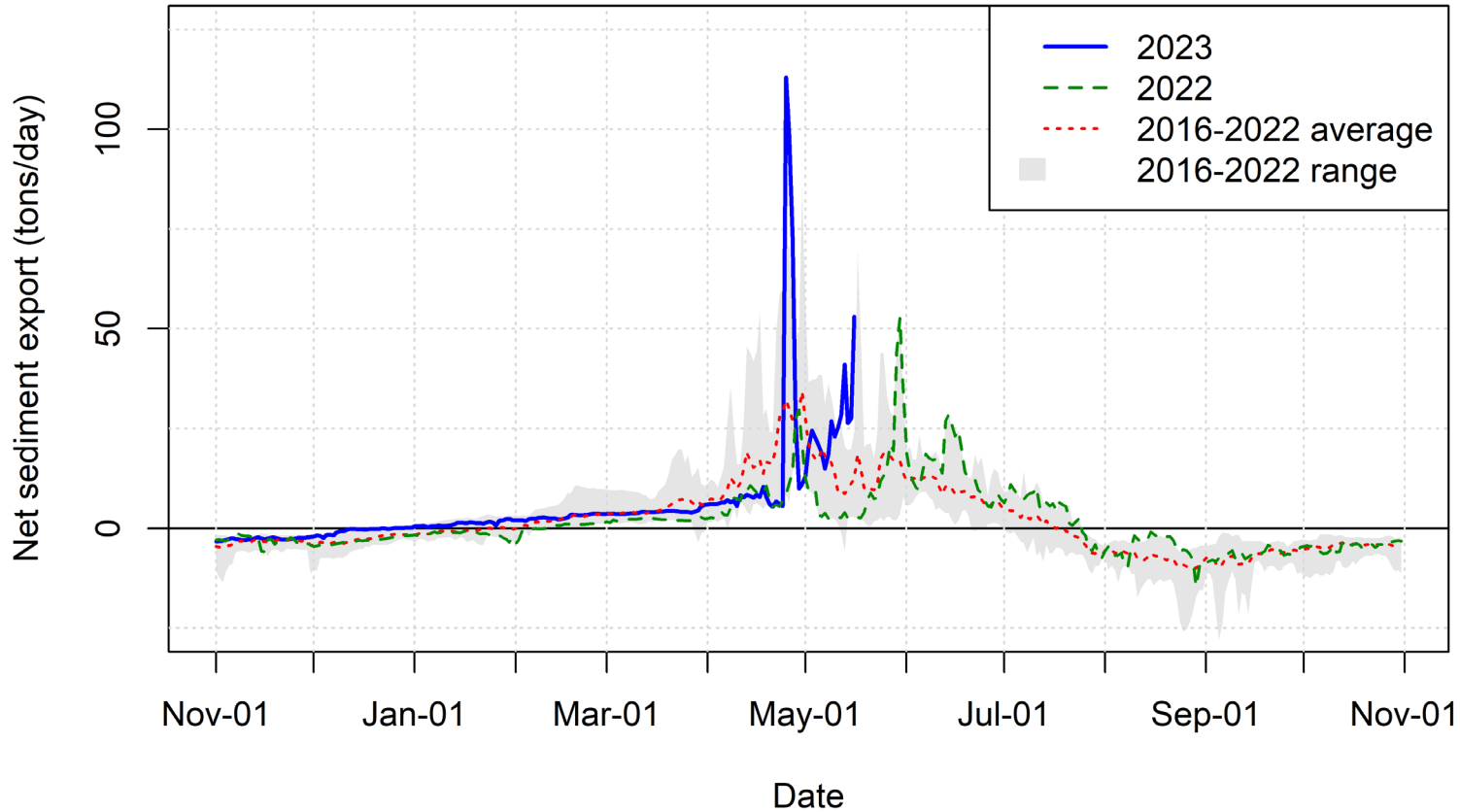
Left: Pinehaven, ~75 NTU,
2023-04-25 ~6 hours after
peak flow reached

Right: IP outflow at typical
mid-summer condition,
~1400 cfs,
8-10 NTU at gates

Bottom right: IP outflow
2023-04-25 ~4 hours after
peak flow reached, 2000
cfs, 5-6 NTU at gates



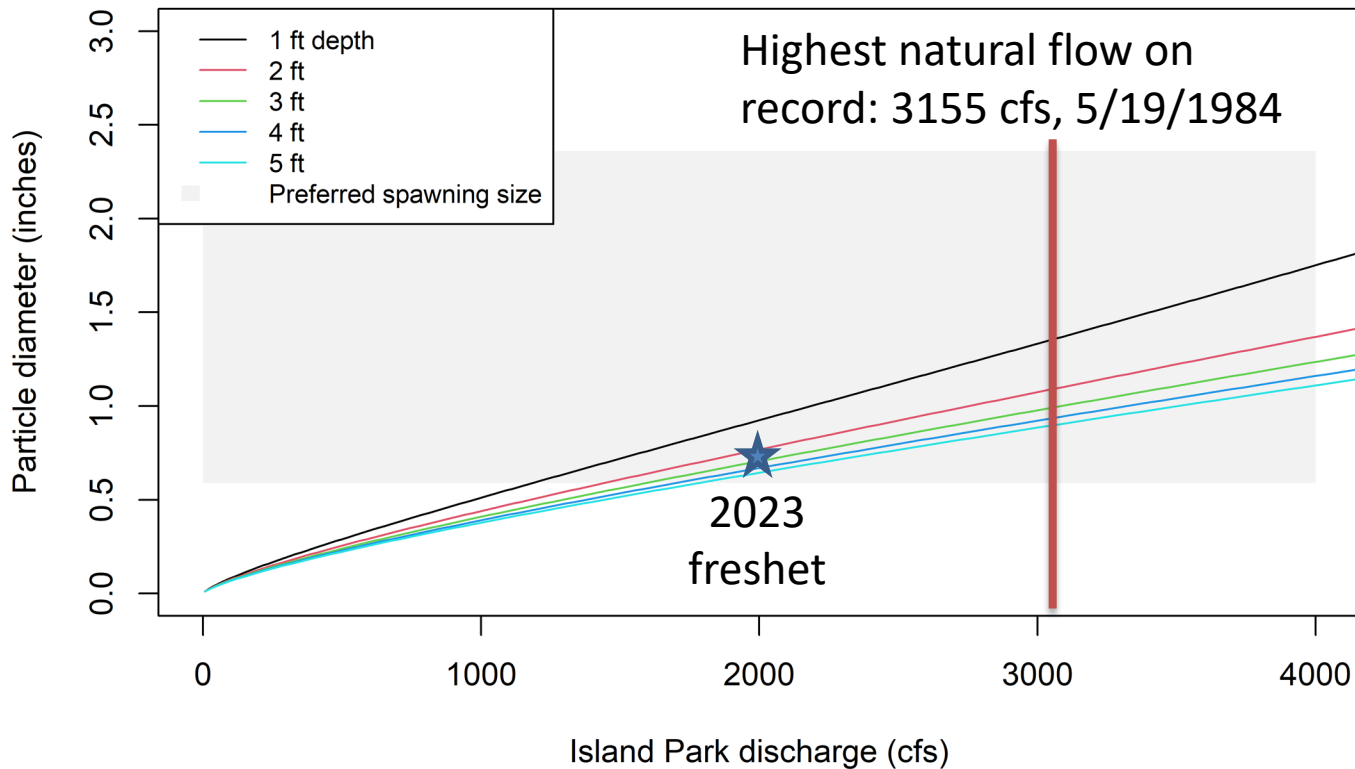
IP to Pinehaven Sediment Budget



Freshet exported
~300 tons of
sediment above
background

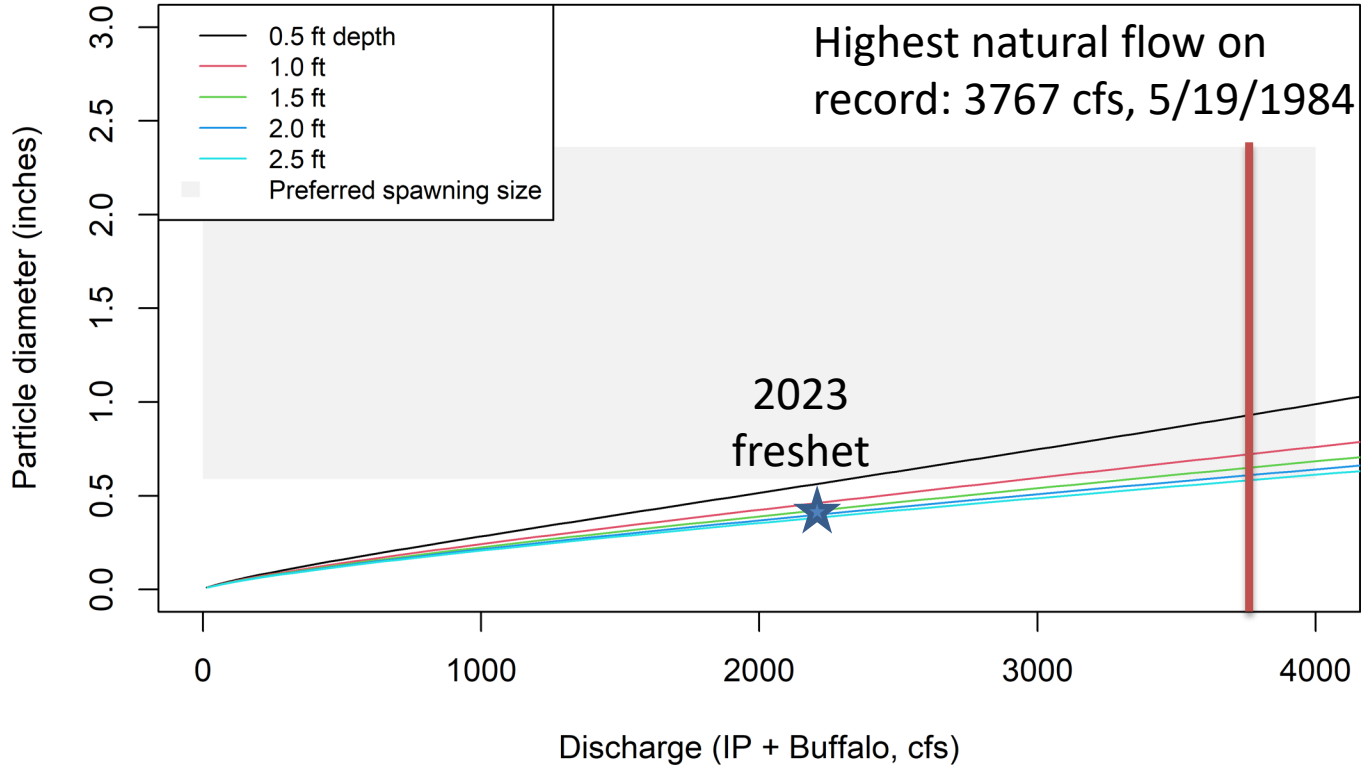
Can high flows mobilize spawning gravel?

Island Park Dam



Can high flows mobilize spawning gravel?

Last Chance



Spawning area below Island Park Dam at ~500 cfs



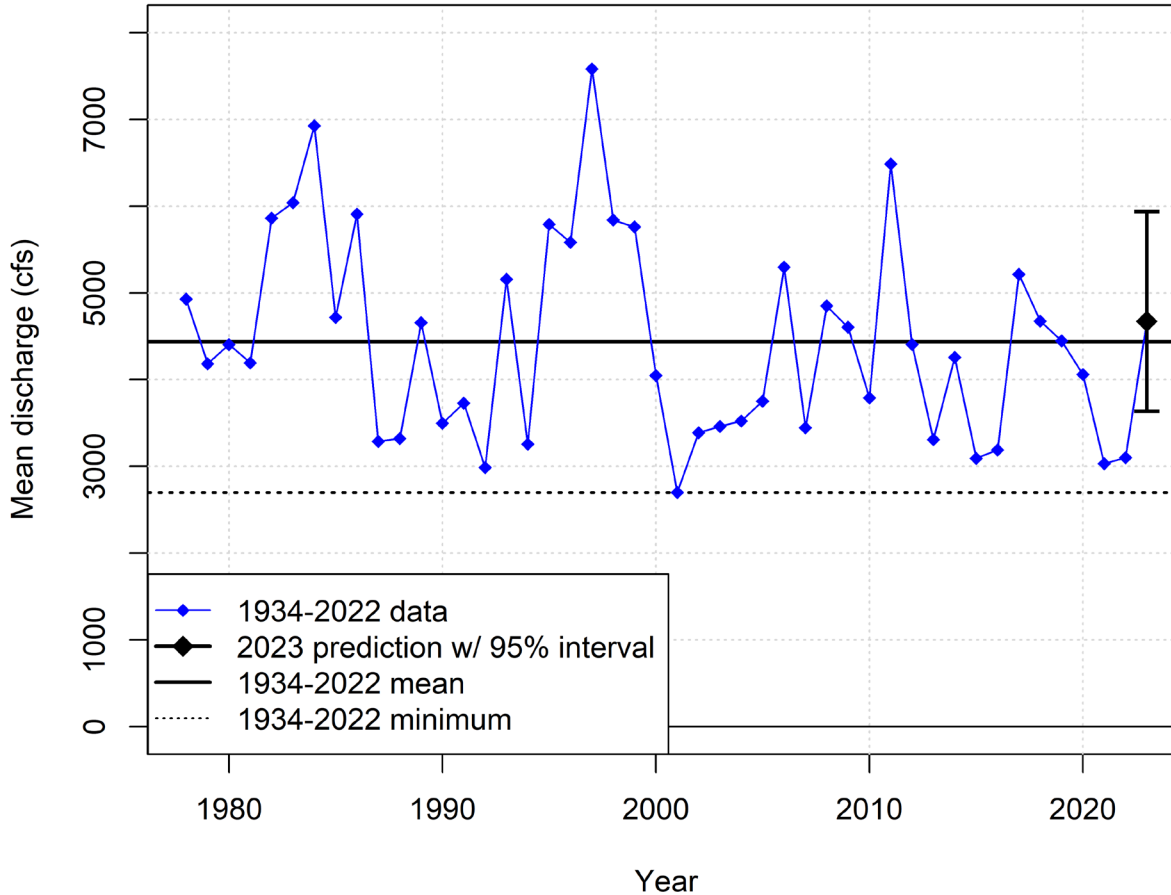
January 27, 2018



May 1, 2023

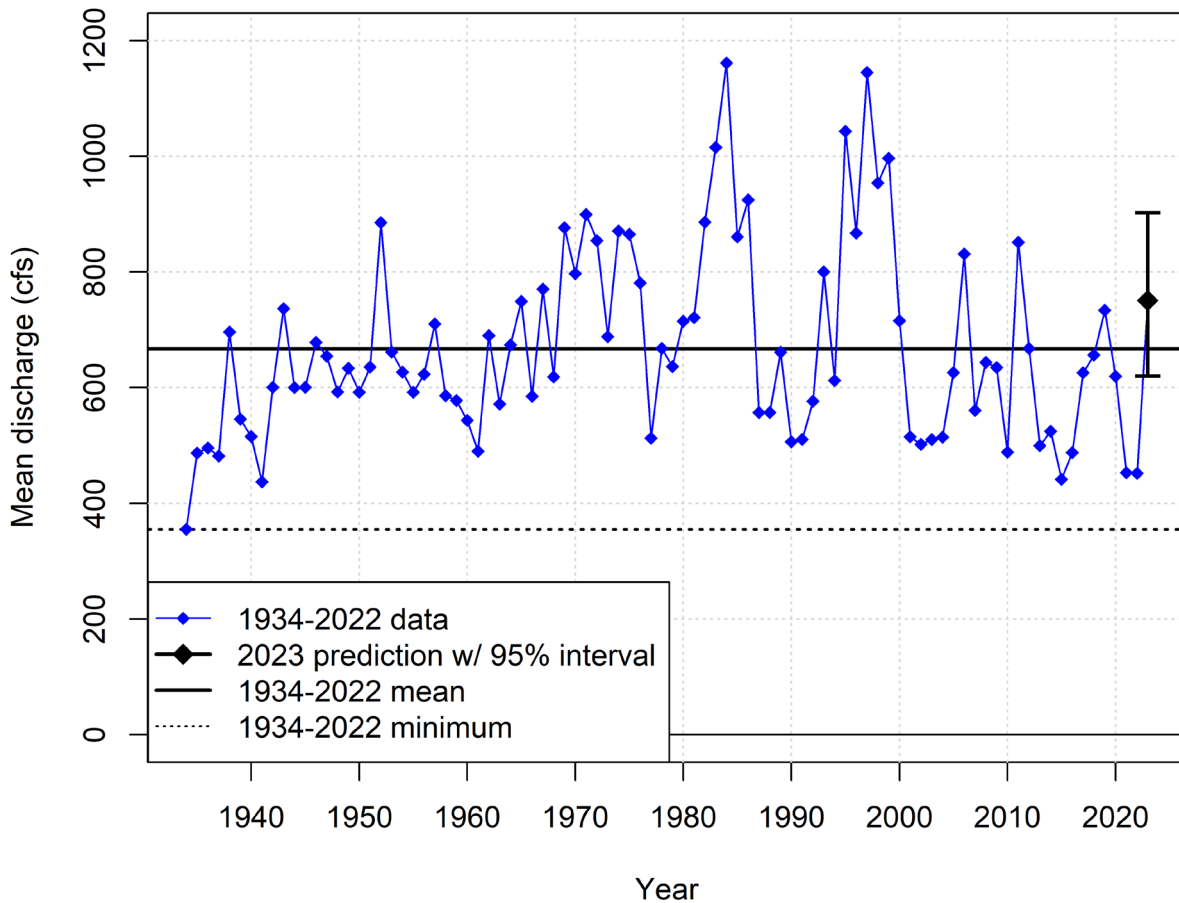
Apr-Sep Henry's Fork Watershed Natural Flow

Summer 2023 predictions



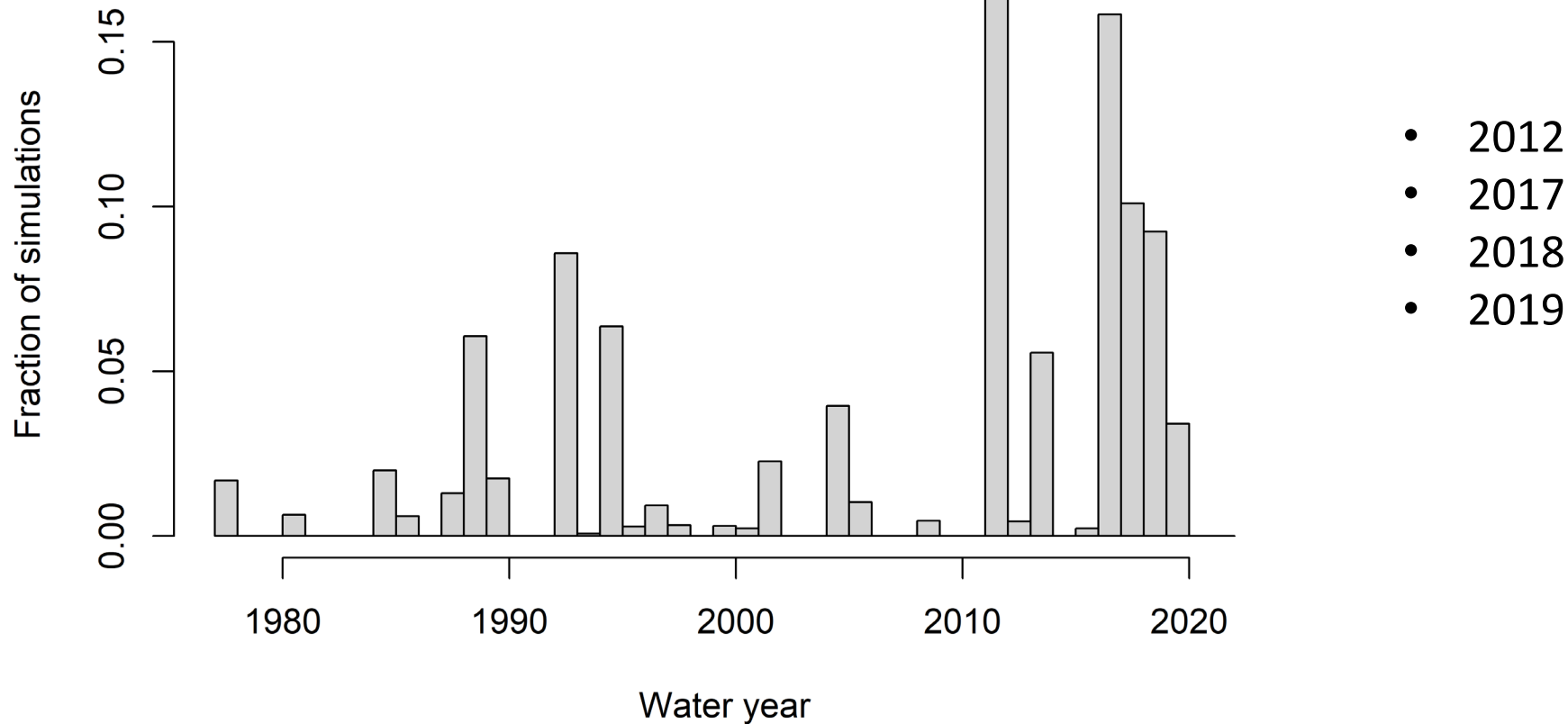
- 105% of “modern” average
- Similar to 2018

Apr-Sep Natural Inflow between HL and IP

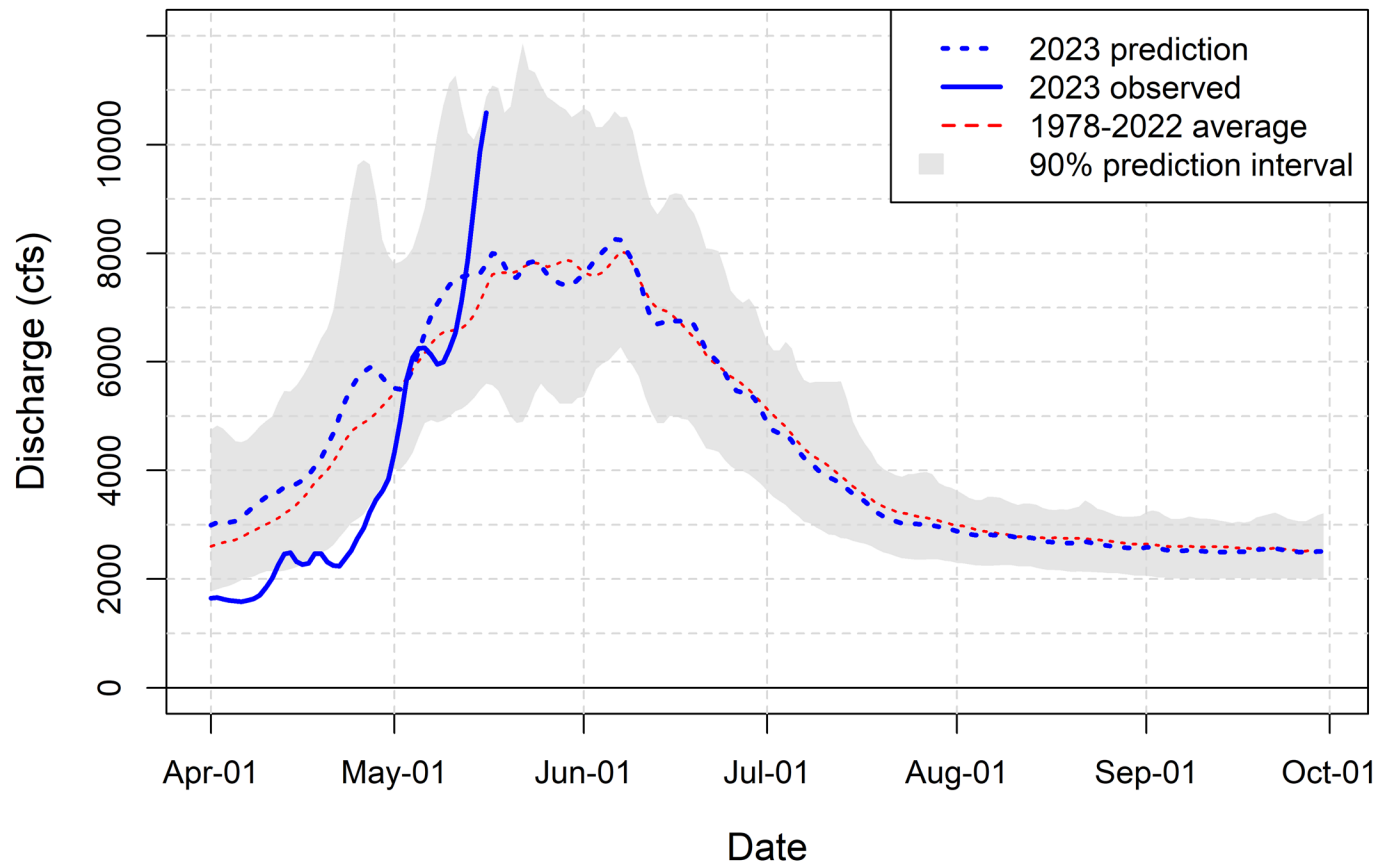


- 109% of long-term average
- Similar to 2019

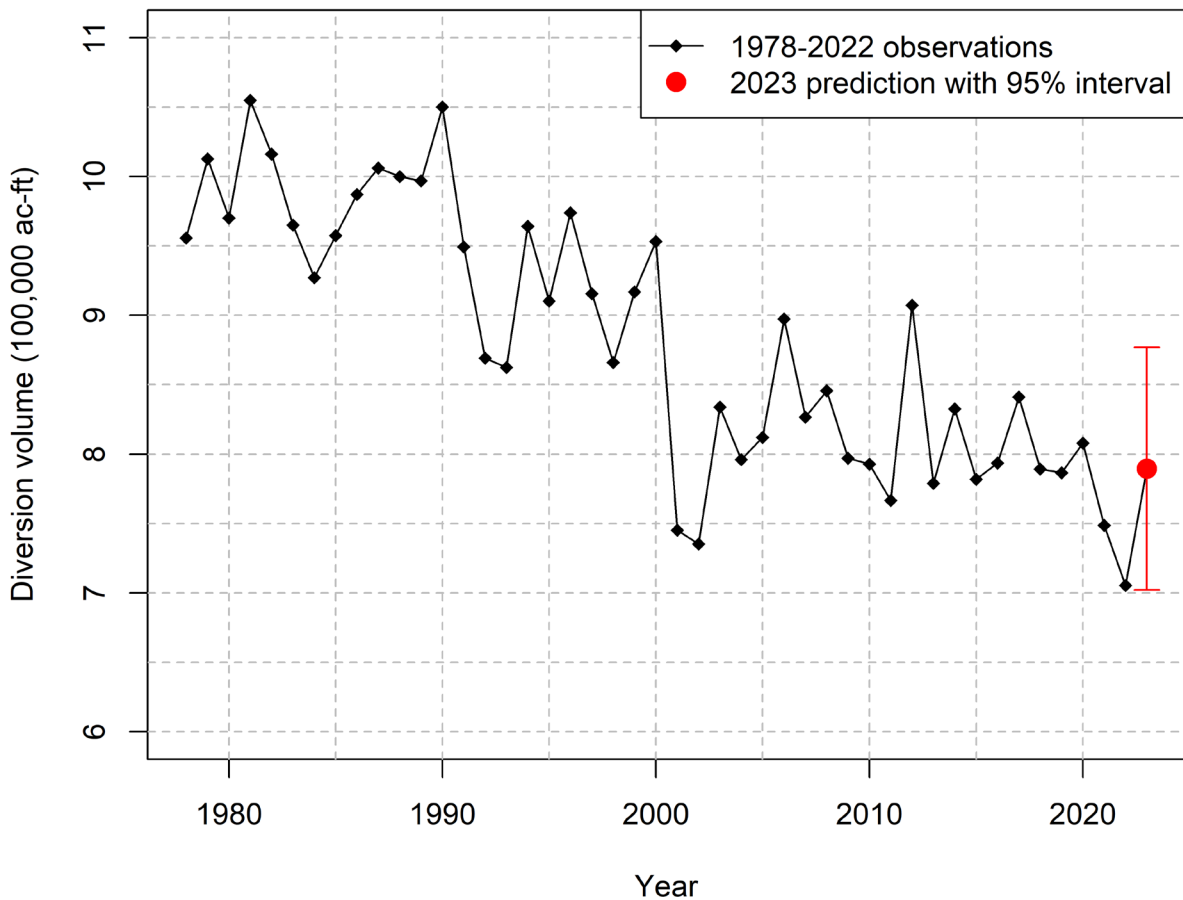
Distribution of Analog Years for Runoff Timing



Henry's Fork Watershed Natural Flow



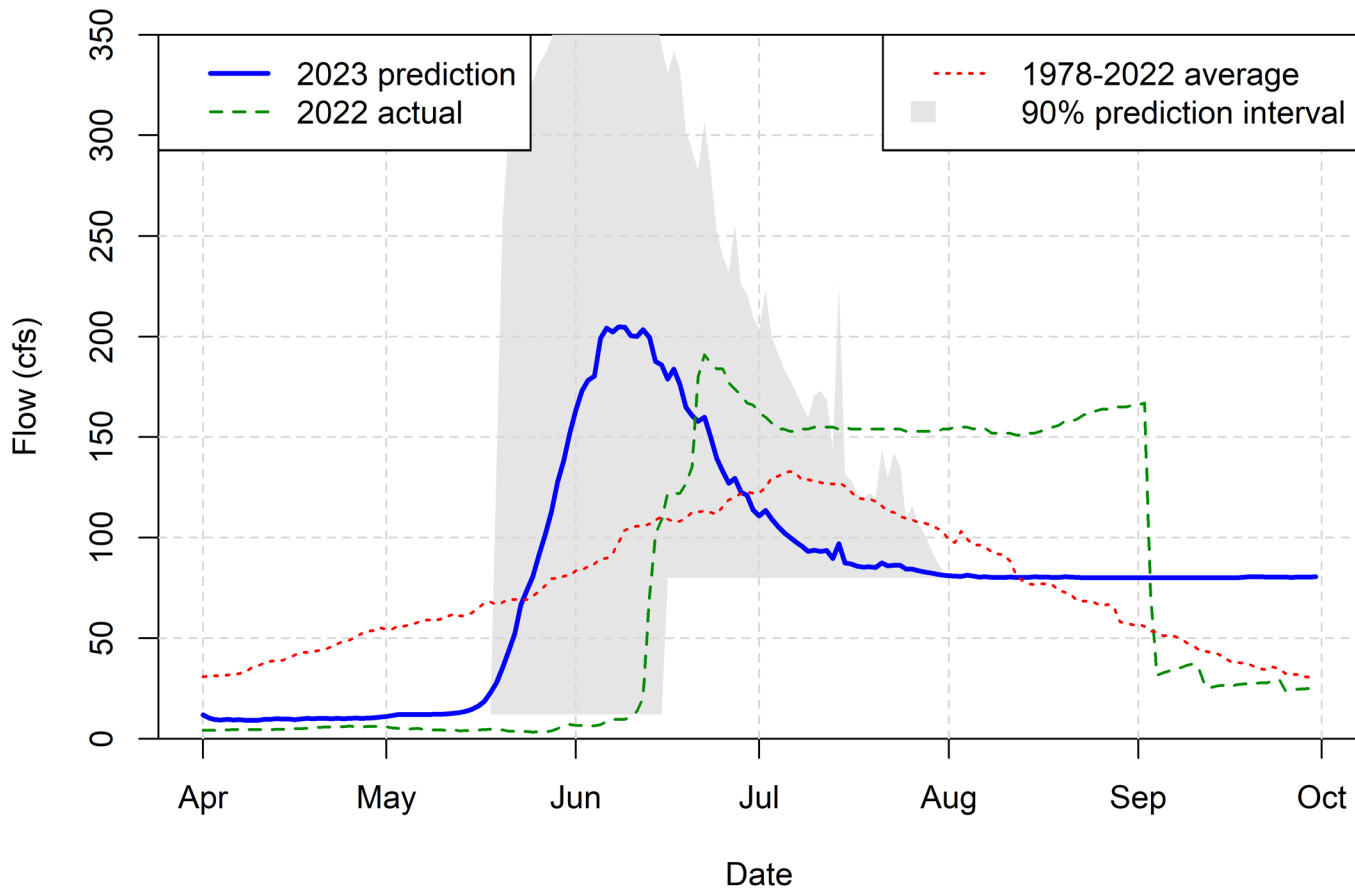
April-September Diversion Volume



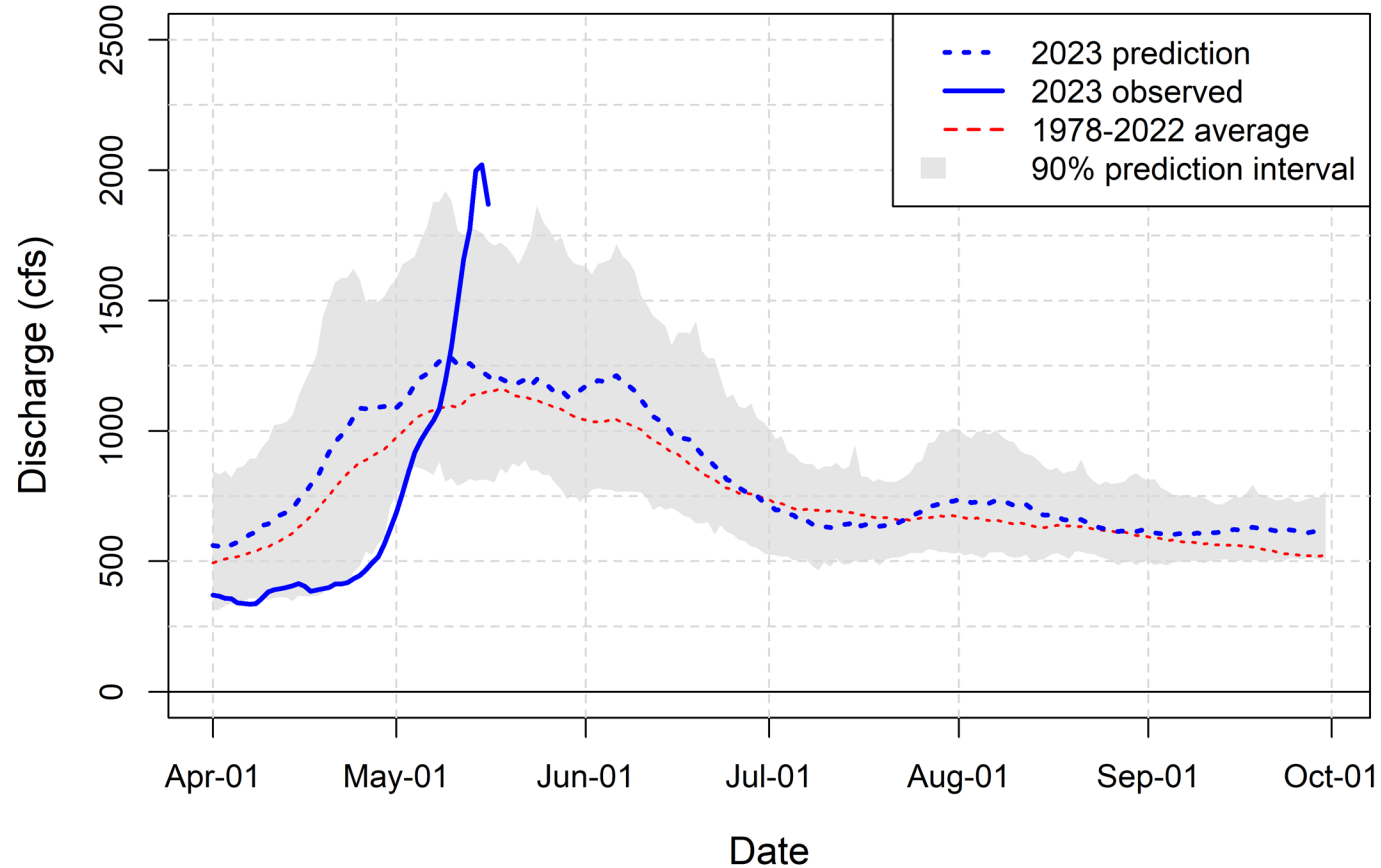
Analog years

- 2018
- 2019

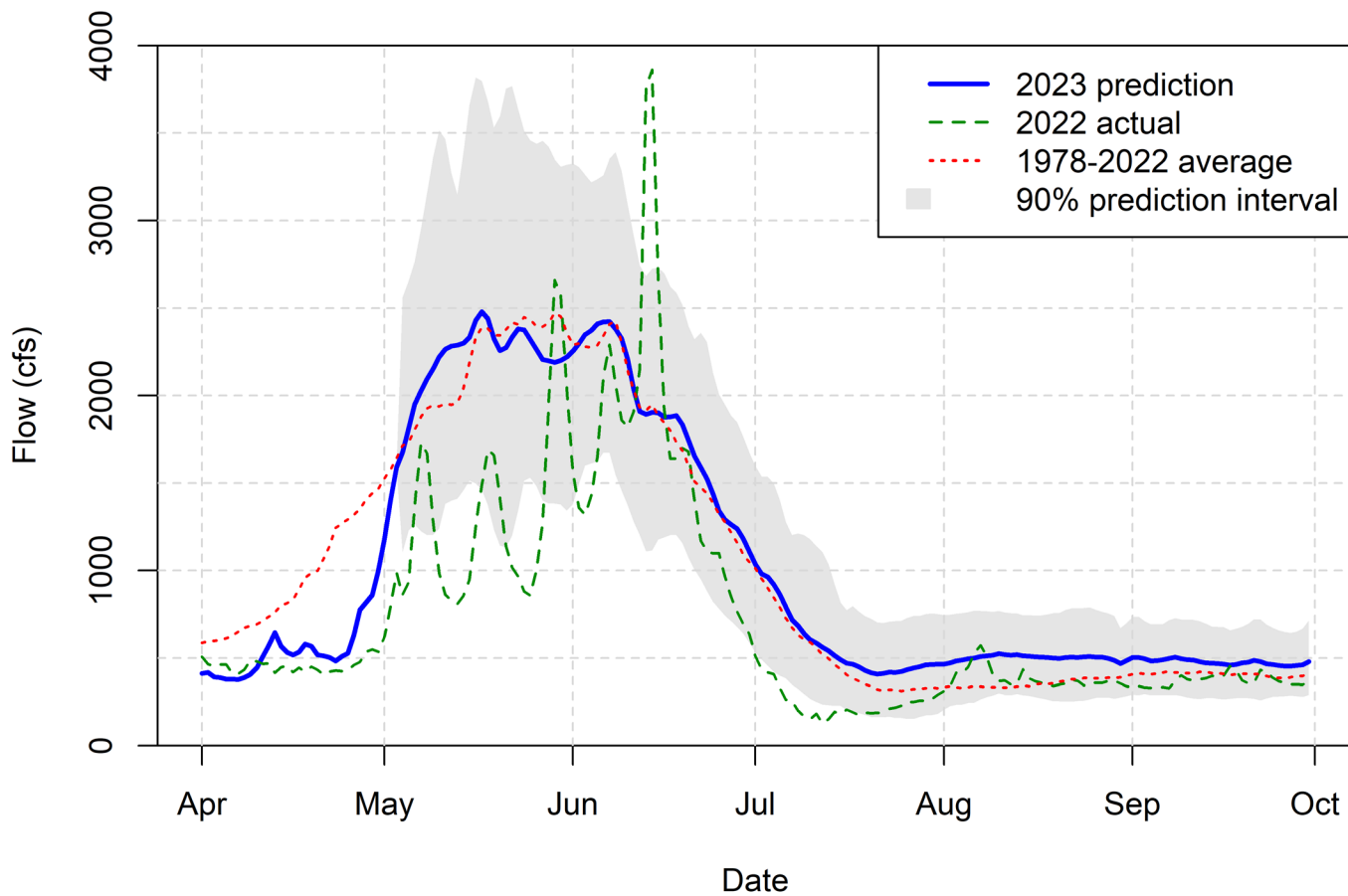
Streamflow in Henrys Lake Outlet



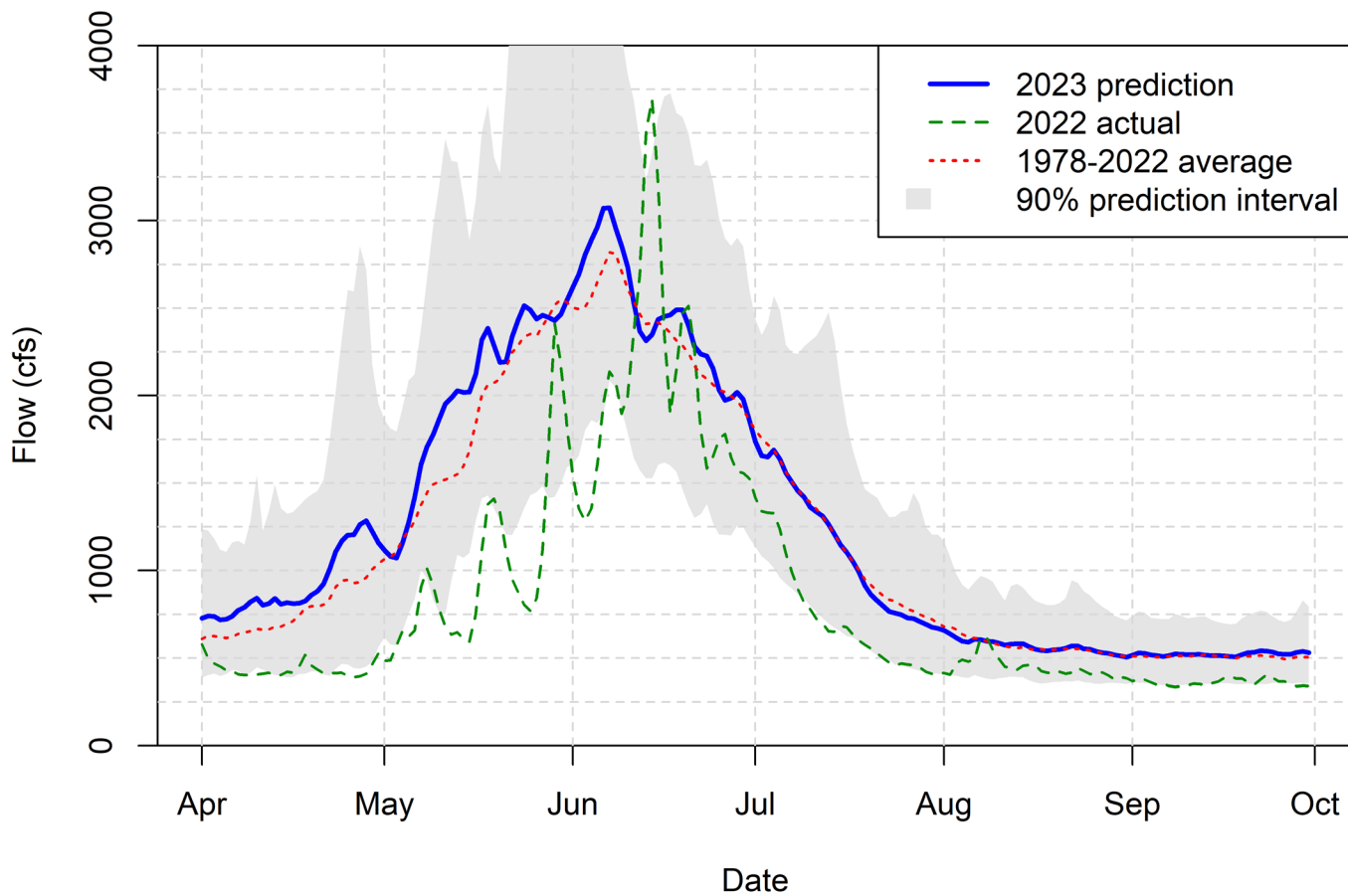
Net Inflow to Island Park Reservoir



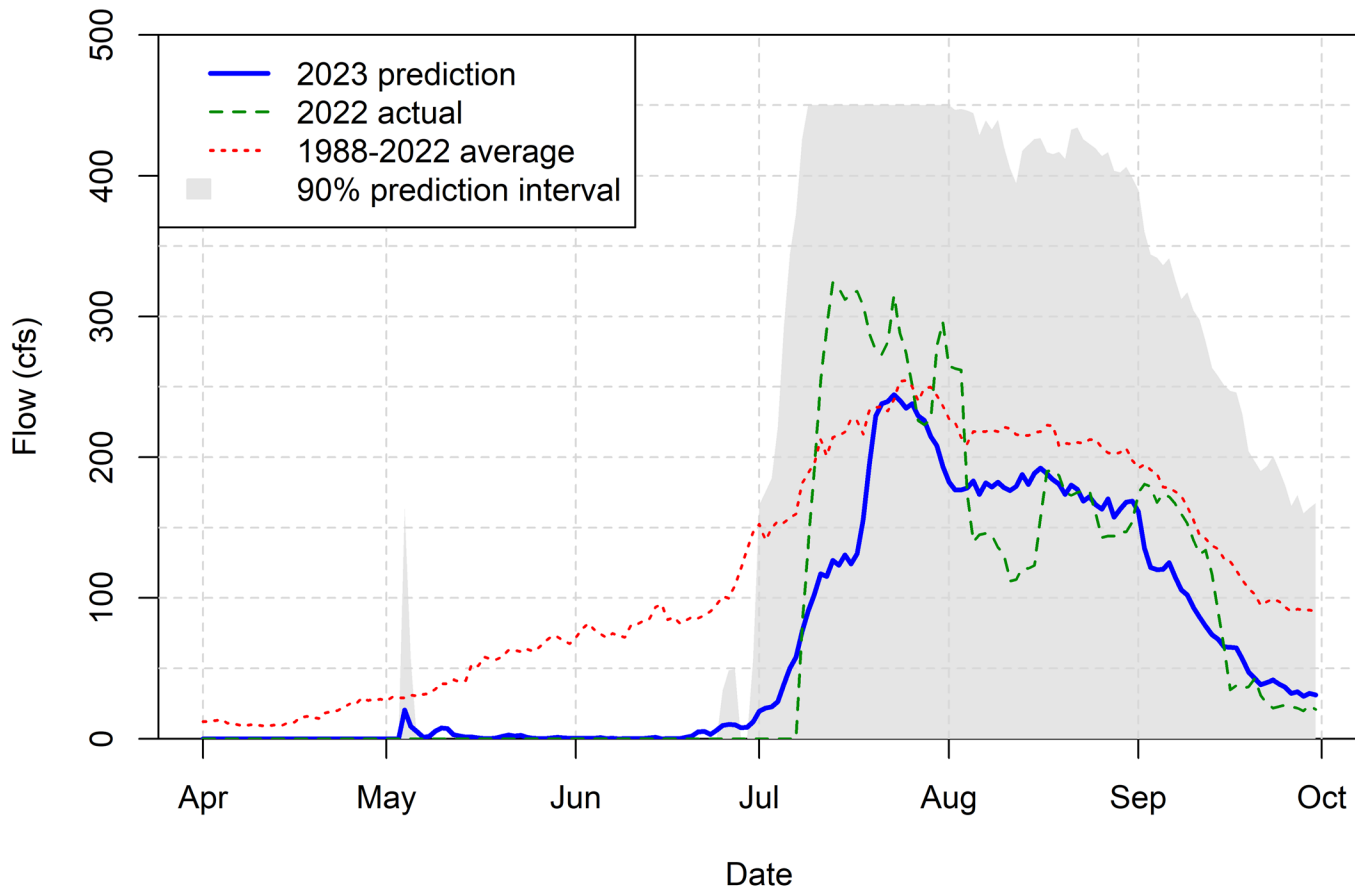
Streamflow in Fall River at Chester



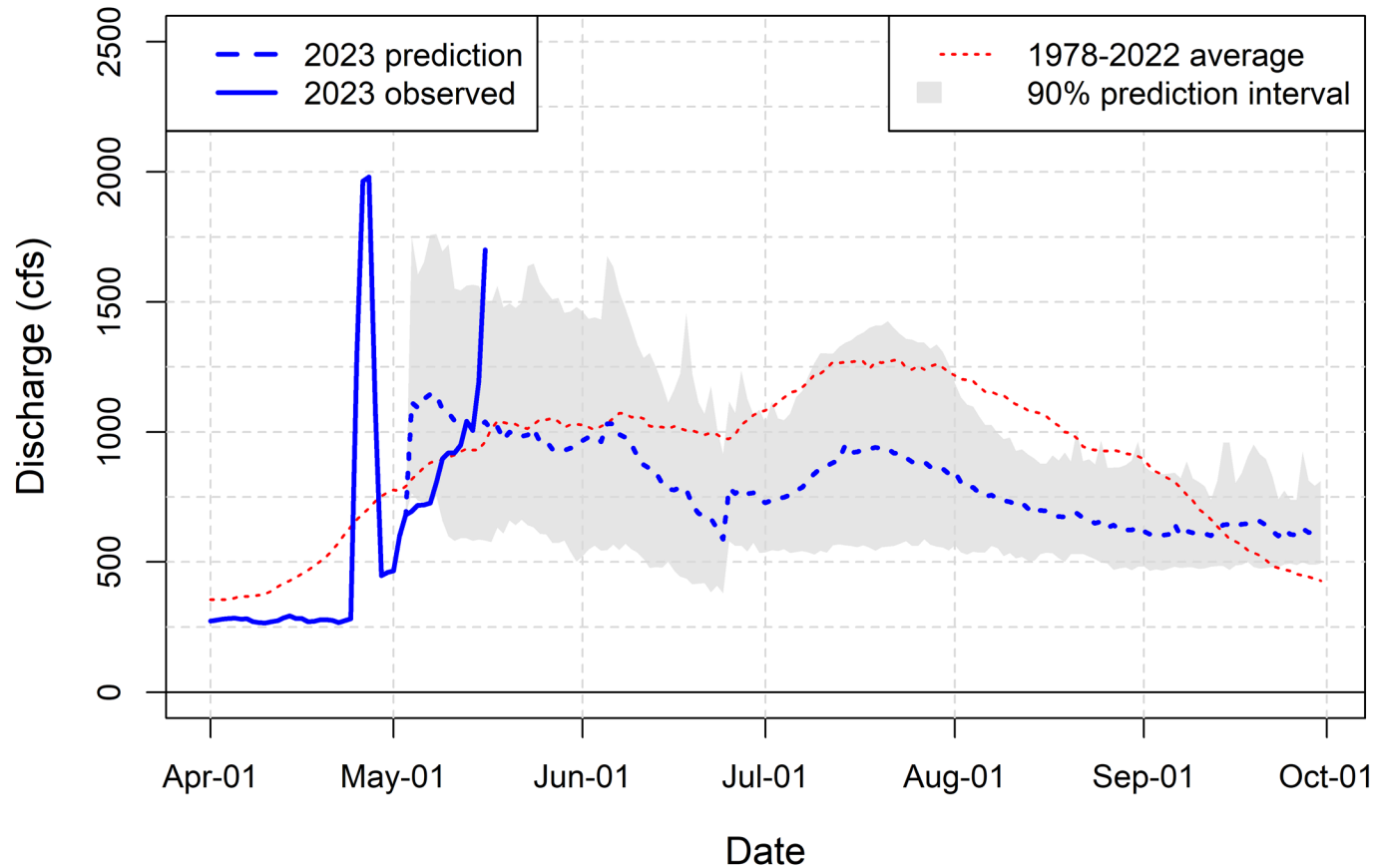
Natural streamflow in Teton River



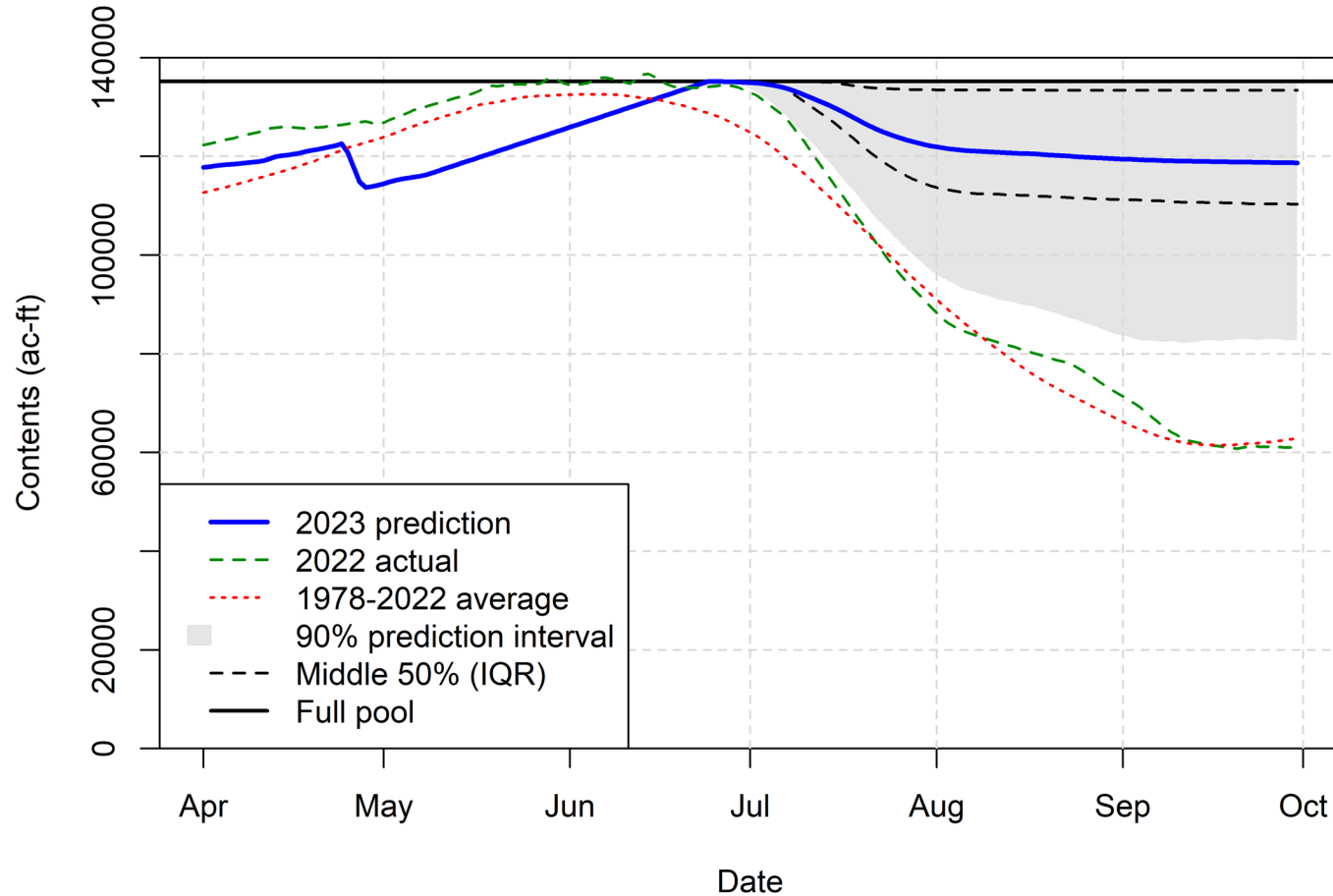
Delivery in Crosscut Canal to Teton R.



Outflow from Island Park Reservoir



Island Park Reservoir Content



- Earliest draft start: June 25
- Predicted draft start: July 5
- 90% chance IPR > 69% full on Sept. 30

Conclusions

- Freshet moved $\sim 1/2$ annual sediment budget in 3 days
- Natural flow ended up much higher than freshet
- Highest snowpack in upper HF subwatershed
- Henry's Lake inflow predicted 140% of average
- 2023 similar to 2018 and 2019 but with a cooler start
- IP Reservoir September volume: > 68% full vs. 43% full on average