CHATFIELD WATERSHED AUTHORITY 2020 Annual Report

MAY 15, 2021

We Protect the Water You Enjoy

www.chatfieldwatershedauthority.org

The Chatfield Watershed Authority promotes protection of water quality in the Chatfield Watershed for drinking water supplies, recreation, fisheries, and other beneficial uses.

The **2020 Annual Report** is the annual water quality summary and status report presented by the Chatfield Watershed Authority to communicate the water quality of Chatfield Reservoir and its watershed, highlighting information required by the Colorado Water Quality Control Commission in Control Regulation #73.

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Chatfield
Watershed Authority

May 15, 2021

Water Quality Control Commission
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, CO 80246

Dear Commissioners:

The Chatfield Watershed Authority (CWA or Authority) is pleased to submit this 2020 Annual Report to the Water Quality Control Commission (WQCC) in accordance with the reporting requirements of the Chatfield Reservoir Control Regulations, Regulation #73. 2020 has certainly been a different year, not only due to the impacts of Covid 19, but also due to the extreme hot and dry climate conditions occurring in the summer of 2020. These conditions appear to have been a substantial contributor to exceedances of the total phosphorus and chlorophyll-α in Chatfield Reservoir for the 2020 monitoring period. These same extreme conditions were also observed in Bear Creek Reservoir and Cherry Creek Reservoir. The highest total phosphorus and chlorophyll-α concentration in Chatfield Reservoir occurred in the second week of August at the same time as there was no flow entering the reservoir from Plum Creek. The Authority will be evaluating these conditions as compared to the historic record of Chatfield Reservoir water quality to try and ascertain the sources and mechanisms that led to this isolated exceedance of water quality standards.

The Authority has been busy in 2020 as is evidenced by the activities reported in this annual report. These activities included review of a new site application and unique phosphorus trade application in Douglas County, the application for and receipt of a NWQI planning grant, the use of the Chatfield watershed model to evaluate the impact on water quality of example watershed events and activities, the results of the Colorado School of Mine Field Session which provided a snapshot in time of water quality in Willow Creek, Plum Creek, West Plum Creek, and on several tributaries to these creeks, and the efforts of our members to promote water quality education and control of water quality from construction activities through their stormwater criteria and MS4 permitting activities, all of which occurred while dealing with the Covid 19 pandemic. We hope you enjoy reading our report and look forward to presenting this report at a future WQCC meeting.

Sincerely,

Lora L Thomas

Lora L. Thomas
2021 Chatfield Watershed Authority Board Chair

CHATFIELD WATERSHED AUTHORITY

The Chatfield Watershed Authority (the Authority) was established in 1984 when the Governor of Colorado designated the Authority as the 208 Management Agency, in accordance with the Federal Clean Water Act. The Authority's mission is to promote protection of water quality in the Chatfield Watershed for recreation, fisheries, drinking water supplies, and other beneficial uses. The Authority preserves these beneficial uses in Chatfield Reservoir and the Watershed through promotion of point source, nonpoint source, and stormwater controls.

The Authority continues to implement Colorado Water Quality Control Commission (WQCC) Chatfield Reservoir Control Regulation, 5 CCR 1002-73 (Control Regulation No. 73); and coordinating with state and federal agencies regarding water quality control measures.

The Authority is comprised of stakeholders within the 400 square mile watershed and is comprised of the Plum Creek basin and portions of the South Platte River basin (from the outfall of Strontia Springs Reservoir to Chatfield Reservoir, including the Massey Draw and Deer Creek sub-basins). The members develop and implement projects to protect the watershed, reservoir health and water quality. Opportunities exist within the watershed to address the chemical, physical and biological constituents (pollutants) that impact the watershed and reservoir. Some examples of this include phosphorus removal in wastewater treatment, stabilizing degraded streambanks, mitigating runoff from agricultural lands, minimizing leachate from septic systems, controlling runoff from wildfire burn areas, and providing public education for reducing contamination from the actions of people.

The Authority member's jurisdiction and service are boundaries as well as the Chatfield watershed boundary are shown on Figure 1. The five-member Board of Directors (Board) is comprised of three elected officials representing Douglas County, Jefferson County, and the Town of Castle Rock; one wastewater district representative; and one representative for other members. The Board continues to implement Control Regulation No. 73. The Board meets regularly to address policy and fiscal issues.

2020 BOARD MEMBERS

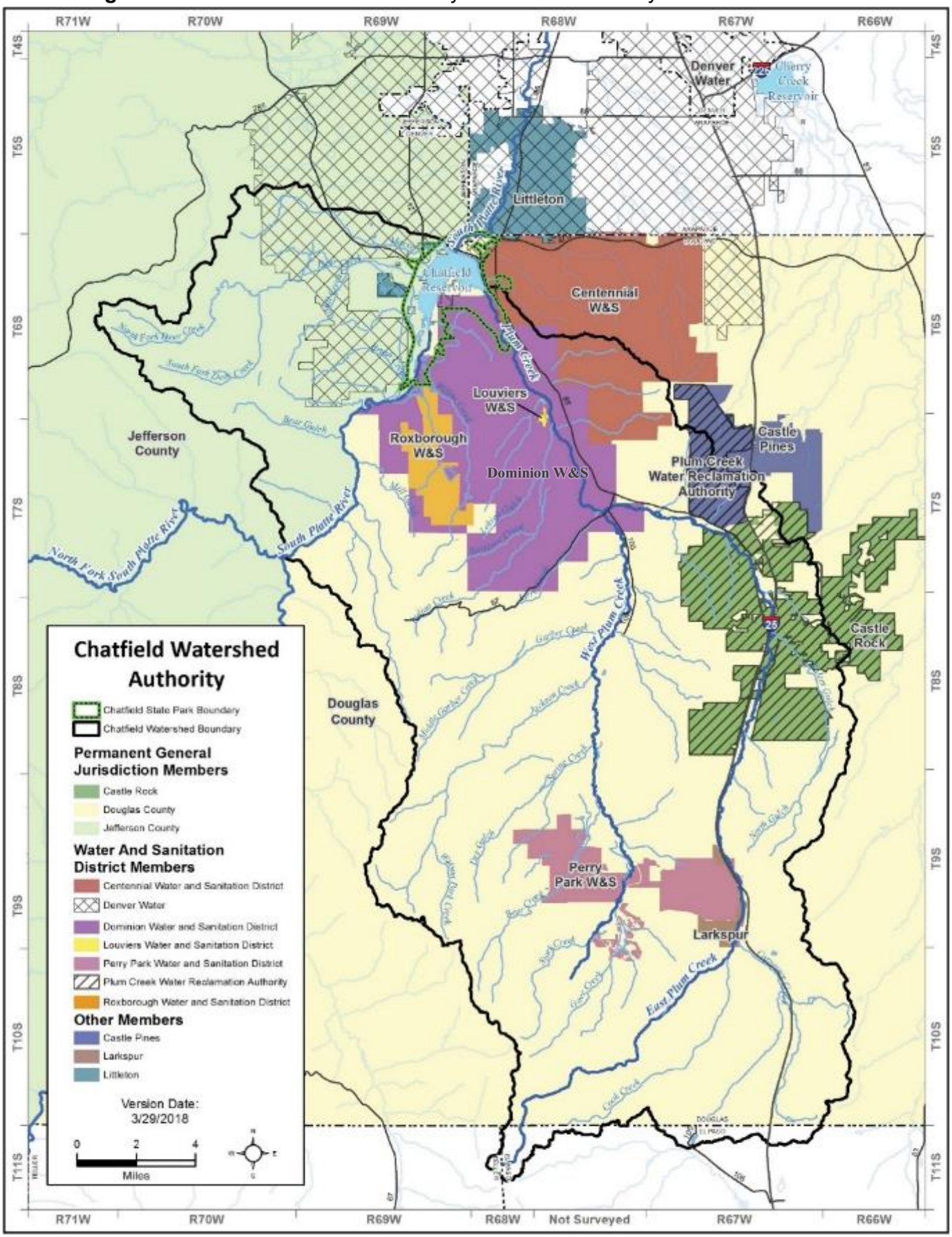
Board Chair: Director Lesley Dahlkemper, Jefferson County Commissioner
Board Vice-Chair: Director Lora L. Thomas, Douglas County Commissioner
Board Director: George Teal – Town of Castle Rock Councilman
Board Director of Water and Sanitation Members: Barbara Biggs, Roxborough Water & Sanitation District Manager
Board Director of Other Members: Alison Witheridge, Denver Water, Watershed Scientist

The Technical Advisory Committee (TAC) is a standing committee that meets monthly to address technical and scientific matters, serving at the pleasure of the Board. Other standing committees are formed, as necessary, to address specific issues at the Board's request.

2020 TECHNICAL ADVISORY COMMITTEE REPRESENTATIVES

Jefferson County: Chair, Patrick O'Connell
Dominion Water & Sanitation District: Vice-Chair, Mary Kay Provaznik
Castle Pines Metropolitan District: Jeff Coufal
Centennial Water & Sanitation District: Julie Tinetti
City of Littleton: Carolyn Roan
Douglas County: Jim Dederick
Louviers Water & Sanitation District: Ron Beane
Plum Creek Water Reclamation Authority: Weston Martin
Perry Park Water & Sanitation District: Diana Miller
Town of Castle Rock: David Van Dellen
Town of Larkspur: Paul Grant

Figure 1. Chatfield Watershed Authority Watershed Boundary and Member Entities.



RESERVOIR REGULATORY COMPLIANCE

Chlorophyll-α

In 2020 Chatfield Reservoir was not in compliance with Regulation 38 (WQCC 5 CCR 1002-38) chlorophyll-a (chl-α) standard. The chlorophyll-α standard in the reservoir is 10 µg/L, with an allowable exceedance frequency of one time in five years. The WQCC adopted an assessment threshold of 11.2 µg/L to be used to determine compliance with the standard. The chl-α standard is the growing season (July through September) average. In 2020, the chl-α average was 24.5 µg/L, significantly above the standard as well as the assessment threshold, likely due to hot and very dry 2020 weather conditions. Pursuant to the assessment protocols, because there have now been two exceedances of the assessment threshold in the last five years (2016); the reservoir is not in compliance with the standard (Figure 2).Observed 2020 chl-α concentrations in Chatfield Reservoir are depicted in Figure 3. Chl-α levels exceeded the assessment threshold and the standard for the 2020 growing season (July through September).

Figure 2. Growing Season Average Chlorophyll α Concentrations, Chatfield Reservoir, 1983-2020.

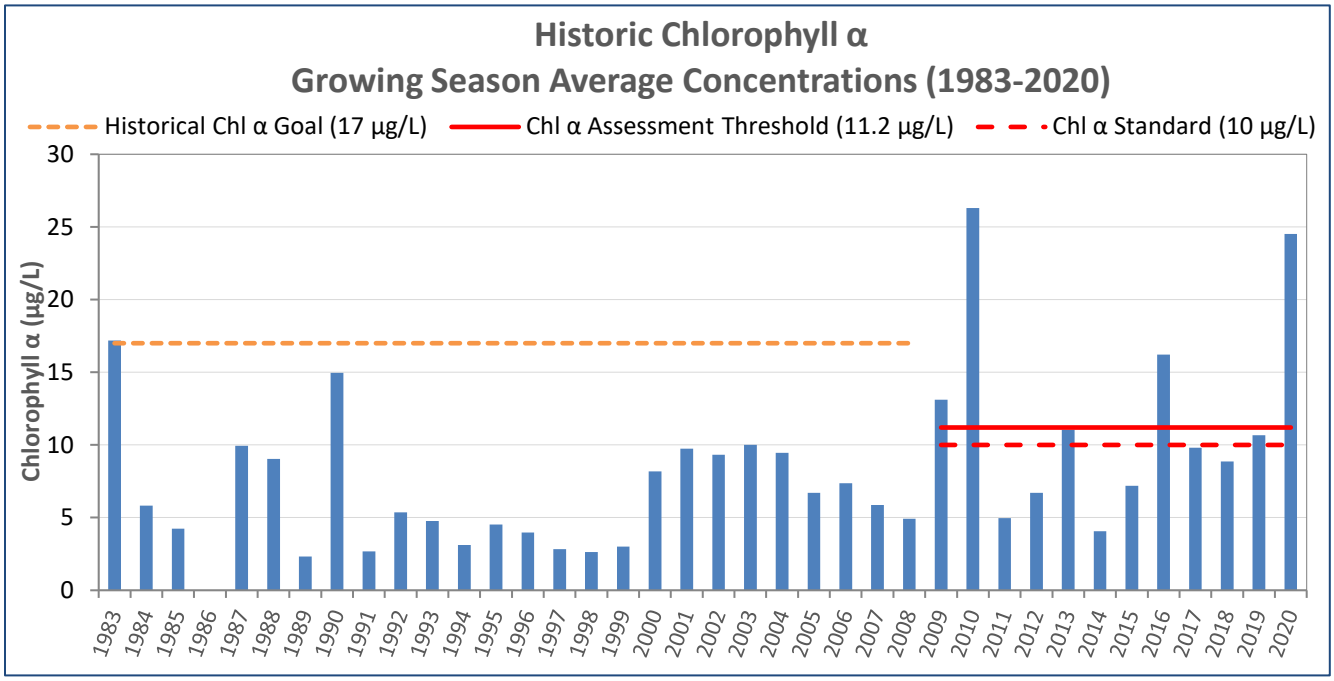
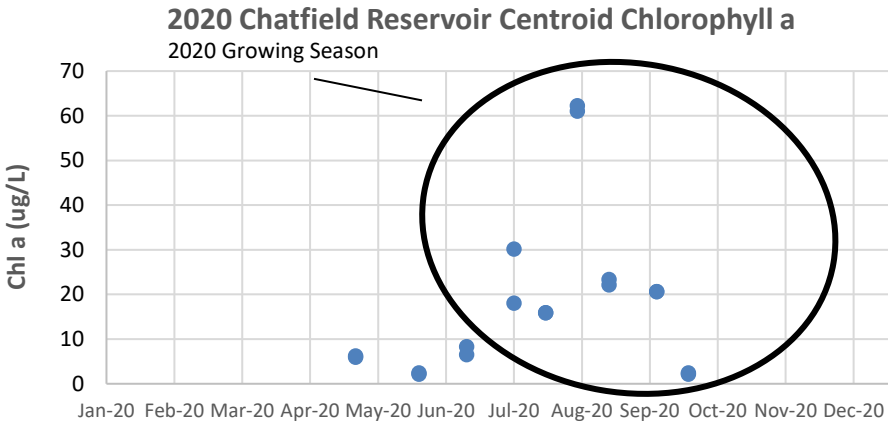


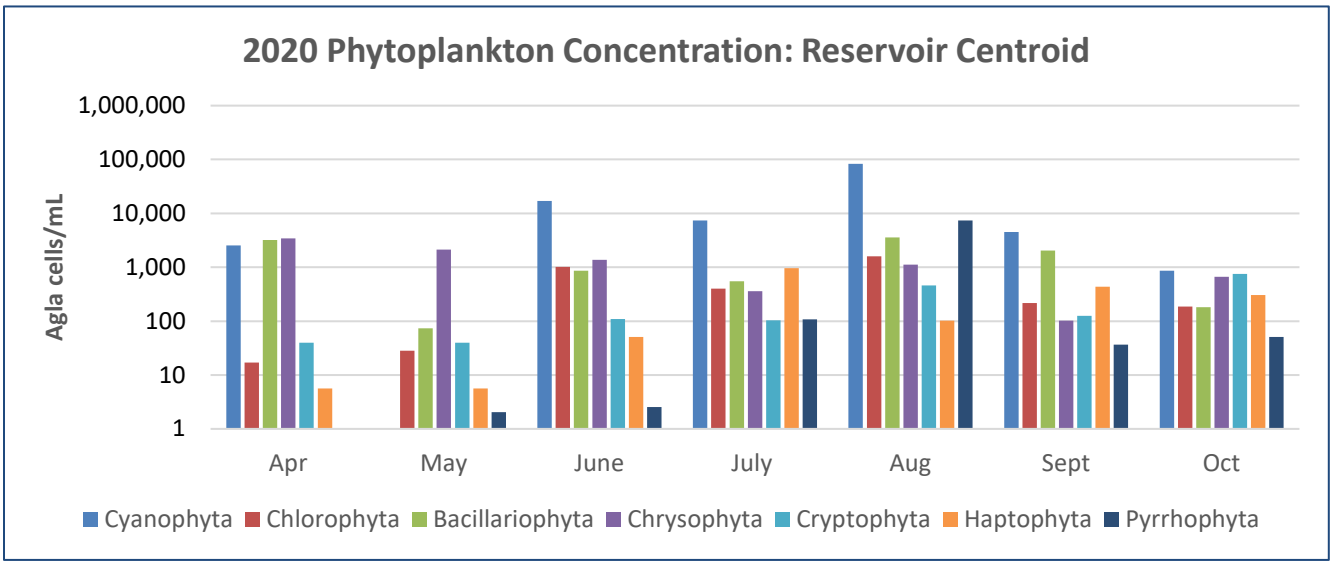
Figure 3. Observed Chlorophyll α Concentrations, Chatfield Reservoir, 2020.

The July-September growing season average in 2020 was 24.5 µg/L, above the assessment threshold of 11.2 µg/L (see Figure 3). In 2020, Chatfield Reservoir is not in compliance with the chlorophyll-α water quality standard.



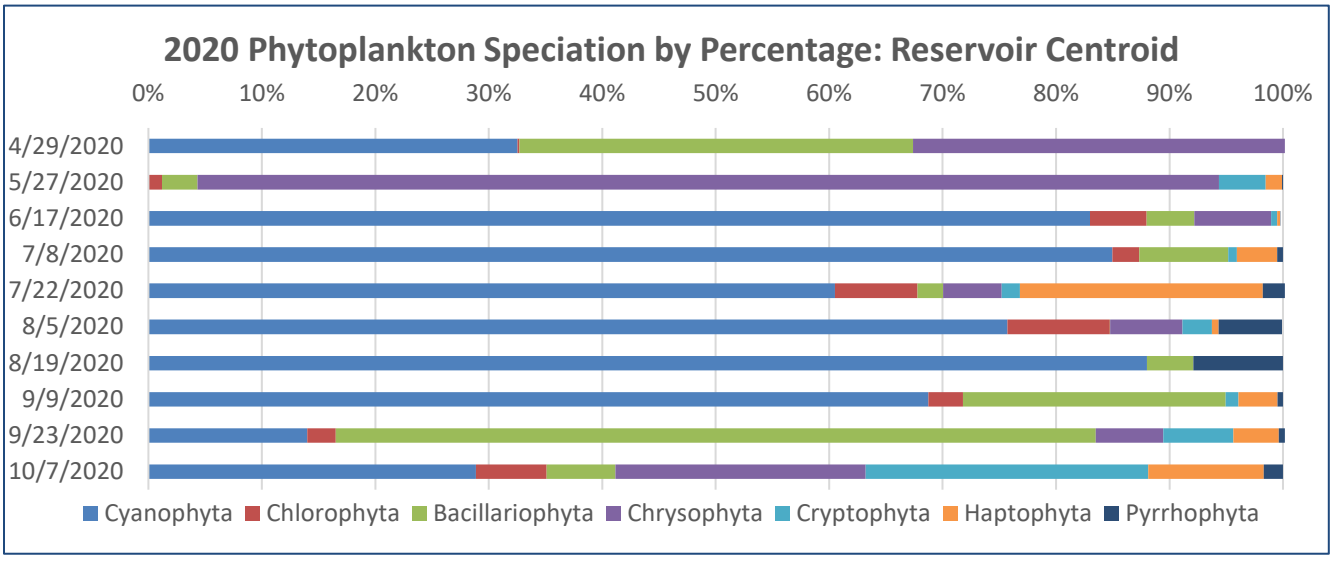
The chl-α concentrations observed result from background, point source and nonpoint sources of nutrients and internal loading. In 2020, Cyanophyta concentrations ranged from 229 to 153,079 algal cells/ml which are significantly higher than the Cyanophyta levels in 2019 which ranged from 1,079 to 43,086 algal cells/mL, but very similar to the levels in 2018 which ranged from 857 to 281,256 algal cells/mL. Consistent with 2019 and 2018, the highest concentrations in 2020 occurred in August (Figure 4).

Figure 4. 2020 Phytoplankton Monthly Summary - Phytoplankton samples taken in the reservoir during 10 sampling events from April through October 2020. Cyanophyta, also sometimes called blue-green algae, are shown to peak in August, averaging 83,207 algal cells/mL



Algae (genera Anabaena, Ankistrodesmus and Aphanocapsa) typically correspond with elevated chl-α measurements. Some species of cyanobacteria can convert nitrogen gas to biologically available forms of nitrogen, serving as an additional source of nitrogen to the reservoir system. Cyanophyta were the predominant algae observed in the majority of the April - October sampling events, with the exception of Chrysophyta and Bacillariophyta, which were higher than the Cyanophyta in April (Figure 5). Cyanophyta samples were not collected in May 2020.

Figure 5. 2020 Phytoplankton Speciation.



Total Phosphorus

In 2020 Chatfield Reservoir was in compliance with Regulation 38 (WQCC 5 CCR 1002-38) total phosphorus (TP) standard. The total phosphorus (TP) July through September growing season average was 41.5 µg/L, which is above the standard of 30 µg/L and above the assessment threshold of 35 µg/L. If not for the one high TP sample in August, the reservoir TP would have been below the assessment threshold. Although the growing season average was above both the standard and assessment threshold, Chatfield Reservoir does not exceed the one in five-year assessment allowance. A review of TP compliance with the water quality standard from 1983 to 2020 is illustrated in Figure 6. The TP growing season average remained below the water quality assessment threshold of 35 µg/L since the standard changed in 2009. The monthly TP concentrations observed in 2020 in Chatfield Reservoir are shown in Figure 7.

Figure 6. Growing Season Average Total Phosphorus Concentrations, Chatfield Reservoir, 1983-2020.

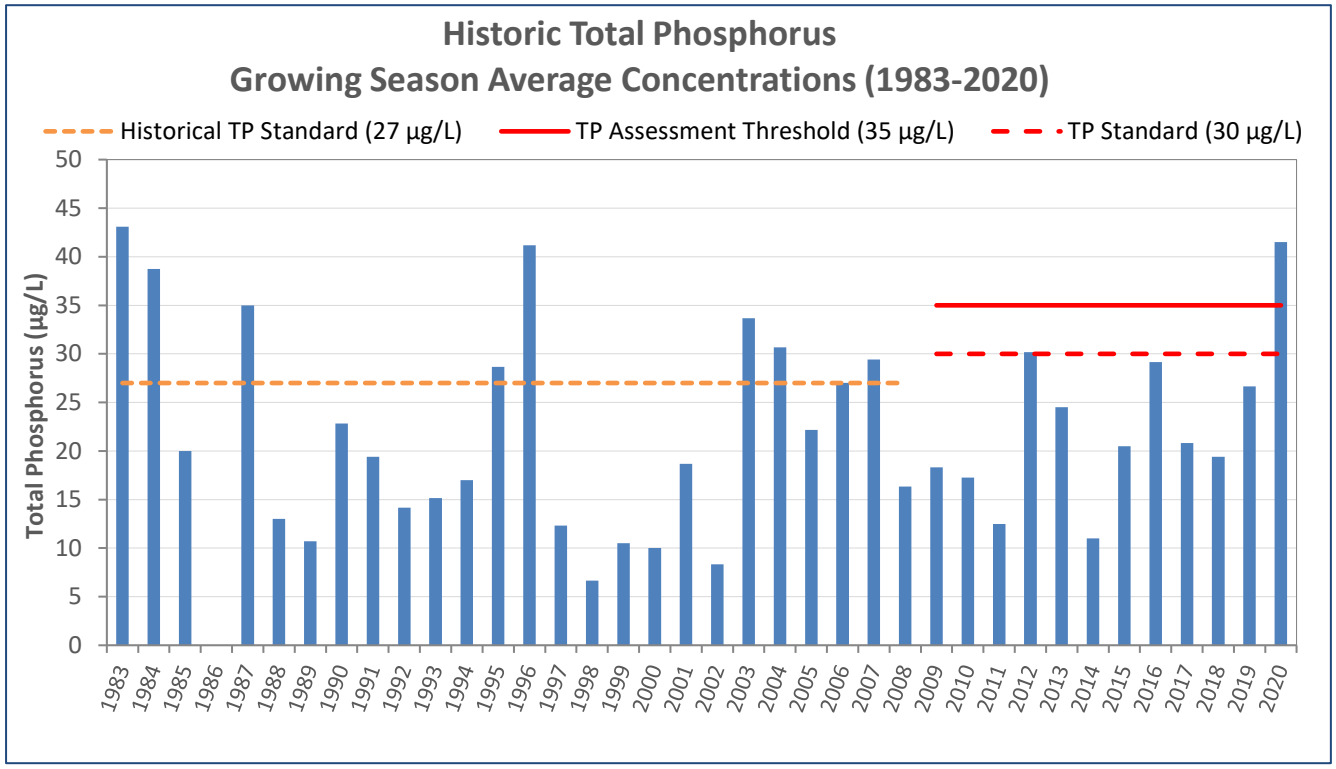
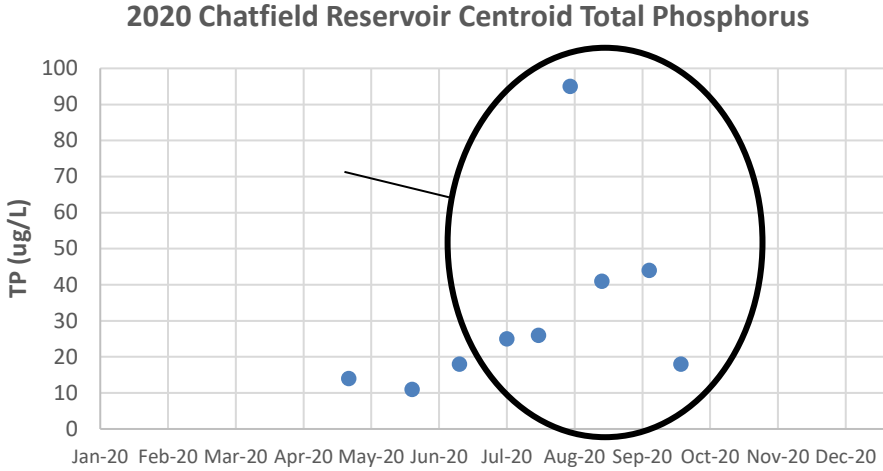


Figure 7. Monthly Total Phosphorus Concentrations, Chatfield Reservoir, 2020.

The July-September growing season average in 2020 was 41.5 µg/L, above the assessment threshold of 35 µg/L (see Figure 6). However, Chatfield Reservoir was still in compliance with the total phosphorus water quality standard.



CHATFIELD RESERVIOR TMAL

The phosphorus Total Maximum Annual Load (TMAL) of 19,600 pounds/year at a median flow of 100,860 acre-feet/year was revised by the WQCC in 2009, based on statewide reservoir data and a probabilistic model describing the linkage between watershed TP loads and in-lake TP concentrations.

The Authority completed the development and calibration of an initial watershed model in 2016. In 2019, plans were developed for additional model runs in 2020 to model the effects of possible improvements and other possible events in the watershed. These initial model runs were started in late 2019 and completed in 2020. Additional watershed modeling and evaluations are planned for 2021.

The Authority continues to collect water quality data (over 20 years of monitoring) and since 2016 has collaborated with the Chatfield Reservoir Mitigation Company (CRMC) on data collection efforts pursuant to the Memorandum of Understanding between the two agencies.

For Chatfield Reservoir the Authority continues to coordinate with the CRMC regarding data collection and calibration of the reservoir model (required as part of the water quality adaptive management program). The Authority currently serves on the Chatfield Reservoir Model Coordination Committee (RMCC), which was tasked with overseeing the development of a two-dimensional, hydrodynamic water quality model for the reservoir. Development of a model was funded by the CRMC as part of the Chatfield Storage Reallocation Project (CSRP). The independently peer- reviewed model has been calibrated for the period of 2013 through 2016. Sensitivity analysis runs were completed in 2018. The Chatfield Reservoir Water-Quality Model Documentation Report was completed by Hydros in December 2018. Future tasks will include ongoing annual model updates (with more recent data) and predictive runs to support the Chatfield Reallocation project management. Potential impacts from the Chatfield Reallocation Project, if any, will be evaluated on a yearly basis.

2020 TP Concentrations – Instream and Reservoir

Average monthly TP concentrations for 2020 at the Chatfield Reservoir Centroid, Chatfield Reservoir Outflow, Plum Creek Inflow, and South Platte Inflow are depicted in Figure 8. Refer to Figure 12 for these sampling locations. Plum Creek TP concentrations were highest for all months of the year in comparison to South Platte Inflows.

Calculated TP load

The calculated annual TP load is the sum of the average monthly loads. The 2020 annual TP load to the reservoir totaled 4,998 pounds at an inflow of 47,605 acre-feet. This is compared to the TMAL of 19,600 pounds at an inflow of 100,860 acre-feet. Figure 9 shows the calculated annual TP loads to Chatfield Reservoir from 1986 to 2020. Figure 10 shows the Chatfield Reservoir calculated annual inflows from 1986 to 2020. A comparison of the 2020 inflows and TP load contributions per source is presented in Figure 11.

The relative TP loading from sources is lower than typical compared to historic TP inputs. This year, TP loading from Plum Creek was 1,975 pounds, or 39% of total input, compared to 2,598 pounds from the South Platte River, or 52% of total input. Direct precipitation on Chatfield Reservoir, alluvial inflows, and other direct flow sources contributed approximately 425 pounds, or 9% of total input.

Figure 8. 2020 Average Monthly Total Phosphorus Concentrations in Chatfield Watershed and Chatfield Reservoir.

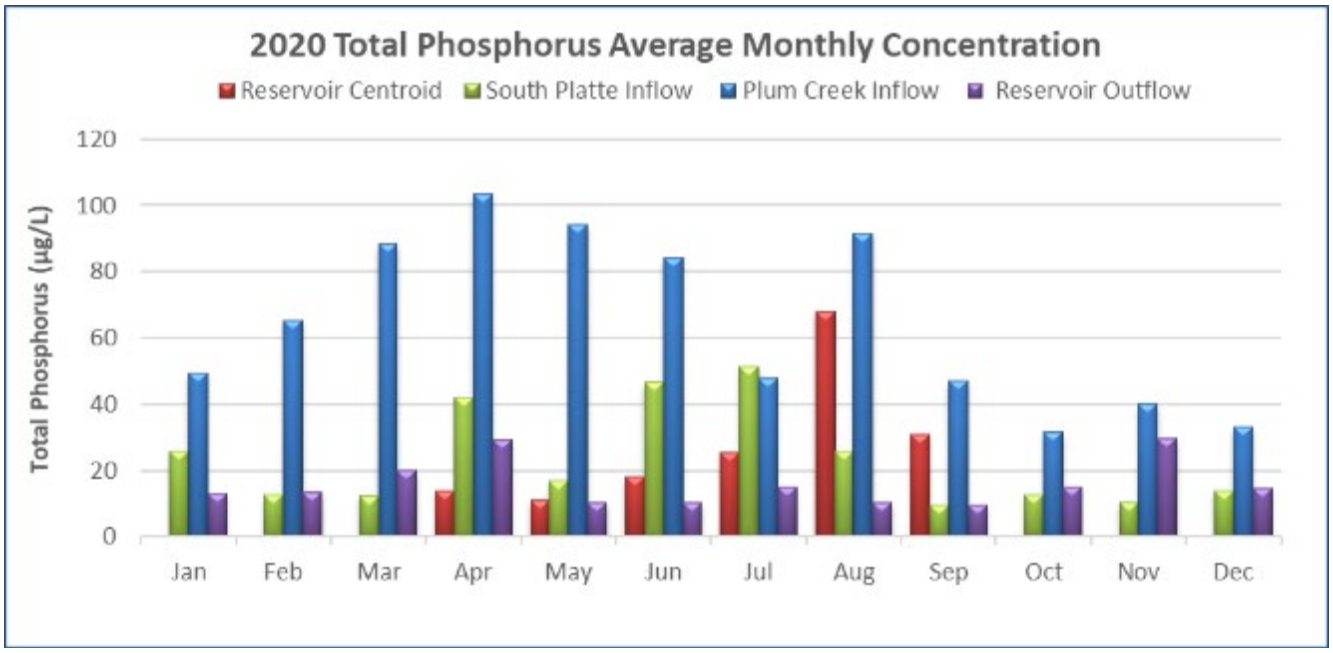


Figure 9. Calculated Annual Total Phosphorus Load to Chatfield Reservoir (1986 – 2020).

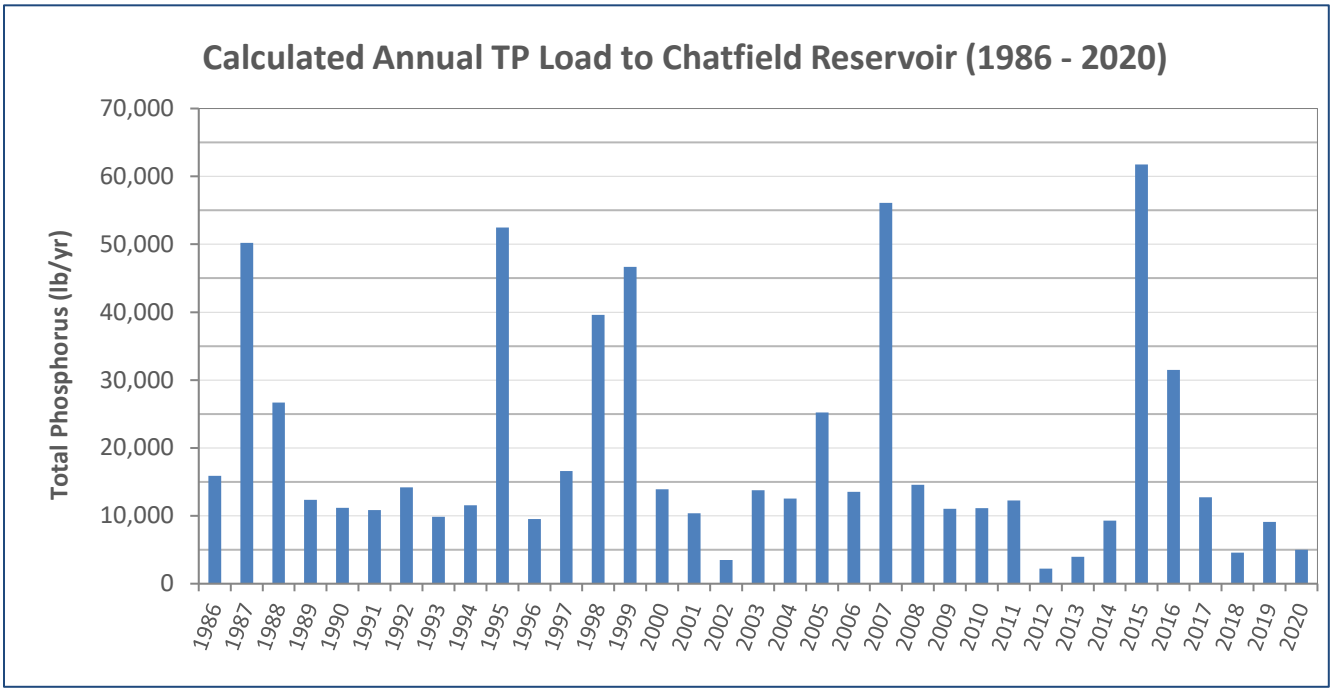


Figure 10. Chatfield Reservoir Calculated Annual Inflow (1986-2020)

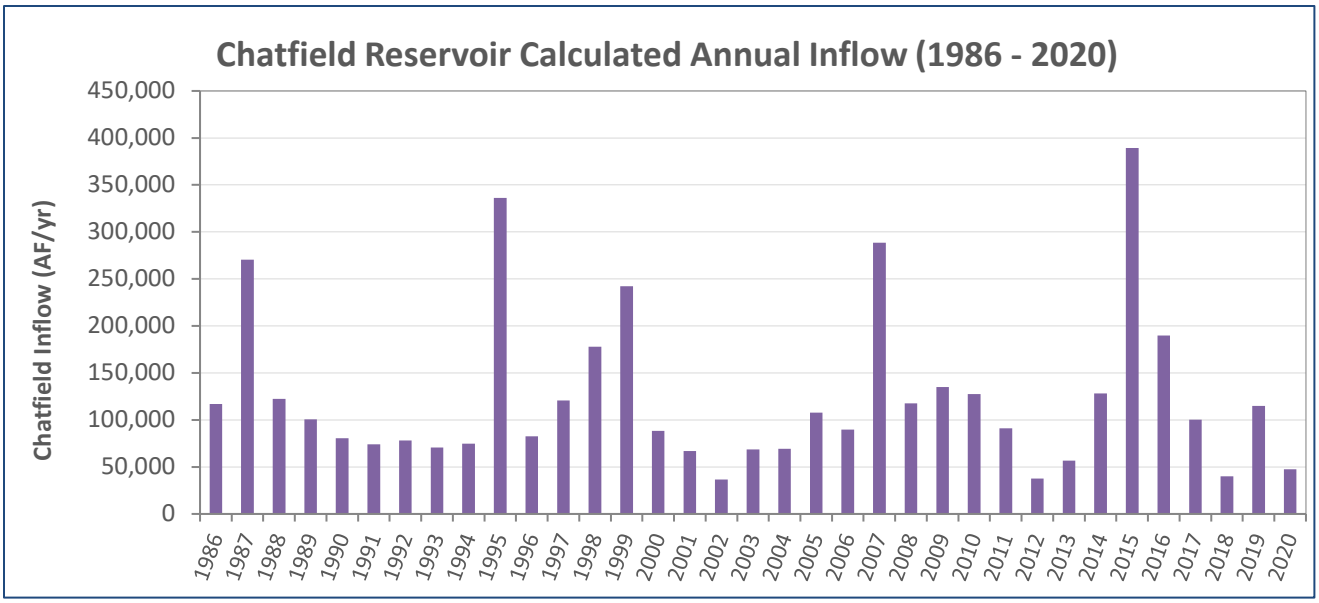
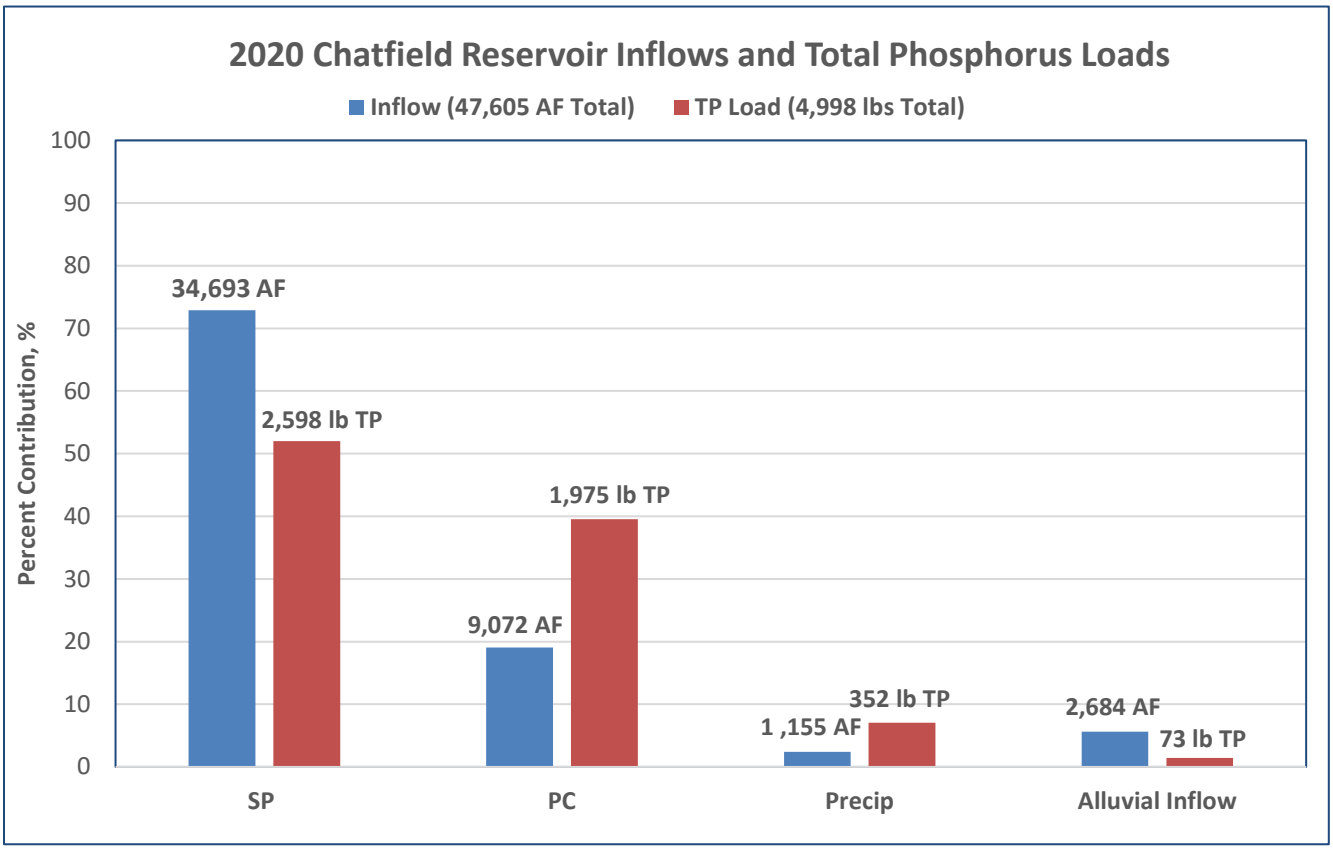


Figure 11. 2020 Chatfield Reservoir Inflows and Total Phosphorus Loads.



WATERSHED AND RESERVOIR MONITORING PROGRAM

Since 1984, the Authority and its members have monitored water quality in the reservoir and upstream in the watershed and has undertaken measures to protect water quality in the Watershed through voluntary funding contributions and grants. The Authority, in coordination with its membership agencies, implements point source, nonpoint source and stormwater controls pursuant to the Chatfield Reservoir Control Regulation #73 (5 CCR 1002-73) to protect water quality and beneficial uses of the Reservoir.

Chatfield Reservoir

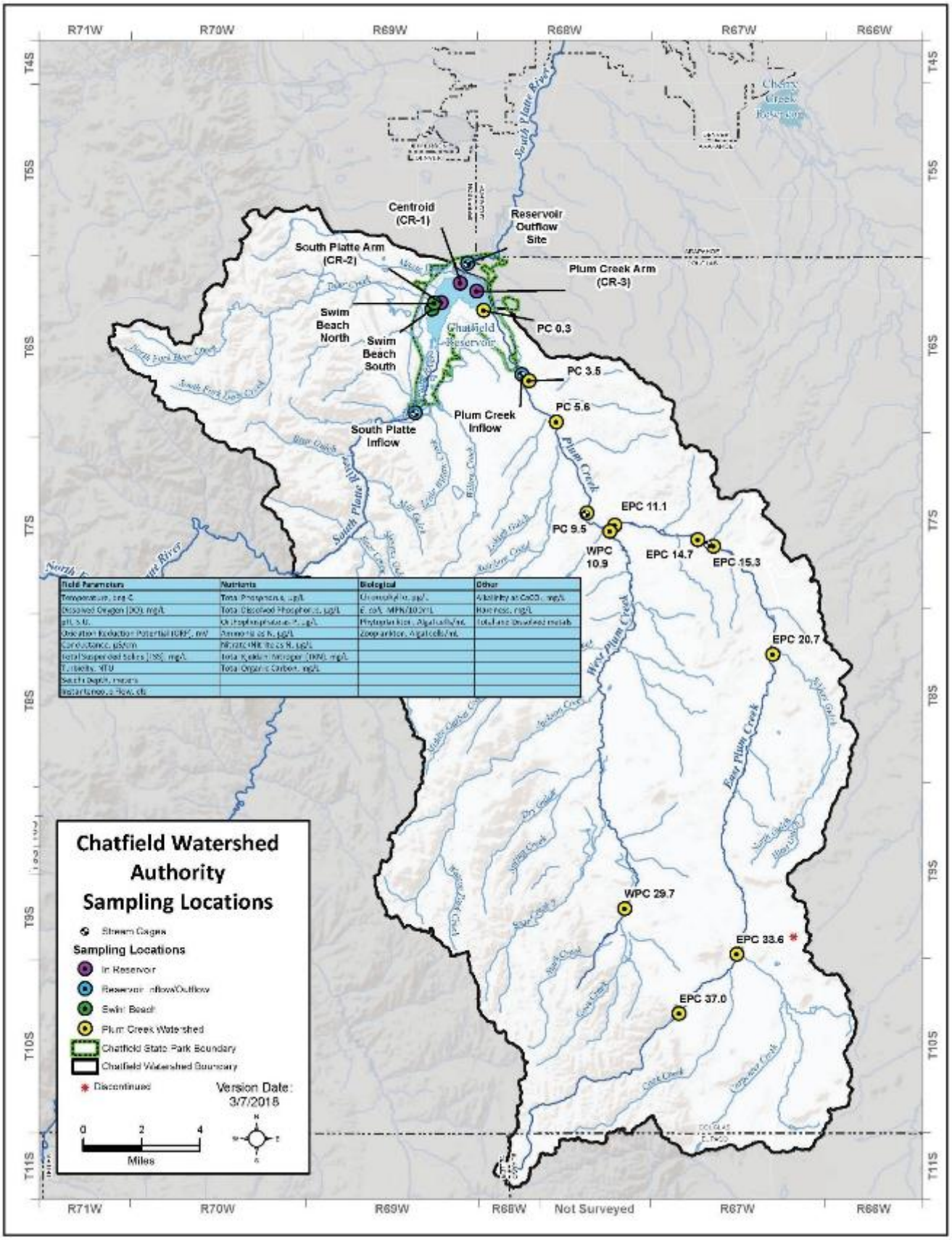
The Authority collects water quality data to determine reservoir chlorophyll levels, temperature, dissolved oxygen concentration, phosphorous concentrations, nitrogen concentrations and inflow quantities. The members develop and implement nonpoint source and stormwater projects which benefit the watershed and reservoir. The Chatfield Watershed Plan identified opportunities within the watershed to address the chemical, physical and biological constituents (pollutants) that impact the watershed. Some examples include phosphorus reductions from stabilizing degraded streambanks, mitigating runoff from agricultural lands, minimizing leachate from septic systems, controlling runoff from wildfire burn areas, and providing public education for reducing contamination from the actions of people.

The monitoring program characterizes water quality and determines regulatory compliance in the reservoir. Surface water samples are collected in the following locations:

- South Platte Inflow
- Plum Creek Inflow
- South Platte Arm (in Chatfield Reservoir)
- Plum Creek Arm (in Chatfield Reservoir)
- Reservoir Centroid (Chatfield Reservoir)
- Reservoir Outfall

The constituents are monitored monthly when ice has melted off the reservoir. During the growing season (July through September), reservoir sampling is conducted twice per month. To better understand reservoir dynamics, the Authority collects water column measurements, including the epilimnion and hypolimnion layers, at various depth intervals. All water quality data are available on the Authority's website: www.chatfieldwatershedauthority.org

Figure 12. 2020 Chatfield Watershed Authority Sampling Locations and Constituents.



Plum Creek Watershed Monitoring System

In the Plum Creek basin, watershed monitoring continued in 2020 through voluntary sampling efforts by the Plum Creek Water Reclamation Authority (PCWRA); monitoring locations are shown in Figure 12. The objective of the Plum Creek monitoring program is to better characterize water quality in Plum Creek and identify potential nonpoint source pollutant sources, a variety of which have already been identified in the watershed, including:

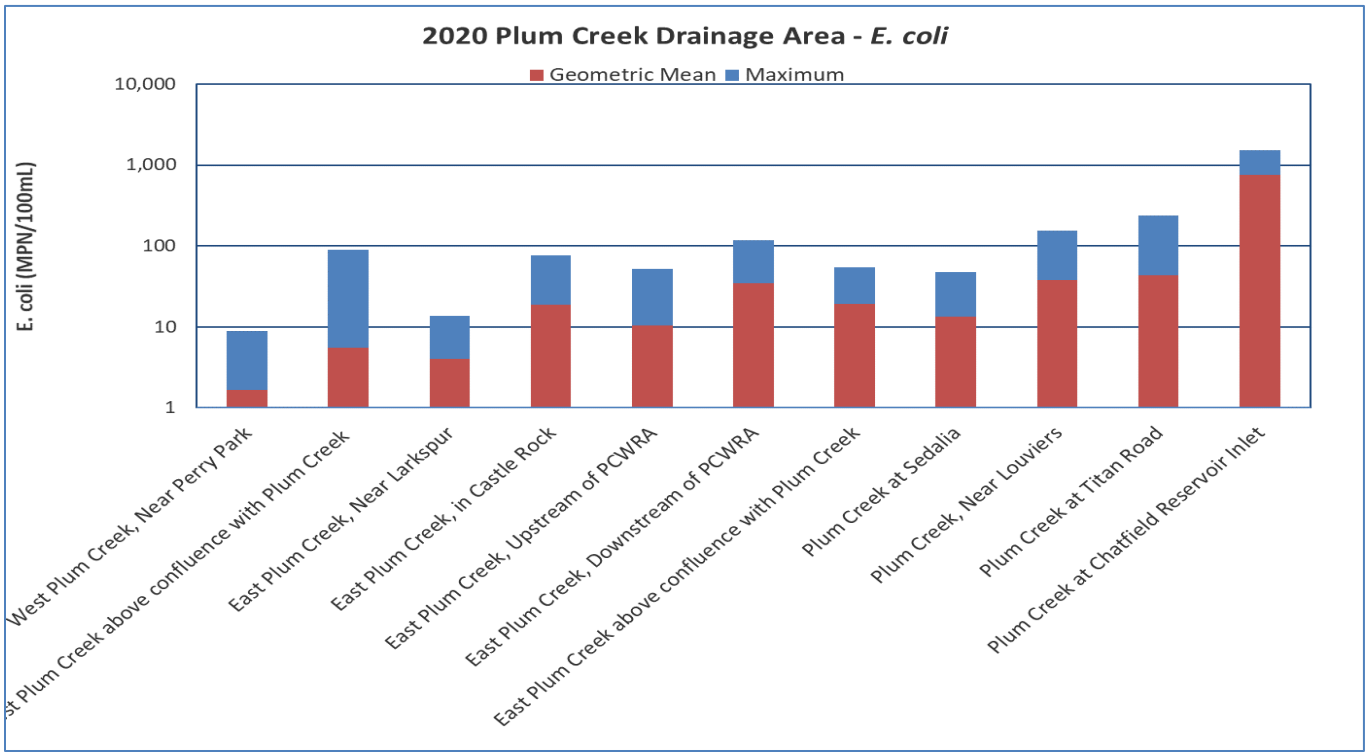
- Stormwater runoff from historic urbanized and rural areas
- Leachate from unmaintained septic systems, agricultural activities, including runoff from overgrazed agricultural lands
- Runoff from wildfire burn areas
- Runoff from impervious areas
- Erosion from degraded streambanks (Chatfield Watershed Plan, May 2015)

Further data collection is needed, contingent on available resources, to identify and quantify phosphorus sources in the Plum Creek basin. The 2020 Plum Creek water quality observations included the following:

Stream Bank Erosion. Historically, there was significant streambank erosion on Plum Creek. This eroding area contributed significant sediment, and likely TP. As part of the mitigation for the CRMC reallocation project, stabilization of a portion of Plum Creek in the State Park has been completed. Additional stabilization on Plum Creek will continue to be evaluated by watershed stakeholders

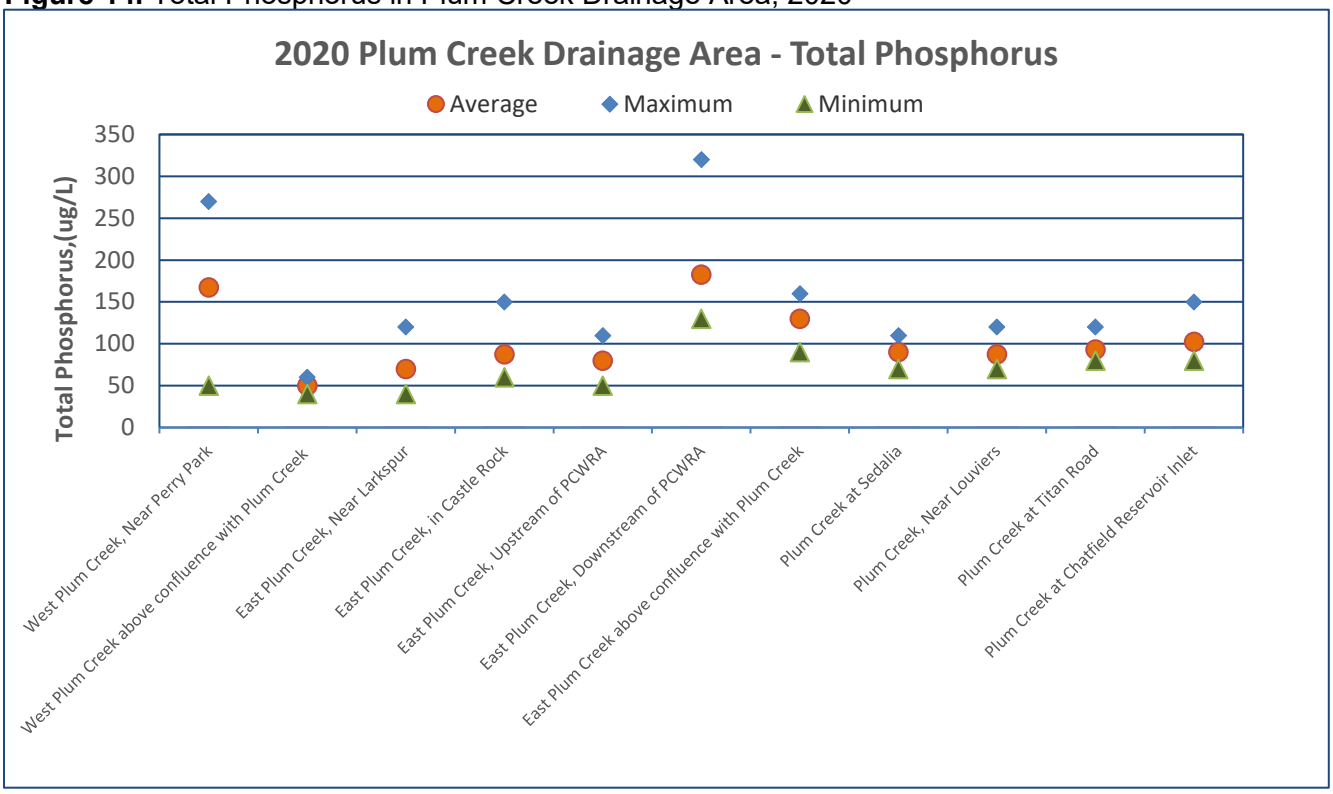
E. coli. Although variability is evident at all monitoring sites, the central tendency of the 2-month geometric mean (or the geometric mean where monthly sampling is not available) of observed *E. coli* remains below the water quality standard of 126 organisms/100 mL (Figure 13) except at the Plum Creek at Chatfield Reservoir Inlet sampling site.

Figure 13. *E. coli* in Plum Creek Drainage Area, 2020



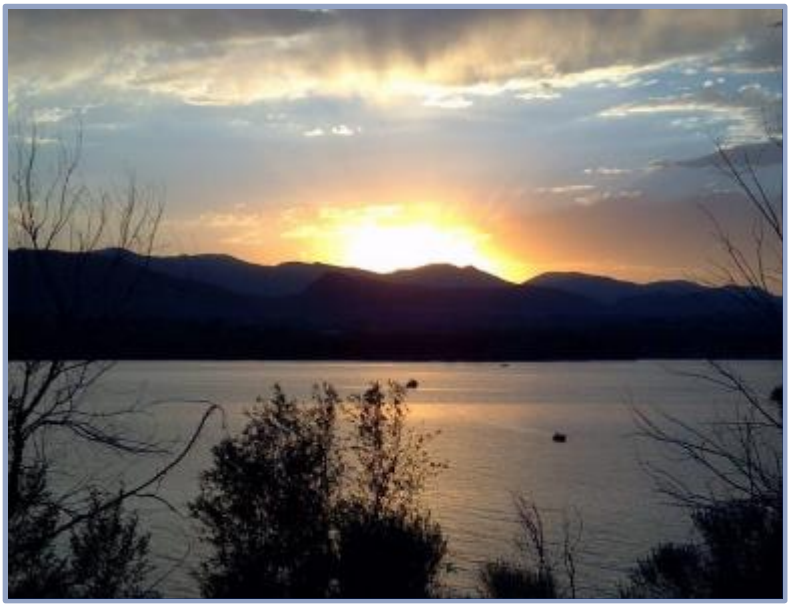
Total Phosphorus. TP concentration generally increases from upstream to downstream for both East Plum Creek and Plum Creek (Figure 14). Average Total Phosphorus in West Plum Creek decreased between Perry Park and the confluence with East Plum Creek. Total Phosphorus concentrations have historically been observed to be relatively high at East Plum Creek, downstream of PCWRA as well as East Plum Creek above the confluence with Plum Creek (Site EPC-11.1), compared to other sites in Plum Creek watershed. In 2020 the average TP at East Plum Creek, downstream of PCWRA was 183 µg/L, compared to the 2019 average of 154 µg/L. In 2020 the average TP at Site EPC-11.1 was 130 µg/L, compared to the 2019 average of 193 µg/L and the 2018 average of 185 µg/L.

Figure 14. Total Phosphorus in Plum Creek Drainage Area, 2020



Considerable monitoring has been performed in the Plum Creek watershed. This effort provides the ability to evaluate conditions on both a temporal and spatial scale.

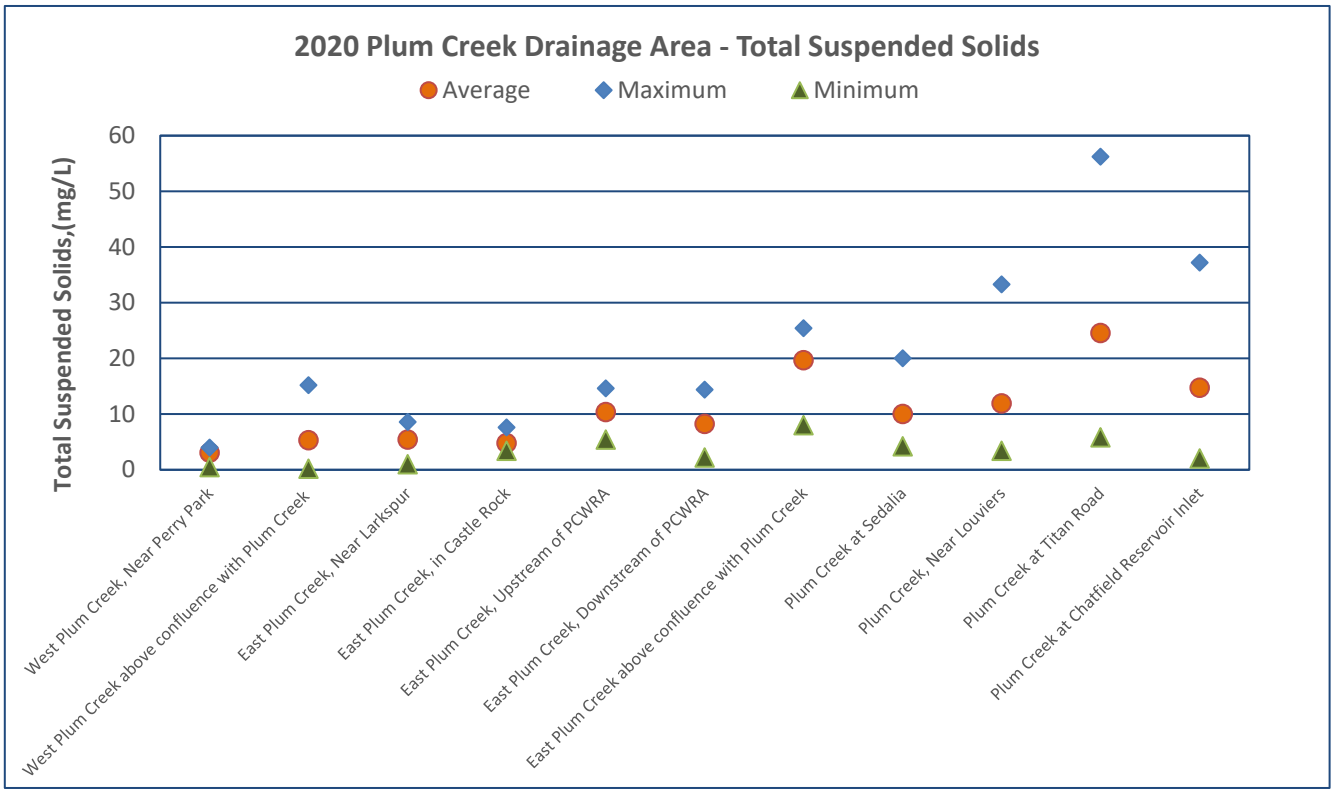
Chatfield Watershed Plan



Total Suspended Solids. The average TSS concentration is an indicator of sediment and high precipitation events. The highest average TSS concentration observed in 2020 was at Plum Creek at Titan Road at 24.5 mg/L. In 2019, the highest TSS concentration was at Site EPC-11.1 (East Plum Creek above the confluence with Plum Creek) at 64.7 mg/L. This was also the highest average TSS site in 2018 (73.6mg/L) and 2017 (201.4 mg/L) (Figure 16). In 2020, the average TSS concentration at Site EPC-11.1 was 19.7 mg/L. This decrease corresponds with a decrease in precipitation events in 2020.

The average TSS at West Plum Creek above the confluence with Plum Creek (WPS-10.9) was 5.3 mg/L in 2020 compared to 4.3 mg/L in 2019. All the other sites decreased in average TSS concentrations in 2020 compared to 2019, potentially indicating less erosion and sediment loading to Plum Creek for 2020 in addition to lower precipitation events.

Figure 15. Total Suspended Solids in Plum Creek Drainage Area, 2020



Total Phosphorus vs. Total Suspended Solids. The relationship between TP and TSS is complex. The highest TSS and TP data collected in the watershed generally occurred during the spring runoff months during high flow, (April-June). Additionally, TP and TSS typically had an increasing trend through the watershed. 2020 showed some slight decreases (TSS) below the confluence of East and West Plum Creek. The TP vs TSS relationship, along with identification of potential nonpoint sources of TP, will be further evaluated as monitoring in Plum Creek basin continues.

WASTEWATER TREATMENT PLANTS

Table 1 summarizes the wastewater treatment plants (WWTPs) in the Chatfield watershed and their respective TP wasteload allocations. In 2020, the total reported TP discharges from WWTPs were approximately 2,757 pounds out of the allowable wasteload allocation of 7,533 pounds. Refer to Figure 17 for WWTP locations. As growth in the watershed continues, wasteloads from the wastewater treatments plants will continue to rise towards the total allowed wasteload allocations.

Wastewater providers treat effluent to meet TP load allocations and a TP concentration pursuant to Control Regulation No. 73. The monitoring and reporting of effluent discharges demonstrate compliance with their individual permits and the state regulations. During 2020, the dischargers maintained their record of compliance, with every discharger in the Chatfield Watershed complying with their TP concentration limits and TP wasteload allocation.

Table 1. 2020 Phosphorus Wasteload from WWTPs in the Chatfield Watershed

Permittee	CDPHE Permit Number	TP Wasteload Allocation (Pounds)	2019 TP Loading (Pounds)
Plum Creek Water Reclamation Authority	CO0038547	4,256	2,142
Perry Park Water and Sanitation District	CO0022551	365	148.1
Perry Park Water and Sanitation District	CO0043044	73	52.4
Lockheed Martin Space Systems Company	CO0001511	1,005	25.9
Town of Larkspur	COX632092	231	16.7
Highlands Ranch Law Enforcement Academy	N/A	30[1]	No Discharge[4]
Centennial Water and Sanitation District	CO0037966	20	No Discharge[6]
Ponderosa Retreat and Conference Center	COX047511	75[2]	No Discharge[5]
Louviers Water and Sanitation District	COX632098	122	No Discharge[6]
Dominion Water and Sanitation District	CO0041645	1,218	No Discharge[6]
Sacred Heart Retreat	COX041874	15[3]	0.38[7]
Jackson Creek Ranch	N/A	50	No Data Available
Reserve Emergency Pool	N/A	73	Not used
TOTAL PHOSPHORUS WASTELOADS		7,533	2757.17

Notes:
*TP loading from WWTPs is from the WWTP point of discharge; the TP load discharged from WWTPs does not equate to the TP load delivered to Reservoir due to assimilation of TP and geochemical fate and transport processes in the watershed.

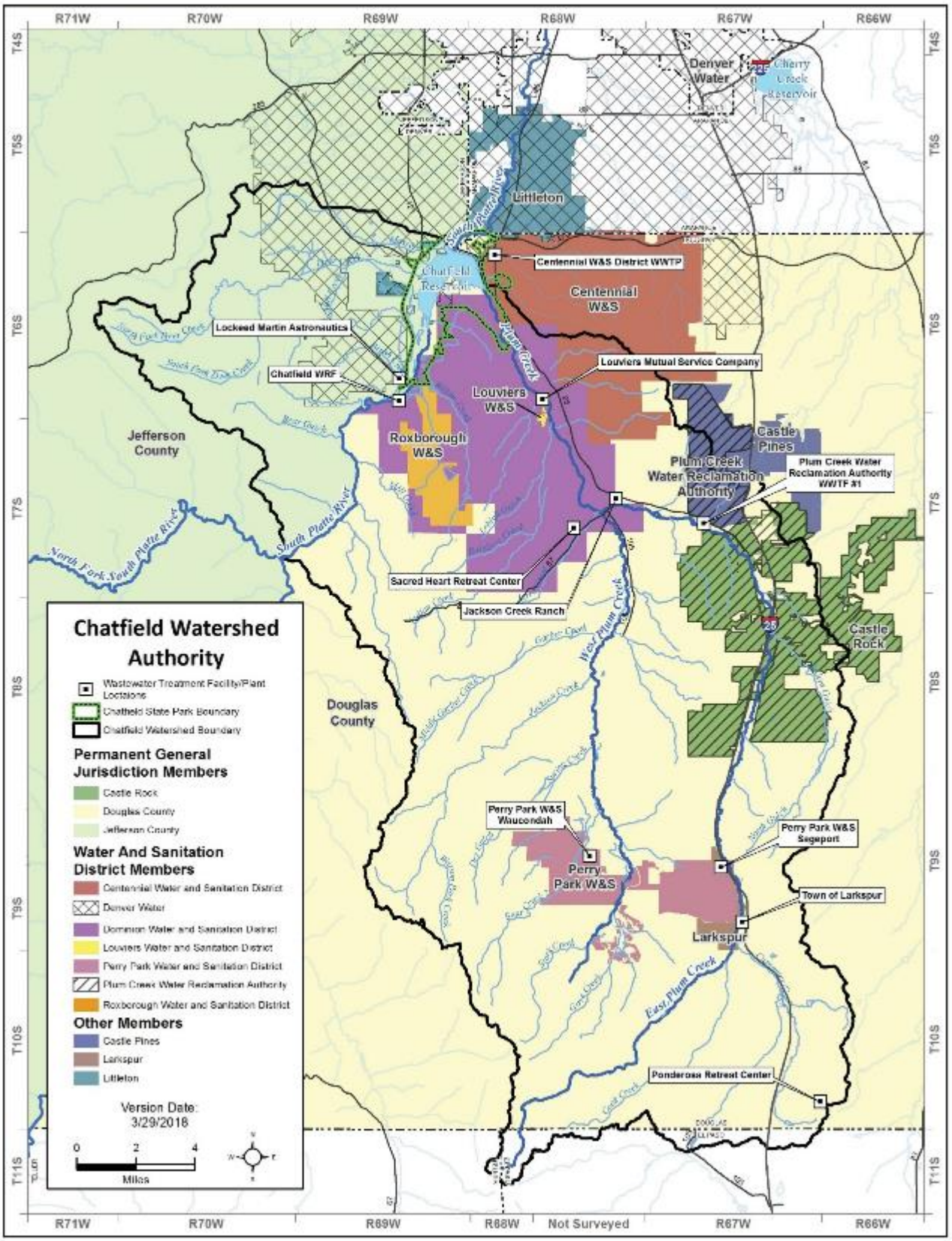
1. Law Enforcement Foundation water quality credits awarded pursuant to Authority's Trading Program.
2. Ponderosa Retreat Center water quality credits are subject to completing a trade project pursuant to the Authority Trading Program.
3. Temporary five-year phosphorus allocation of 15 pounds for inclusion in discharge permit; allocation obtained from Dominion Water and Sanitation District.
4. Wastewater reuse is authorized under Regulation 84 – Reclaimed water, with no discharge.
5. Source: Environmental Protection Agency Integrated Compliance Information System database.

6. No discharge of wastewater effluent reported in the Chatfield watershed.
7. Sacred Heart is not submitting required DMRs. Last DMR submitted 12-31-2017.

Table 2. 2020 Monthly Total Phosphorus Concentrations from WWTPs (mg/l)

Permittee	CDPHE Permit No.	J	F	M	A	M	J	J	A	S	O	N	D
PCWRA	CO0038547	.18	.18	.15	.15	.16	.19	.14	.11	.12	.12	.25	.10
PPWSD	CO0022551	.36	.15	.16	.45	.61	.48	.64	.16	.16	.24	.21	.14
PPWSD	CO0043044	.36	.19	.17	.48	.48	.26	.21	.59	.24	.19	.14	.14
LMSSC	CO0001511	.06	.06	.10	.08	.21	.13	.15	.24	.17	.27	.15	.14
Larkspur	COX632092	.29	.28	.73	.73	.68	.44	.45	.42	.35	ND	ND	.28
HRLEA	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CWSD	CO0037966	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PRCC	COX047511	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LWSD	COX632098	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DWSD	CO0041645	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SHR	COX041874	.08	.07	.03	.04	.08	.08	.15	.07	.07	.04	.06	.06
JCR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Figure 17. Wastewater Treatment Plants located within the Chatfield watershed.



SITE LOCATION APPLICATIONS

As the 208 Management Agency, the Authority reviews site location applications and associated engineering reports for new or proposed facilities to effectively manage waste treatment works and related facilities serving Chatfield Basin.

The Authority reviews, comments, and makes recommendations to the Water Quality Control Division for site location applications for domestic wastewater treatment works, including wastewater treatment plants, individual sewage disposal systems, lift (pumping) stations, and certain interceptor sewers with a capacity of 2,000 gallons per day or greater, as well as certain facilities that produce reclaimed domestic wastewater. As required by Colorado's Site Location and Design Approval Regulations for Domestic Wastewater Treatment Works (Regulation 22), most site location applications are submitted to the Authority by the Applicant prior to submittal to the Water Quality Control Division.

Under Control Regulation No. 73, the Authority is to implement the TMAL for total phosphorus loading to the Reservoir. The Authority reviews site location applications for compliance with the Control Regulation No. 73 and the Emergency Response Plan. The review primarily assesses the following criteria:

- Colorado Department of Public Health and Environment (CDPHE) WQCC Control Regulation No. 73: 73.3.2(b): "No municipal, domestic, or industrial wastewater discharge in the Chatfield Watershed shall exceed 1.0 mg/L total phosphorus as a 30-day average concentration, except as provided under section 73.3(2)(f)."
- CDPHE WQCC Control Regulation No. 73, 73.3.2(c): "The allowed annual wasteload of point source phosphorus in the Chatfield watershed is limited to 7,533 lb/year, allocated among the dischargers."
- The likelihood of sanitary sewer overflows and contaminants reaching Chatfield Reservoir, Plum Creek, or the South Platte River and, in the event of an emergency, the ability of emergency response plans to contain the sanitary sewer overflows and contaminants, per the Cherry Creek Reservoir Watershed Site Application Review Process Emergency Response Plan Criteria (Emergency Response Plan Criteria) which have also been adopted by the Chatfield Watershed Authority.

Jellystone Site Application and Phosphorus Trade Application

In 2019, the Authority reviewed the following project for compliance with the Chatfield Reservoir Control Regulation No. 73:

- Jellystone RV Park at Larkspur
  - Project Summary: Site application for a wastewater lift station, a wastewater treatment facility (0.044 mgd design capacity), and a phosphorus non-point source to point source trade application (145.2 lbs/yr current septic system to 72.6 lbs/yr WWTF discharging to groundwater).

In 2019 the Authority recommended approval of the site application and phosphorus trade to the Division with conditions. The Division approved the Jellystone phosphorus trade and site application on May 13, 2020, as part of the process design report approval.

Pine Canyon Site Application and Phosphorus Trade Application

In 2020, the Authority reviewed the following project for compliance with the Chatfield Reservoir Control Regulation No. 73:

- Pine Canyon
  - Project Summary: Site application for a wastewater treatment facility (0.405 mgd design capacity), and a phosphorus non-point source to point source trade application (1528 lbs/yr cattle operations elimination to 763 lbs/yr WWTF discharging to East Plum Creek). Pine Canyon proposed to remove on-site cattle operations on the JRW property as the source of the nonpoint source trade.
  - The Authority's technical consultant reviewed the submitted applications and found that Pine Canyon's initial analyses which calculated the phosphorus removal effect of cattle removal did not account for the diminished effect of the change on the amount of phosphorus actually reaching the waters of East Plum Creek. On December 29, 2020, Pine Canyon revised their request to address this issue, and proposed a revised nonpoint source phosphorus credit of 380.5 lbs./yr. based upon a calculated 761 lbs./yr. of phosphorus reaching East Plum Creek from the JRW property.
  - On October 27, 2020, the Division issued a Request for Information (RFI) on the submitted Site Application for the WWTF. The RFI included, among other requests, a request of the Applicant to 1) submit an application to the Division for the phosphorus allocation approval following the final recommendation of the phosphorus allocation by the Authority, and 2) to address the phosphorus allocation with respect to the MS4 requirements in the phosphorus allocation application. The Applicant provided responses to the Division's RFI on December 10, 2020.
  - On January 26, 2021, the Division issued a letter to the Applicant stating that "because the Applicant's property is subject to Douglas County MS4 permit, the discharge is a point source, not a nonpoint source. Furthermore, discussions with our MS4 workgroup have clarified that trading under an MS4 permit also is not a feasible option at this time".
  - Further review and actions were taken on the applications in 2021 and will be reported in the 2021 Annual Report.

WATERSHED MODELING

The Authority contracted with Lynker to use the watershed model to examine the potential effect on water quality of various activities that are likely to occur in the Chatfield watershed, specifically future development and stream reclamation. In addition, Denver Water funded the use of the watershed model to examine the potential impacts of a forest fire in the upper reaches of the Chatfield watershed. The purposes of these modeling efforts were to:

- Assess the estimated magnitude and areal extent of the effects of these activities/events on water quality.
- Assess the ability of the watershed model to represent these types of activities/events.
- Assess the performance of the model in the fate and transport of water quality constituents of interest.
- Use the model results to guide in the continued use and implementation of the model for water quality modeling.

Lynker conducted the following model scenarios:

Scenario 1: This scenario models the effects of additional development on water quality in the Chatfield Reservoir watershed. The scenario proposed the conversion of 640 acres of undeveloped land to low density urban development (see Figures 18 and 19). The results of this model scenario are presented in Table 3.

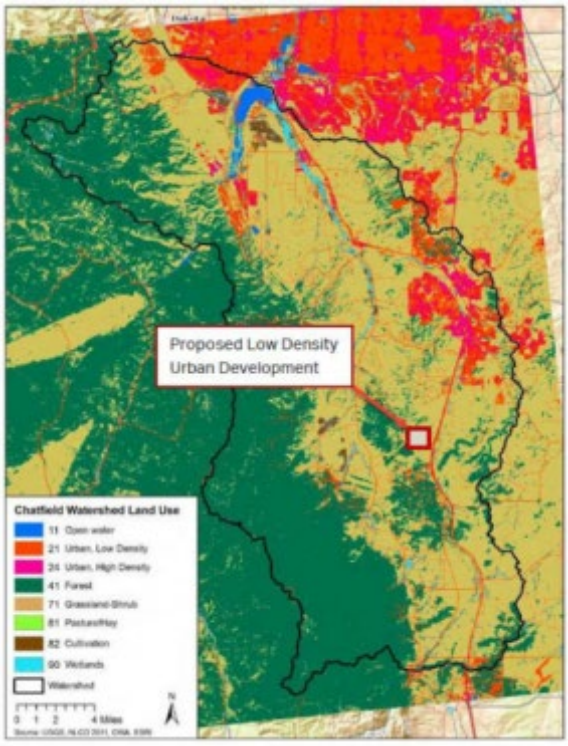


Figure 18: Proposed Low Density Development

Figure 19: East Plum Creek Subbasins

Table 3: Annual Change in Water Quality after Low-density Development

Reach ID	Description	Total Phosphorus Load (% / lbs)	Total Nitrogen Load (% / lbs)	Total Sediment Load (% / tons)	Total Flow (% / af)
Percent Increase (%)					
Reach 105	East Plum Creek	5.2	1.6	5.7	1.7
Reach 56	East Plum Creek (upstream of PCWRA)	2.1	0.8	2.4	1.1
Reach 52	East Plum Creek (downstream of PCWRA)	1.1	0.4	2.4	0.7
Reach 45	Plum Creek at Sedalia	0.8	0.2	1.3	0.4
Reach 28	Plum Creek at Titan Rd	0.8	0.2	1.1	0.4
Absolute Increase (lbs, tons, af)					
Reach 105	East Plum Creek	59.1	449.2	21.3	80.4
Reach 56	East Plum Creek (upstream of PCWRA)	55.6	390.4	22.2	80.5
Reach 52	East Plum Creek (downstream of PCWRA)	55.5	388.7	22.2	80.5
Reach 45	Plum Creek at Sedalia	55.6	378.1	22.7	80.6
Reach 28	Plum Creek at Titan Rd	54.4	358.0	22.5	80.7

This scenario showed that future development in the watershed without water quality control facilities will have a negative impact on total phosphorus, total nitrogen, and sediment loads, and will produce increased volumes of runoff. Although both total phosphorus and total nitrogen are attenuated from the development site to Chatfield Reservoir (represented as the Plum Creek at Titan Road location), total flow and total sediment loads are not attenuated.

Scenario 2: This scenario models the effects of stream restoration on water quality for the downstream stream segments in the Chatfield Reservoir watershed. This scenario recommended modeling 4 miles of stream restoration along East Plum Creek, to reflect current and proposed work by the Town of Castle Rock.

Table 4: Stream Reclamation Reaches

Reach	Length (miles)	Actual Stream Condition	Modeling Summary
70	1.1	Stable	No adjustment
67	1.3	Degrading	Stabilized
63	1.2	Degrading	Stabilized
57	1.2	Degrading	Stabilized
56	1.2	Degrading	Stabilized
52	0.8	Degrading	No adjustment

Figure 20: Stream Reclamation Reaches

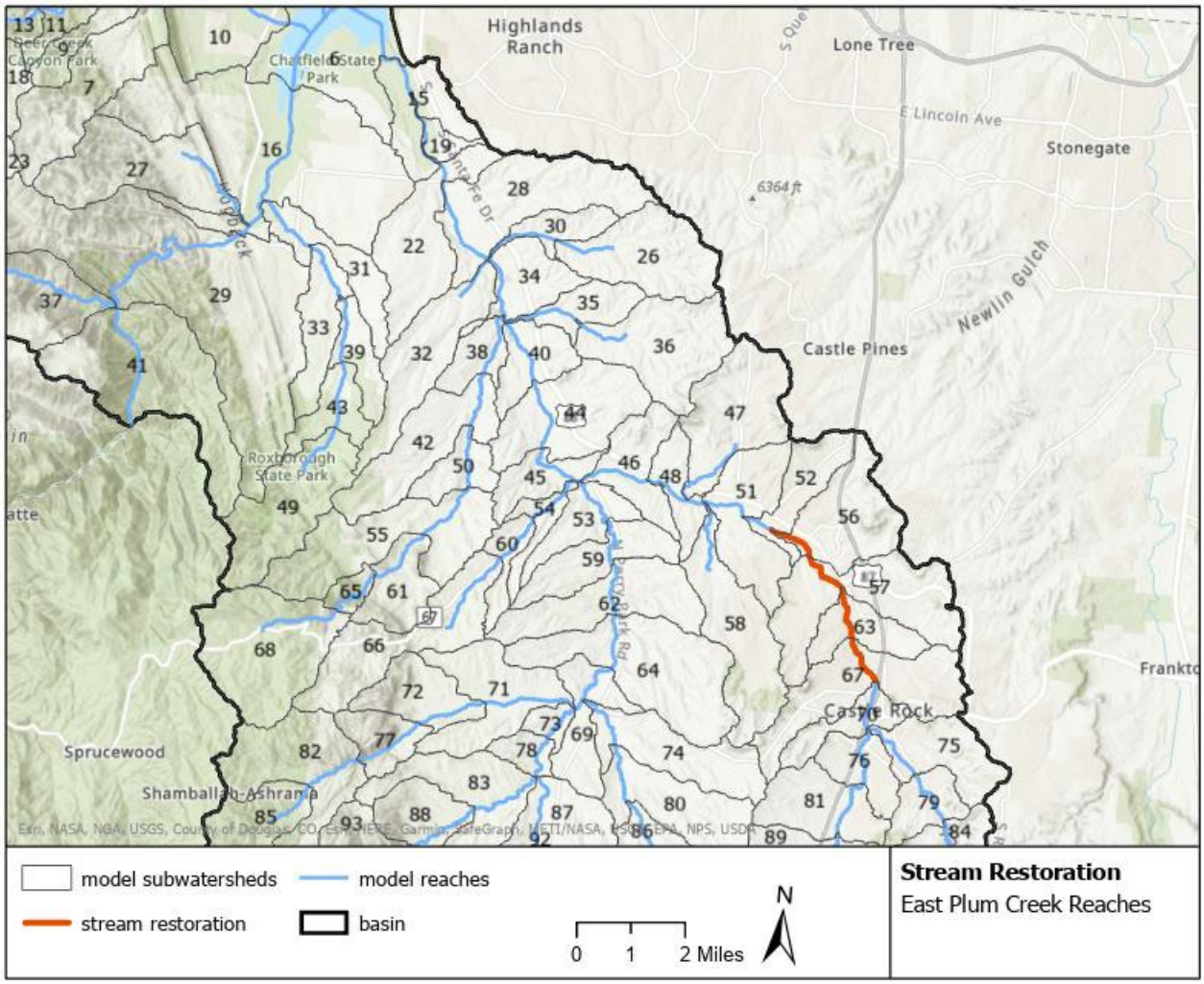


Table 5: Annual Change in Water Quality from Stream Restoration

Reach ID	Description	Total Phosphorus Load (% / lbs)	Total Nitrogen Load (% / lbs)	Total Sediment Load (% / tons)
Percent Increase (%)				
Reach 70	East Plum Creek (upstream of restoration)	0	0	0
Reach 67*	East Plum Creek	-1.2	-0.006	-4.0
Reach 63*	East Plum Creek (upstream of PCWRA)	-1.5	-0.007	-4.6
Reach 57*	East Plum Creek	-1.8	-0.009	-5.5
Reach 56*	East Plum Creek	-3.0	-0.016	-8.7
Reach 52	East Plum Creek (downstream of PCWRA)	-1.9	-0.009	-9.3
Reach 51	East Plum Creek	-1.7	-0.008	-8.0
Reach 48	East Plum Creek	-1.5	-0.007	-6.4
Reach 46	East Plum Creek	-1.5	-0.007	-6.3
Reach 45	Plum Creek at Sedalia	-0.6	-0.002	0.0
Reach 28	Plum Creek at Titan Rd	-0.6	-0.001	0.0

Reach ID	Description	Total Phosphorus Load (% / lbs)	Total Nitrogen Load (% / lbs)	Total Sediment Load (% / tons)
Absolute Increase (lbs or tons)				
Reach 70	East Plum Creek (upstream of restoration)	0	0	0
Reach 67*	East Plum Creek	-29.0	-3.2	-36.2
Reach 63*	East Plum Creek (upstream of PCWRA)	-36.5	-4.0	-46.1
Reach 57*	East Plum Creek	-51.5	-5.6	-67.8
Reach 56*	East Plum Creek	-90.8	-9.9	-120.4
Reach 52	East Plum Creek (downstream of PCWRA)	-105.3	-11.5	-139.8
Reach 51	East Plum Creek	-96.6	-10.4	-130.1
Reach 48	East Plum Creek	-86.4	-9.0	-113.5
Reach 46	East Plum Creek	-86.8	-8.9	-113.4
Reach 45	Plum Creek at Sedalia	-48.5	-3.8	0.0
Reach 28	Plum Creek at Titan Rd	-48.3	-1.8	0.0

*Reach where restoration was modeled.

This scenario showed that stream reclamation has a significant local impact on total phosphorus reduction which is attenuated from the end of the stream reclamation to Chatfield Reservoir. Total nitrogen was not significantly affected. Total sediment loads are significantly reduced in East Plum Creek, but those load reductions are negated once the sediment traverses the mainstem of Plum Creek.

Scenario 3. This scenario analyzes the effects of a forest fire on the water quality of the downstream reaches within the Chatfield Reservoir watershed. This scenario recommended modeling a wildfire burn area of approximately 10 square miles in the upper Plum Creek watershed.

Physical and chemical changes of soil from wildfires can have cascading effects on the land and watershed of a burned area, resulting in increased runoff, erosion and sediment production, reduced infiltration, increased soil-water repellence, and degraded water quality. Wildfire severity often affects watershed processes that regulate sediment, streamflow and nutrient responses, and these impacts are found to increase with wildfire extent and severity. In turn, higher runoff and sediment production can severely affect stream physical conditions, water quality, aquatic habitat, and human health and safety.

The sub-basins modeled as have been burned in a wildfire event are presented in Table 6.

Table 6: Burned Forested Area by Model Subbasin

Model Subbasin	Creek Name	Original Forested Area (acres)	Revised Unburned Forested Area (acres)	New "Burned" Forested Area (acres)	Percent of Subbasin that is Burned	Cumulative Upstream Area Burned
131	West Plum Creek	3,768.9	1,828.9	1,940.0	51%	51%
157	East Plum Creek	1,270.5	448.5	822.0	65%	17%
153	East Plum Creek	800	1.0	799.0	100%	29%
152	East Plum Creek	1,105.5	1.0	1,104.5	100%	41%
150	East Plum Creek	453	146.0	307.0	68%	43%
146	East Plum Creek	1,022.6	352.6	670.0	66%	45%
156	Cook Creek	2,556	1,798.0	758.0	30%	30%
	Total Area	**10,976.5**	**4,576**	**6,400.5**		

Figure 21: Wildfire Burn Area

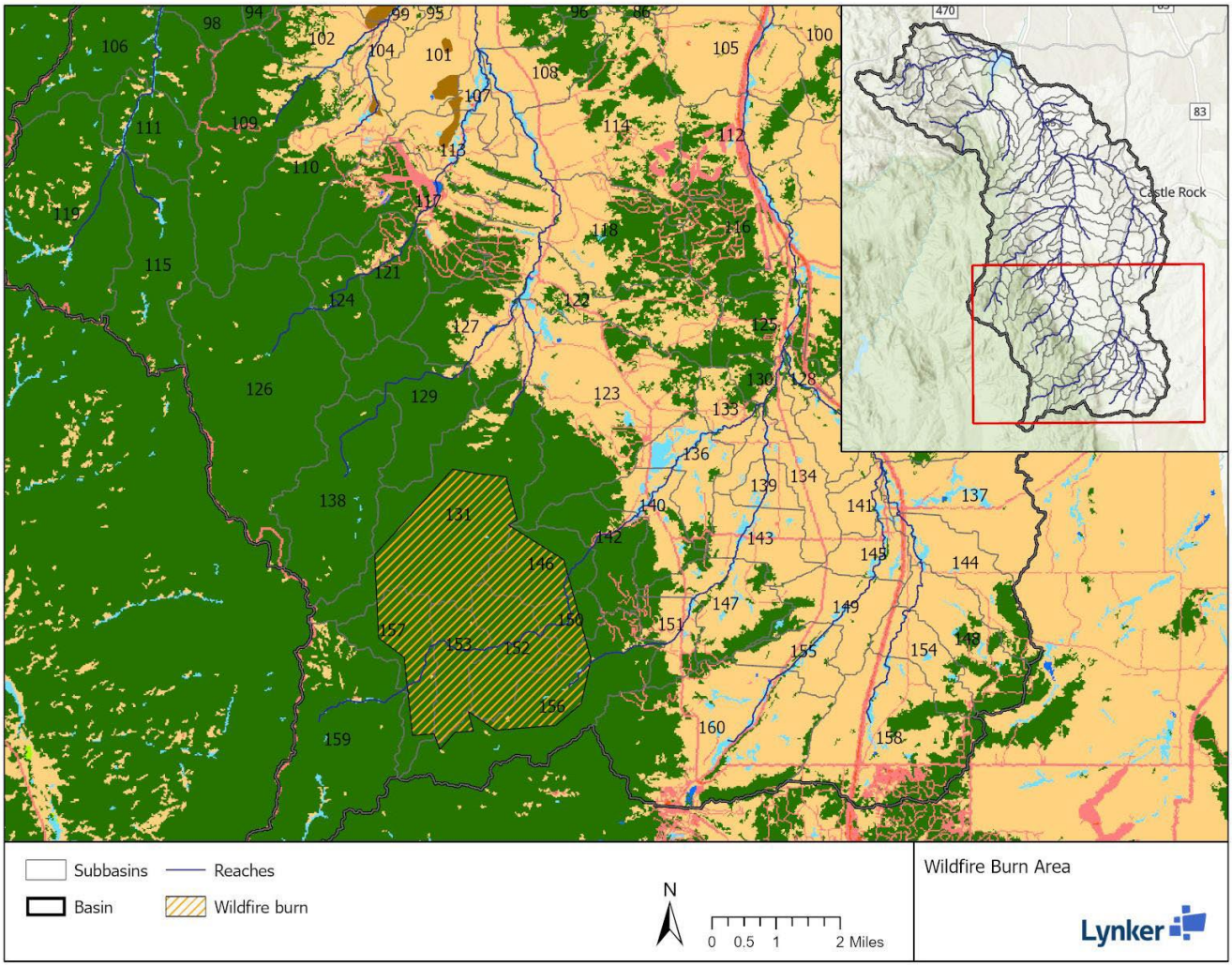


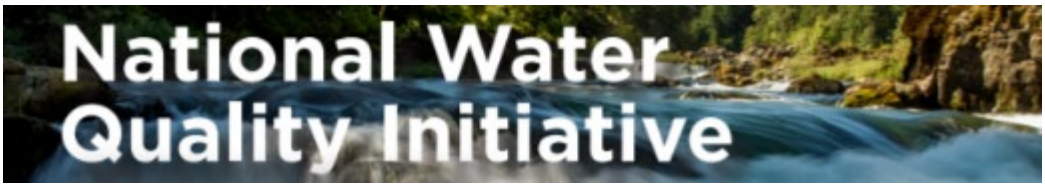
Table 7: Annual Change in Water Quality due to Wildfire

Reach ID	Description	Total Phosphorus Load (% / lbs)	Total Nitrogen Load (% / lbs)	Total Sediment Load (% / tons)	Total Flow (% / AF)
Percent Increase (%)					
Reach 131	West Plum Creek (burned)	99.3	103.1	238.5	36.9
Reach 146	East Plum Creek (burned)	86.7	2.5	189.5	34.2
Reach 156	Cook Creek (burned)	52.1	58.0	108.2	21.3
Reach 92	West Plum Creek	8.2	12.2	21.6	4.5
Reach 53	West Plum Creek (confluence)	4.4	6.7	11.3	2.5
Reach 76	East Plum Creek	11.8	18.4	30.5	8.1
Reach 46	East Plum Creek (confluence)	3.8	5.6	12.1	3.8
Reach 45	Plum Creek at Sedalia	3.9	5.8	12.7	3.2
Reach 28	Plum Creek at Titan Rd	3.8	5.5	11.5	3.0
Absolute Increase (lbs or tons)					
Reach 131	West Plum Creek (burned)	85.8	3,430	62.8	195.7
Reach 146	East Plum Creek (burned)	167.5	6,490	130.7	373.4
Reach 156	Cook Creek (burned)	34.0	1,330	31.0	76.4
Reach 92	West Plum Creek	80.9	3,310	66.4	195.9
Reach 53	West Plum Creek (confluence)	78.3	3,260	67.5	195.9
Reach 76	East Plum Creek	195.0	7,450	173.7	449.1
Reach 46	East Plum Creek (confluence)	231.8	7,370	218.4	449.0
Reach 45	Plum Creek at Sedalia	304.0	10,620	251.0	644.9
Reach 28	Plum Creek at Titan Rd	297.0	10,500	245.2	644.7

This scenario showed that a wildfire has an extensive initial impact on total phosphorus and extreme increases in total nitrogen. Flow volume is significantly increased which causes an ever-increasing load of sediment being carried into Chatfield Reservoir. These effects will diminish over time as the watershed heals but this healing period is expected to occur over an extended time period.

These scenarios provided substantial information which the Authority will use to plan for additional watershed model runs and future watershed improvements.

NRCS GRANT



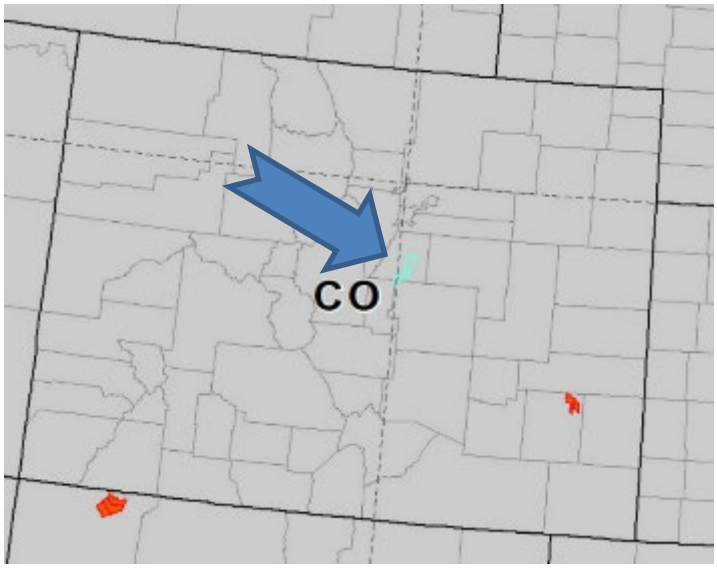
The Authority teamed up with the National Resource Conservation Service (NRCS) to apply for a National Water Quality Initiative (NWQI) Watershed Project Readiness Planning Grant. The NWQI is a partnership among NRCS, state water quality agencies and the U.S. Environmental Protection Agency to identify and address impaired water bodies through voluntary conservation. NRCS provides targeted funding for financial and technical assistance in small watersheds most in need and where farmers can use conservation practices to make a difference.

Conservation systems include practices that promote soil health, reduce erosion, and lessen nutrient runoff, such as filter strips, cover crops, reduced tillage and manure management. These practices not only benefit natural resources but enhance agricultural productivity and profitability by improving soil health and optimizing the use of agricultural inputs.

This grant targets planning, for the future implementation by local agricultural producers, of voluntary improvements on agricultural lands to reduce the impact of agricultural operations on water quality. Two Hydrologic Unit Code (HUC) 12 sub-watersheds were selected for this application: HUC 10190002503 - Middle East Plum Creek, and HUC 10190002502 - Upper East Plum Creek. Proposed stakeholders in the project include local agricultural landowners, water providers, wastewater providers, Denver Water, Town of Castle Rock, and the United States Forest Service. The grant will target water quality degradation from nutrients and sediments.

The Authority was notified on October 1, 2020, that the Authority's grant application was selected for $28,000 funding in 2021. The grant was one of only two that were selected in the State of Colorado. The Authority will work with the local NRCS Douglas County office in the fulfillment of the grant in 2021.

Figure 22. NWQI Grant Watersheds



COLORADO SCHOOL OF MINES WATER QUALITY PROJECT

The Authority tasked environmental engineering students at the Colorado School of Mines (Mines) with gathering water quality data from varying tributaries of the Chatfield watershed, including portions of Plum Creek, West Plum Creek, East Plum Creek, Garber Creek, Jackson Creek, Bear Creek, Willow Creek, and Bear Creek (Figure 23 and 24).

The goals of Mines field session course were as follows:

- Obtain and document a snapshot-in-time of water quality in the Chatfield watershed tributary creeks through sampling and testing of water quality parameters of concern and streamflow rates.
- Interpret the potential linkages between the watershed soils/geology/land uses on the sampled water quality constituents.
- Provide advice on possible measures to improve the quality of water in the Chatfield watershed.
- Report and present their findings to representatives of the Authority.

Figure 23. Mines Field Session Sampling Locations

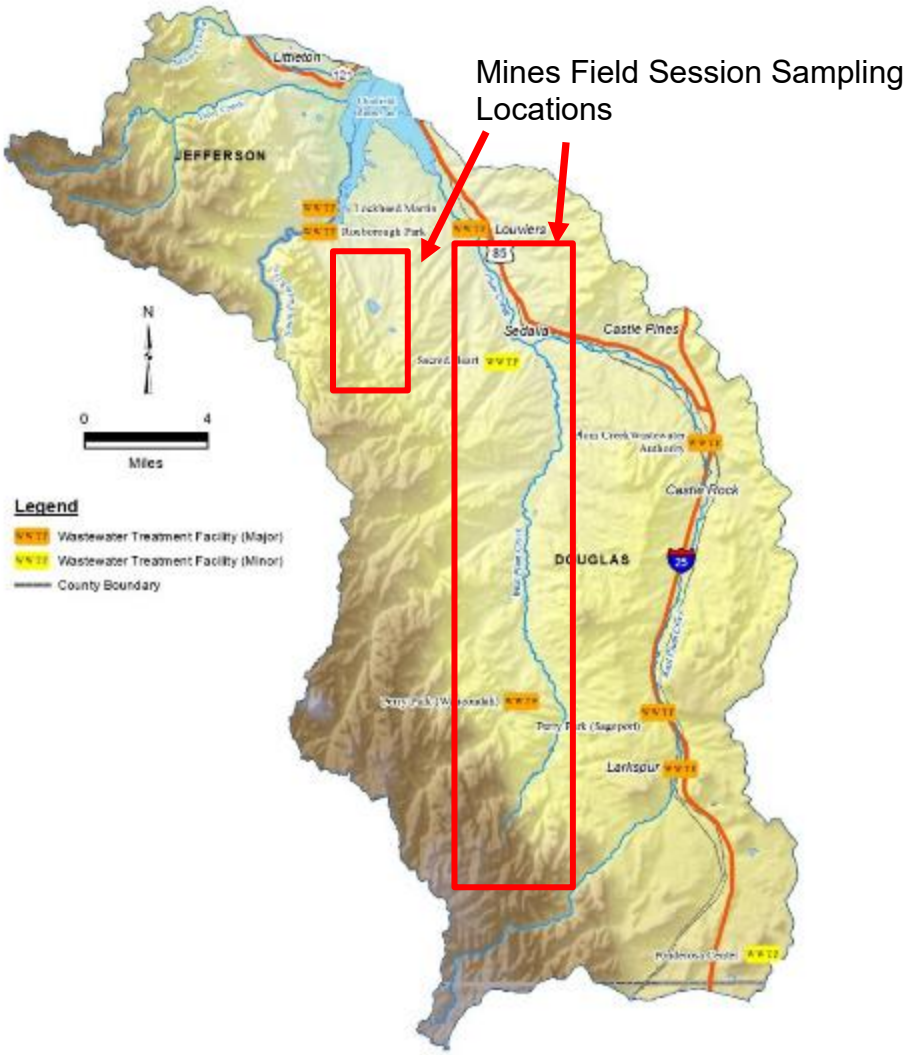


Figure 24. Mines Field Session Sampling Sites

Notes:

- The orientation of the map in Figure 24 has north to the right.
- The creeks generally flow south to north towards Chatfield Reservoir.
- The site identification numbers follow the naming convention: Creek Abbreviation – Site Number – Year of Sample
  - Example: WC320 (Willow Creek – Site 3 – 2020)

Regulation 93

This regulation establishes Colorado's Section 303(D) list of Impaired Waters and the Monitoring and Evaluation List based upon analysis of existing water quality as compared to the stream and lake water quality standards. The results below are comparing the water quality data collected by Mines and the corresponding locations on the 303(D) list:

Location COSPUS07_B:

- CSM Group 6 sampled Willow Creek; their results supported the 303(d) categorizations (for selenium). CSM measured higher than stream standards for selenium, arsenic, and total phosphorus at this location.

Location COSPUS10a_D:

- CSM Group 4 sampled the confluence of East Plum Creek and West Plum Creek. They measured higher than stream standards for coliform and selenium.

- CSM Group 5 sampled the confluence of Indian Creek and Plum Creek. They measured higher than stream standards for selenium, DOC, total coliform, E. coli, total phosphorus, and NO3.

- All arsenic levels were below standards. No temperature or iron samples at this time.

REGULATED STORMWATER SOURCES

Colorado's stormwater permit program requires control of stormwater runoff in all Phase I and Phase II Municipal Separate Storm Sewer Systems (MS4) entities. These requirements are separate and distinct from the Chatfield Control Regulations and complement the TMAL's purpose. Through the efforts of the MS4s, rate payers have spent significant funds to address water quality through implementing projects to mitigate impacts from urban stormwater runoff. Authority members with Phase I and II MS4 permits in the Chatfield Basin include:

- Statewide General Permit (COR090000)
  - Jefferson County
  - City of Littleton
- Cherry Creek Reservoir General Permit (COR080000)
  - Douglas County
  - City of Castle Pines
  - Town of Castle Rock
- Individual / Other Permit
  - Castle Pines Metropolitan District
  - Colorado Department of Transportation
- Non-Standard General Permit (COR070000)

General MS4 permits require the permittee to develop programs that meet six minimum control measures:

- Public education and outreach on stormwater impacts
- Public participation and involvement
- Detection and elimination of illicit connections and discharges
- Construction site stormwater runoff control
- Post-construction stormwater management in development and redevelopment
- Pollution prevention/good housekeeping for municipal operations

MS4 permits require implementation of best management practices (BMPs) to reduce pollutants discharged to the "maximum extent practicable." A summary of 2020 MS4 permit inspection and enforcement metrics are provided in Table 8.

Table 8: Summary of 2020 MS4 Permit Activities

		Permit Inspection Actions			Permit Enforcement Actions		
Land Use Agency	Permit Number	Illicit Discharges	Construction	Post-Construction	Illicit Discharges	Construction	Post-Construction
Douglas County	COR080003	5	4,584	19	0	172	0
Jefferson County	COR090024	19	258	8	19	34	0
Town of Castle Rock	COR080012	11	3622	229	5	1229	0
City of Littleton	COR090055	9	149	15	9	2	0

Notes:

- Castle Pines Metropolitan District inspection and enforcement action data are incorporated in Douglas County reporting; City of Castle Pines MS4 boundary is predominately in the Cherry Creek Basin; only a very small portion is located in the Chatfield Watershed.
- Town of Castle Rock inspection and enforcement action data includes data from the Cherry Creek Basin and the Chatfield Watershed. Town of Castle Rock MS4 boundary is predominately in the Chatfield Basin; about two-thirds of the Town is located in the Chatfield Watershed.
- The data for the City of Littleton includes all MS4 activities within the city limits. However, the city limits of Littleton only overlap with the Chatfield watershed boundary for a small portion (i.e. the Trailmark development)
- Data for Jefferson County includes all MS4 activities within the County limits.

EDUCATION AND OUTREACH

Covid 19 significantly impacted the ability of the Authority members to connect with the public to educate and inform on the benefits of their stormwater programs. Most of these programs include face-to-face opportunities to interact with citizens and students in active hands-on activities. This year, all the Authority members focused on on-line programs, billing inserts, and advertisements to reach their constituents. These members plan to continue these practices in 2021 with the hope that they can return to using the more robust face-to-face opportunities as conditions and restrictions allow. Programs used by Authority members are as follows:

Douglas County

Douglas County's Stormwater Management Program provides public education, tracking of stormwater system impact activities, stormwater system project reviews, and coordination between federal, state, and local government for compliance with federally-mandated programs.

Through a county Co-op program, the county has created the "One Thing is Clear… our creeks, rivers and lakes depend on you" public awareness program. The interactive website provides information for Douglas County residents on how they can work to keep pollution out of their water ways. CLEAR Members collaborated with Members of Stormwater Permittees for Local Awareness of Stream Health (SPLASH) on Nutrient Outreach and training seminars.

Douglas County's programs have typically included:

- Maintained the CLEAR website at http://onethingisclear.org/
- Ran two-third page residential and commercial awareness advertisements in Colorado Community Media newspapers covering certain portions of Douglas, Arapahoe, Jefferson, and Elbert Counties. Ads ran in the Castle Rock News Press, Castle Pines News Press, Douglas County News Press, Lone Tree Voice, Highlands Ranch Herald, Centennial Citizen, Englewood Herald, Littleton Independent, South Platte Independent, Parker Chronicle and Elbert County News.
- Members supported Tri-County Health Department/Douglas County Household Chemical Roundups.
- Members actively participated and commented on the Non-Standard MS4 "Draft" Permit.
- Supported the Douglas County Sheriff's Office drug collection program.

Additional information on various topics related to Stormwater and Pollution Control can be found on Douglas County's website.

Town of Castle Rock

Spring Up the Creek has become a tradition for Castle Rock and draws residents every year to preserve our waterways by removing trash that collects along the stream banks. Typically held in May of each year (except in 2020 due to Covid-19 restrictions), this activity plays a significant part in cleaning up the stream corridors in the Town.

For example, the 2019 event had 178 volunteers and picked up 89 bags of trash. The event was headquartered at Festival Park and participants either walked or were shuttled to seven locations throughout town.

The Town of Castle Rock hosted this event in partnership with Douglas County, Castle Pines Metro District, Chatfield Watershed Authority, and Plum Creek Water Reclamation Authority. Through these sponsorships, the partners were able to offer breakfast, gloves and trash bags for the clean-up, kids' activities, and commemorative t-shirts to volunteers, free of charge.

Jefferson County

Jefferson County provides opportunities for residents and visitors in the watershed to learn and be involved in environmental stewardship and programs that promote water quality. The county has a comprehensive storm sewer outfall map to trace sources of potential illicit discharges and illegal dumping in the watershed. Jefferson County continues to participate with Rooney Road Recycling Facility and in 2020 the facility collected over 480,000 pounds of household hazardous waste. Household hazardous waste (includes electronic waste, household chemicals, paints, propane cylinders and automotive products) materials collected at the Rooney Road Recycling facility since 1994 total more than 7,500,000 pounds of potential surface water and ground water pollutants. This process keeps materials out of septic systems and helps reduce illegal dumping in the watershed. Jefferson County participated in several public events to reach diverse audiences for their MS4 and floodplain management programs. Jefferson County regularly reports to the Authority on stormwater management practices and programs. More information about Jefferson County's municipal stormwater program is contained in their CDPS Stormwater Permit Annual Report. More information about Jefferson County's municipal stormwater program is contained in their CDPS Stormwater Permit Annual Report.

City of Littleton

The City of Littleton (City) staff typically conducts stream cleanups, storm inlet marking, and water quality educational outreach to schools, in the City newspaper, and through social media sites. The City holds an annual Hazardous Household Waste collection event with the City of Englewood.

Due to the restrictions due to Covid-19, public outreach was limited in 2020, but the City joined in efforts of regional groups with radio advertisements and waterway cleanups. In addition, the City publishes articles on water quality awareness in the Littleton Report and social media.

PROGRESS TO PROMOTE WATER QUALITY PROTECTION

While funding sources remain very limited, the Authority's collaborative role seeks out partnerships to support our water quality goals now and in the future. Donations and in-kind services from Authority members to support progress to promote water quality protection included:

- Continued implementation of the amended Intergovernmental Agreement (IGA) and bylaws.
- Continued water quality monitoring program in both the reservoir and the watershed.
- Continued implementation of the Chatfield Watershed Plan.
- Continued collaboration with Chatfield Reservoir Mitigation Company (CRMC) regarding data collection to support CRMC reservoir modeling efforts.
- Continued Watershed modeling efforts.
- Collaboration with local and state agencies in grant funding effort.
- Continued Public Outreach Committee activities.

In addition, our members have been expending significant funds for drainageway and storm sewer projects to reduce erosion and flooding and improve water quality. Following are a couple of example projects completed by the Town of Castle Rock in 2020.

Town of Castle Rock

Industrial Tributary Stabilization ($1,257,253)

This project is located along Town open space east of the Miller Activity Complex, south of Topeka Way and west of Prairie Hawk Drive. The Stormwater Master Plan, prepared in 2010, determined the need for stabilization measures along Industrial Tributary to mitigate for development impacts and restore a healthy and sustainable stream system. Through the project reach, the channel was incised between two to ten feet. This project included nine grouted boulder grade control structures to restore the channel invert between Prairie Hawk Drive and the Miller's Landing development. Due to stream degradation, large pine trees were being lost from undercutting and erosion in the channel. Significant effort was made in the design process to minimize the number of trees to be removed as a result of construction. Additionally, the improvements will restore essential root support along the drip line of existing trees to maintain ecological health along the corridor. 53 Corporation, LLC was awarded the construction contract. Construction began in March and was substantially completed in September.

Minor Drainageway Improvements ($730,259)

Castle Rock Water has completed storm drainage improvements within the Woodlands open space (Hangmans Gulch Tributary B) and along Canyon Dive in Rock Park (Parkview Tributary). The project involved extending existing storm sewer outfalls to their respective drainageway channels, and backfilling and replanting the eroded areas with native grasses. Internal RCP energy dissipaters were utilized to reduce outfall velocities. Additionally, the most severe areas of stream bank erosion were repaired using soil lifts to minimize overall disturbance and provide a more natural appearance once native vegetation is restored. Benefits include protection of public and private property, water quality, wildlife habitat, and safety for users of Rock Park and Town-owned open space.

CHATFIELD WATERSHED AUTHORITY MEMBERS

www.chatfieldwatershedauthority.org

Members consist of water and sanitation districts, water providers, municipalities, metropolitan districts and other area stakeholders within the Chatfield Watershed. The membership representation consists of organization staff and elected officials. Membership dues assist with collaborative projects and water quality testing.

Chatfield Watershed Authority Members

City of Littleton
Denver Water
Douglas County
Jefferson County
Roxborough Water & Sanitation District
Town of Castle Rock
Perry Park Water & Sanitation District
Centennial Water & Sanitation District
Town of Larkspur
Castle Pines Metropolitan District
Dominion Water & Sanitation District
Louviers Water & Sanitation District
Plum Creek Water Reclamation Authority

Ex-Officio Participants

Colorado Agricultural Leadership Foundation (CALF)
Colorado Parks and Wildlife Commission (Chatfield State Park)
Colorado Department of Transportation
Colorado Water Conservation Board
Ken Caryl Ranch Master Association
The Law Enforcement Foundation
Ponderosa Retreat
Sacred Heart Retreat
Tri-County Health Department
U.S. Army Corps of Engineers
Chatfield Reservoir Mitigation Company
Water Quality Control Division of the Colorado Department of Public Health and Environment

Watershed Manager

Colorado Watershed Assembly

Website

Hughes and Stuart Sustainable Marketing

Financials

TWS Financial, Inc.

Technical Consultant

RESPEC Company, LLC