City of Loveland Utilities

City of Loveland

Big Thompson River Watershed Source Water Quality Conditions

Spring 2025

July 7, 2025

Common Acronyms

AMF	Alexander Mountain Fire
CB-T	Colorado-Big Thompson Project
CPF	Cameron Peak Fire
CFS	Cubic Feet per Second
DBP	Disinfection Byproduct
EWP	Emergency Watershed Protection
mg/L	Milligrams per liter (parts per million)
$CaCO_3$	Calcium carbonate
NRCS	Natural Resources Conservation Service
NTU	Nephelometric Turbidity Unit
North Fork	North Fork of the Big Thompson River
SNOTEL	Snow Telemetry
SU	Standard Units
SWMP	Source Water Monitoring Program
TOC	Total Organic Carbon
ug/L	Micrograms per liter (parts per billion)
uS/cm	Microsiemens per centimeter

Executive Summary

Water quality conditions in spring 2025 were similar to five-year average values of most parameters. Some parameters are beginning to reflect a return to background concentrations while others suggest new baseline concentrations after disturbance from the Cameron Peak Fire (CPF). For example, total iron and nitrate were higher in the years immediately following the CPF, began to decline in 2024, and are now somewhat below five-year average values. Total copper and orthophosphate concentrations were relatively low after the CPF and have remained so. Miller Fork was the Big Thompson River tributary that experienced the most severe fire damage from the CPF and had a disproportionate effect on water quality in the mainstem. In spring 2025, Miller Fork water quality was similar to other tributaries in the area and was no longer an outlier for most water quality parameters, which is an indication of fire recovery.

Unfortunately, dry conditions in Summer and Fall 2024 set the stage for the Alexander Mountain Fire (AMF) which began on July 29. This fire burned 9,968 acres of the Big Thompson River watershed immediately upstream of the Loveland Water Treatment Plant intake. Spring 2025 conditions appeared to be unaffected by the AMF. The primary Big Thompson River tributaries affected by the AMF are Cedar Creek and Sulzer Gulch, both of which are intermittent and were not flowing during the spring. We expect any contributions from these tributaries to be apparent during the summer monsoon season.

Average turbidity and pH were somewhat elevated in the Colorado-Big Thompson project sites in spring 2025. While these elevated values were not high enough to be of concern regarding water treatment, the cause is unknown.

City of Loveland Utilities Source Water Monitoring Program

The purpose of the City of Loveland Utilities Source Water Monitoring Program (SWMP) is to collect, analyze, and interpret water quality data of interest to drinking water, wastewater, recreation, and aquatic ecosystems. These data are used to identify and quantify current issues, document management successes, evaluate regulatory compliance, assess the appropriateness of current water quality standards, and identify issues that may present themselves.

One central component of the SWMP is the source water sampling and analysis accomplished by staff at the City of Loveland Utilities Water Quality Laboratory. The City has collected operational source water data for over 30 years and a more targeted set of parameters for nine years from the three water sources utilized for drinking water (Colorado-Big Thompson Project, Big Thompson River, and Green Ridge Glade Reservoir). The values for these targeted parameters are available in a short timeframe due to our in-house laboratory capacity. Consequently, results can be used to inform more immediate water system operational decisions.

Water quality information is routinely collected from 15 sites. Of these sites, two are intake locations at the Loveland Water Treatment Plant (river intake and reservoir intake), two are tributary sites (Fall River and North Fork Big Thompson River), seven are associated with the Colorado-Big Thompson River project (CB-T), and four are mainstem river sites (Table 1, Figure 1). Three additional sites were added beginning in April 2023. One location is upstream of the Estes Park Sanitation District outfall (by the Rocky Mountain National Park visitor center). Another site added in spring 2023 is located on the North Fork, upstream of the confluence with Miller Fork. Miller Fork has been a substantial contributor of water affected by the Cameron Peak Fire (CPF) to the mainstem of the Big Thompson River. The site located above the confluence of Miller Fork with the North Fork helps provide context for Miller Fork's contributions to the North Fork. The final site is in Miller Fork itself, just above the confluence with the North Fork. All these sites are located upstream of the Loveland drinking water intake, and therefore, water quality results from these locations have implications for Loveland water treatment and drinking water quality.

Table 1. Big Thompson Watershed sampling location descriptions.

Site Name	Type	Description
S-BTR-10	River	Big Thompson River below Mary's Lake Bridge
S-BTR-15	River	Rocky Mountain National Park Visitor Center
S-BTR-20	River	Downstream of Olympus Dam
S-BTR-30	River	Big Thompson Mainstem above Confluence with North Fork
S-BTR-40	River	Mainstem Big Thompson at Narrows Park
S-BTR-50	River	Mainstem Big Thompson at Viestenz-Smith Park
S-BTT-10	Tributary	Fall River Court Bridge
S-BTT-15	Tributary	North Fork Big Thompson above Miller Fork Confluence
S-BTT-17	Tributary	Miller Fork at Streamside Drive
S-BTT-20	Tributary	North Fork Big Thompson at Storm Mountain Road
S-CBT-10	CB-T	Near Gate at East Portal
S-CBT-20	CB-T	Shore of Mary's Lake
S-CBT-30	CB-T	Shore of Pinewood Reservoir
S-CBT-40	CB-T	Shore of Flatiron Reservoir
S-CBT-50	CB-T	Downstream of Flatiron Reservoir
S-CBT-60	CB-T	Hansen Canal near Outlet to Green Ridge Glade Reservoir
S-LNN-10	Lab Line	River Line in Laboratory
S-LNN-20	Lab Line	Reservoir Line in Laboratory

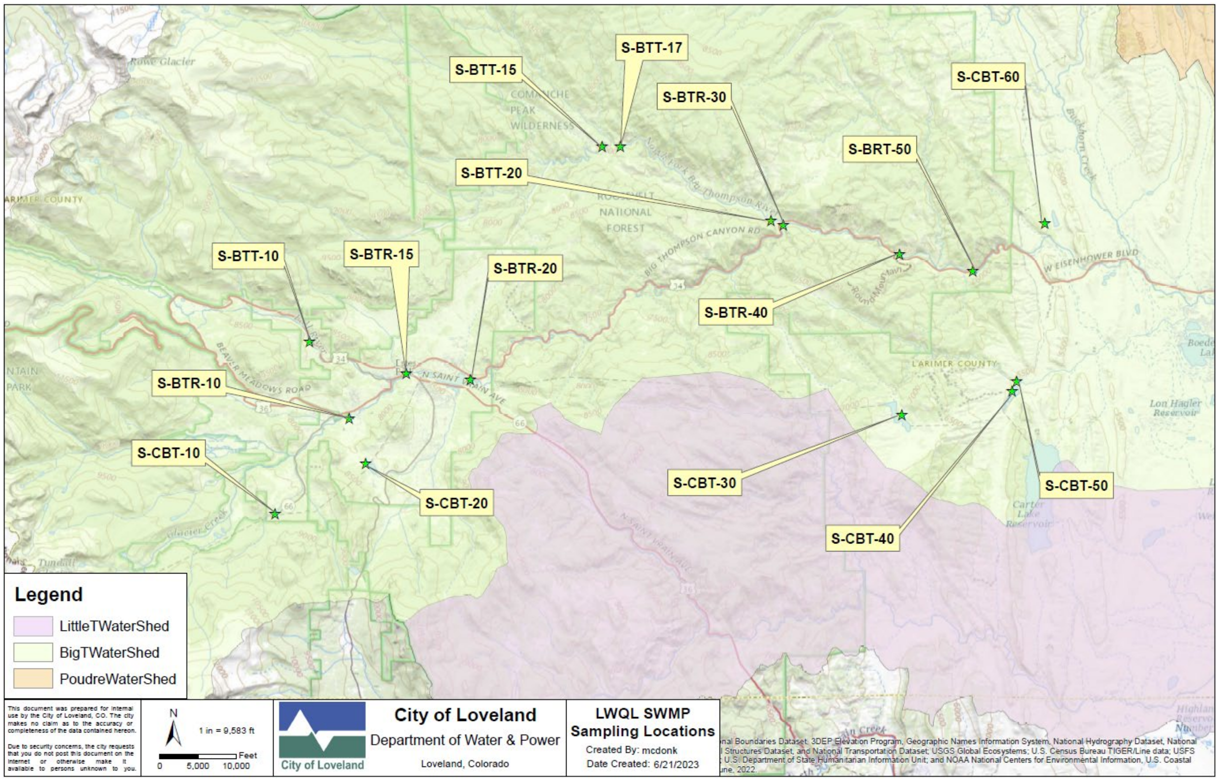

Figure 1. 2024 Source Water Monitoring Program water quality sampling sites.

Objective

The objective of these seasonal reports is to describe notable events and summarize important water quality parameters for those interested in the water quality of the Big Thompson River. These reports do not summarize all the water quality data collected by the WQL and do not represent a quantitative statistical or regulatory analysis of the data.

Evaluation of current data with historical data provides the opportunity to understand recent conditions relative to the previous five-year period and to established water quality standards. While water quality conditions have changed on time scales greater than five years, this relatively short period provides context for recent conditions. Comparisons for the three sites that were sampled beginning in 2023 are included, but 2024 data are compared only to the previous year. Examination of longer-term trends and conditions can be found in City of Loveland Utilities Big Thompson River Annual Reports. Figures associated with each water quality parameter are color-coded to represent different components of the source water system. Sites with the same color are likely to be more similar than sites of different colors. In the figures, blue bars indicate sites located in the mainstem of the Big Thompson River, light blue bars indicate sites that are in tributaries to the Big Thompson River, and aqua blue bars represent sites located in the Colorado-Big Thompson Project.

The results and findings presented in this report pertain only to source water and not to the treated drinking water delivered to our customers. Drinking water information and the annual Consumer Confidence Report are on our website.
(https://www.lovelandwaterandpower.org/waterquality)

For this report, the term “spring” is defined as the months of February, March, and April. Post-runoff and flow conditions reducing toward baseflow conditions drive water quality conditions during this period. Average values were calculated from all samples collected during these months in 2025 and compared to the average value of all samples collected during these months from 2020 through 2024.

Summary Conditions

Water quality effects of the CPF have dissipated and many affected parameters have returned to near pre-fire levels (e.g. total iron and nitrate) or, in the case of total copper, were notably lower after the fire. Five years of post-fire recovery is sufficient for many water quality parameters to return to baseline levels (Rust et al. 2018, Paul et al. 2022) although some may take as long as 15 years to recover to baseline (Paul et al. 2022). Further evidence of fire recovery is the fact that Miller Fork data from spring 2025 are generally similar to nearby sampling locations in the watershed. The Miller Fork watershed was the area of the Big Thompson watershed that was most affected by the CPF and water quality samples from Miller

Fork in past years were often substantially different from nearby sites as a result. However, the water quality in Miller Fork was often similar to nearby sampling locations in spring 2025.

Precipitation was near average and temperatures were somewhat elevated in spring 2025 compared to the previous five-year reference period. 2021 was included in the 5-year reference period and was the 3rd hottest year on record in Colorado. As such, temperatures in spring 2025 may be functionally even warmer than they appear. Low precipitation and high temperatures preceded the Alexander Mountain Fire (AMF), which occurred Jully 29, 2024, and facilitated its spread. The primary tributaries to the mainstem Big Thompson River that were affected by the AMF include Sulzer Gulch and Cedar Creek. Both of these streams are intermittent and were not running during spring 2025; therefore, any negative water quality effects from the AMF were not apparent. Any negative effects of the AMF are likely to appear during the runoff in June and/or during summer monsoon season (July through late August).

Although many water quality parameters were near five-year average values, turbidity and pH were somewhat elevated at most of the CB-T sampling locations. These values were not of particular concern with regard to successful water treatment but they do seem elevated compared to recent years. The cause of these elevated values is unknown and should be investigated if these conditions persist.

Water Quality Parameters

Precipitation

The amount of precipitation is directly proportional to the amount of water present in the Big Thompson River. In addition, the amount of precipitation can indicate the relative quality of the water, as substantial rain events and runoff often result in increased turbidity and decreased water quality. Precipitation in the Spring of 2025 was near five-year average values.

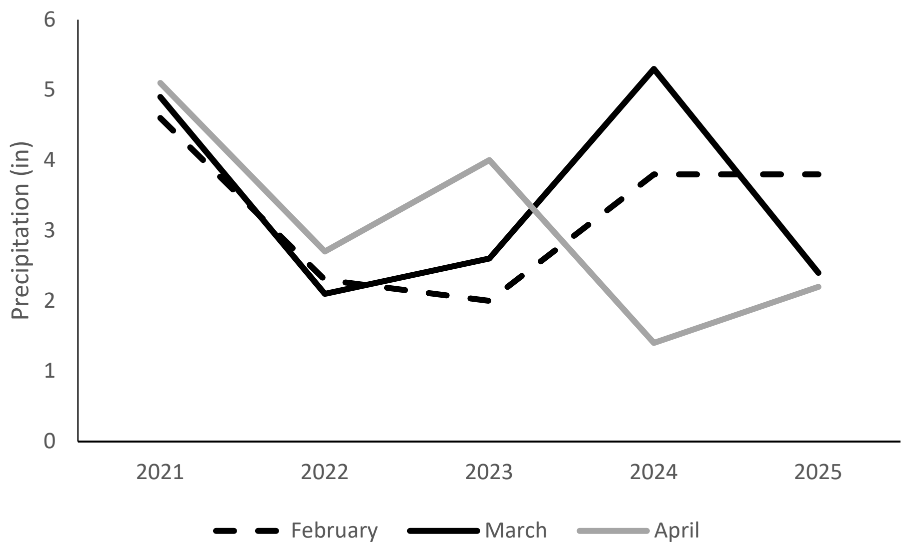

Figure 2. Monthly precipitation by year at the Bear Lake Natural Resources Conservation Service Snow Telemetry (SNOTEL) station.

Temperature

Aquatic organisms have preferred temperature ranges. These ranges can vary widely, and species with similar temperature tolerances are often associated with one another. Some organisms require relatively cold water to survive, particularly during spawning, egg/larval growth, and development. Consequently, elevated water temperatures can cause mortality and reduced reproduction and growth. Conversely, water temperatures can be too low for optimal growth and survival of some species, particularly those found in the lower reaches of the Big Thompson River.

In addition, temperature is of interest to water treatment operators because the temperature of the water influences the speed at which chemical reactions used to treat drinking water occur. Chemical reactions generally take longer to complete in colder water.

Spring 2025 temperatures were somewhat above five-year average values (Figure 3), which indicates relatively high temperatures compared to values over a longer time period. Water temperatures during the five-year reference period included 2021 and 2022, the seventh and fourth hottest years on record in Colorado (1886-present).

Big Thompson River near the Loveland Water Treatment Plant drinking water intake.

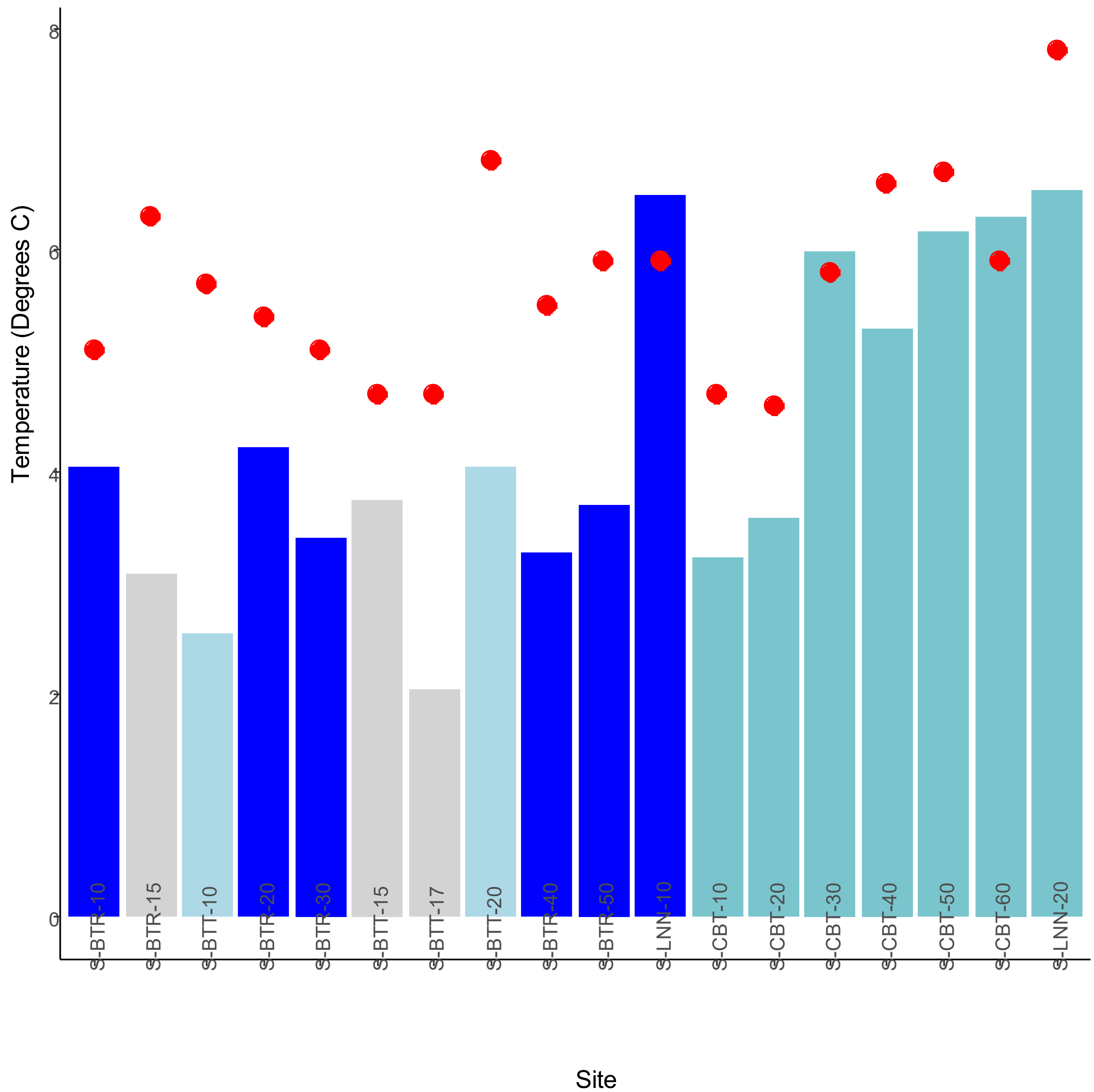

Figure 3. Average water temperature values for August through October 2020-2024 and the 2025 average value (red dot) at sites included in the SWMP. Blue bars indicate mainstem sites, light blue bars indicate tributary sites, and aqua bars represent Colorado-Big Thompson sites. Grey bars indicate sites where data collection began in 2023. In these cases, the grey bar represents average 2023-2024 values, and the red dot represents the average 2025 value.

Turbidity

Turbidity is a general measurement of water clarity, measured as NTU (Nephelometric Turbidity Unit). Water with higher turbidity levels has a greater number of suspended particles and is less clear. Elevated turbidity has negative impacts on municipal water treatment plants and aquatic communities. The City alters the location of water collection to avoid high levels of turbidity as it is an indicator of high sediment load. Turbidity levels are also positively associated with total organic carbon (TOC) levels, which require additional water treatment efforts.

Elevated turbidity can have negative direct and indirect effects on aquatic organisms and can be associated with high concentrations of some metals. Elevated turbidity and suspended sediment can also negatively affect the density and species richness of macroinvertebrates. Growth of trout species, such as rainbow trout (*Oncorhynchus mykiss*), is negatively associated with increased turbidity, and increased turbidity can also lead to increased mortality. Effects of elevated turbidity become more severe with more prolonged exposure.

Turbidity levels in spring 2025 were near five-year average values at many sites but were somewhat elevated at the CB-T sampling locations (Figure 4). These results were not of particular concern with regard to the ability to effectively treat the water (all the values were below 70 NTU) but they were unusual. The cause of this increase is unknown, but it may be worth investigating should the pattern persist.

Historically in the years following the CPF, turbidity in Miller Fork (S-BTT-17) has been notably higher than other sampling locations. In spring 2025, turbidity values were similar to those of nearby sites and reflect recovery from the fire.

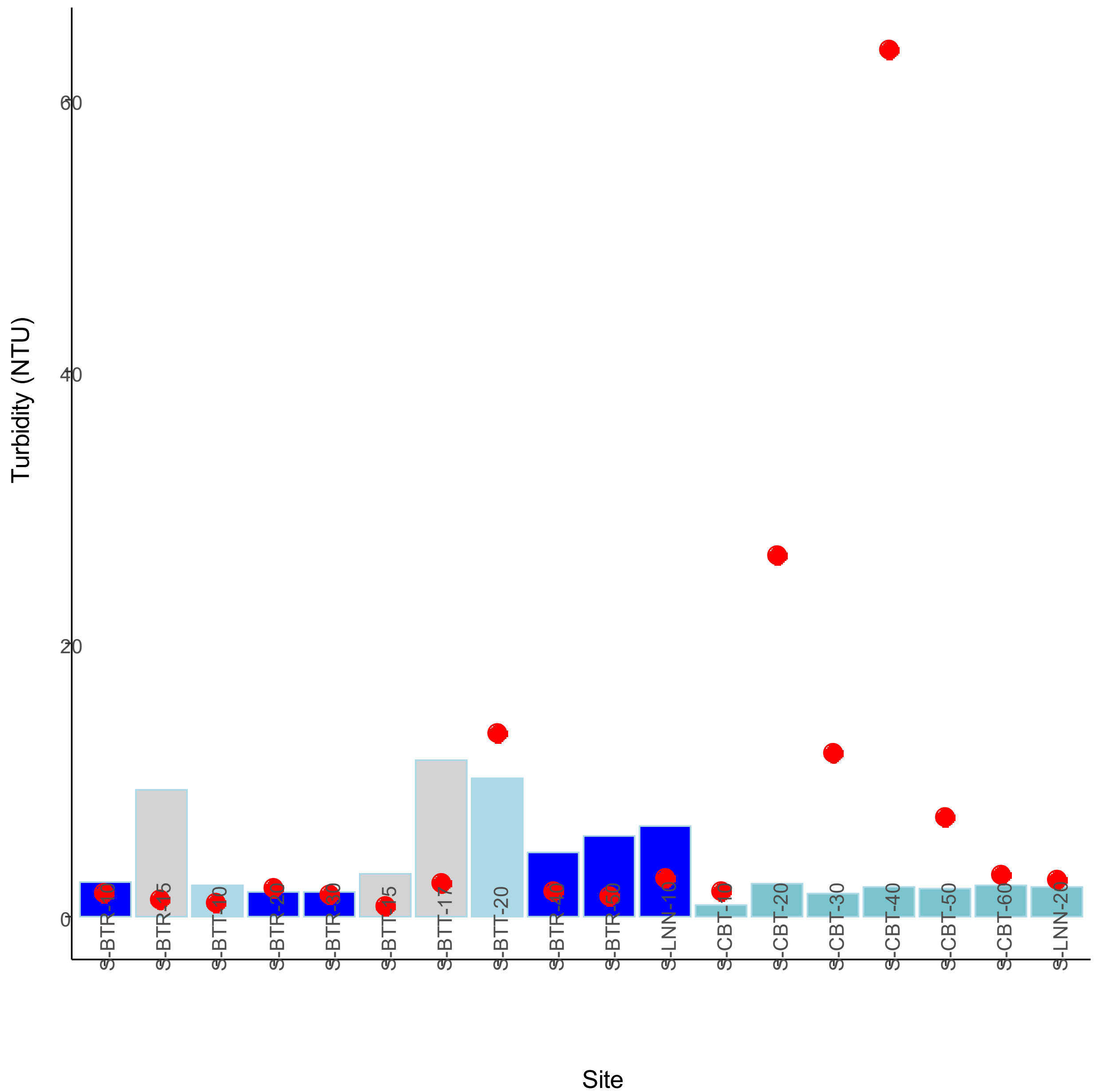

Figure 4. Average turbidity values for the months of August through October 2020-2024 and the 2025 average value (red dot) at sites included in the SWMP. Blue bars indicate mainstem sites, light blue bars indicate tributary sites, and aqua blue bars represent Colorado-Big Thompson sites. Grey bars indicate sites where data collection began in 2023. In these cases, the grey bar represents average 2023-2024 values and the red dot represents the average 2025 value.

pH

The pH value (SU, Standard Units) indicates how acidic or basic water is. A pH value of 7 is considered neutral, with lower values considered acidic and higher values considered basic. Colorado Regulations 31 and 38 establish a pH of 6.5 as a minimum and 9 as a maximum to protect aquatic life. A maximum pH of 9 is also the Colorado Regulation 31 standard for drinking water supplies. The pH level also impacts the efficacy of alum coagulation in drinking water treatment, with the optimal range being between 6 and 8. Outside this pH range, coagulation is less efficient in removing particles present in the water.

Mean pH values were generally approximately the same as the five-year average values for most sampling locations in spring 2025 (Figure 5). However, like turbidity values, pH values seem to be somewhat elevated at several of the CB-T sites. These results were not apparent in 2024. These elevated results were still approximately 8 SU and were well within normal values but they do seem to depart from average values somewhat. The cause of this increase is unknown but it may be worth investigating should the pattern persist.

North Fork of the Big Thompson River

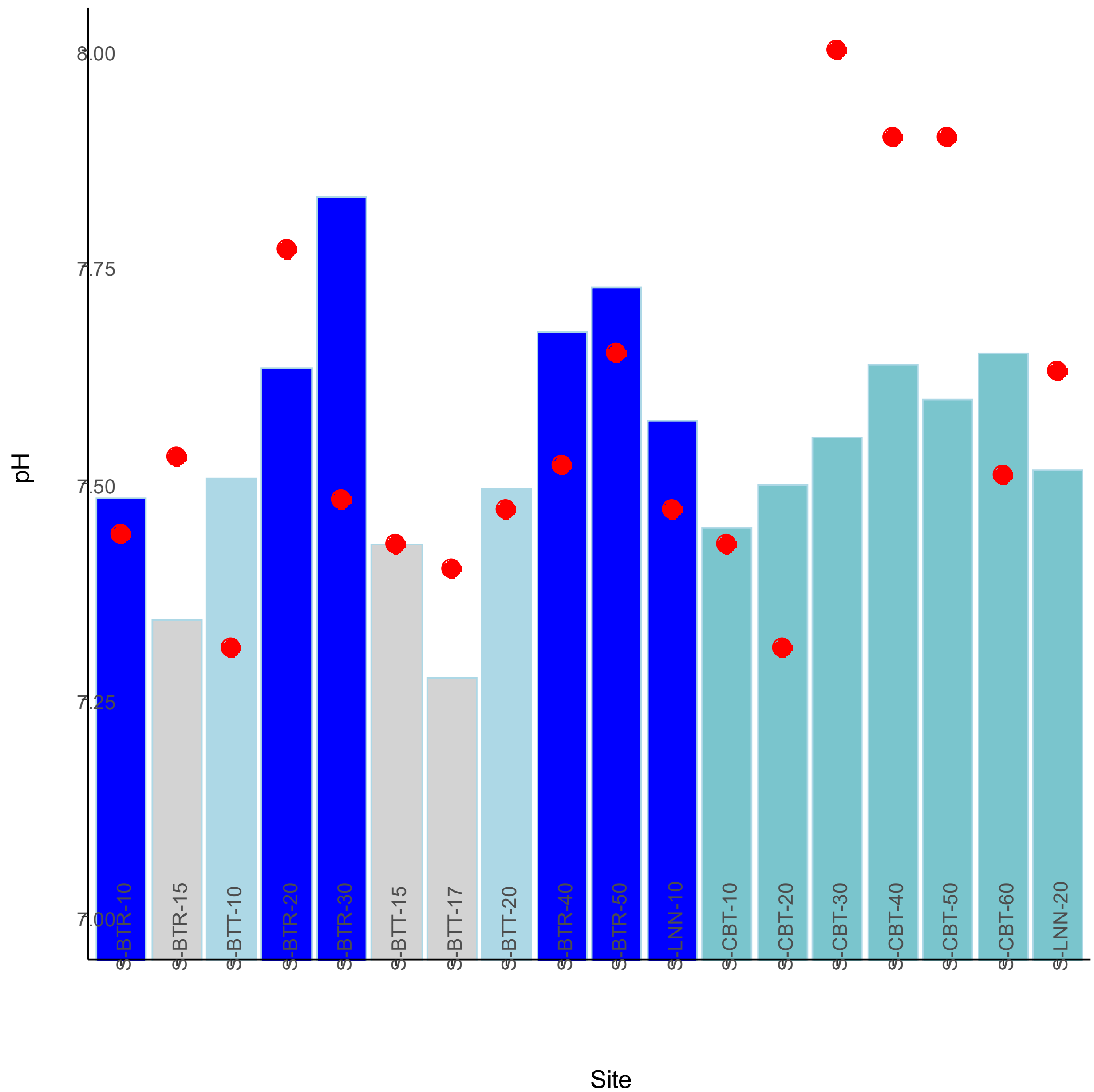

Figure 5. Average pH values for August through October 2020-2024 and the 2025 average value (red dot) at sites included in the SWMP. Blue bars indicate mainstem sites, light blue bars indicate tributary sites and aqua-blue bars represent Colorado-Big Thompson sites. Grey bars indicate sites where data collection began in 2023. In these cases, the grey bar represents average 2023-2024 values and the red dot represents the average 2025 value.

Dissolved Oxygen

Dissolved oxygen levels are important to aquatic life and drinking water facilities and are affected by several factors such as temperature, altitude, turbulence, and biological activity. Turbulent cold water at a low altitude can have higher dissolved oxygen levels than still, warm water at a higher altitude. Biological activity (particularly photosynthesis) can increase dissolved oxygen during the day as photosynthesis occurs and decrease dissolved oxygen levels at night when respiration dominates. Biological activity often has no net effect on dissolved oxygen levels, but it can increase the daily range of values, with wider ranges being associated with more biological activity.

Virtually all aquatic organisms require dissolved oxygen to survive, with the necessary concentration differing by species. For example, many fish species in the upper portion of the Big Thompson River have evolved to live in cold water streams and require higher concentrations of dissolved oxygen (e.g., cutthroat trout, *Oncorhynchus clarkii*) than those that evolved to persist in the lower warm water portion of the river (e.g., plains killifish, *Fundulus zebinus*). Aquatic organisms can experience mortality if the dissolved oxygen levels drop below their threshold level for even a short time. Although some life stages require higher dissolved oxygen levels, a minimum threshold to support most aquatic life is approximately 6 mg/L (ppm, parts per million). In addition, dissolved oxygen levels regulate the degree to which some elements (like manganese) remain in solution. Relatively high dissolved oxygen levels allow these elements to precipitate out of the water column, making drinking water treatment easier.

Spring 2025 dissolved oxygen levels were generally near five-year average values across sites (Figure 6). All measured dissolved oxygen concentrations were above concentrations to support most aquatic life.

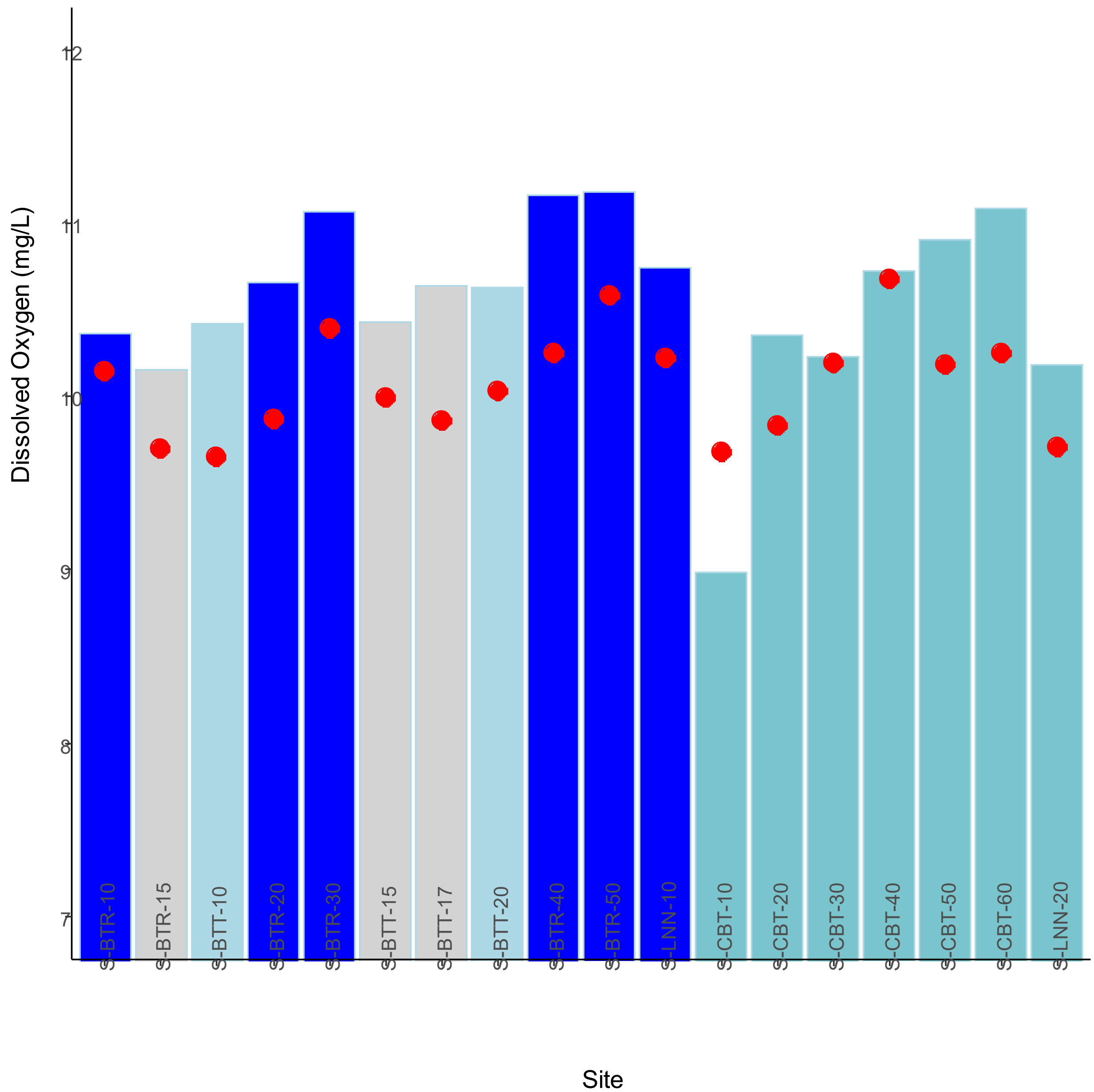

Figure 6. Average dissolved oxygen values for the months of August through October 2020-2024 and the 2025 average value (red dot) at sites included in the SWMP. Blue bars indicate mainstem sites, light blue bars indicate tributary sites and aqua-blue bars represent Colorado-Big Thompson sites. Grey bars indicate sites where data collection began in 2023. In these cases, the grey bar represents average 2023-2024 values and the red dot represents the average 2025 value.

Alkalinity

Alkalinity is a measure of the ability of water to neutralize acid and resist declines in pH and is generally determined by the amount of calcium carbonate in water. Calcium carbonate provides buffering capacity to protect aquatic life from acidic conditions and decreases the ability of water to corrode distribution pipes. Conversely, water treatment plants (including City of Loveland Utilities) often use flocculation techniques to purify water, and these techniques are often optimized by altering the pH (Naceradska et al. 2019). High alkalinity makes this pH adjustment more complex and requires higher doses, whereas low alkalinity can lead to incomplete chemical reactions and poor flocculation.

Spring 2025 alkalinity measurements were similar to those from the previous five years (Figure 7) with no notable changes associated with the CPF despite the fact that wildfires often result in a significant decline in alkalinity (Rust et al. 2018).

Big Thompson River at Viestenz-Smith Park.

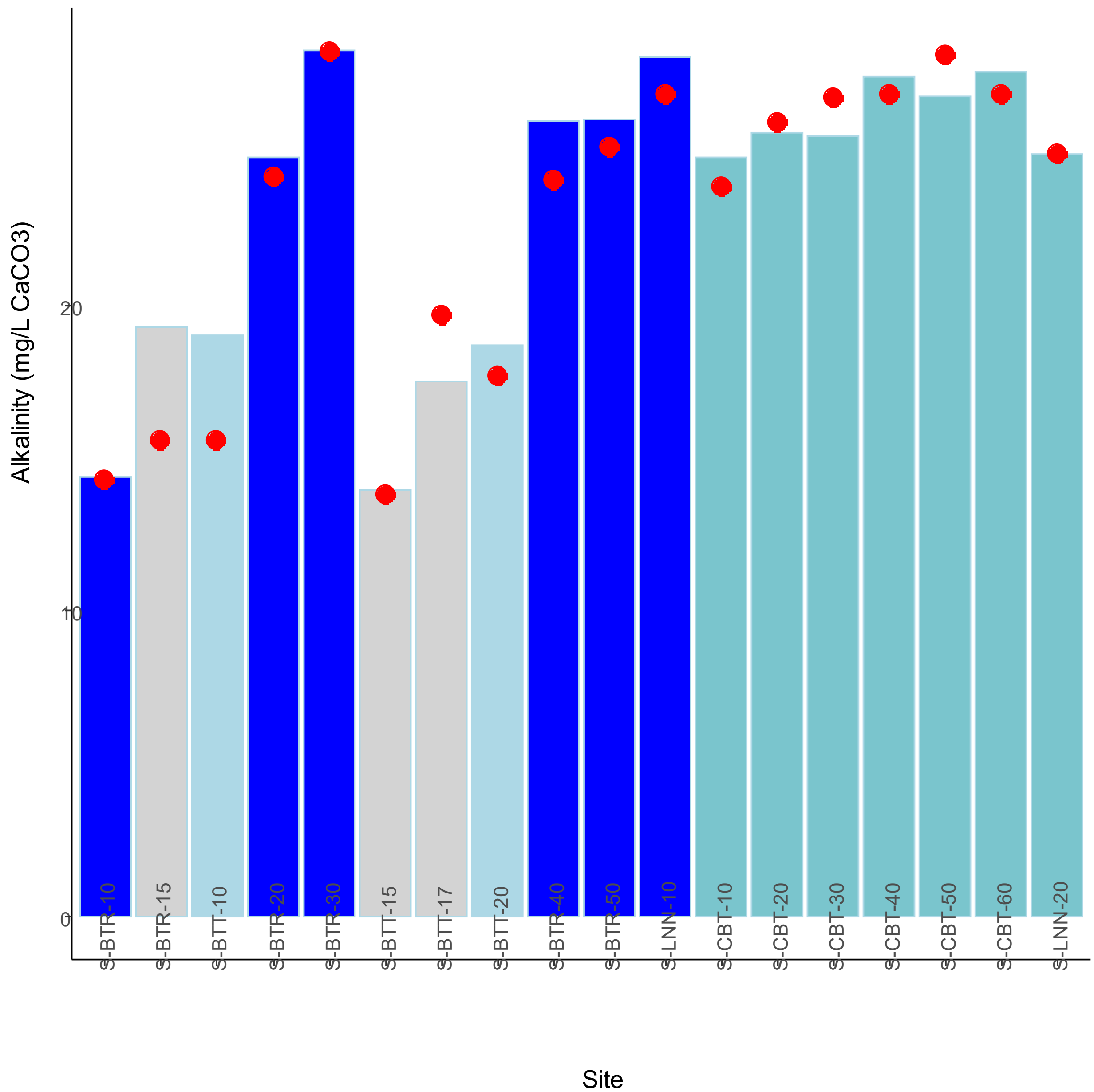

Figure 7. Average alkalinity values for August through October 2020-2024 and the 2025 average value (red dot) at sites included in the SWMP. Blue bars indicate mainstem sites, light blue bars indicate tributary sites and aqua-blue bars represent Colorado-Big Thompson sites. Grey bars indicate sites where data collection began in 2023. In these cases, the grey bar represents average 2023-2024 values and the red dot represents the average 2025 value.

Manganese

Manganese is an element that is considered beneficial to human health at low levels and is one of the least toxic elements. However, elevated levels can cause non-health-related effects such as bad taste and staining of clothes and plumbing fixtures. Elevated manganese levels can also cause problems for water distribution systems. Specifically, manganese may cause buildup in water distribution pipes. The relative toxicity of manganese to aquatic life is based on the hardness of the water, but manganese levels of concern to aquatic life are much higher than those present in the Big Thompson River.

Spring 2025 concentrations of total manganese were somewhat lower than the five-year average values at most sites. This result is similar to 2024 results and is a decline from very elevated manganese levels experienced at sites downstream of the CPF in recent years. Of particular interest were the facts that the total manganese concentrations at the Miller Fork site (S-BTT-17) were similar to adjacent sites and were lower than the average value. This circumstance is consistent with recovery from the CPF.

The EPA has a “secondary” standard of 0.05 mg/L (ppm) for dissolved manganese. This level does not make water unsafe to drink, but the water may be aesthetically unpleasant due to a reddish/black/brown color, which can stain laundry, plumbing, sinks, and showers. Mean spring 2025 manganese concentrations were well below this standard.

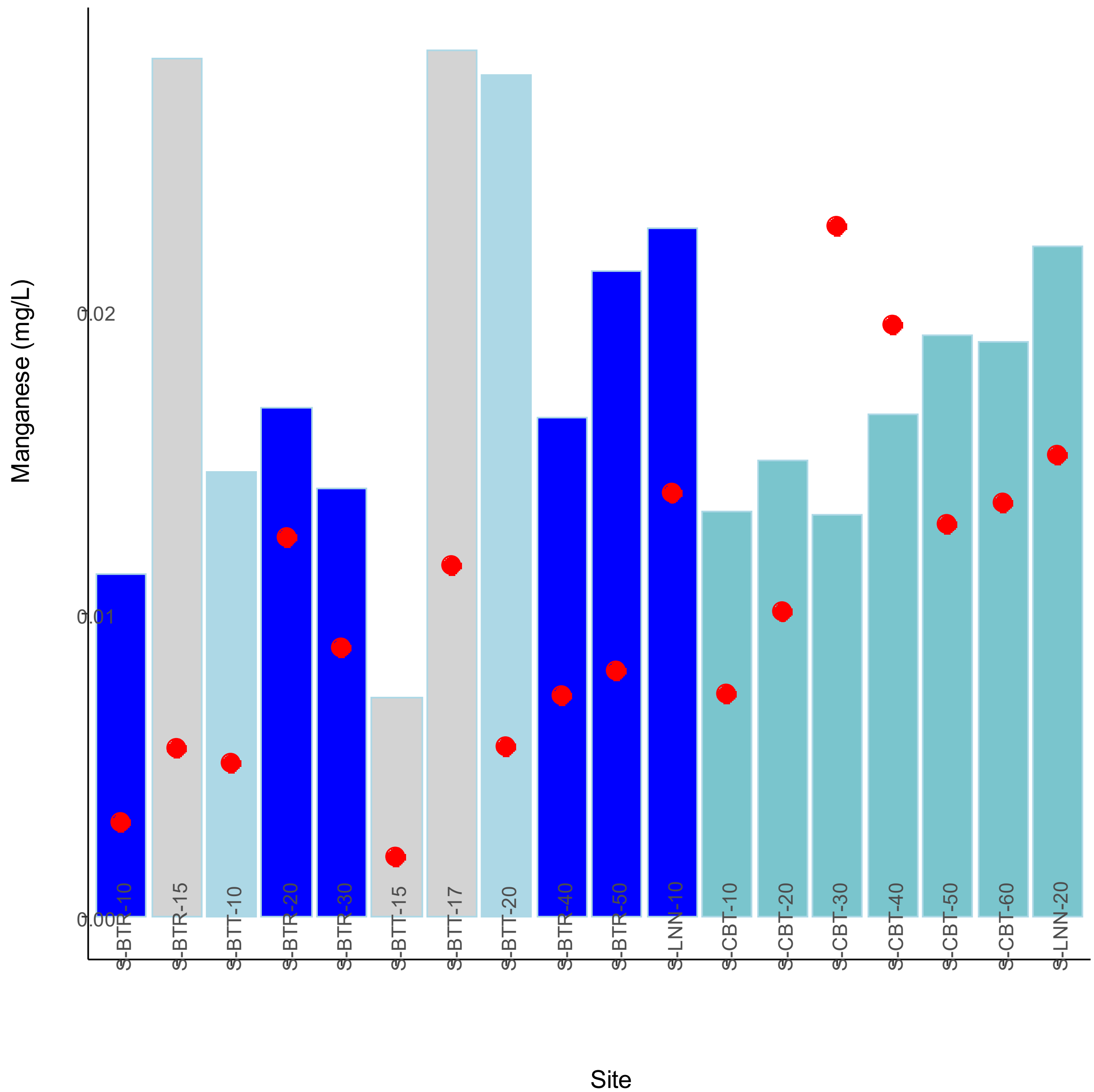

Figure 8. Average manganese values for August through October 2020-2024 and the 2025 average value (red dot) at sites included in the SWMP. Blue bars indicate mainstem sites, light blue bars indicate tributary sites and aqua-blue bars represent Colorado-Big Thompson sites. Grey bars indicate sites where data collection began in 2023. In these cases, the grey bar represents average 2023-2024 values and the red dot represents the average 2025 value.

Copper

Copper is of interest primarily due to its potential effects on aquatic life. While copper is an essential nutrient, it can cause chronic and acute effects to aquatic life at higher concentrations. Acute effects include mortality; chronic effects include reduced survival, growth, and reproduction. Copper toxicity is partially determined by the hardness of the water. Copper toxicity to aquatic organisms is lower when hardness is higher because dissolved copper is less bioavailable when hardness is high.

Total copper levels in spring 2025 were below five-year average values (Figure 9) and were similar to levels that have been markedly lower in the post-CPF period. While these lower levels indicate continued effects of the CPF, they are also positive from a water quality perspective and may represent new and lower baseline conditions. There was a dramatic decrease in total copper concentration in the first spring after the full effects of the fire were apparent (i.e., summer 2021), and these lower levels seem to persist.

Aerial view of the Big Thompson River at Viestenz-Smith Park.

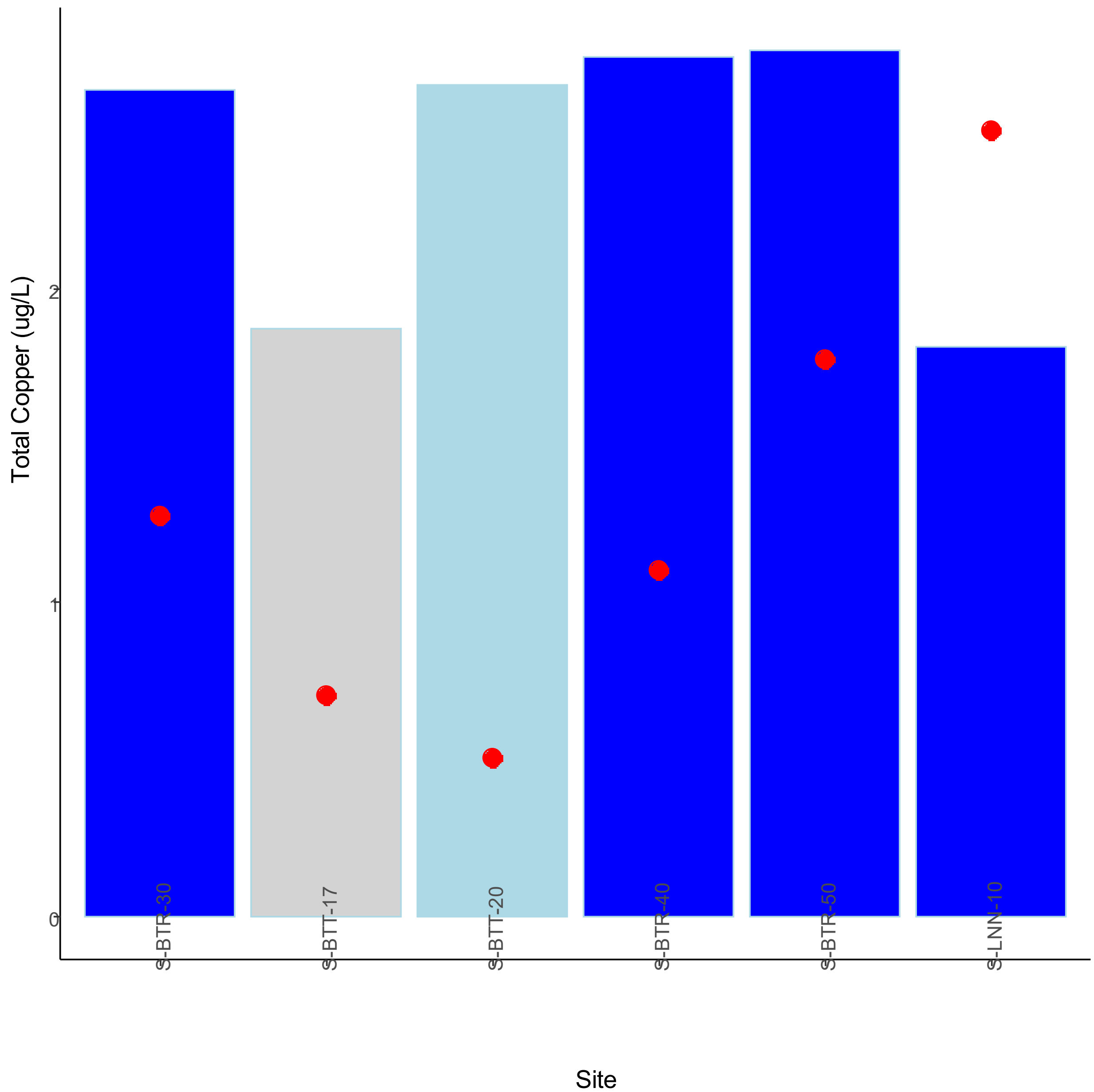

Figure 9. Average total copper values for August through October 2020-2024 and the 2025 average value (red dot) at sites included in the SWMP. Light blue bars indicate tributary sites, and blue bars indicate mainstem sites. Grey bars indicate sites where data collection began in 2023. In these cases, the grey bar represents average 2023-2024 values and the red dot represents the average 2025 value.

Iron

Iron is common in surface water, although it is usually present at levels harmless to people and aquatic life. However, water discoloration and staining issues can occur in water with dissolved iron levels greater than 3,000 ug/L (ppb), and the drinking water standard is a 30-day average value of 300 ug/L (ppb). Detrimental effects to aquatic life can occur when levels of dissolved iron are above 1000 ug/L (ppb). The levels of dissolved iron that can affect aquatic life are dependent, in part, on the hardness of the water. Less dissolved iron is necessary to negatively impact aquatic life in water with lower hardness values than in water with higher hardness values.

Average total iron concentrations in Spring 2024 were generally substantially below five-year average values at all sites (Figure 10). This circumstance is also consistent with fire recovery. The area in the North Fork watershed above the sampling site was included in the area that was most severely burned during the CPF in the fall of 2020, and total iron levels have been elevated at this location in the years immediately following the fire.

Aerial view of the Big Thompson River at Viestenz-Smith Park.

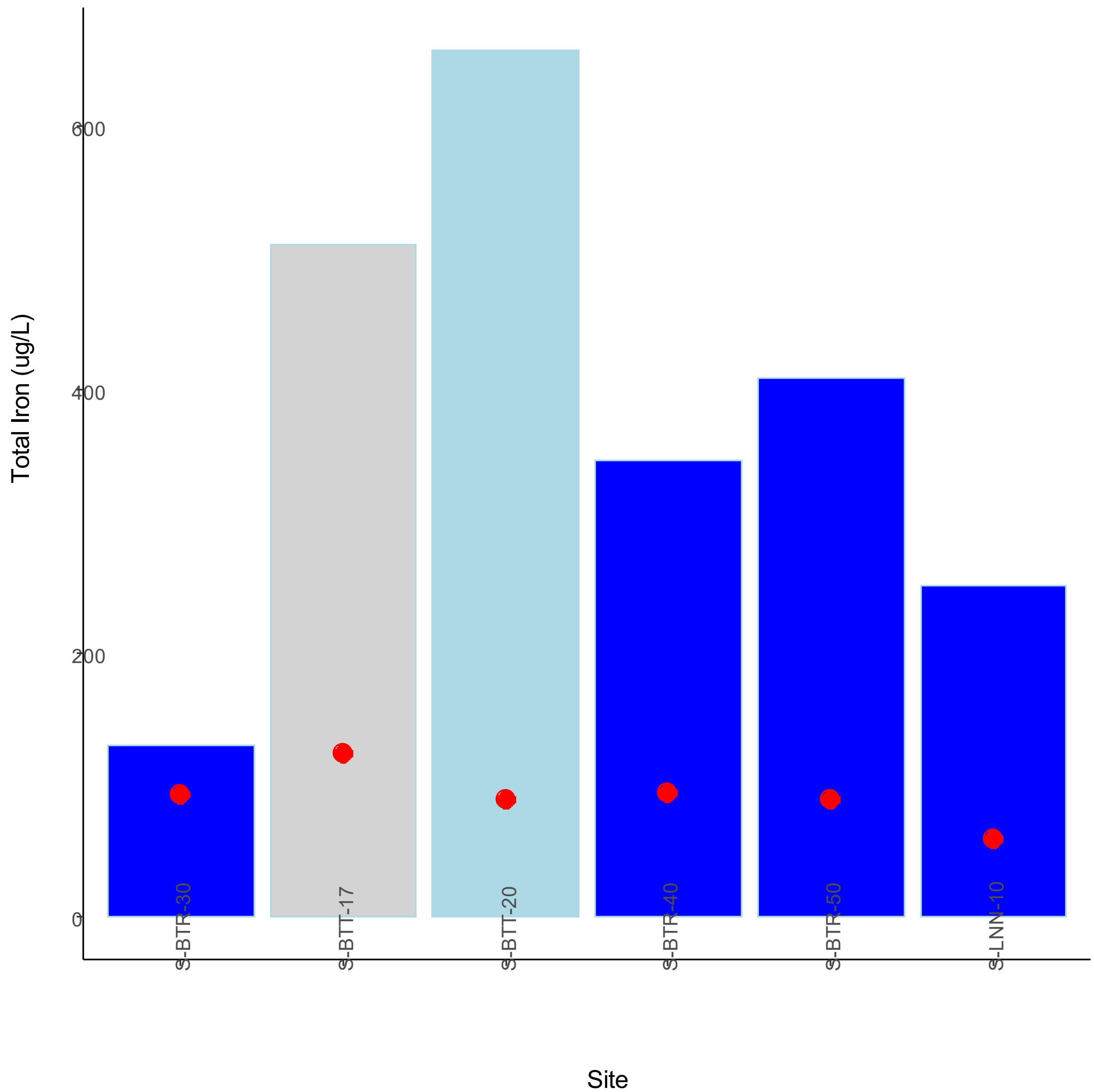

Figure 10. Average total iron values for August through October 2020-202 and the 2025 average value (red dot) at sites included in the SWMP. Light blue bars indicate tributary sites, and blue bars indicate mainstem sites. Grey bars indicate sites where data collection began in 2023. In these cases, the grey bar represents average 2023-2024 values and the red dot represents the average 2025 value.

Nitrate

Nitrate and nitrite are of interest due to their role in aquatic plant growth and their potential effects on human health. Nitrate, along with ammonia, is a form of nitrogen that is available for immediate uptake by algae and is, therefore, of interest due to its role in determining the productivity of a given waterbody. At higher concentrations (e.g., >10 mg/L (ppm)), nitrate can be of concern in drinking water because it can reduce the oxygen-carrying capacity of hemoglobin in humans and create a condition known as methemoglobinemia, particularly in those under two years of age. Nitrite is also available for uptake by algae but is rarely present at high concentrations.

Nitrate concentrations in Spring 2024 were below five-year average values at all sampling locations. Values at the Miller Fork site (S-BTT-17) were lower than average and indicate a continuation of recovery from the CP given that elevated nitrate can and has been an aftereffect of the CPF (Ruckhaus et al. 2025, Rust et al. 2018). We have documented elevated nitrate as a continuing effect of the CPF in previous seasonal and annual reports. Below-average values are another positive indication that the Big Thompson watershed is recovering from the CPF.

Fall River just upstream of Fall River Court Bridge.

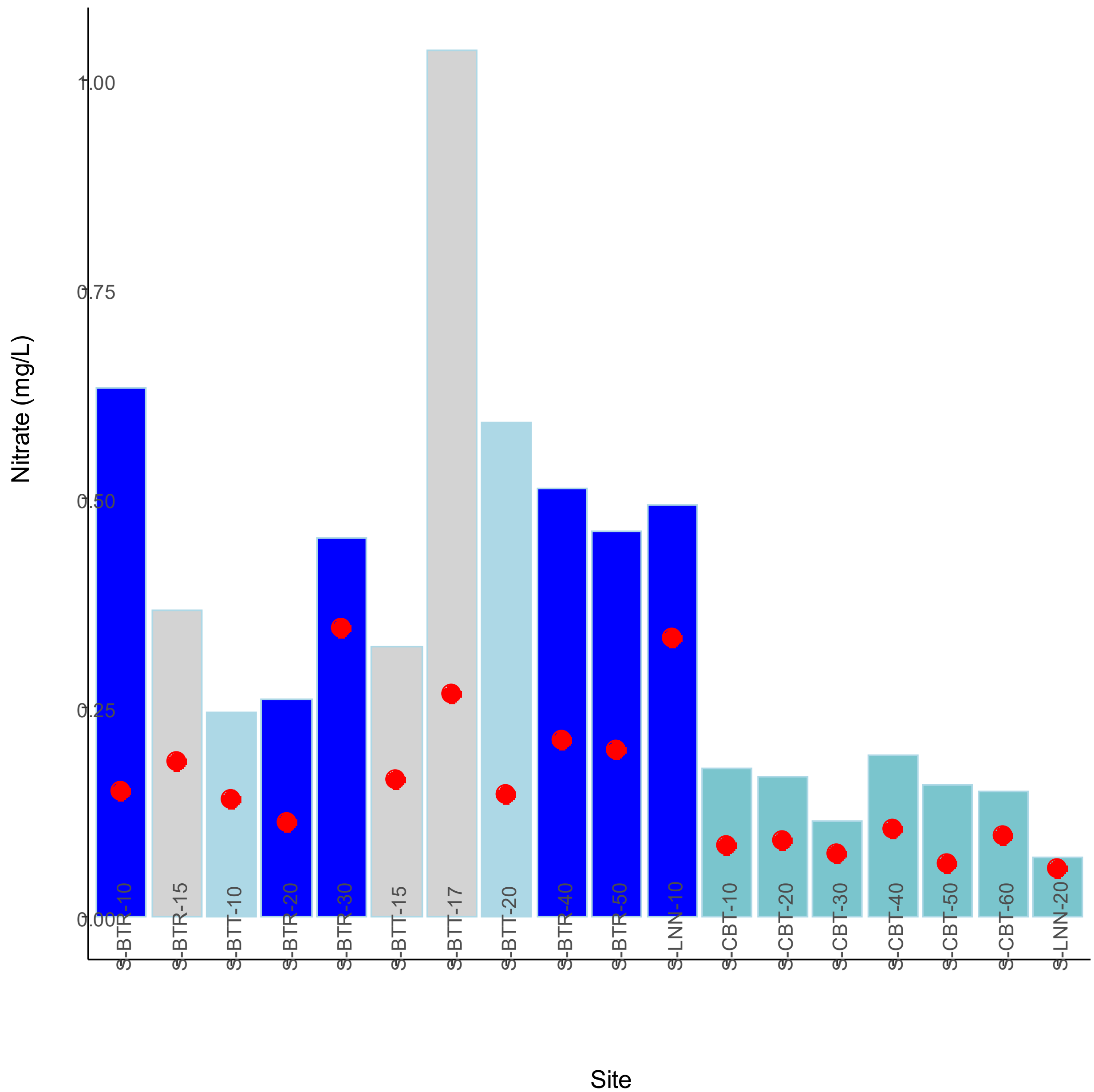

Figure 11. Average nitrate values for August through October 2020-2024 and the 2025 average value (red dot) at sites included in the SWMP. Blue bars indicate mainstem sites, light blue bars indicate tributary sites and aqua-blue bars represent Colorado-Big Thompson sites. Grey bars indicate sites where data collection began in 2023. In these cases, the grey bar represents average 2023-2024 values, and the red dot represents the average 2025 value.

Orthophosphate

Orthophosphate is a dissolved form of phosphorus and is the only form that is immediately available for uptake by algae. Orthophosphate concentrations often limit algal populations and are of concern due to the ability of some algal species to produce toxins and negatively affect drinking water taste and odor. Therefore, elevated orthophosphate levels can be of concern. Sources of orthophosphate include the decay of plant debris and other organic matter; the minerals that makeup rocks, soils, and sediments in the watershed; wastewater treatment plant effluent; failing individual sewage disposal systems; runoff from fertilized agricultural lands and urban areas; and erosion of stream channels, dirt roads, construction sites, and other land surfaces.

Like 2024, spring 2025 orthophosphate concentrations were generally low compared to the five-year average values for most sites (Figure 12). This result is positive from a water quality perspective. These low and declining orthophosphate concentrations were observed over the last year and will hopefully persist.

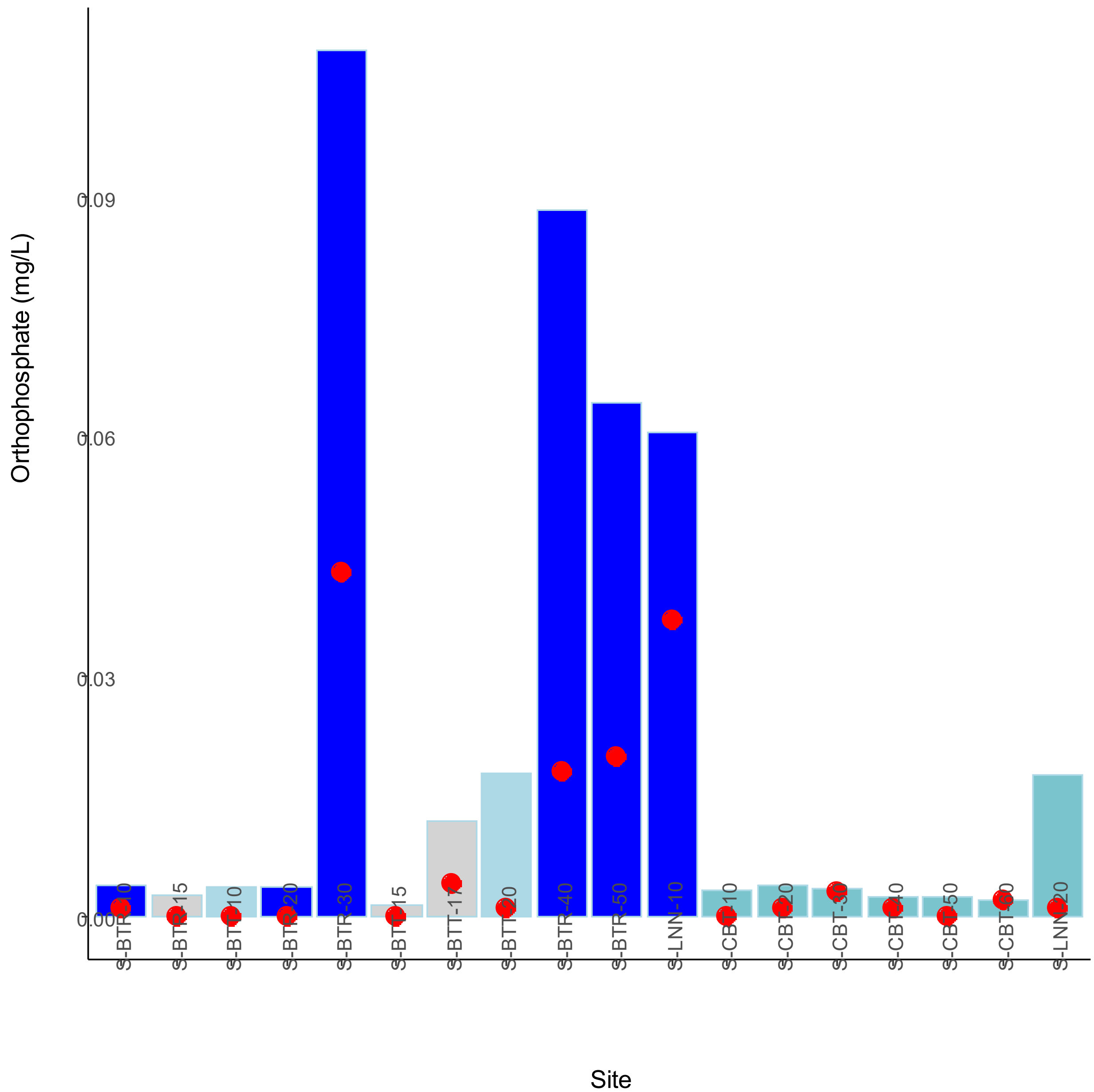

Figure 12. Average orthophosphate values for August through October 2020-2024 and the 2025 average value (red dot) at sites included in the SWMP. Blue bars indicate mainstem sites, light blue bars indicate tributary sites and aqua-blue bars represent Colorado-Big Thompson sites. Grey bars indicate sites where data collection began in 2023. In these cases, the grey bar represents average 2023-2024 values, and the red dot represents the average 2025 value.

Total Organic Carbon (TOC)

TOC is a measure of the amount of dissolved and particulate organic matter in a water sample. Organic carbon compounds result from decomposing organic matter such as algae, terrestrial plants, animal waste, detritus, and organic soils. The higher the carbon or organic content of a water body, the more oxygen is consumed as microorganisms break down the organic matter.

Although TOC is not a direct human health hazard, the dissolved portion of TOC can react with chemicals (chlorine and others) used for drinking water disinfection to form disinfection by-products (Allen et al. 2022), which are regulated as potential carcinogens (e.g., chloroform, $CHCl_3$). As such, TOC levels are of concern to drinking water treatment facilities.

Spring 2025 TOC values were similar or slightly lower than five-year average values at virtually all sites (Figure 13). Organic carbon is often reduced in severely burned areas compared to unburned areas immediately post-fire (Rhoades et al. 2019) and has generally been low at sites most affected by the CPF (S-BTT-15, S-BTT-17, and S-BTT-20) since the fire. TOC values may increase in the future as the watershed continues to recover from the CPF or perhaps these relatively low values represent new and reduced baseline conditions.

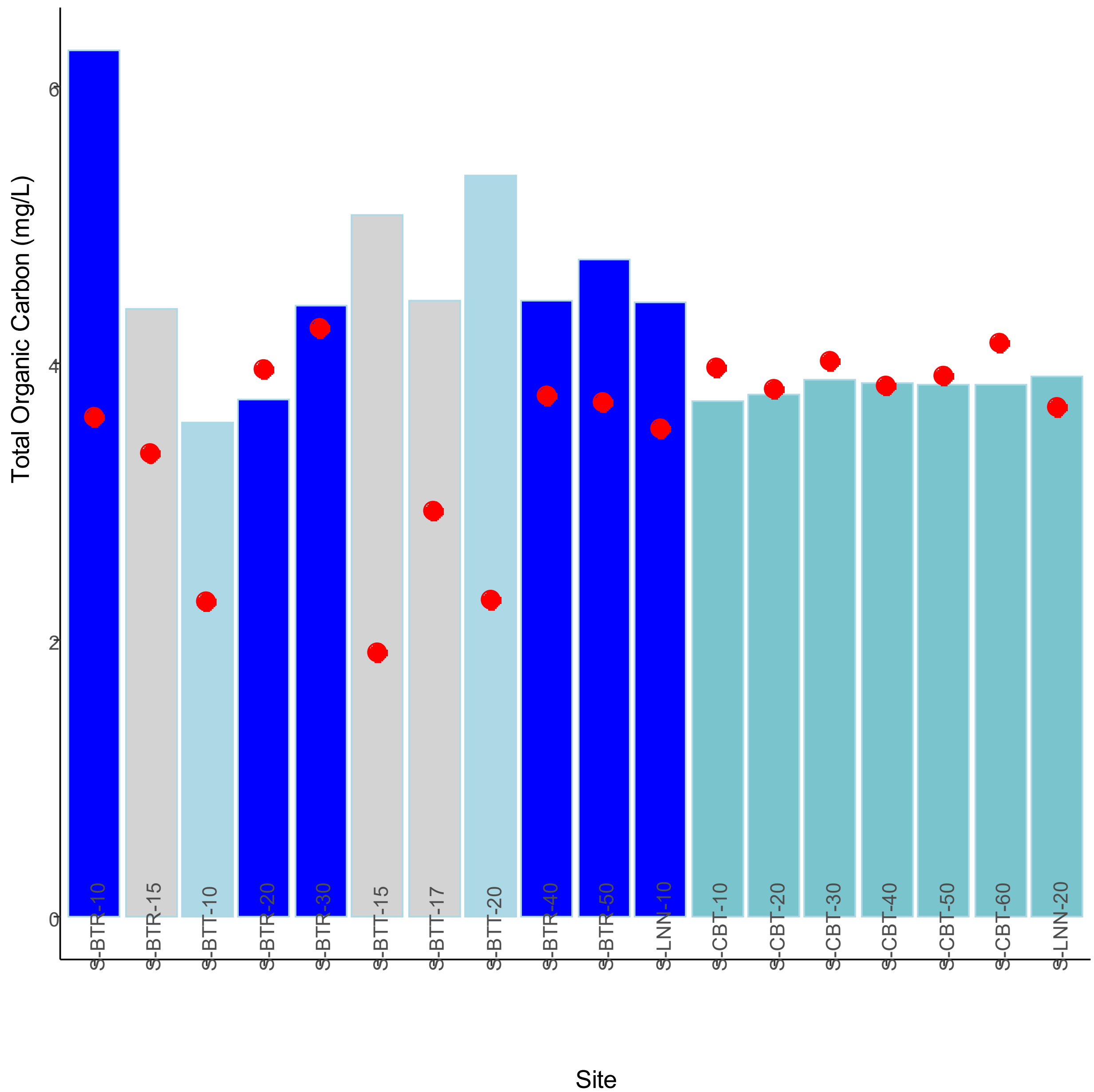

Figure 13. Average total organic carbon values for August through October 2020-2024 (blue bar) and the 2025 average value (red dot) at sites included in the SWMP. Blue bars indicate mainstem sites, light blue bars indicate tributary sites and aqua-blue bars represent Colorado-Big Thompson sites. Grey bars indicate sites where data collection began in 2023. In these cases, the grey bar represents average 2023-2024 values and the red dot represents the average 2025 value.

Conclusions

Spring 2025 water quality conditions were good and generally improving. Concentrations of most measured parameters were typically near five-year average values and some continued to provide indications that the water quality effects of the CPF are recovering (or have recovered) from the fire.

The City is continuing to focus efforts on mitigating the effects of the AMF as well as reducing the likely impacts of the next wildfire in the Big Thompson Watershed by partnering with groups such as the Big Thompson Watershed Coalition and the Larimer Conservation District to conduct forest management projects, primarily through tree thinning (Figure 14). The purpose of these projects is to reduce the overall occurrence of wildfires and to reduce the severity of their impact for those that do occur. It is perhaps the case that even the AMF was less severe than it could have been in part due to past forest management activities. Although water quality remained relatively good despite the fire effects, we expect that these efforts, combined with natural regenerative processes, will continue to yield improved water quality in the coming years. In addition, The City has been working in partnership with the Natural Resources Conservation Service (NRCS) to utilize Emergency Watershed Protection (EWP) funds to mitigate potential water quality aftereffects of the AMF. The purpose of these projects is to reduce the severity of water quality effects of the fire by slowing runoff and reducing sediment transport in the most severely burned areas. These projects will be “low-tech” and consist of contour felling of logs and log check dams where appropriate and will be implemented on private property thanks to the gracious cooperation of the landowners.

Although spring 2025 water quality conditions were within acceptable ranges, turbidity and pH levels were somewhat elevated at several CB-T sites. This circumstance is not of particular concern but does provide context for the interpretation of data collected in the future and may be worthy of investigation if these conditions persist or worsen.

Continued monitoring of core water quality parameters, as well as others that may be worthy of inclusion in future efforts (e.g. hydrocarbons), provides the context to prepare for issues that may arise in the future as well as documenting the success of management actions and natural recovery.

Figure 14. An example of forest management in the Big Thompson River watershed. The forest on the left side of the road has been thinned to historic tree density. The forest on the right side of the road has not been treated.

References

Allen, J.M., Plewa, M.J., Wagner, E.D., Wei, X., Bokenkamp, K., Hur, K. Jia, A., Liberatore, H.K., Lee, C.T., Shirkhani, R., and Krasner, S.W. 2022. Drivers of disinfection byproduct cytotoxicity in US drinking water: should other DBPs be considered for regulation? Environmental Science & Technology 56: 392-402.

Naceradska, J., Pivokonska, L., and Pivokonsky, M. 2019. On the importance of pH value in coagulation. Journal of Water Supply: Research and Technology-Aqua 68: 222-230. https://doi.org/10.2166/aqua.2019.155

Paul, M.J., LeDuc, S.D., Lassiter, M.G., Moorhead, L.C., Noyes, P.D., and Lebowitz, S.G. 2022. Wildfire induces changes in receiving waters: a review with considerations for water quality management. Water Resources Research 58. https://doi.org/10.1029/2021WR030699

Rhoades, C.C., Chow, A.T., Covino, T.P, Fegel, T.S. Pierson, D.N., and Rhea, A.E. 2019. The legacy of a severe wildfire on stream nitrogen and carbon in headwater catchments. Ecosystems 22: 643–657.

Rodela, M.H., Chowdhury, I., and Hohner, A.K. 2022. Emerging investigator series: physiochemical properties of wildfire ash and implications for particle stability in surface waters. Environmental Science: Processes & Impacts 24: 2129-2139.

Ruckhaus, M.H., Clow, D.W., Hirsh, R.M., and Chapin, T.W. 2025. Characterising water-quality response after the 2020 Cameron Peak Fire using a novel application of the weighted regressions on time, discharge, and season method. Hydrological Processes 39: e70178. https://doi.org/10.1002/hyp.70178

Rust, A.J., Hoque, T.S, and McCray, J. 2018. Post-fire water-quality response in western United States. International Journal of Wildland Fire 27: 203–216.

Office
Loveland Service Center
200 North Wilson Avenue
Loveland, CO 80537
Public Water System Identification
Number: CO0135485
Office Hours: 8 a.m. to 5 p.m.
Monday-Friday

Contact Us
(970) 962-3000
LWPInfo@cityofloveland.org
www.lovelandwaterandpower.org

Loveland Water and Power