

# **ANNUAL REPORT 2018**

**May 15, 2019**

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# CHATFIELD WATERSHED AUTHORITY

[www.chatfieldwatershedauthority.org](http://www.chatfieldwatershedauthority.org)

The purpose of the Chatfield Watershed Authority (Authority) is to provide for and promote a regional, coordinated approach for the provision of water quality improvements and the protection of water quality in the Chatfield watershed for recreation, fisheries, drinking water supplies, and other beneficial uses.

This approach is for the public benefit of the Members of the Authority, watershed inhabitants, and the People of the State of Colorado, as deemed appropriate by the Board of Directors of the Authority. This includes continuing to implement Colorado Water Quality Control Commission Chatfield Reservoir Control Regulation, 5 CCR 1002-73 (Control Regulation No. 73); and coordinating with state and federal agencies regarding water quality control measures.

In 2016, the Authority approved an amended Intergovernmental Agreement (IGA) and bylaws. The Authority Board of Directors (Board) is comprised of

three elected officials representing Douglas and Jefferson Counties, the Town of Castle Rock; one wastewater district representative; and one representative for other members. The Board continues to implement Control Regulation No. 73. It meets regularly to address policy and fiscal issues. 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 may be formed to address specific issues at the Board's request.

The Chatfield watershed includes over 400 square miles and is comprised of the Plum Creek basin and South Platte River basin (from the outfall of Strontia Springs Reservoir to Chatfield Reservoir, including the Massey Draw and Deer Creek sub-basins).

Figure 1 on the next page shows the Authority member entities and the Chatfield watershed boundary.



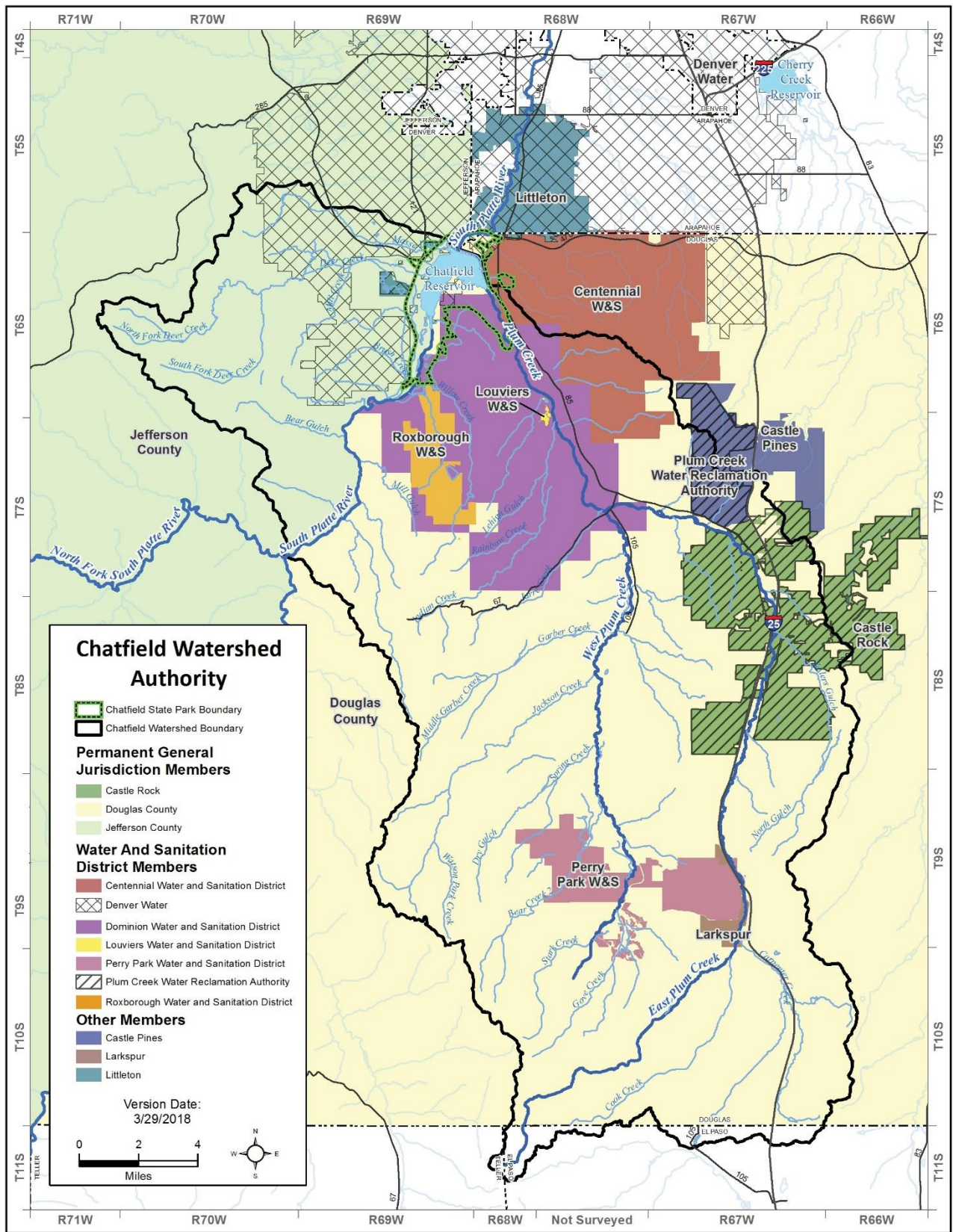


Figure 1. Chatfield Watershed Authority Watershed Boundary and Member Entities.

## 2018 Chatfield Watershed Authority Board Members

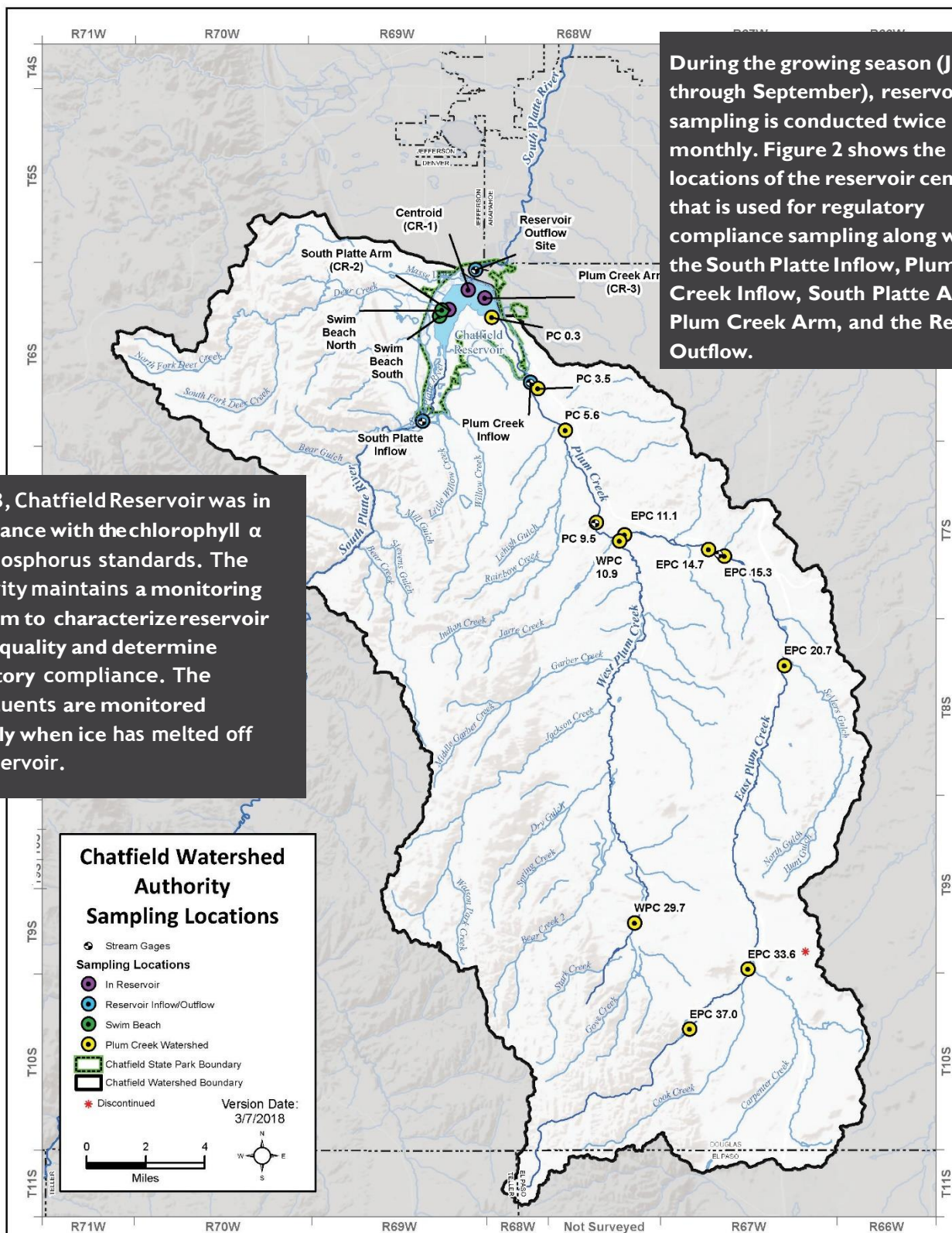
Chair: Lora L. Thomas, Douglas County Commissioner  
Vice-Chair: George Teal, Town of Castle Rock  
Councilman Director: Tina Francone, Jefferson County  
Commissioner Director: Alison Witheridge, Denver  
Water  
Director: Barbara Biggs, Roxborough Water & Sanitation District

## 2018 Chatfield Watershed Authority Technical Advisory Committee Representatives

Jefferson County: Patrick O'Connell (TAC Chair)  
Dominion Water & Sanitation District: Mary Kay Provaznik (TAC Vice-Chair)  
Castle Pines Metropolitan District: Jeff Coufal  
Centennial Water & Sanitation District: Julie Tinetti  
City of Littleton: Carolyn Roan  
Denver Water: Craig Lamacraft  
Douglas County: Jim Dederick  
Louviers Water & Sanitation District: Ron Beane Perry Park  
Water & Sanitation District: Scott Monroe  
Plum Creek Water Reclamation Authority: Weston Martin  
Roxborough Water & Sanitation District: Ronda Sandquist  
Town of Castle Rock: David Van Dellen  
Town of Larkspur: Paul Grant



# RESERVOIR REGULATORY COMPLIANCE



During the growing season (July through September), reservoir sampling is conducted twice monthly. Figure 2 shows the locations of the reservoir centroid that is used for regulatory compliance sampling along with the South Platte Inflow, Plum Creek Inflow, South Platte Arm, Plum Creek Arm, and the Reservoir Outflow.

In 2018, Chatfield Reservoir was in compliance with the chlorophyll  $\alpha$  and phosphorus standards. The Authority maintains a monitoring program to characterize reservoir water quality and determine regulatory compliance. The constituents are monitored monthly when ice has melted off the reservoir.

Figure 2. Chatfield Watershed Authority Sampling Locations.

## CHLOROPHYLL

The chlorophyll  $\alpha$  (chl- $\alpha$ ) standard in the reservoir is 10  $\mu\text{g/L}$ , with an allowable exceedance frequency of one time in five years. The Colorado Water Quality Control Commission (WQCC) adopted an assessment threshold of 11.2  $\mu\text{g/L}$  to be used to determine compliance with the standard. The chl- $\alpha$  standard is the growing season (July through September) average. In 2018, the average was 8.9  $\mu\text{g/L}$ , which is below the assessment threshold.

There has only been one exceedance in the last five years (2016); the reservoir remains in compliance with the standard (Figure 3).

Observed 2018 chl- $\alpha$  concentrations in Chatfield Reservoir are depicted in Figure 4. Chl- $\alpha$  levels were met for the growing season (July through September), but spiked in October which is outside of the growing season (Figure 4).

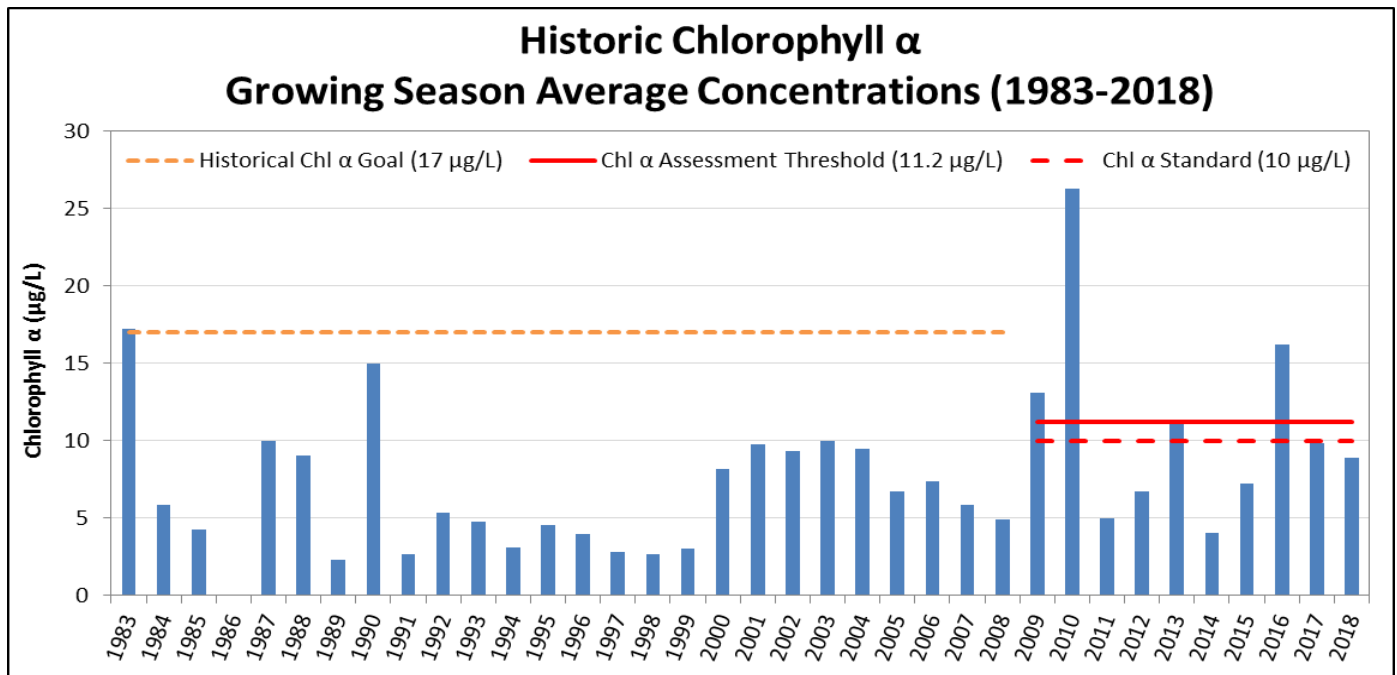


Figure 3. Growing Season Average Chlorophyll  $\alpha$  Concentrations, Chatfield Reservoir, 1983-2018.

The July-September growing season average in 2018 was 8.9  $\mu\text{g/L}$ , below the assessment threshold of 11.2  $\mu\text{g/L}$  (see Figure 3). In 2018, Chatfield Reservoir continued to be in compliance with the chlorophyll- $\alpha$  water quality standard.

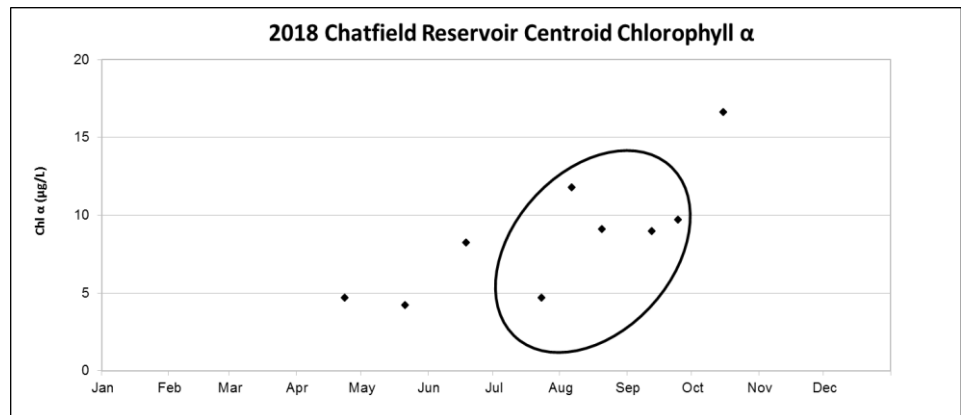


Figure 4. Observed 2018 Chlorophyll  $\alpha$  concentrations, Chatfield Reservoir, 2018.

The chl- $\alpha$  concentrations observed are a function of nutrient availability from reservoir inputs and internal loading, as well as other conventional reservoir parameters including dissolved oxygen, temperature, and pH.

In 2018, cyanobacteria (phylum Cyanophyta) concentrations ranged from 857 to 281,256 algal cells/mL,<sup>1</sup> compared to the 2017 range of 2,619 to 128,693 algal cells/mL.<sup>2</sup> The highest concentrations occurred in August (Figure 5).

Algae (genera *Anabaena*, *Ankistrodesmus* and *Aphanocapsa*) typically correspond with elevated chl- $\alpha$  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. Cyanobacteria were the predominant algae observed in most of the April - September sampling events, with the exception of Bacillariophyta, which were high in April (Figure 6).

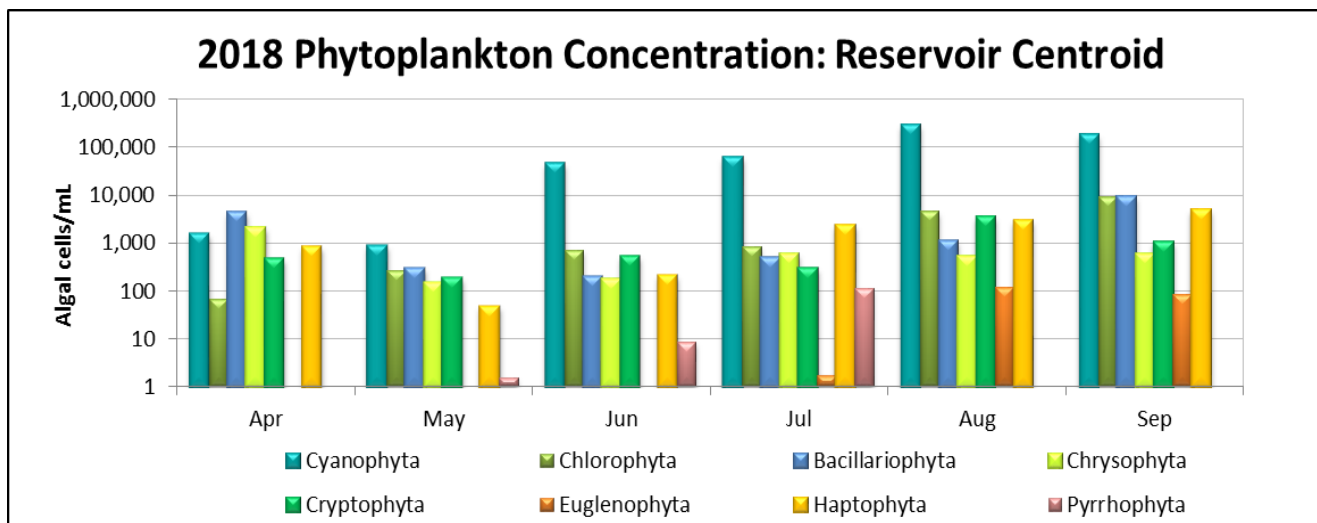


Figure 5. 2018 Phytoplankton Monthly Summary - Phytoplankton samples taken in the reservoir during 9 sampling events from April through September 2018. Cyanophyta, also sometimes called blue-green algae, are shown to peak in August at 281,256

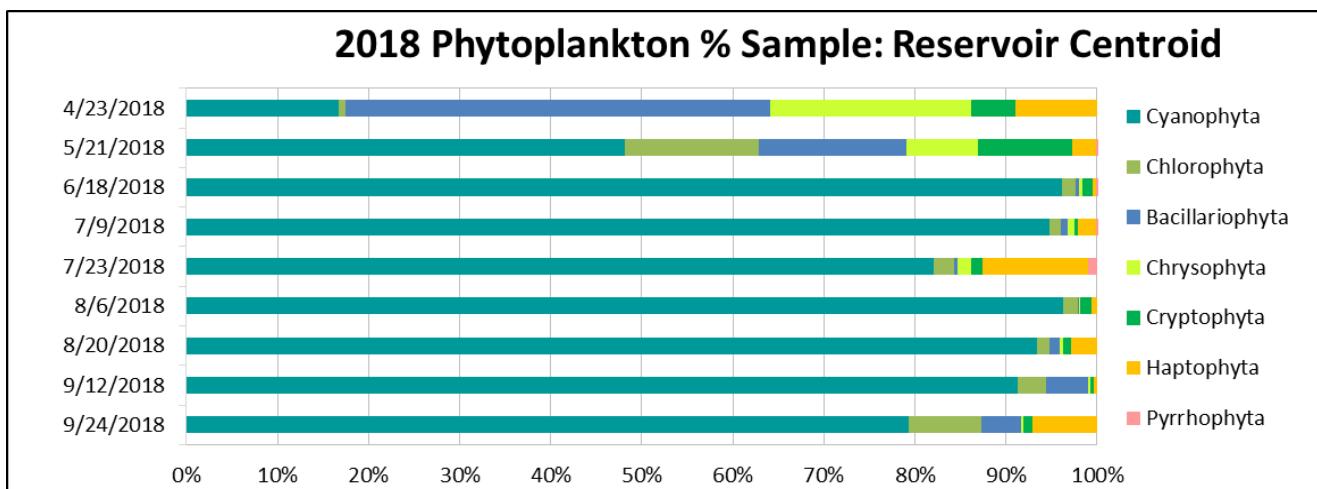


Figure 6. 2018 Phytoplankton Speciation Variability – Cyanophyta (cyanobacteria) were a predominant algae observed in May through September, whereas Bacillariophyta predominated in April.

<sup>1</sup> Sample was biovolume.  
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<sup>2</sup> Sample measurement was cell count.



# TOTAL PHOSPHORUS

The total phosphorus (TP) growing season average was 19.4 µg/L, which is below the standard of 30 µg/L, and assessment threshold of 35 µg/L. The one time in five-year allowable exceedance frequency was also met (Figure 7). A review of TP compliance with the water quality standard from 1983 to 2018 is illustrated in Figure 7.

The TP growing season average has remained below the water quality assessment threshold of 35 µg/L since the standard changed in 2009.

The monthly TP concentrations observed in 2018 in Chatfield Reservoir are shown in Figure 8.

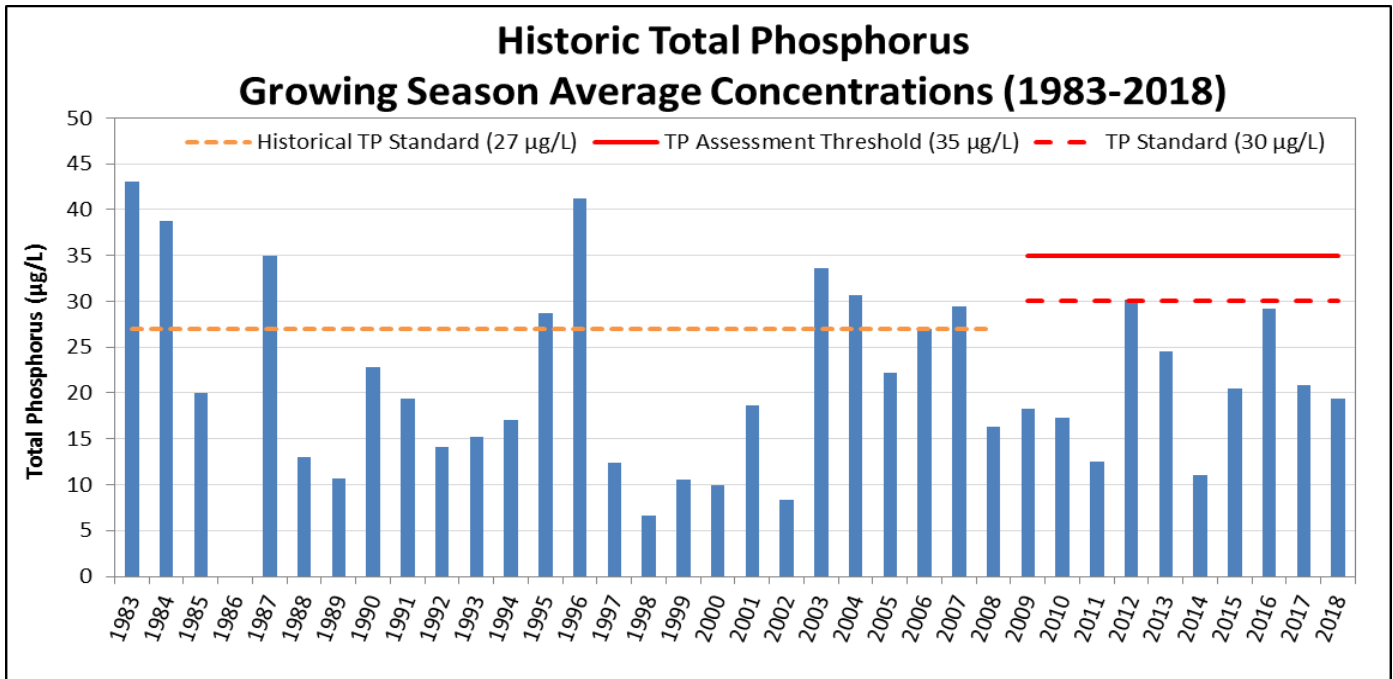


Figure 7. Growing Season Average Total Phosphorus Concentrations, Chatfield Reservoir, 1983-2018.

**The July-September growing season average in 2018 was 19.4 µg/L, below the assessment threshold of 35 µg/L (see Figure 3). In 2018, Chatfield Reservoir continued to be in compliance with the total phosphorus water quality standard.**

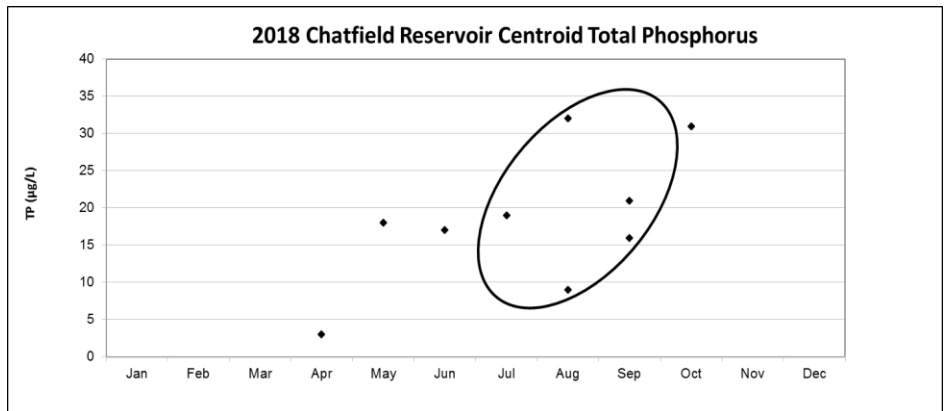


Figure 8. Monthly Total Phosphorus Concentrations, Chatfield Reservoir, 2018.

# COMPLIANCE WITH THE 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 WQCC acknowledged that progress towards development of revised phosphorus allocations to achieve the revised TMAL is contingent on suitable funding to support data and modeling needed to:

- Re-partition loads between the South Platte River and Plum Creek;
- Reallocate loads within each basin; and
- Revise wasteload allocations, as appropriate.

The Authority completed the development and calibration of a watershed model in 2016. Additional stream, precipitation, and stormwater quantity and quality data would be needed for the model to be applied to identify TP sources, locations, and net contributions to the reservoir. The Authority continues to coordinate with the Chatfield Reallocation Mitigation Company (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 is tasked with overseeing the development of a two-dimensional, hydrodynamic water quality model for the reservoir. Development of the model is funded by the CRMC as part of the Chatfield Storage Reallocation Project (CSR). 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. After storage begins in 2020, potential impacts from the Chatfield Reallocation Project, if any, will be evaluated on a yearly basis.

The Authority continues to collect water quality data (over 20 years of monitoring) and since 2016 has collaborated with the CRMC on data collection efforts pursuant to the Memorandum of Understanding between the two agencies. This data will support work on the revised TMAL in the coming years. While there are uncertainties associated with the CSR as it relates to water quality, modeling is a useful tool to provide insight into water-quality dynamics in the reservoir. Data collection and modeling provide information on what is happening in the watershed and the reservoir. In turn, that information can guide proper and efficient implementation of management activities that are focused on meeting water quality needs.

## 2018 TP CONCENTRATIONS – INSTREAM AND RESERVOIR

Average monthly TP concentrations for 2018 at the Chatfield Reservoir Centroid, Chatfield Reservoir Outflow, Plum Creek Inflow, and South Platte Inflow are depicted in Figure 9. Refer to Figure 2 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 2018 annual TP load to the reservoir totaled 4,585 pounds at an inflow of 39,942 acre-feet. This is compared to the TMAL of 19,600 pounds at an inflow of 100,860 acre-feet. Figure 10 shows the calculated annual TP loads to Chatfield Reservoir from 1986 to 2018. Figure 11 shows the Chatfield Reservoir calculated annual inflows from 1986 to 2018. A comparison of the 2018 inflows and TP load contributions is presented in Figure 12.

The relative TP loading from sources is typical compared to historic TP inputs. This year, TP loading from Plum Creek was 1,786 pounds, or 39% of total input, compared to 2,218 pounds from the South Platte River, or 48% of total input. Direct precipitation on Chatfield Reservoir, alluvial inflows, and other direct flow sources contributed approximately 581 pounds, or 13% of total input.

## 2018 Total Phosphorus Average Monthly Concentrations

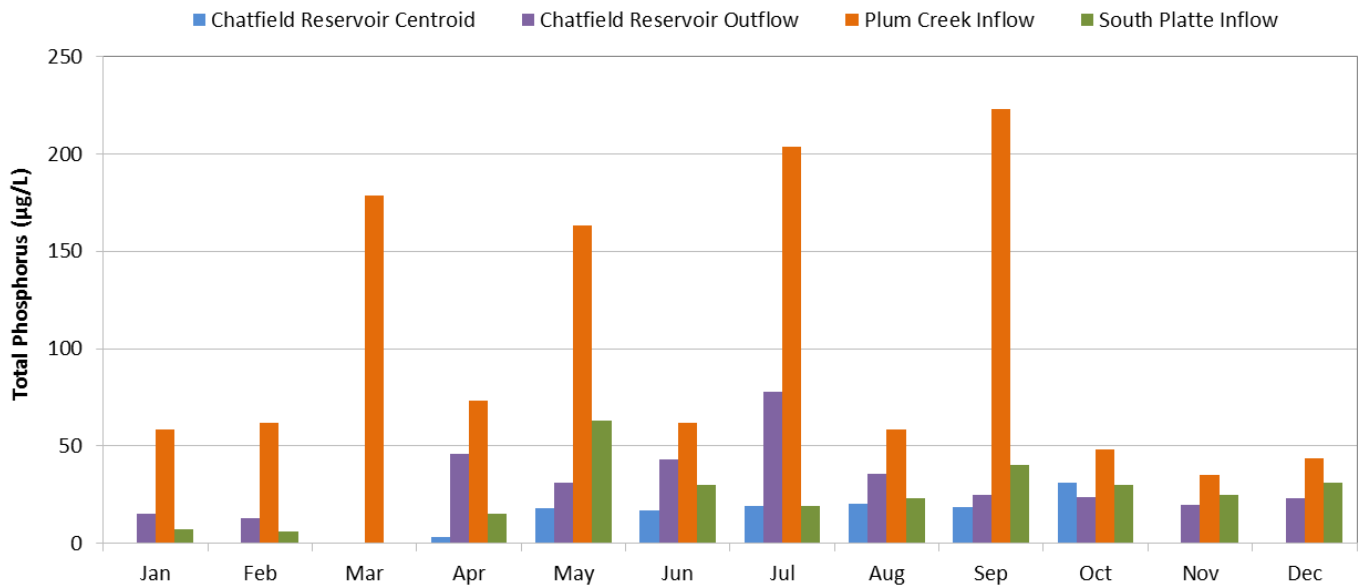


Figure 9. 2018 Average Monthly TP Concentrations in the Chatfield Watershed and Chatfield Reservoir.

## Chatfield Reservoir: Calculated Annual TP Load

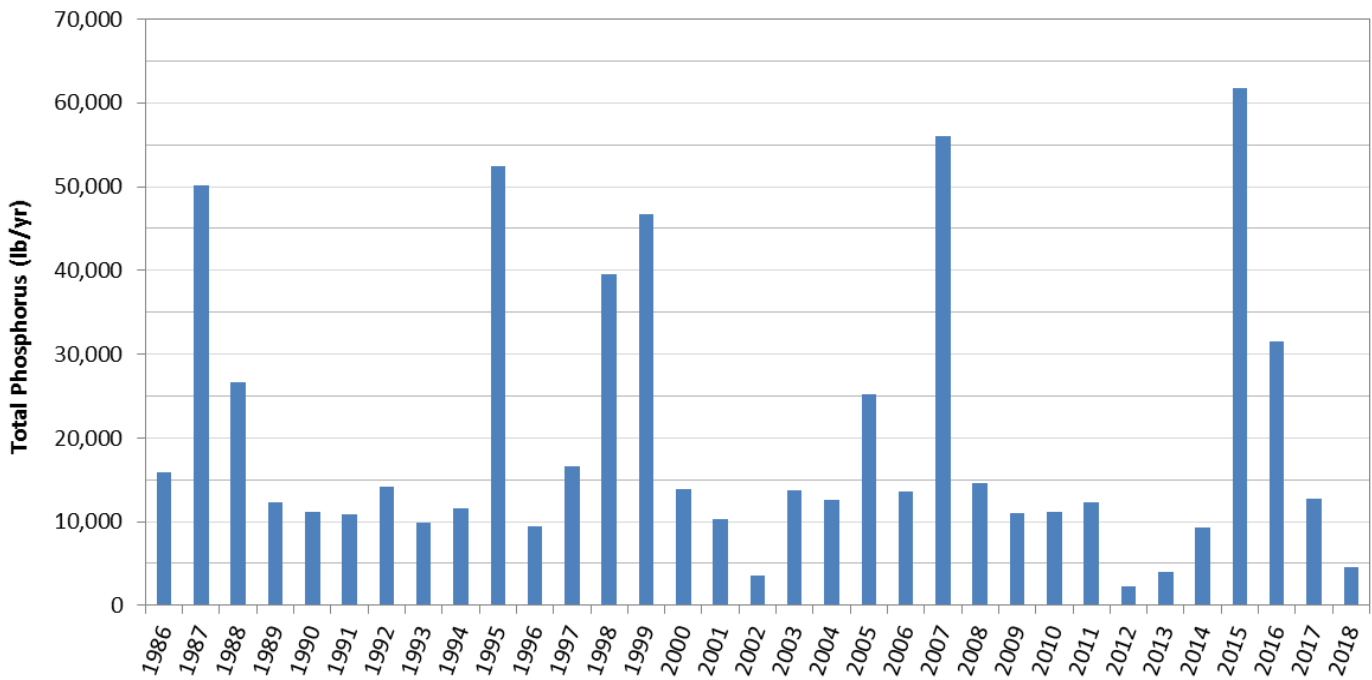


Figure 10. Calculated TP Load to Chatfield Reservoir (1986 – 2018).

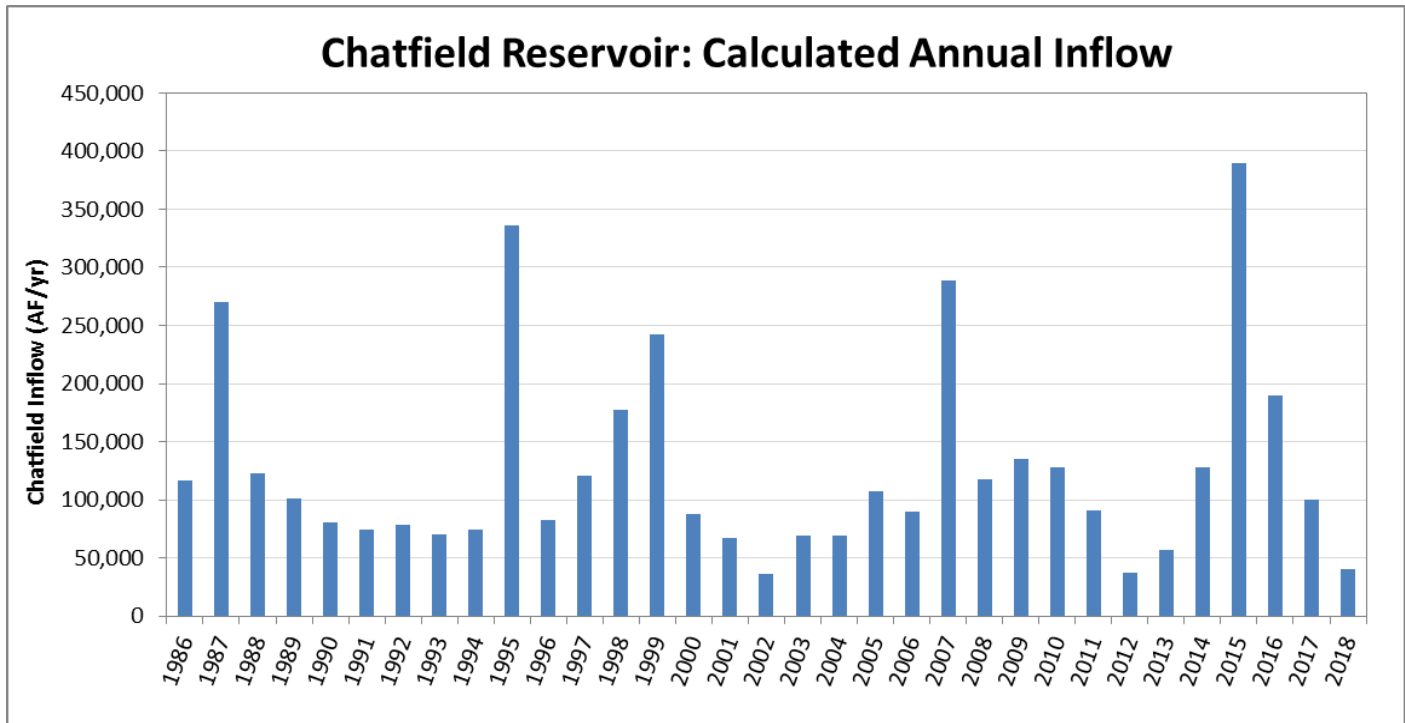


Figure 11. Chatfield Reservoir Calculated Annual Inflow (1986 – 2018).

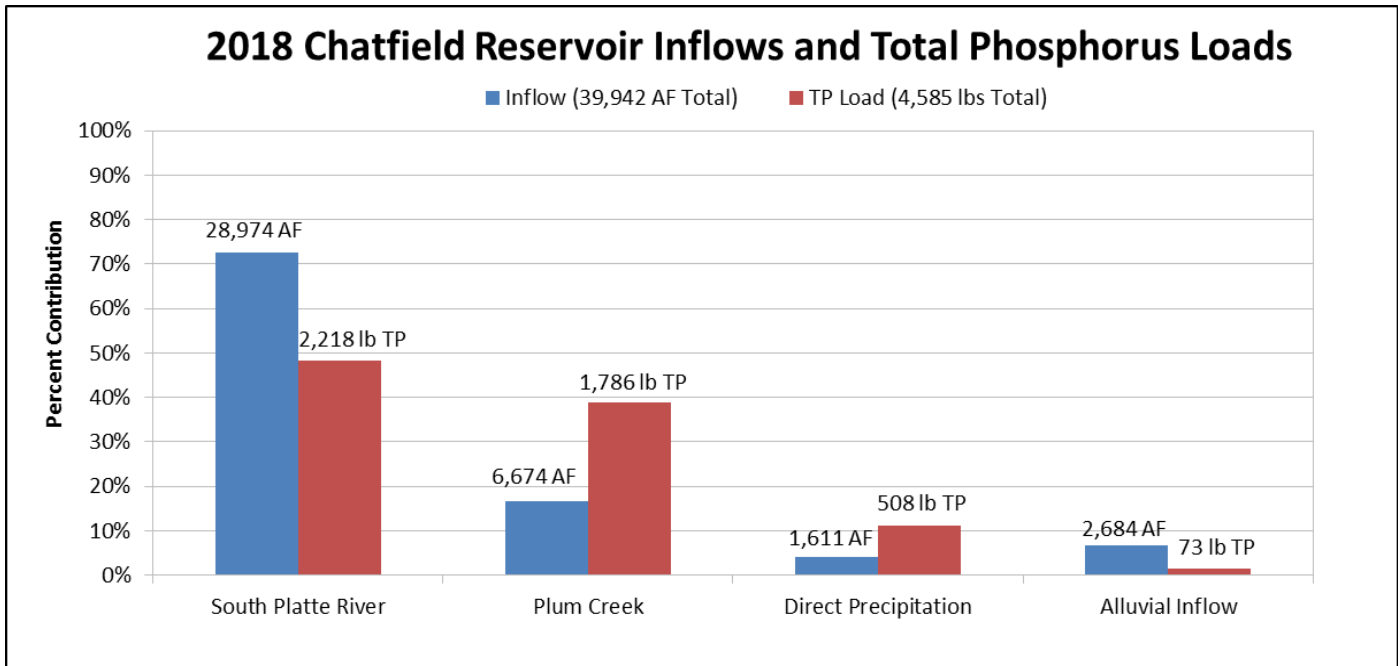


Figure 12. 2018 Comparison of Chatfield Reservoir Inflows and TP Loads.

# RESERVOIR MONITORING PROGRAM



The Authority has conducted a monitoring program for over 20 years to characterize water quality and determine regulatory compliance in the reservoir. Surface water samples are collected by Centennial Water and Sanitation District, Colorado Parks and Wildlife, and Denver Water (Figure 13). These locations include:

- 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](http://www.chatfieldwatershedauthority.org)

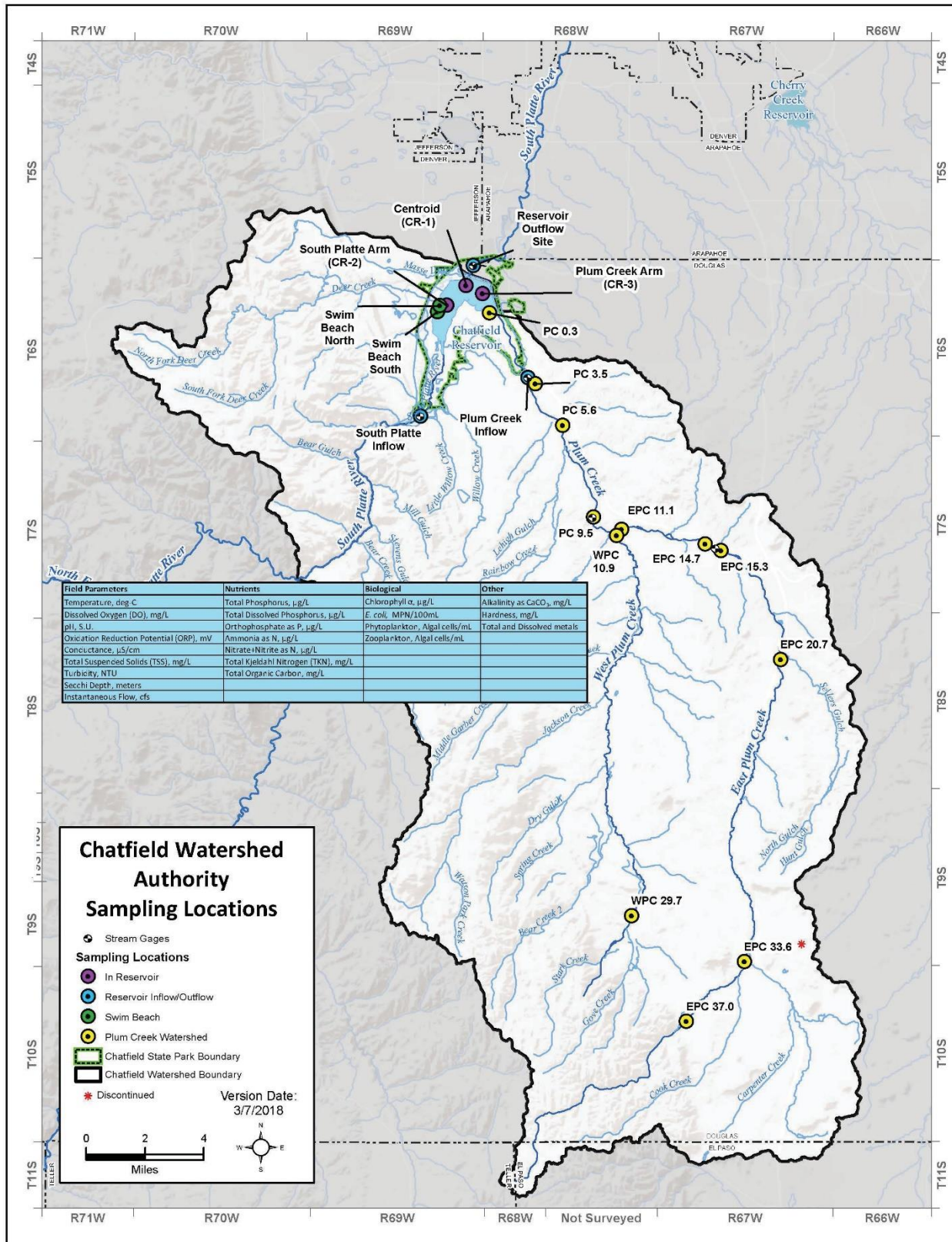


Figure 13. Chatfield Watershed Authority Sampling Locations and Constituents.

# PLUM CREEK WATERSHED MONITORING SYSTEM

In the Plum Creek basin, watershed monitoring continued in 2018 through voluntary sampling efforts by the Plum Creek Water Reclamation Authority (PCWRA); monitoring locations are shown in Figure 13 on previous page. 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 2018 Plum Creek water quality observations included the following:

- **Streambank Erosion.** There is major streambank erosion on Plum Creek in the State Park. This eroding area is contributing significant sediment, and likely TP. As part of the mitigation for the CRMC reallocation project, stabilization of a portion of Plum Creek 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 observed *E. coli* remains below the water quality standard of 126 organisms/100 mL (Figure 14), with the exception of site PC-3.5 (Plum Creek at Titan Road) which had a geomean value of 147.6 organisms/100 mL. In 2015, the Authority commenced a molecular source tracking monitoring program to help understand potential sources of *E. coli*. Sources identified in East Plum Creek, West Plum Creek, and at the inlet to the Reservoir included human, horses, cattle, beaver and general Bacteroidetes.

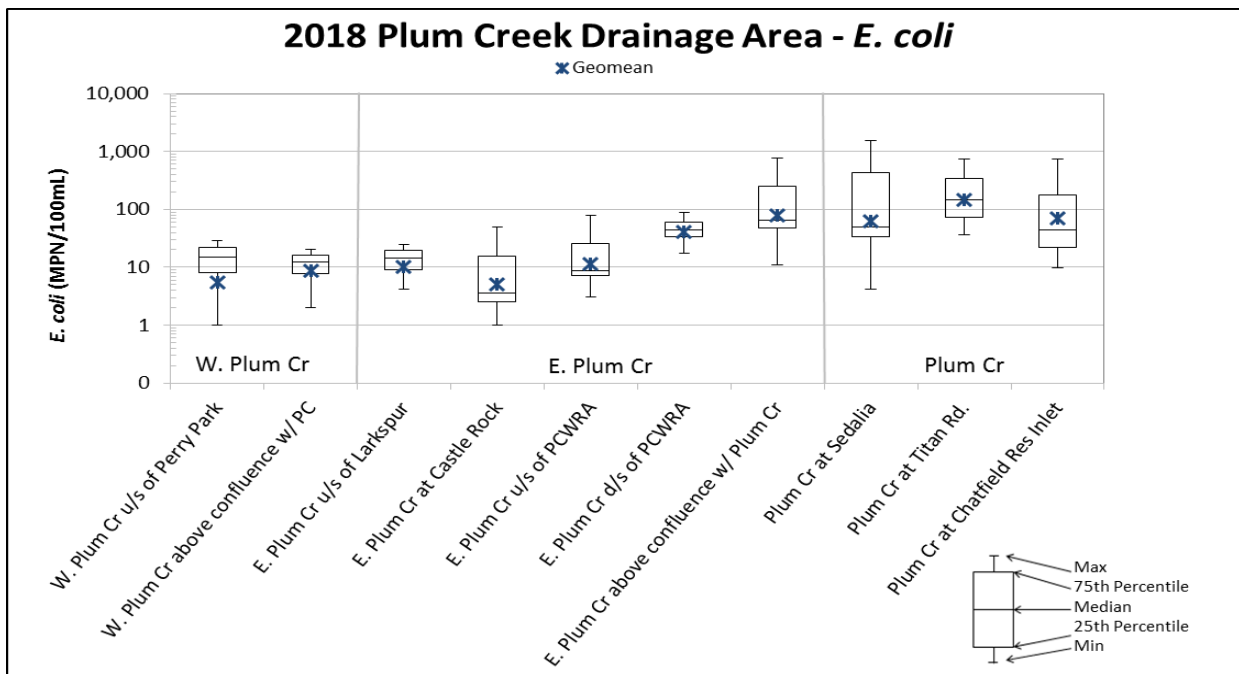


Figure 14. *E. coli* in Plum Creek Drainage Area, 2018.

- **Total Phosphorus.** TP concentration generally increases from upstream to downstream for both East Plum Creek and Plum Creek (Figure 15).

Phosphorus in West Plum Creek decreased between Perry Park and the confluence with Plum Creek. Total Phosphorus concentrations have historically been observed to be relatively high at East Plum Creek above the confluence with Plum Creek (Site EPC-11.1), compared to other sites in Plum Creek watershed. In 2018 the average TP at this site was 185.0  $\mu\text{g/L}$ , compared to the 2017 average of 245.0  $\mu\text{g/L}$ .

**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  
2015*

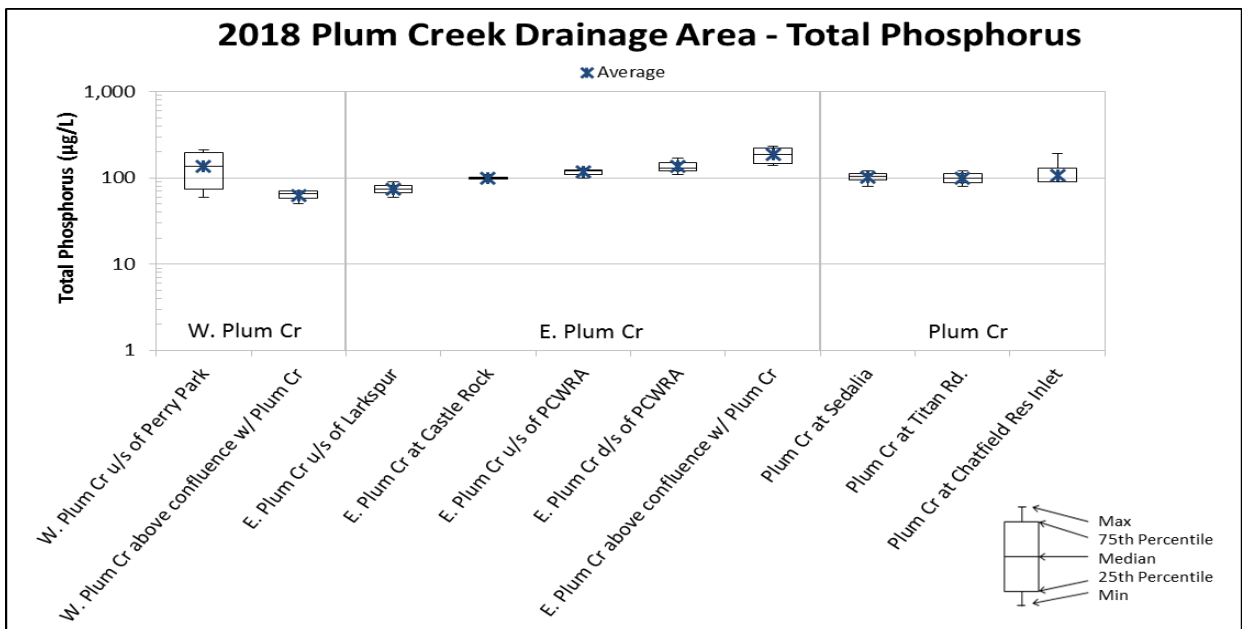


Figure 15. 2018 Total Phosphorus Variability in the Plum Creek Basin.



- Total Suspended Solids (TSS).** The average TSS concentration is an indicator of sediment and high precipitation events. The highest average TSS concentration observed in 2018 was at Site EPC-11.1 (East Plum Creek above the confluence with Plum Creek) at 73.6 mg/L. This was also the highest average TSS site in 2017 (201.4 mg/L) (Figure 16). Only one site increased in average TSS compared to 2017.

The average TSS at site EPC-33.6 (East Plum Creek Upstream of Larkspur) was 4.7 mg/L in 2018 compared to 1.4 mg/L in 2017. All of the other sites decreased significantly in average TSS concentrations in 2018 compared to 2017, potentially indicating less erosion and sediment loading to Plum Creek for 2018.

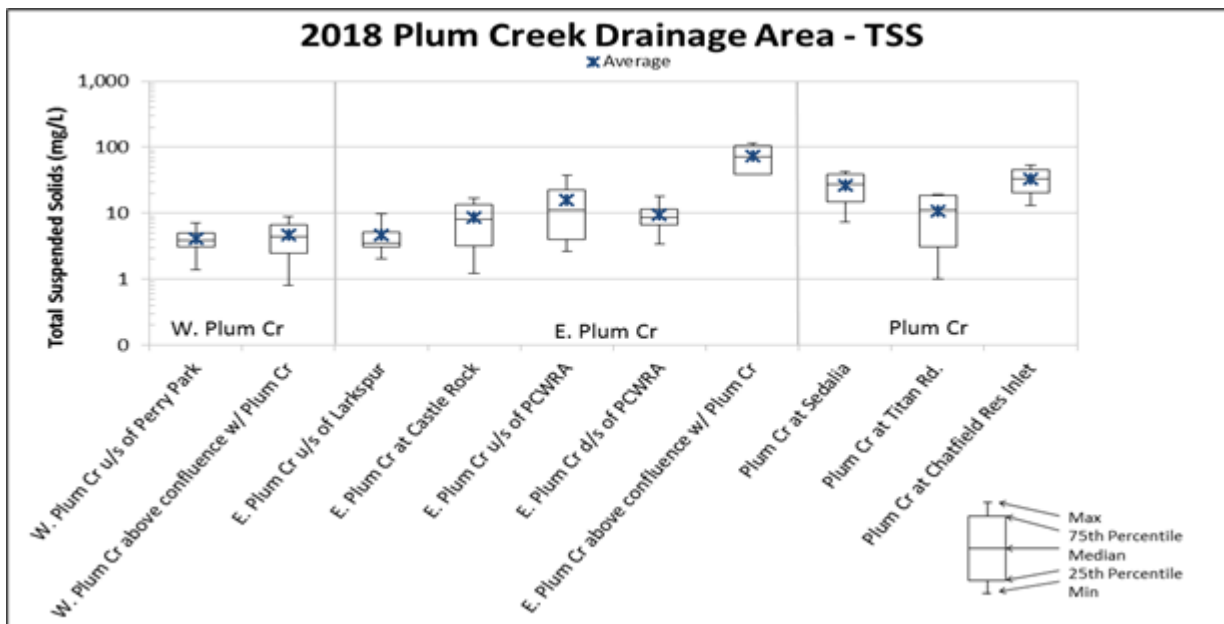


Figure 16. 2018 Total Suspended Solids (TSS) Variability in the Plum Creek Basin.



**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 has an increasing trend through the watershed. 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.

# CHATFIELD STORAGE REALLOCATION PROJECT

Overall construction of the Chatfield Storage Reallocation Project (CSRP) commenced in late 2017. Chatfield Reservoir Mitigation Company (CRMC) is working closely with its contractors to complete their portions of the CSRP by the end of 2019, with the goal to have all improvements completed and approved by U.S. Army Corps of Engineers (USACE) before spring of 2020. CRMC has also utilized construction oversight services from each of the main design consultants (Muller, HDR, and CH2M) to ensure that construction meets specifications.



*Downstream view of completed environmental mitigation work on Plum Creek looking toward Chatfield Reservoir.*

In November 2017, CRMC entered into a contract with Concrete Express, Inc. (CEI) to construct the Plum Creek Environmental Mitigation Project. CEI was tasked with constructing a new stream system, complete with the installation of a new main channel and secondary channels, plus several riffle-drop structures, guide banks and sloughs. A significant revegetation effort is associated with the project, which involved the installation of over 54,000 native potted plants, shrubs, and trees. CEI completed construction of the Plum Creek Environmental Mitigation Project in December of 2018.

In June of 2018, CRMC entered into a contract with CEI to construct the South Platte Environmental Mitigation Project, located upstream of Chatfield Reservoir. The project involved significant regrading and stabilization work along Upper Titan Lake to repair damage caused by the 2015 flood. The project also involves stream restoration along Willow Creek, plus regrading and stabilization work along the South Oxbow



*Aerial view of completed North Boat Ramp project.*

and Cigar Lake. The project also includes a significant revegetation effort, involving the installation of more than 34,000 native potted plants, shrubs, and trees. Work commenced in July of 2018 and is scheduled for completion in the summer of 2019.

The Season 1 activities (November 2017 – September 2018) included work on the North Boat Ramp, Massey Draw, Eagle Cove, Balloon Launch/Deer Creek, Swim

Beach, Jamison, Catfish Flats, and Fox Run day use areas, plus Deer Creek Crossing, and a portion of the Perimeter Road stretching from Fox Run north to Eagle Cove. The North Boat Ramp, Massey Draw, Eagle Cove, Deer Creek, Balloon Launch, and Jamison day use areas were completed in 2018, as well as the Perimeter Road from Fox Run north to Eagle Cove. Swim Beach, Catfish Flats, and Fox Run are on schedule to be completed by the Spring of 2019 and therefore have carried over into Season 2 work.

The Season 2 activities (September 2018 – August 2019) include the Swim Beach, Catfish Flats, Fox Run, Gravel Ponds, Kingfisher, Roxborough Cove and Plum Creek day use areas, the South Platte Bridge, Marina landside, Marina docks, Marina floating building, and the Perimeter Road, east and west of the South Platte Bridge. Additionally, Season 2 work includes Denver Water Pump Station relocation near the Fox Run day use area and the revegetation of Borrow Areas 3 and 5. The improvements summarized above are on schedule to be completed by the fall of 2019. The Sugar Creek (CR 67) environmental enhancements and roadway improvements were completed in fall 2018.



*Aerial view of Swim Beach and Jamison Day Use Area projects.*

## **WASTEWATER TREATMENT PLANTS**

Table 1 summarizes the wastewater treatment plants (WWTPs) in the Chatfield watershed and their respective TP wasteload allocations. In 2018, reported TP discharges from WWTPs were approximately 2,073.7 pounds or 27.5% of the allowable wasteload allocation of 7,533 pounds. Refer to Figure 17 for WWTP locations. Wastewater providers treat effluent to meet TP load allocations and a TP concentration

pursuant to Control Regulation No. 73. Their monitoring and reporting of effluent discharges demonstrates compliance with their individual permits and the state regulations. During 2017, the discharges maintained their record of compliance, with every discharger in the Chatfield Watershed complying with their TP concentration limits and TP wasteload allocation.

<b>Table 1 - 2018 Phosphorus Wasteload from WWTPs in the Chatfield Watershed</b>		
<b>ALLOCATION SOURCES</b>	<b>TP WASTELOAD ALLOCATION (POUNDS)</b>	<b>2018 TP LOADING FROM WWTFs (POUNDS)</b>
Plum Creek Water Reclamation Authority	4,256	1,876
Perry Park Water and Sanitation District:	365	108.3
Perry Park Water and Sanitation District: Sageport	73	46.5
Lockheed Martin Space Systems Company	1,005	30.0
Town of Larkspur	231	11.6
Highlands Ranch Law Enforcement Training Facility	30 <sup>1</sup>	No discharge <sup>4</sup>
Centennial Water and Sanitation District	20	0.0
Ponderosa Retreat Center	75 <sup>2</sup>	Lysimeter has insufficient flow for sampling <sup>5</sup>
Louviers Water and Sanitation District	122	No discharge <sup>6</sup>
Roxborough/Dominion Water and Sanitation	1,218	No discharge <sup>6</sup>
Sacred Heart Retreat	15 <sup>3</sup>	1.3
Jackson Creek Ranch	50	No reporting data available
Reserve Emergency Pool	73	Not Used
<b>TOTAL PHOSPHORUS WASTELOADS</b>	<b>7,533</b>	<b>2,073.7</b>

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 Roxborough Water and Sanitation District.
4. Wastewater is authorized under Regulation 84 / Reclaimed Water – a system that has reuse of water, with no discharges.
5. Source: Environmental Protection Agency Integrated Compliance Information System database through the third quarter (October 31, 2017).
6. No discharge of wastewater effluent reported in the Chatfield watershed.

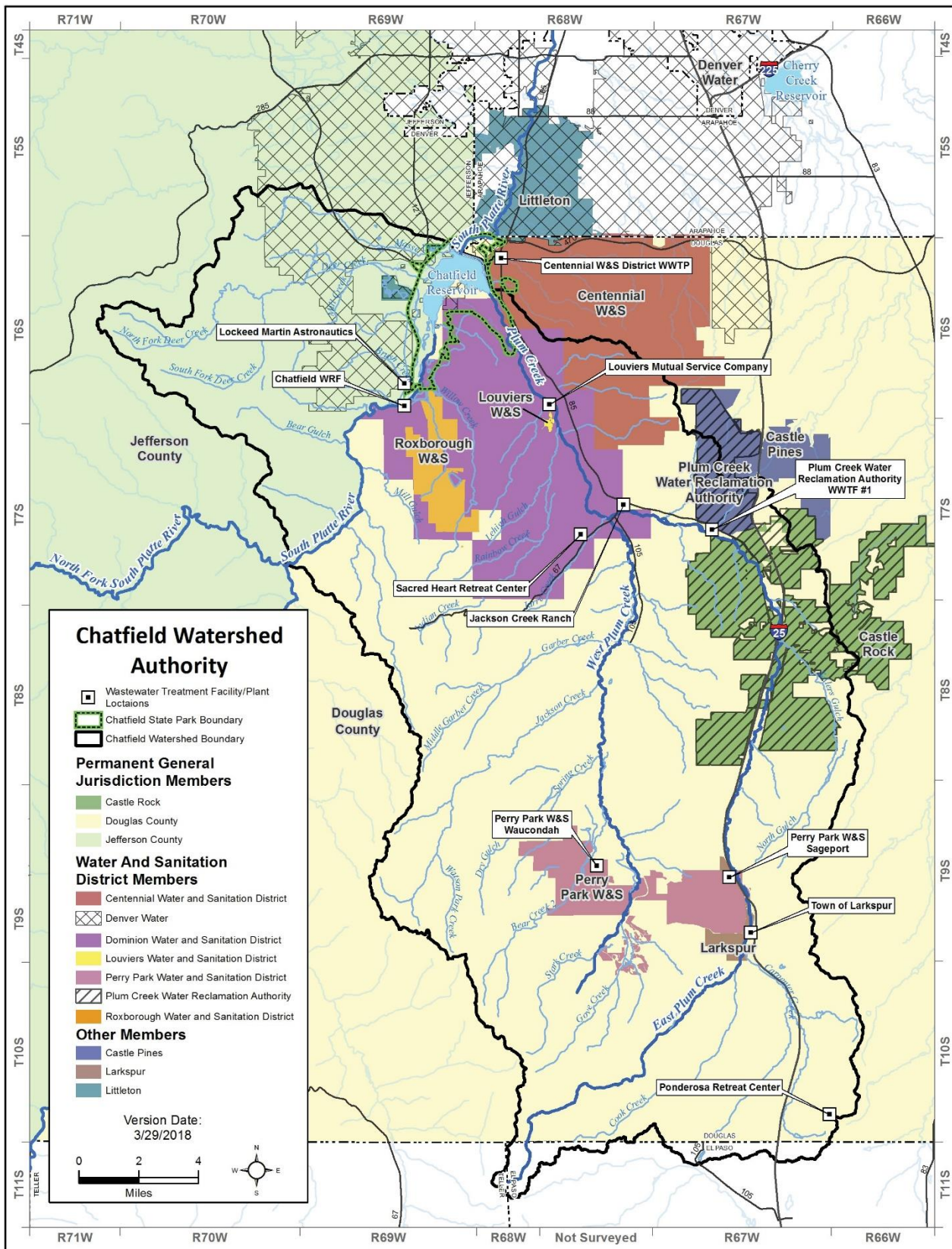


Figure 17. Chatfield Watershed Authority Wastewater Treatment Plants.

# SITE LOCATION APPLICATIONS AND LAND USE REFERRALS

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 manages land use referrals in conformance with the water quality and regulatory requirements.

**Site Location Applications.** 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.

In 2018, Authority reviewed the following projects for compliance with the Chatfield Reservoir Control Regulation No. 73:

- PCWRA WRF Capacity Expansion Project: Wastewater Utility Plan Update
- Plum Creek Lift Station
- Willow Creek Lift Station

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.

**The Chatfield Watershed Authority was formed by local governments and Title 32 districts, industry, corporations, and other entities within the Chatfield Watershed to implement point source, nonpoint source, and/or stormwater controls.**

**- Control Regulation No. 73.2.4**

**Land Use Referrals.** In 2018, the Authority reviewed 16 land use referrals from the Town of Castle Rock, Douglas County, and the Town of Larkspur for compliance with the Chatfield Reservoir Control Regulation No. 73. Table 2 summarizes the 2018 land use referrals.

The Authority took no exception to these projects, as long as each project complied with Control Regulation No. 73.

<b>TABLE 2 - REVIEWED LAND USE REFERRALS</b>					
<b>YEAR</b>	<b>TOTAL LAND USE REFERRALS REVIEWED</b>	<b>RESIDENTIAL</b>	<b>ROAD/UTILITY</b>	<b>INDUSTRIAL</b>	<b>OTHER<sup>1</sup></b>
2018	16	5	2	0	9

Notes:

1. Other includes Parks, Recreation Centers, Charter Schools, Regulation Changes



# 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, but 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 2018 MS4 permit inspection and enforcement metrics are provided in Table 3

TABLE 3-SUMMARY OF 2018 MS4 PERMIT ACTIVITIES							
LAND USE AGENCY	PERMIT NUMBER	PERMIT INSPECTION ACTIONS			PERMIT ENFORCEMENT ACTIONS		
		ILICIT DISCHARGES	CONSTRUCTION	POST-CONSTRUCTION	ILICIT DISCHARGES	CONSTRUCTION	POST-CONSTRUCTION
Douglas County	COR080003	8	16,192	65	0	65	19
Jefferson County	COR090024	29	4425	72	28	40	0
Town of Castle Rock	COR080012	15	5,002	295	12	1455	0
City of Littleton	COR090055	23	143	121	20	66	28

Notes: Castle Pines Metropolitan District inspection and enforcement action data incorporated in Douglas County reporting; City of Castle Pines MS4 boundary predominately in the Cherry Creek Basin; only a very small portion is located in the Chatfield Watershed. Town of Castle Rock inspected and enforcement action data includes data from the Cherry Creek Basin. 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).



# NONPOINT SOURCE CONTROL PROJECTS



*Grouted boulder drop structure.*

## **6400 South Tributary Drainage Improvements**

This project was undertaken to construct Stormwater Master Plan improvements to stabilize the 6400 South Tributary drainageway, which flows through Town-owned open space north of Red Hawk Ridge Golf Course. The improvements included a grouted boulder drop structure, concrete cutoff wall, riprap, and grading within the drainageway channel. This work was funded by the Town of Castle Rock Stormwater Management Program and is necessary to protect the drainageway and underground utilities from erosion, and to preserve the natural resource. In February 2018, a construction contract in the amount of \$162,665 was awarded to RMC Consultants

to perform the work. A Notice to Proceed was issued on March 26th, and the project was substantially completed by April 20, 2018, on time and under budget at a final cost of \$156,445.



*Before: Stormwater runoff channel.*

## **Douglas Lane Tributary Stabilization**

Douglas Lane Tributary is located between the Union Pacific Railroad and Plum Creek Boulevard, near Fire Station 152. The primary objectives of this project were to manage stormwater runoff, minimize flood hazards and improve water quality along Douglas Lane Tributary, and provide stream stabilization improvements consistent with the Stormwater Master Plan.

Channel improvements generally included six grade control structures, with fill and riprap lining along the degraded low flow, to restore the historic channel invert, reduce erosion and protect existing foliage along the drainageway. Due to aggressive stream degradation, several trees have been lost in recent years due to undercutting and erosion in the channel. Although it was impossible to save all existing trees during construction, 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 help restore essential root support along the drip line of existing trees to maintain ecological health along the corridor.



*After: Control structures with riprap lining.*

The project also included improvements to the existing Heckendorf Regional Detention Pond, which was frequently silted in due to channel instabilities, to ensure adequate storage volume during storm events. Storm flows are now being diverted into the northeast corner of the pond, while base flows are continuing along the original channel alignment. This diversion allowed for a new forebay to be constructed further away from the existing outfall.

Along with the construction of trickle channels, a micropool with defined boulder edge and replacement of the outlet structure orifice plate and trash rack, the improvements are expected to improve the overall function of the pond and help ensure the outlet structure remains unobstructed to comply with stormwater release requirements.

Lawrence Construction Company was awarded the construction contract, which began in March and was substantially completed in August. The total construction cost for the project was approximately \$800,000.



*Before: 3-24" Culverts completely filled in with sediment following a June 2015 storm event.*

### **Hangmans Gulch Channel Improvements, Phase III**

This project is located along the Hangmans Gulch Trail, between I-25 and the confluence with East Plum Creek (EPC). The primary objective of this project was to address sediment deposits and scour along the trail system due to the incomplete infrastructure.

In accordance with the Stormwater Master Plan, Phase I and II Hangmans Gulch Channel Improvements were completed in 2011 and 2012 at the time the Hangmans Gulch Trail was constructed. Due to budget limitations, the first phases of improvements were understood to only partially stabilize the drainageway and that future improvements would be required as budget became available. Phase III drainageway improvements generally included additional grade control structures

to further stabilize the channel downstream of I-25, and reduce erosion and sedimentation along the Hangmans Gulch and East Plum Creek (EPC) Trails.

Soils along the channel bottom and banks of Hangmans Gulch are highly erosive, and regular channel maintenance has been necessary since completion of the trail in 2012 to protect the safety of trail users. In addition to grade control, Phase III improvements also included construction of a larger culvert under the EPC trail and modifications at the Union Pacific Railroad crossing to minimize flooding impacts, reduce trail closures and prolong the time period between required maintenance efforts.



*After: 10'x6' Box culvert at the East Plum Creek Trail.*

Hudick Excavating, Inc., dba HEI Civil, was awarded the construction contract. Construction began in June and was substantially completed in September 2018. The total construction cost for the project was approximately \$615,000.

# EDUCATION AND OUTREACH



Jefferson County regularly reports to the Chatfield Watershed Authority on stormwater management. The county has a municipal separate storm sewer (MS4) permit management program that includes:

- Public Education and Outreach through Stewardship Programs
- Public Participation and Involvement in Water Quality Improvement
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post Construction Site Runoff Control
- Pollution Prevention/ Good Housekeeping



Jefferson County participated in a number of public events to reach diverse audiences for their MS4 and floodplain management programs. As part of their MS4 permit, the county maintains an erosion and sediment control program, including publishing a small-site erosion control manual that explains the basic principles of erosion control and illustrates techniques to control sediment from small development sites. Finally, Jefferson County has an inspection program for illicit discharges, construction activities, and includes post- construction inspections.

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

## Douglas County



The Authority helped to sponsor the Town of Castle Rock's annual "Spring Up the Creek", a public outreach community event to preserve waterways by removing trash that collects along the stream banks. The 2018 theme was "Think About Your Drink" and 208 volunteers collected and filled 166 bags of trash and various pieces of debris, including several bike tires, a decades old bike frame, a large tire, pallets, sport balls, and a couple of animal skulls were removed from East Plum Creek and its tributaries. Sponsor donations included funding for breakfast, gloves and trash bags for the clean-up, kids' activities and commemorative t-shirts to volunteers free of charge.

## Town of Castle Rock

# ONGOING ACTIVITIES

## 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. In 2018, 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, including Plum Creek
- Continued implementation of the Chatfield Watershed Plan
- Continued collaboration with Chatfield Reservoir Mitigation Company (CRMC) regarding data collection to support CRMC reservoir modeling efforts
- Revised and updated Authority policies
- Continued Public Outreach Committee activities



# CHATFIELD WATERSHED PLAN

The Authority adopted the Watershed Plan in 2015. While data collection and modeling are a priority in understanding water quality processes in the reservoir and watershed and developing the new TMAL, there is still a need to holistically address nonpoint source water quality issues in Chatfield Reservoir and its watershed to protect water quality now and in the future.

The Watershed Plan prioritizes the additional monitoring, data collection, studies, and projects, contingent on funding, to address water quality concerns. It also provides a starting place to define water quality issues, and to solve potential nonpoint problems with the goal of promoting water quality for high-value water uses, drinking water supplies, recreation, aquatic life, and agriculture.

As part of the Watershed Plan, in 2016 the Chatfield watershed model was completed, with some additional data collection and modeling needs identified. The model utilized topography, land use, meteorological data, soils, hydrology, diversions and return flows, water quality data, and atmospheric deposition data inputs. The purpose of the watershed model was to determine phosphorus loading in the Chatfield watershed and have a tool to predict pollutant loads and source identification.



## PROACTIVE MEASURES

Proactive measures are required to protect Chatfield Reservoir for its long-term designated uses. High-quality surface water is essential to sustain growth and development in the watershed.



## NONPOINT SOURCES

Nonpoint sources potentially impact water quality; consequences may include degraded streambank erosion, runoff over agricultural lands, seepage from unmaintained septic systems located in the floodplain, and wildfire burn areas.



# CHATFIELD WATERSHED AUTHORITY

[www.chatfieldwatershedauthority.org](http://www.chatfieldwatershedauthority.org)

## Member Entities

Douglas County  
Jefferson County  
Town of Castle Rock

## Water and Sanitation Members

Centennial Water & Sanitation District  
Dominion Water & Sanitation District  
Louviers Water & Sanitation District  
Perry Park Water & Sanitation District  
Roxborough Water & Sanitation District  
Plum Creek Water Reclamation Authority

## Other Members

Castle Pines Metropolitan District  
Denver Water  
Town of Larkspur  
City of Littleton

## Ex-Officio Participants

Colorado Agricultural Leadership Foundation  
Colorado Parks and Wildlife Commission  
Colorado Department of Transportation  
Colorado Water Conservation Board  
Ken Caryl Ranch Master Association  
Highlands Ranch Law Enforcement Training Facility  
Ponderosa Retreat  
Sacred Heart Retreat  
Tri-County Health Department  
U.S. Army Corps of Engineers  
Chatfield Reservoir Mitigation Company, Inc.  
Water Quality Control Division  
Highlands Ranch  
ERO Resources  
Hydros Consulting

## Management

Leonard Rice Engineers, Inc.

## Website

Hughes and Stuart Sustainable Marketing

## Financials

TWS Financial, Inc.

## Photographs

U.S. Army Corps of Engineers, Omaha District  
Tri-Lakes Project Office  
Leonard Rice Engineers, Inc.  
The Town of Castle Rock  
Douglas County

