

# Portland Water Bureau

## Water Quality



**2022 Seasonal Water Supply– Retrospective**  
**Prepared: June 8, 2023, Portland Water Bureau**

### Summary

The 2022 Seasonal Supply year provided unique challenges in managing the drinking water system to meet the needs of all customers.

- From February 8-11, PWB shut down the Bull Run supply and switched to **100% supply from the Columbia South Shore Well Field in anticipation of a potential staffing shortage.**
- 2022 saw an **extended cool wet spring followed by a quick transition to dry conditions.** Drawdown began very near the historical average timing in early July.
- In July, the **I-G-6 outlet of the diversion pool became inoperable** in a partially-open position, this resulted in excess water being released downstream. On August 10, the diversion pool was drained, and the gate closed. In total, this resulted in approximately 1.2 BG of additional water being released downstream.
- Due to a combination of the water release from the I-G-6 valve and ongoing very dry weather conditions, PWB **released additional water from the Bull Run Lake.** From September 20 to October 17, water was released from the lake for an approximate 0.5 BG of additional supply.
- Despite the cool wet spring, an **extended summer and dry fall with record warm temperatures and low precipitation** resulted in utilizing the Columbia South Shore Well Field for supply augmentation from October 13 to November 3.
- Heavy fall rains resulted in **elevated turbidity in the Bull Run reservoirs** and a switch to 100% groundwater from November 5-21.
- **Complications bringing the new corrosion control treatment online** when switching back to the BR source resulted in re-activating the Columbia South Shore Well Field from November 22-23.

### Weather

The accumulation of snowpack during the snow season of 2021-22 started a few weeks later than average with December storms. Despite languishing accumulation from January through March, the snowpack at all but the lowest elevations was maintained just slightly above average. Late season snow in early April boosted snow accumulation in the Bull Run considerably, bringing snow water equivalent (SWE; the depth of liquid water if the snowpack were completely melted) values well above average. SWE values remained above average for the rest of the spring. Heavy spring rains resulted in rapid melting of the snowpack. Snowmelt was complete throughout the watershed by the end of June. Snowmelt was not a large contributor to summer supply from Bull Run in 2022, as later spring rains ultimately governed the timing of drawdown as is the case in most years. Figure 1 shows snow water equivalent at the three snow monitoring sites in the watershed.

Precipitation during 2022 was, overall, above average in the Bull Run watershed. Total rainfall for the calendar year was 83 inches at Headworks, 104% of the 80 inches of annual average rainfall from 1899-2021. The year began with somewhat below average precipitation January through March, followed by a

---

very wet second quarter, with April through June rains at Headworks totaling 29 inches, nearly twice the historical average of 16 inches. Very wet conditions gave way to very dry conditions July through September, when only 1.5 inches of rain were observed at Headworks, less than 25% of the average 6.7 inches. Halfway through October, rains began again, and October through December precipitation was near average. Figure 2 shows monthly precipitation at Headworks for 2022.

### **Demand**

Historic winter base demand peaked between 1979 and 1991 at an average of approximately 100 million gallons per day (MGD). Since then, winter base demand (November-March) has declined, with demand over the past 5 years approximately 20% lower at an average of about 80 MGD. In 2022, average demand was 91 MGD, lower than the previous 5-year average of 94 MGD. Figure 3 shows demand from 2022 and the preceding five-year period. These demand numbers reflect the total amount of water supplied to serve Portland retail and wholesale customers and are not equivalent to the total amount of water that is metered and billed.

### **Bull Run Supply**

Drawdown of the Bull Run Reservoirs began on July 3, which was influenced by the temporary inoperability of the I-G-6 diversion pool outlet valve that occurred July 1 through August 10 and resulted in excess flow releases to the lower Bull Run River. Drawdown would have begun on July 9 with an operable valve, which is very close to the historical average onset of drawdown on July 10. The reservoirs reached their minimum storage on October 21, when 0.8 of 9.9 billion gallons (BG) of usable storage (8%) remained in the reservoirs. The reservoirs completed filling on November 5. Figure 4 shows the 2022 drawdown of the Bull Run Reservoirs.

Due to a combination of the water release due to I-G-6 valve and ongoing very dry weather conditions, the bureau released water from the Bull Run Lake by opening the outlet piping from the lake and allowing additional water to be released by gravity. From September 20 to October 17, approximately 0.5 BG of additional supply was provided by the lake release.

### **Groundwater Use**

2022 saw five activations of the Columbia South Shore Well Field. The first activation was in February in anticipation of a possible extended labor shortage. On February 8, 2022, PWB switched to 100% groundwater supply allowing non-represented staff to continue operation of the system. Groundwater's proximity to in-town operations made it preferable to the Bull Run to operate with limited staff. The staffing shortage was resolved quickly allowing a return to the Bull Run supply on February 11.

Each year, the Portland Water Bureau (PWB) operates the Columbia South Shore Well Field to exercise equipment and identify repair needs. In 2022 the groundwater maintenance operation occurred in August and ran for 23 days during working hours Monday through Friday. Beginning August 2<sup>nd</sup>, approximately 40 MGD of groundwater was blended with the Bull Run and resulted in 300 MG of supply.

Due to an extended hot dry summer and fall, the Columbia South Shore Well Field was activated to augment the Bull Run supply on October 13 to November 3, 2022. Groundwater was pumped at a rate of approximately 56 MGD over the 22-day supply augmentation operation, contributing approximately 900 MG. The groundwater operation was delayed until October 13, in order to allow for the Lead and Copper Rule sample collection to be performed when the system was receiving 100% Bull Run in order to measure the impacts of the new corrosion control treatment.

---

On November 5, 2022, heavy rains resulted in elevated turbidity in the Bull Run reservoirs and forced the shutdown of the Bull Run supply. As a result, from November 5- 21, groundwater replaced the Bull Run supply until turbidities in the Bull Run declined below regulatory levels. Approximately 1.3 billion gallons were used during the turbidity event.

On November 22, 2022, groundwater was activated again to augment the Bull Run supply due to challenges in restarting the Improved Corrosion Control Treatment facilities at Lusted Hill. From Nov 22- 23 approximately 30 MG were used to augment the Bull Run supply.

During 2022, Production Well (PW)1 was out of service for routine 20-year maintenance and returned to service in November. PW 19 experienced a failure in June, and PW 13 failed in November. An emergency contract for repairs has been put in place to expedite repairs and return them to service before the 2023 drawdown season.

### **Groundwater Use Model**

The Groundwater Use Model was run in the spring of 2022 before drawdown began. The model does not incorporate weather forecasts and is therefore run only once each year. Subsequent application of the Groundwater Use Model involves comparison of the actual course of drawdown to the groundwater pumping curves generated by the model. Figure 5 shows the groundwater pumping curves that were developed, along with the actual reservoir volumes that were observed during the drawdown season. During drawdown, if the actual storage volume in the Bull Run Reservoirs drops below a groundwater pumping curve, then the pumping rate corresponding to that curve is recommended to augment supply.

### **Instream Flows and Fish Habitat Management**

The bureau managed water releases downstream of Bull Run Reservoir 2 to meet minimum flow requirements and water temperature targets for the lower Bull Run River, which are required by the Bull Run Water Supply Habitat Conservation Plan (HCP).

Per requirements as defined in the HCP, lower Bull Run flows stayed at or above 120 cubic feet per second (cfs) January through mid-June and above the gradually decreasing required levels in the latter half of June. In July through September, summer flow minimum requirements of 20 cfs were observed. Summer flow releases were actively managed each day to meet the water temperature goal of keeping the 7-day average of the daily maximum water temperatures at the warmest point on the Bull Run River, measured at Larson's Bridge, below the temperature target, which moves according to temperatures observed at the Little Sandy River. August and September cumulative tributary inflows to Bull Run reservoirs were below the tenth percentile of historic flows, which would have allowed for implementation of reduced flow releases in October and November. However, to minimize impacts to fish, the bureau chose to implement normal downstream flow releases; lower Bull Run River flows increased to reflect a percentage of tributary inflows. In December, minimum flows returned to 120 cfs.

The bureau met downstream water temperature targets in the HCP for 2022 with the exception of a period of time in the fall. Figure 6 shows the temperature of the Lower Bull Run River. Throughout the management season, the bureau presented the 2022 water temperature information to the Oregon Department of Environmental Quality, the National Marine Fisheries Service, and the Oregon Department of Fish and Wildlife.

---

### **Cold-water Transfer**

In 2022, PWB completed replacement of the Dam 1 needle valves with fixed-cone valves. The new fixed cone valves were used to conduct a cold-water transfer to move the bottom-most cold water from Reservoir 1 downstream into Reservoir 2, where it would be available for release to town or downstream. The transfer started on August 18 and continued through September 12 releasing a total of 3.5 BG of bottom water from Reservoir 1 via the Dam 1 fixed cone valves (using the 895' elevation gates) into Reservoir 2. The temperature effect of these releases was most apparent in the upper and middle elevations of Reservoir 2.

### **Water Efficiency and Conservation**

Water Efficiency programs and services continue to be one component of Portland's approach to meeting customer water use demands. The bureau resumed its normal conservation programming after two years of limited outreach due to the COVID pandemic. Programs available in the 2022 supply season included:

- Distributed water saving devices and information through community events, partner workshops, and customer requests.
- Provided rebates to replace inefficient toilets with WaterSense labeled toilets for residential, commercial, and multi-family customers.
- Provided rebates to replace an irrigation controller with a WaterSense weather-based model in addition to rebates for retrofit of efficient sprinkler nozzles.
- Provided rebates to commercial customers to replace water-cooled equipment and to support other water efficiency projects.
- Published a Customer Newsletter with water conservation information that was included in all bills that were sent out in the summer.
- Income-qualified customers received critical leak repairs through the Water Leak Repair Program. We partner to fund repairs through the African American Alliance for Homeownership (AAAH) and Community Energy Project (CEP). Eligible customers received repairs or replacement of service-lines, toilets, faucets, in-home pipes, outdoor spigots, and inefficient clothes washers.
- Resumed data logging and on-site water use assessments for commercial and large multi-family customers.
- Resumed community engagement and outreach through workshops and participation in community events including Community Services Network Resource Fairs, Good in the Hood, Sunday Parkways, and the sponsorship of DIY plumbing workshops through the Rebuilding Center.
- The PWB is a member of the Regional Water Providers Consortium (RWPC), and an active participant in the Conservation subcommittee. The bureau achieves public education and communication goals through the RWPC's regional conservation programming. Below is a summary of key offerings completed in Summer 2022:
  - The Consortium's outdoor water conservation campaign ran from May - August 2022. The campaign ran in English and Spanish and included ad buys and on-air interviews with three television partners, five radio partners, and several digital advertising platforms. The campaign's messaging focused on tips to help use water wisely in summer and included: giving your plants a deep soak a couple times a week rather than

- 
- watering daily, how to make sure your watering system is working efficiently, mow your lawn less often and skip the fertilizer until fall, and the Weekly Watering Number.
  - Summer outreach messaging was also distributed through the RWPC’s website [www.regionalh2o.org](http://www.regionalh2o.org), social media (7+ messages per week on Facebook and Twitter), and through the RWPC’s summer e-newsletter, which reached approximately 900 recipients per issue. In addition to televised programs, KUNP sent three Spanish-language conservation e-newsletters which reached approximately 25,000 recipients.
  - Provided the Weekly Watering Number (WWN) on [www.regionalh2o.org](http://www.regionalh2o.org) and via a weekly listserv that reached approximately 1,200 recipients from April-September. The WWN is the amount of water in inches to apply to lawns and gardens based on local weather conditions and evapotranspiration.

### **Curtailment and Contingency Planning**

In September of 2020, the PWB submitted its final [Water Management and Conservation Plan](#) to the State of Oregon. That plan includes the bureau’s curtailment plan which outlines the process the bureau would follow if a curtailment action was necessary. Curtailment is a call to action for all water users to reduce water use with three levels of urgency. To successfully implement a curtailment action, PWB recognized that it would need to launch a communications effort to accomplish the water use reductions. In the summer of 2022, PWB completed its first phase of this work by contracting with EnviroIssues. We developed a curtailment communications manual, key messages, and template messages, and graphics to allow support for fast messaging should a curtailment be declared. These materials have been translated into Spanish, Vietnamese, Russian and simplified Chinese and will be translated to all Portland List Languages moving forward.

In addition to communications planning, the bureau participated with the RWPC’s ‘Curtail your Enthusiasm’ exercise. The exercise simulated a regional curtailment event and provided the bureau a chance to test our readiness for a potential curtailment event. Lessons learned from this exercise have informed next steps for the bureau to take to improve its curtailment readiness.

### **Conclusions**

During the 2022 supply season, PWB was able to meet all in-town and in-stream demands using its baseline resources—Bull Run Reservoirs, Bull Run Lake Increment #1, streamflow, conservation, and groundwater. Several key points from the supply planning season:

#### *Groundwater*

As captured above, groundwater was instrumental in meeting system demands in 2022 with a total of five activations for a wide variety of reasons, demonstrating its importance as well as the unpredictability of system needs. In total ground water was activated for 68 days contributing 2.8 BG.

#### *Demand*

The cool wet spring and near average start to drawdown saw lower than average demand for the majority of the summer, however the extended hot weather into the fall saw above average demands before fall rains in late October reduced demands close to the winter average.

#### *Emergency Supply*

Two high-capacity wells (PW13 and PW19) experienced failures in 2022, potentially impacting PWB’s ability to meet system needs with groundwater alone. While additional contingency resources were not

---

needed to meet demands, we were prepared to utilize additional resources such as requesting wholesaler offloads to meet system demands if needed.

In summary, the bi-weekly meetings of the Supply Planning Group were integral to the successful management of supply operations. The group balances multiple objectives in order to ensure a reliable high-quality water supply for all users while effectively managing costs.

Figure 1. Snow water equivalent, in inches, at snow monitoring sites in Bull Run during water year (WY) 2022

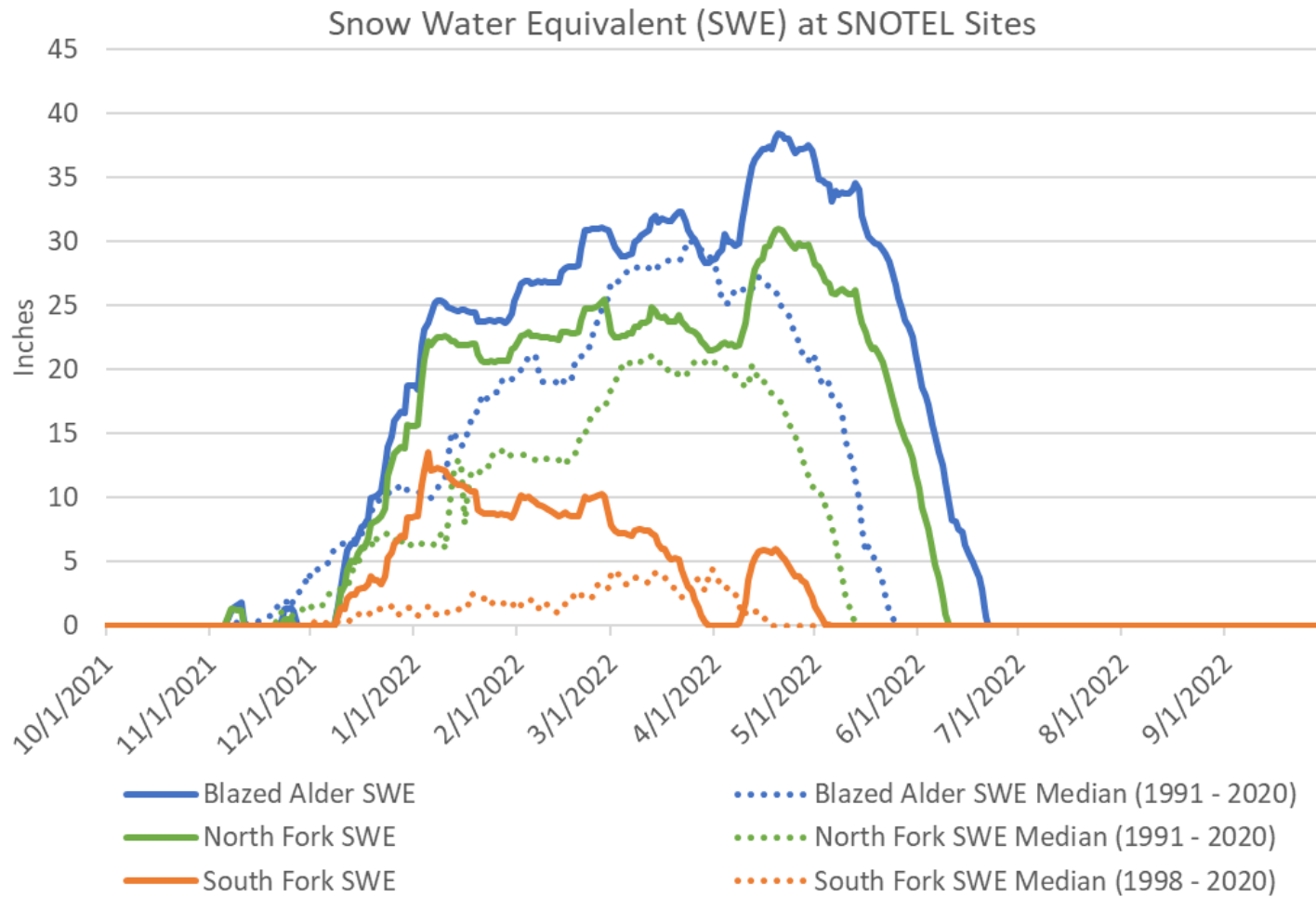


Figure 2. Monthly precipitation at Headworks

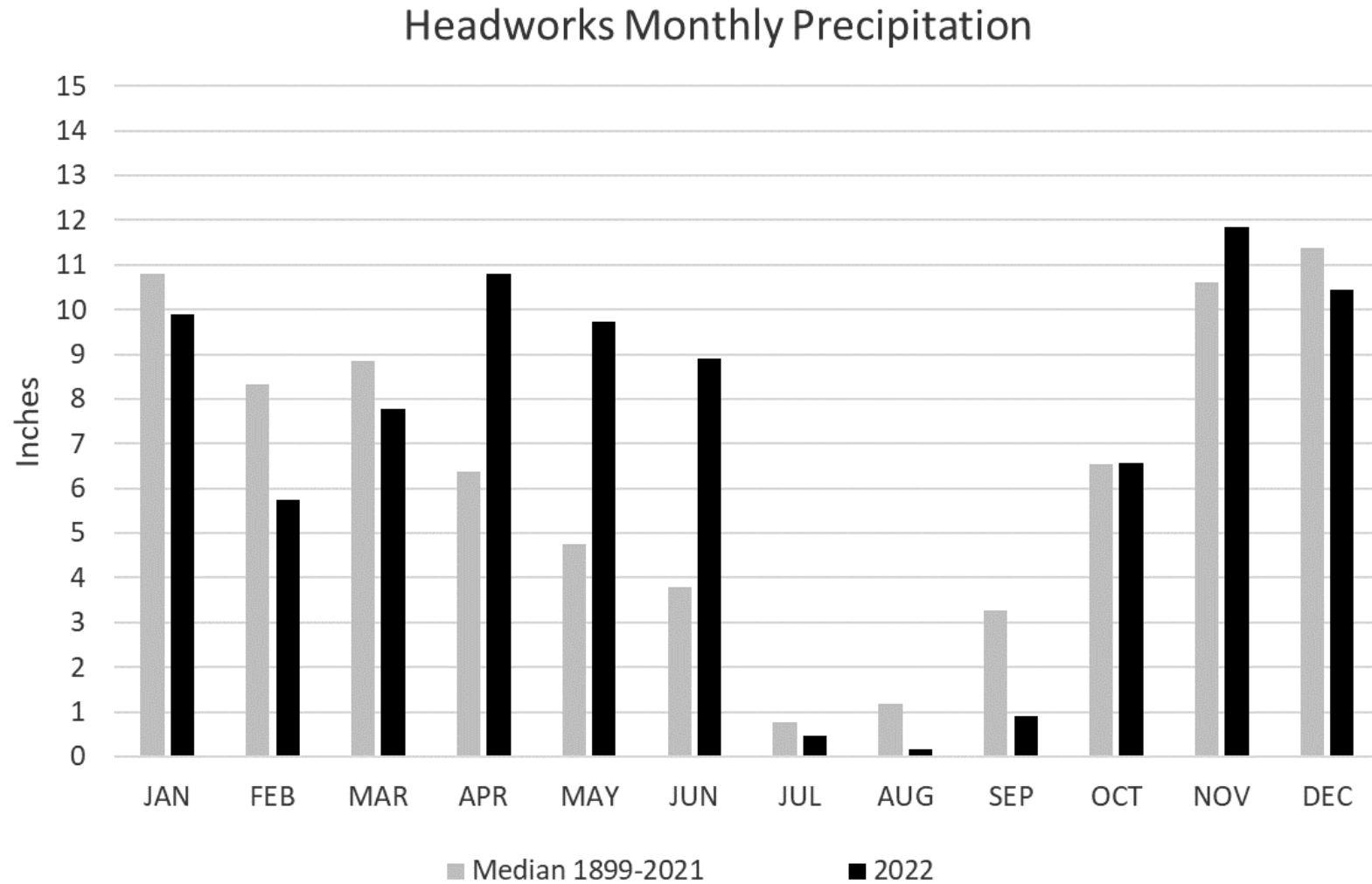




Figure 3. Current demand compared to previous five years; 7-day moving averages

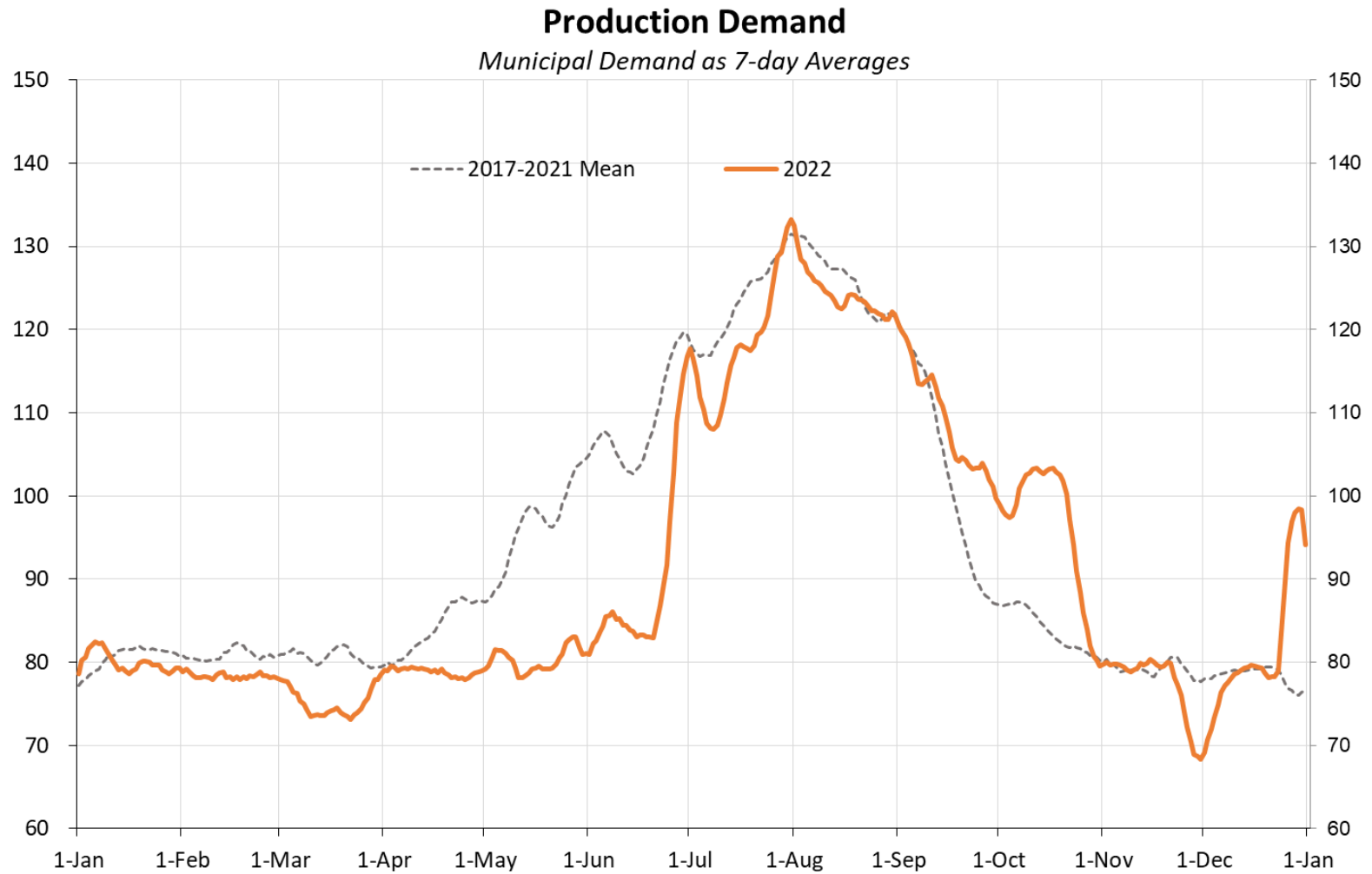


Figure 4. 2022 Bull Run Reservoirs drawdown and refill

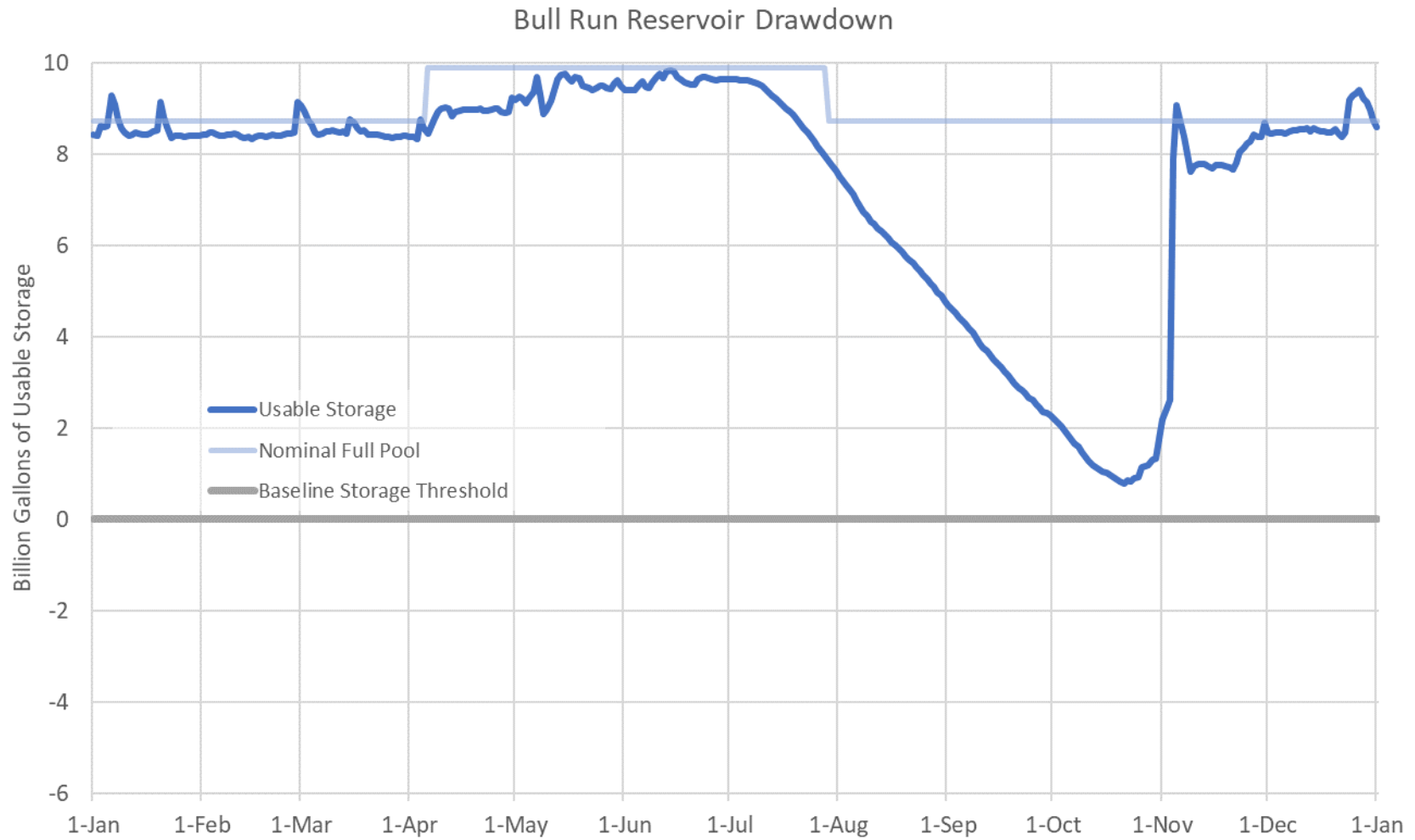


Figure 5. 2022 Observed Bull Run Reservoirs storage and modeled groundwater pump rates

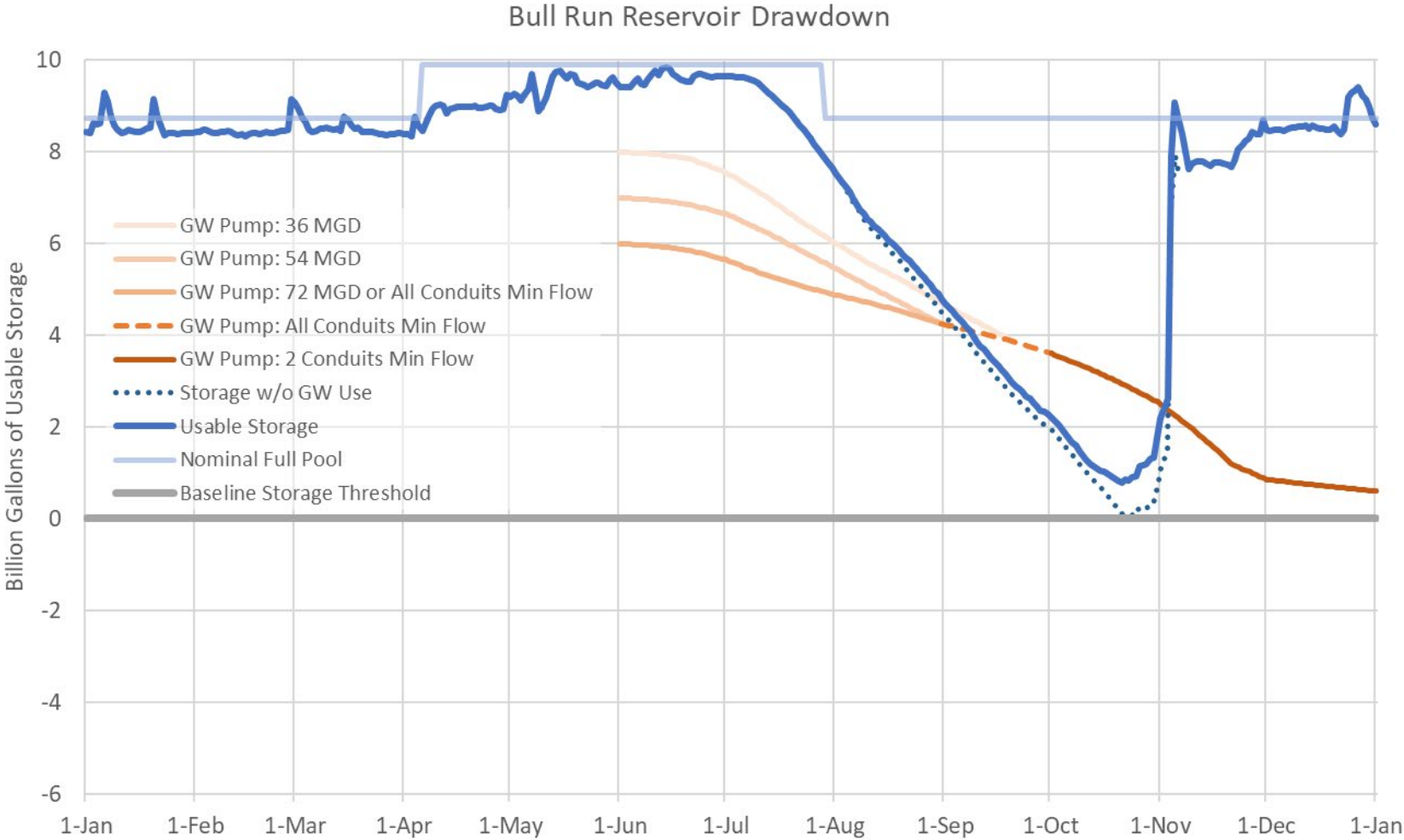


Figure 6. Water temperature of the Lower Bull Run River, summer 2022

