

BOLINAS COMMUNITY PUBLIC UTILITY DISTRICT

BCPUD

BOX 390 270 ELM ROAD BOLINAS CALIFORNIA 94924

415 868 1224



MEMORANDUM

TO: Board of Directors
FROM: Jennifer Blackman
RE: Update on Water Supply
DATE: May 19, 2021

This memorandum provides a summary of the status of the District's water supply and current consumption data since the last memorandum to the Board on April 19, 2021 and as of May 17, 2021.

1. Water Supply: From April 20 – May 17, 2021 our diversions from the Arroyo Hondo Creek averaged 64,500 gallons per day (GPD), which was quite similar to the diversions from the prior month (65,702 GPD); no water was diverted from Woodrat 1 reservoir during this time, once again underscoring the beneficial impact of the community's conservation efforts and also the rain received thus far this rain year.
2. Rainfall: Virtually no rain has been received thus far in May¹. Total annual rainfall in the district (since July 1, 2020) is 16.25 inches, an increase of 0.10 of an inch received on April 26, 2021. As a reminder, we received 22.7 inches of rain last year. Average annual rainfall received in Bolinas is 32.5 inches.
3. Woodrat 1 and Woodrat 2: Our stored usable water supply in the Woodrat reservoirs as of May 17, 2021 (combined) was 9,881,516 gallons², a decrease of 45,400 gallons in reservoir storage when compared to the 9,926,916 gallons in storage on April 19, 2021, but still an increase of 3,048,339 gallons in storage when compared to the 6,833,177 gallons in storage on December 31, 2020. Again, this increase in storage since December reflects the overall beneficial impacts of the community's water conservation efforts; the decline in storage between April and May is due to minor losses (evaporation and seepage) and possible measurement imprecision.
4. Water Consumption. From April 20, 2021 – May 17, 2021 water *production* averaged 60,956 GPD or 103 GPD per connection. Water *consumption* during this same timeframe averaged 61,082 GPD, or 103 GPD per connection. As a reminder: during the previous reporting period from March 20 - April 19, 2021, water *production* averaged 58,151 GPD or 98 GPD per connection. Water *consumption* during this same timeframe averaged 58,827 GPD, or just less than 100 GPD per connection (averaged across the entire district). As such, water production and water consumption both increased slightly during the most recent April – May timeframe as compared to the previous reporting period.

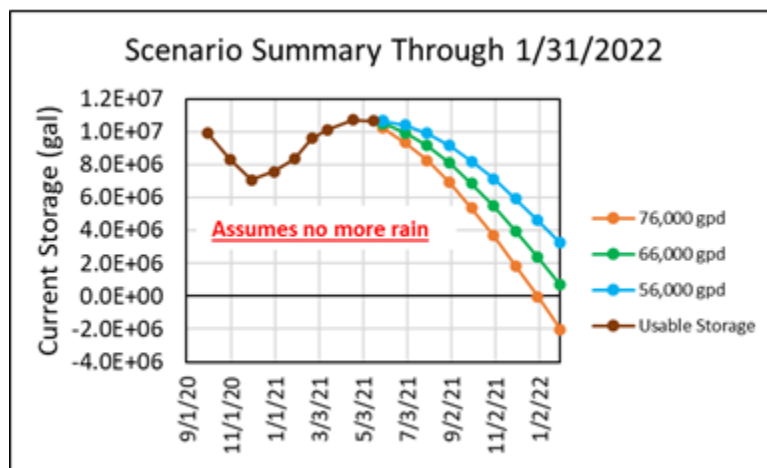
¹ Staff measured 0.05 of an inch of "rain" on May 17, 2021, which was a result of heavy fog that morning.

² We also had 780,542 gallons of treated water in storage in our East and West tanks (combined) as of May 17, 2021, for total water storage (treated + raw) of 10,662,068 gallons.

Individual water consumption increased across the customer base in April 2021 as compared to March 2021 and that consumption remains quite uneven. For example, in April 2021, the highest 12 water users logged an average consumption of 321 - 1,057 gallons per day, whereas in March the highest 12 water users consumed between 302 - 891 gallons of water per day. Water use at the laundromat downtown dropped further down in April to 794 gallons per day (use at the laundromat in March 2021 was 891 gallons per day.) Also, in April 2021, 33 customers (including the highest 12) used more than 200 gallons of water per day, whereas only 29 customers did so in March 2021 and only 23 customers did so in February 2021. In April 2021, 129 customers used more than the anticipated ration amount of 125 gallons per day, whereas in March 2021, only 106 customers did so and in February, only 96 customers did so in February 2021. In April 2021, 174 customers used more than 100 gallons per day.

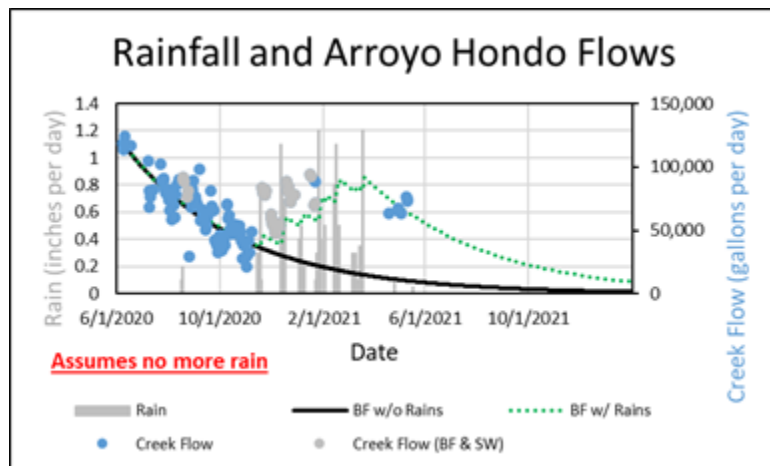
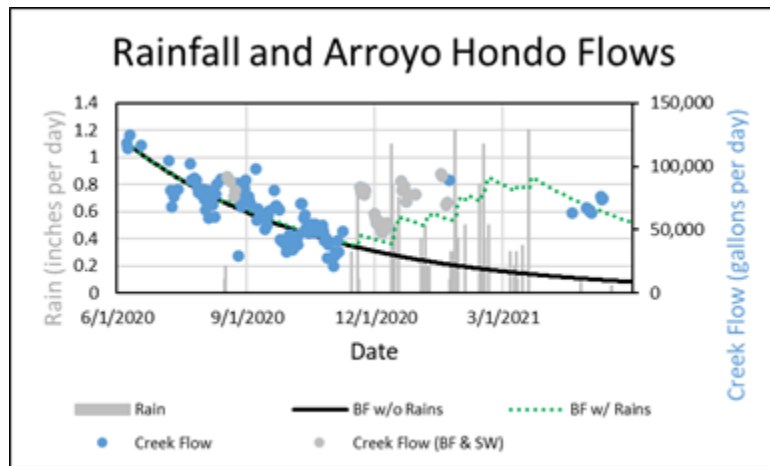
5. Updated Models:

The graph below is an updated Scenario Summary reflecting the actual data recorded as of May 17, 2021 (brown line in upper left area of graph with the nine dots) and the “fork” of projections as to how much stored water the district will have available through 2021 and beyond based on differing rates of overall community water consumption. The most recent seven-day running average community consumption is approximately 57,000 GPD (largely because consumption has trended downward in the last week after the district sounded a heightened alarm about increasing consumption (particularly at the beginning of May) and worsening drought conditions (warm and windy weather), placing the district very close to the blue line right now, which is excellent. This graph indicates that if consumption stays at or below current levels, we will have some water available in storage through January 2022 (3,241,000 gallons – blue dot on right side of graph box). However, if consumption increases to an average of 66,000 GPD, the district will have only 688,000 gallons of water in storage as of January 31, 2022 (green dot on right side of graph box). And, if consumption increases to an average of 76,000 GPD (the mandatory ration “trigger”), the district effectively will be out of water by December 31, 2021.



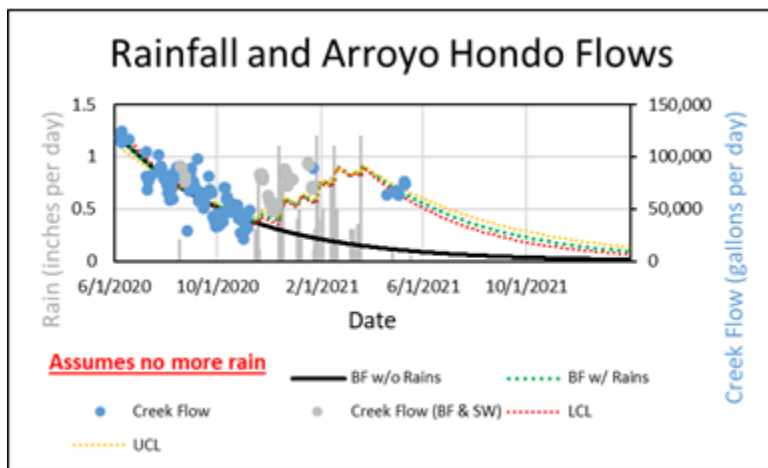
Note that the slope of the recorded storage curve (brown line with dots) flattened after the February measurement, reflecting the relatively minimal amount of rain received at that time, and then declined slightly between the April and May measurements, reflecting the decline in storage previously noted. The district’s reservoirs remain well-below full, at approximately 60% capacity.

The two graphs below depict an updated base flow (BF) recession model³ for the Arroyo Hondo creek, with the first graph showing conditions through today, and the second projecting creek flows (via the downward sloped dotted green line) through December 31, 2021. Although creek flows increased as a result of the rain earlier in the year (jagged green dotted lines in December – March timeframe), the updated model (created and maintained by the district’s consulting hydrogeologist, Rob Gailey), is more pessimistic than the model previously presented to the Board (based on more limited data). For example, the updated model projects that creek flows will provide only about 28,272 gallons of water per day by September 1, 2021, whereas the previous model predicted 34,000 gallons per day by this same date

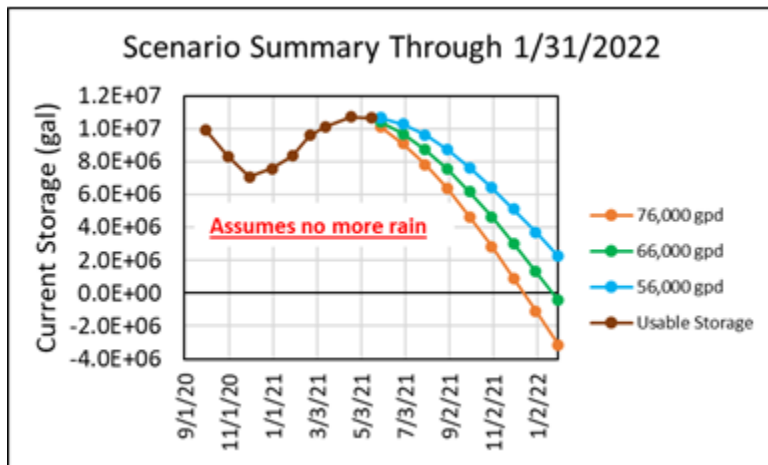


³ The term base flow recession curve is typically used to describe such a model because the flow decreases, or recedes, with time since the last rainfall event. The effects of recent rains as well as surface flows to the creek (which are not modeled) are indicated. The model now assumes a 2-day lag between rainfall in the watershed and base flow response at the creek

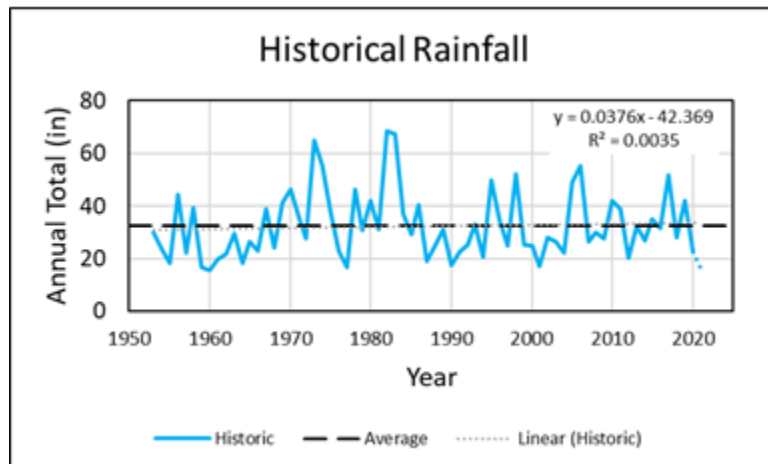
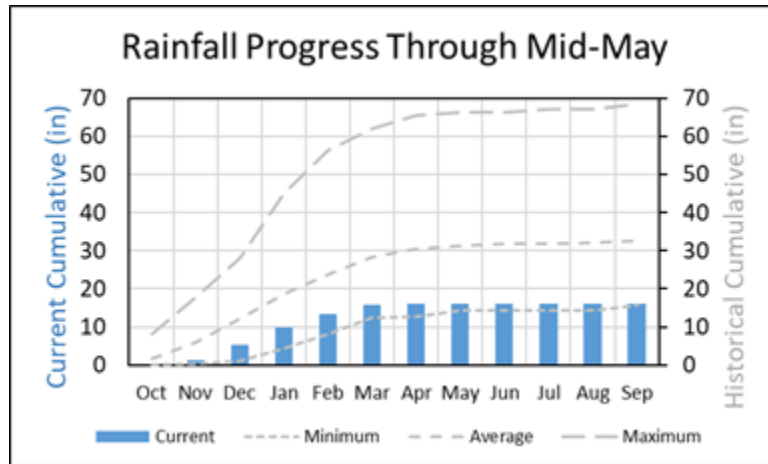
The next graph is new: Rob Gailey developed this graph after conducting a preliminary uncertainty analysis to explore how confident the district should feel in the predictive accuracy of its updated base flow recession model given that certain model parameters values are difficult to estimate as a result of the impact of fog vs. sun and the difficulty of accurately measuring current creek flows. Note the yellow and red dotted lines plotted above and below with the dotted green updated base flow recession curve discussed on the prior page. The dotted yellow line is the upper 95% confidence limit, or UCL, and the dotted red line is the lower 95% confidence limit, or LCL. Looking at September 1, 2021 (when the updated base flow recession curve dotted green line predicts the creek will provide 28,272 gallons of water per day), the UCL predicts 34,100 gallons per day and the LCL predicts 23,364 gallons per day, for an uncertainty band of 10,700 gallons per day (at 95% confidence).



Applying the LCL uncertainty analysis to the “Scenario Summary” of predicted water in storage through January 31, 2022, we see a significant result: if consumption increases to an average of 66,000 gallons per day, the district will have negative 440,000 gallons in storage as of January 31, 2022 (rather than positive 688,000 gallons of water in storage per the updated model) for a decline of approximately 1 million gallons in predicted storage. If consumption increases to an average of 76,000 gallons per day (the current mandatory ration “trigger”), the district will be out of stored water one month earlier than predicted in the updated model -- in November rather than in December 2021. If consumption averages 56,000 gallons per day, the district would still have 2,236,000 gallons in storage as of January 31, 2022.



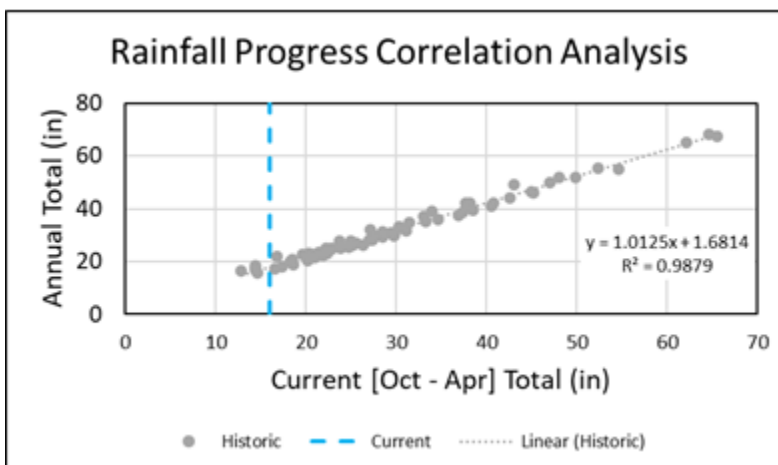
The next two graphs depict rainfall received in Bolinas as of May 17, 2021: 15.95 inches from October 1, 2020 – May 17, 2021⁴ relative to historic minimum, average and maximum rainfall (68 years of BCPUD rainfall data); as these graphs show, the district has received only slightly above the minimum recorded rainfall for this time of year.



The graph on the next page correlates the rainfall progress through May of each year with total annual rainfall for the available historical record (preceding 68 years). During that time, the district has experienced only 5 other years where the rainfall received was 15.95 inches or less through the end of May 1. Those rain years generally turned out to be *much* drier than normal years with a minimum total rainfall received of 15.6 inches, a maximum of 18.4 inches, an average of 17.0 inches and a line of “best

⁴ Note: the BCPUD measures rainfall as of July 1 for each rain year; the models in this memorandum utilize the October 1 start date for the rainy season based on the Water Year as defined by the State. The difference is a negligible 0.3 inches as the district received 0.3 inches of rain in August 2020.

fit” projection of 17.8 inches. These statistics reinforce the accepted prediction that the 2020-21 year will conclude on June 30th as one of the lowest rainfall years on record.



6. Recommendations.

In light of the deepening drought conditions and the impacts thereof on the district’s water supply as discussed in this memorandum, the Board should be prepared to update and revise BCPUD Resolution 680 in the near future. The data indicate that the district should make every effort to ensure that water consumption does not exceed a target 60,000 gallons per day district-wide to preserve sufficient water to meet public health and sanitation purposes through 2021. To achieve and maintain this target level of consumption, the Board likely will need to amend BCPUD Resolution 680 to lower the ration “trigger” to 66,000 GPD and to lower the mandatory ration amount from 125 GPD per property to 100 GPD per property. The mandatory ration amount may need to be even lower depending on updated supply conditions and/or additional exceptions the Board may later grant to the ration amount.⁵

For now, staff recommends the Board hold a special meeting as soon as possible to provide staff the enforcement authority **to prohibit any customer water use (other than by those with current exceptions set forth in the resolution) of more than 175 GPD** -- this will impact approximately 40 customers at present. Staff recommends this on the basis of fundamental fairness: excessive water use by approximately 7% of the district’s customers should be addressed before *all* of our customers – the majority of which are using far less water due to their extraordinary conservation efforts -- are subject to mandatory rationing. Staff believes the district can forestall the imposition of mandatory rationing a bit longer (even at the 66,000 trigger level) if the highest water users in the district immediately reduce their use.

Finally, staff strongly recommends against granting *any* additional exceptions to the anticipated ration amount until *after* mandatory rationing has been implemented throughout the district.

⁵ The current ration exceptions also should be revised downward when the Board amends BCPUD Resolution 680. At present, the cumulative amount of water allowed per the exceptions is 6,287 GPD. If these exceptions aren’t lowered, then the mandatory ration amount for all other customers will need to be 94 GPD.