

# CHATFIELD WATERSHED AUTHORITY



2021 ANNUAL REPORT

WATER QUALITY CONTROL COMMISSION

SEPTEMBER 2022



# CHATFIELD WATERSHED AUTHORITY

Voluntary organization with self-imposed dues whose mission is to promote protection of water quality in the Chatfield Watershed for recreation, fisheries, drinking water supplies, and other beneficial uses through the promotion of point source and nonpoint source stormwater controls and monitoring.



# CWA MEMBERSHIP

## Permanent General Jurisdiction Members

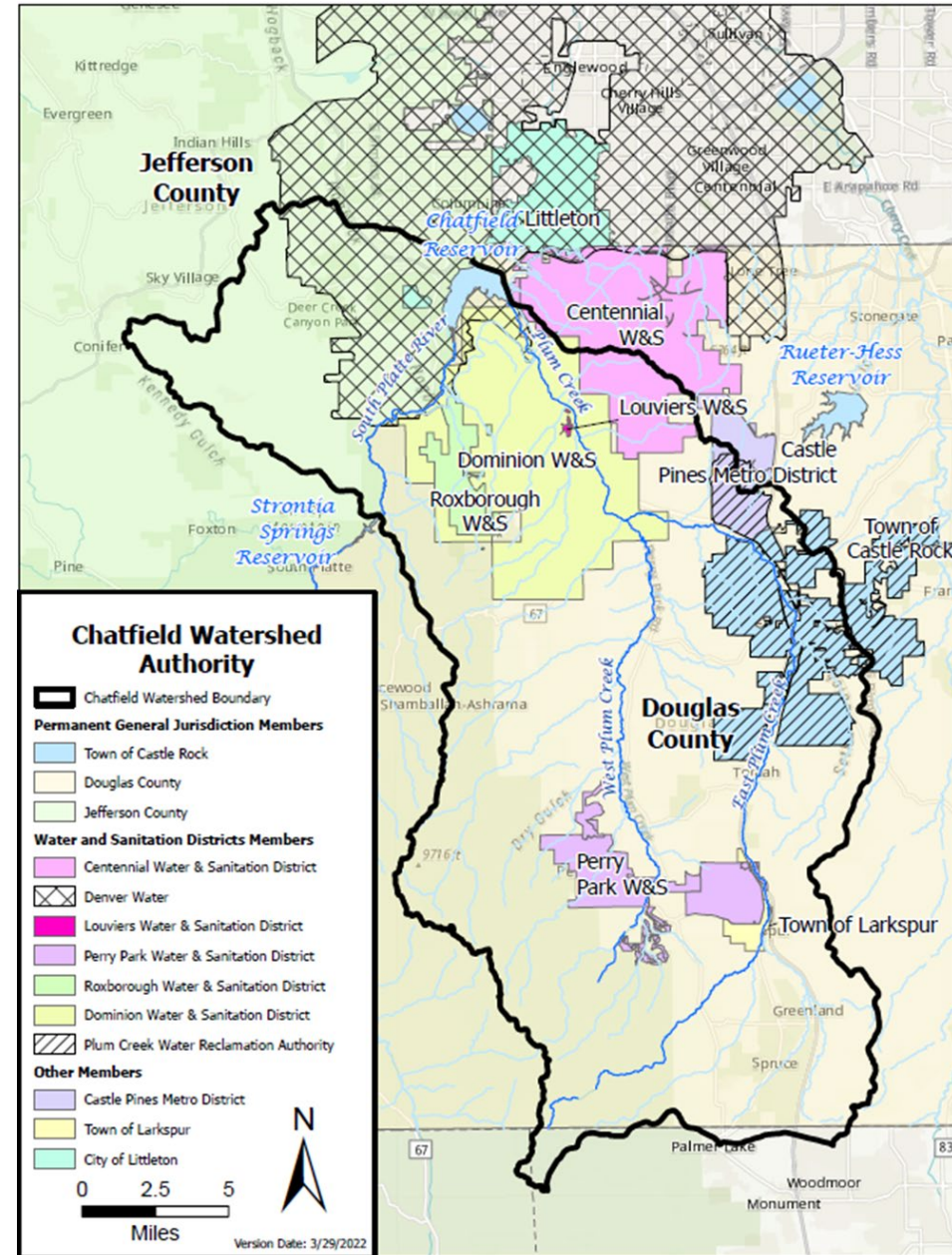
- / Douglas County
- / Jefferson County
- / Town of Castle Rock

## Water and Sanitation Members

- / Centennial Water and Sanitation District
- / Denver Water
- / Dominion Water and Sanitation District
- / Louviers Water and Sanitation District
- / Perry Park Water and Sanitation District
- / Plum Creek Water Reclamation Authority
- / Roxborough Water and Sanitation District

## Other Members

- / Castle Pines Metropolitan District
- / Town of Larkspur
- / City of Littleton



# 2021 RESERVOIR REGULATORY COMPLIANCE SUMMARY



In compliance with Regulation 38 for chlorophyll  $\alpha$



In compliance with Regulation 38 phosphorus standard

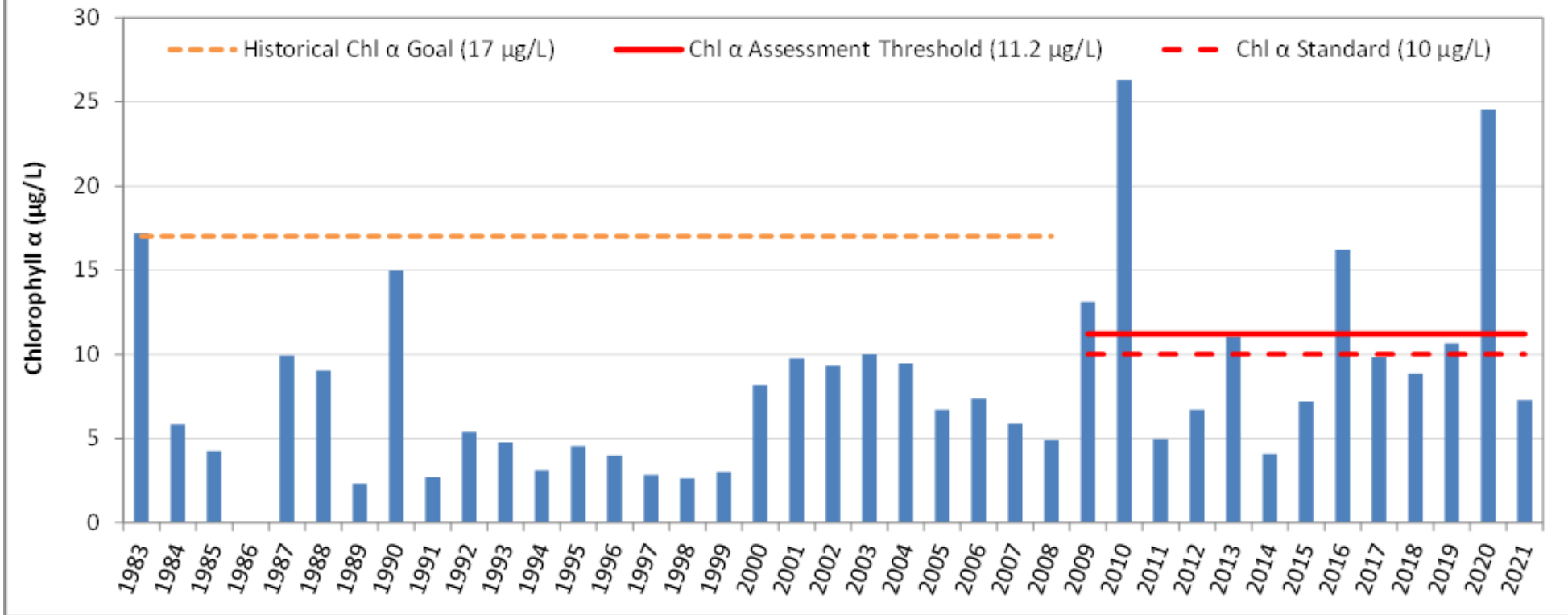


One point source exceeded its wasteload allocation in Regulation 73



# CHLOROPHYLL $\alpha$

## Historic Chlorophyll $\alpha$ Growing Season Average Concentrations (1983-2021)



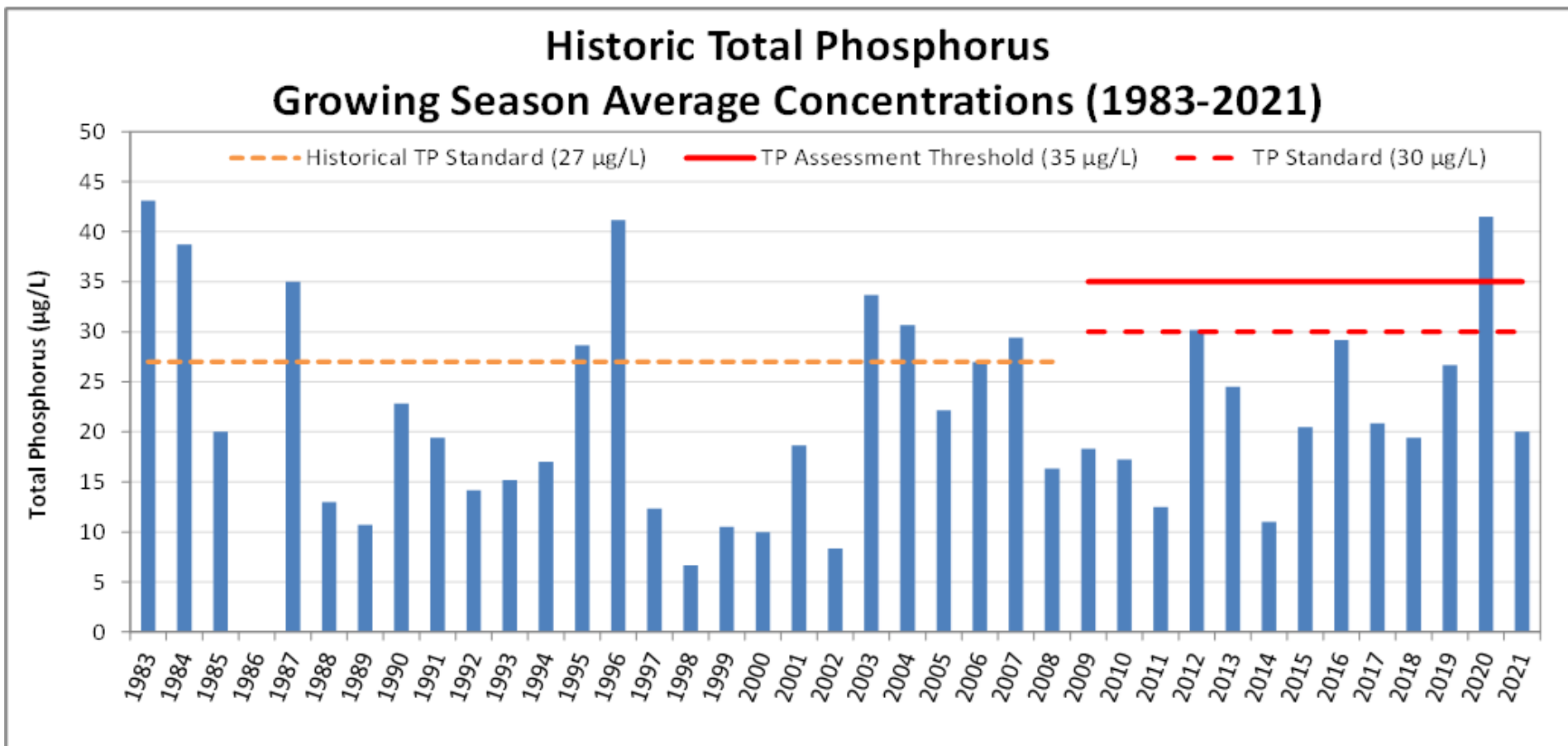
Attainment Assessment Threshold: 11.2  $\mu\text{g/L}$  (Jul. – Sep.)

1 in 5 years allowable exceedance frequency

**2021 Summer Average = 7.3  $\mu\text{g/L}$**



# TOTAL PHOSPHORUS



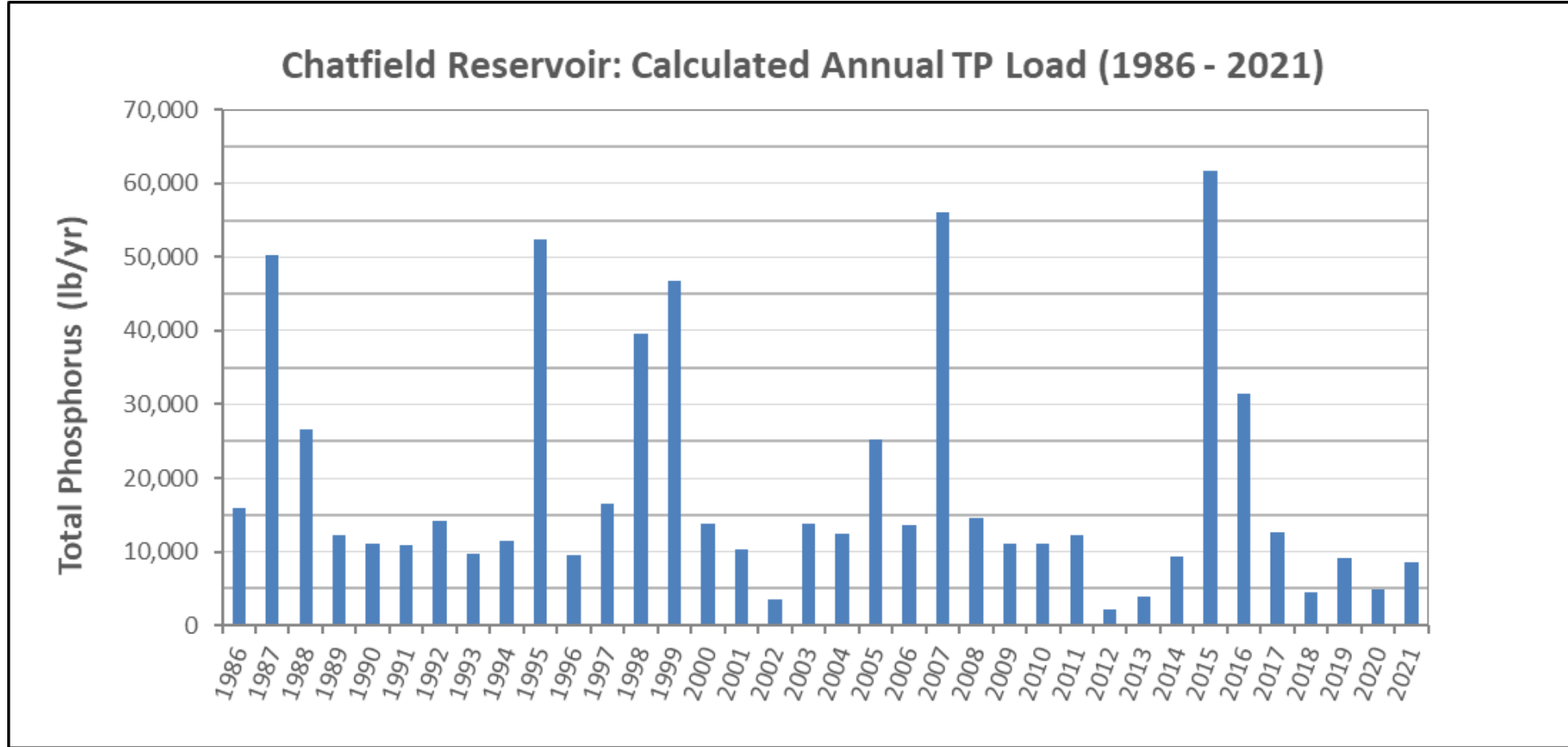
Attainment Assessment Threshold: 35 µg/L (Jul. – Sep.)

1 in 5 years allowable exceedance frequency

**2021 Summer Average = 20 µg/L**



# TOTAL PHOSPHORUS LOADING



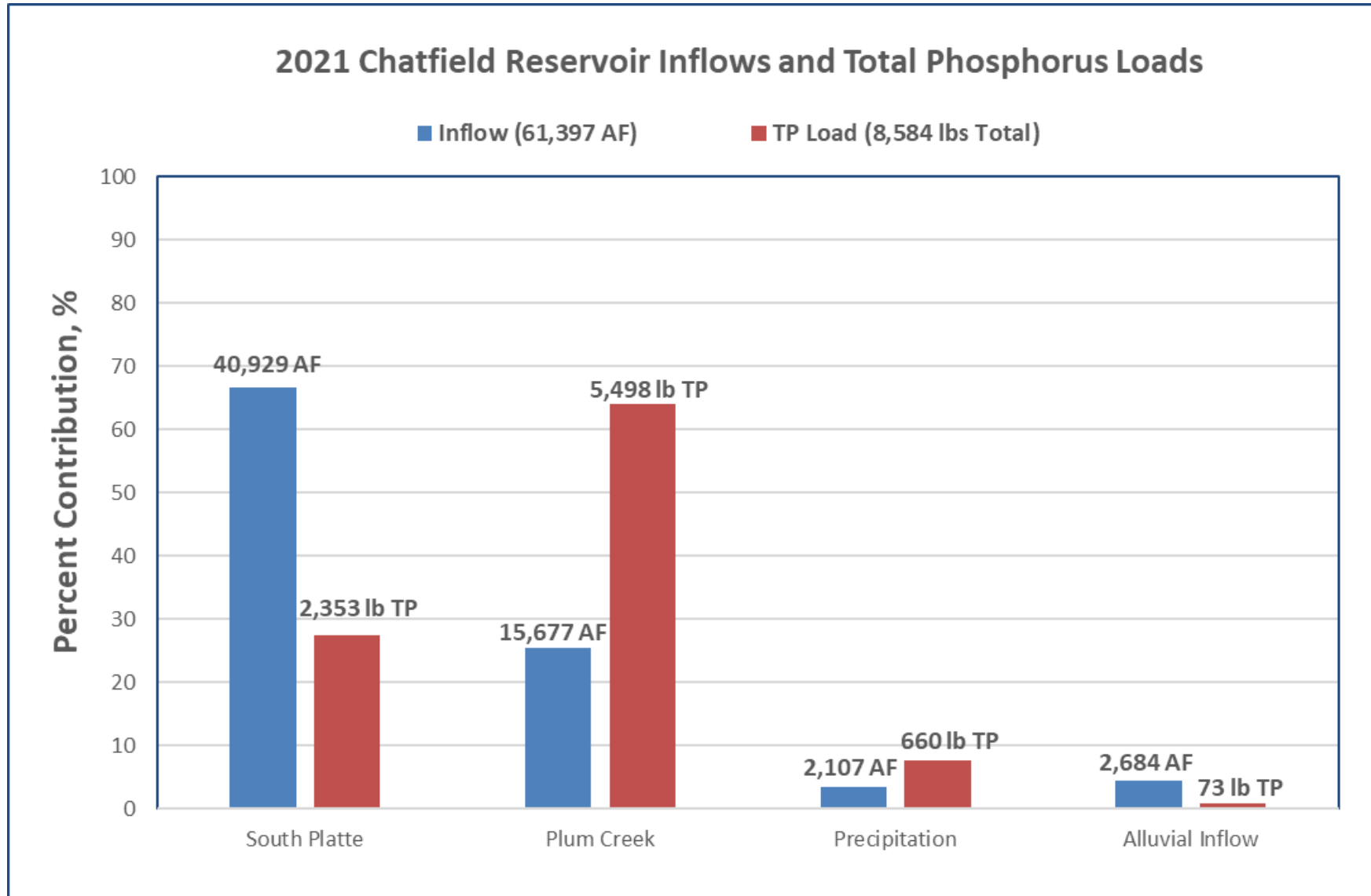
/ TMAP = 19,600 pounds at an inflow of 100,860 acre-feet

**2021 Annual Load to Reservoir**

**8,584 pounds at an inflow of 61,397 acre-feet**



# TOTAL PHOSPHORUS LOADING





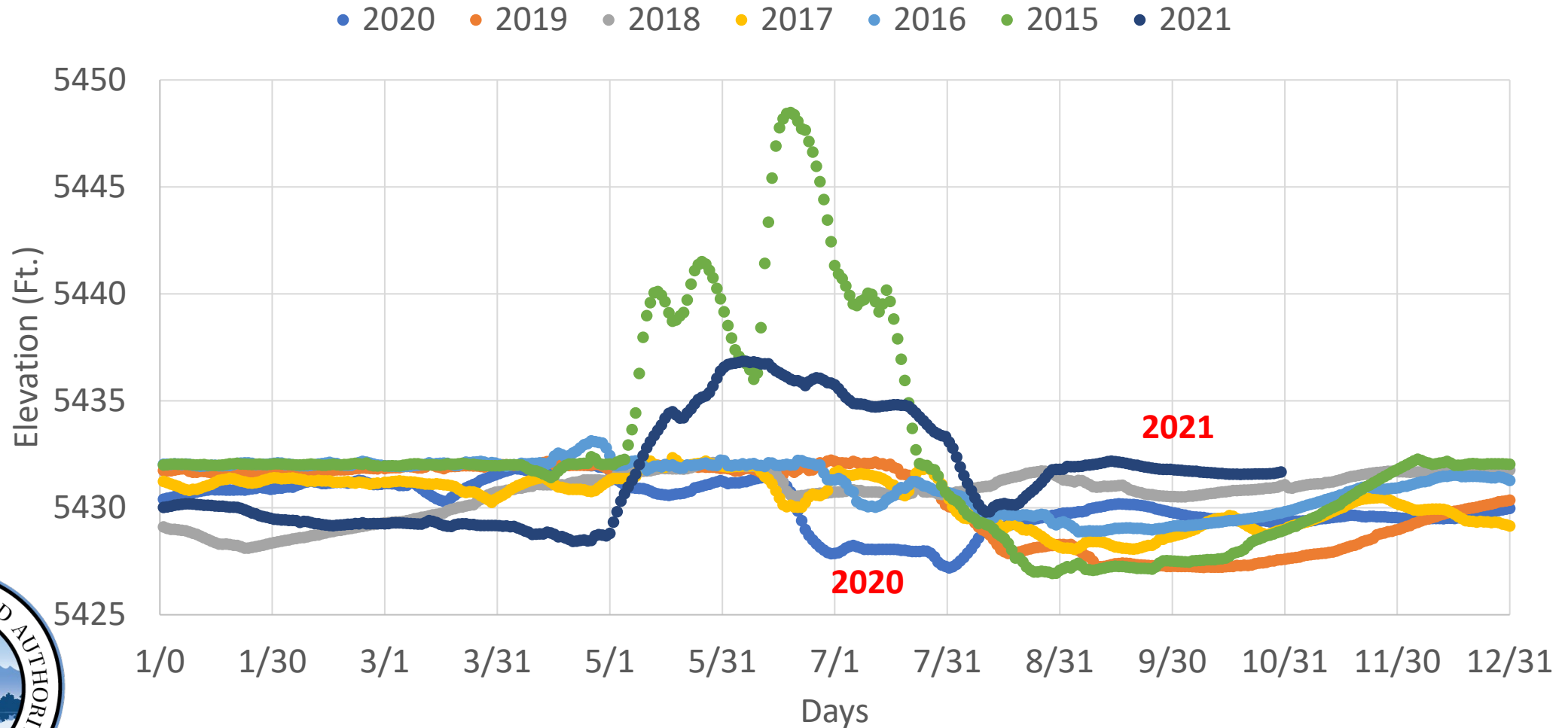
# WHY DID EXCEEDANCE OF THE CHLOROPHYLL $\alpha$ STANDARD OCCUR IN 2020 BUT NOT IN 2021?



- Very hot and dry summer? **BOTH YEARS**
- Changes in activities at the reservoir? **NO**
- Significant decreases in total phosphorus reaching the reservoir? **NO. 72% INCREASE IN TOTAL PHOSPHORUS LOADS FROM 2020 to 2021**
- Significant increases in flow reaching the reservoir? **29% INCREASE IN FLOW FROM 2020 TO 2021**
- Changes in reservoir storage levels? **2021 HAD SOME REALLOCATION STORAGE**
- Expected based upon past history? **UNRELIABLE**
- Will this replicate itself under similar conditions? **DON'T KNOW**
- Other? **NEED MORE INFORMATION / ANALYSIS**

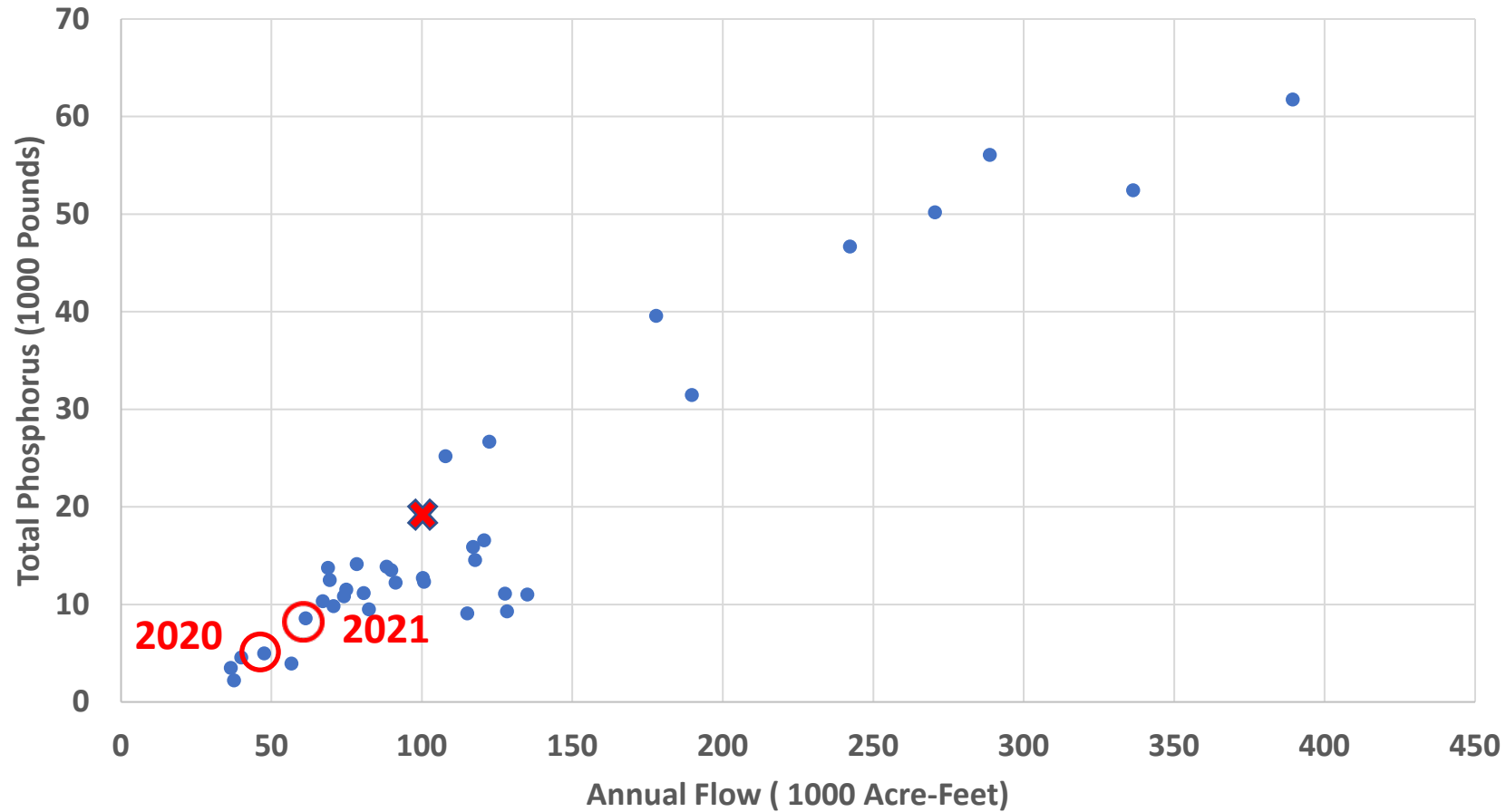


# CHATFIELD RESERVOIR STORAGE ELEVATION (2016-2021)



# FLOW vs TOTAL PHOSPHORUS

Annual (1986-2021)

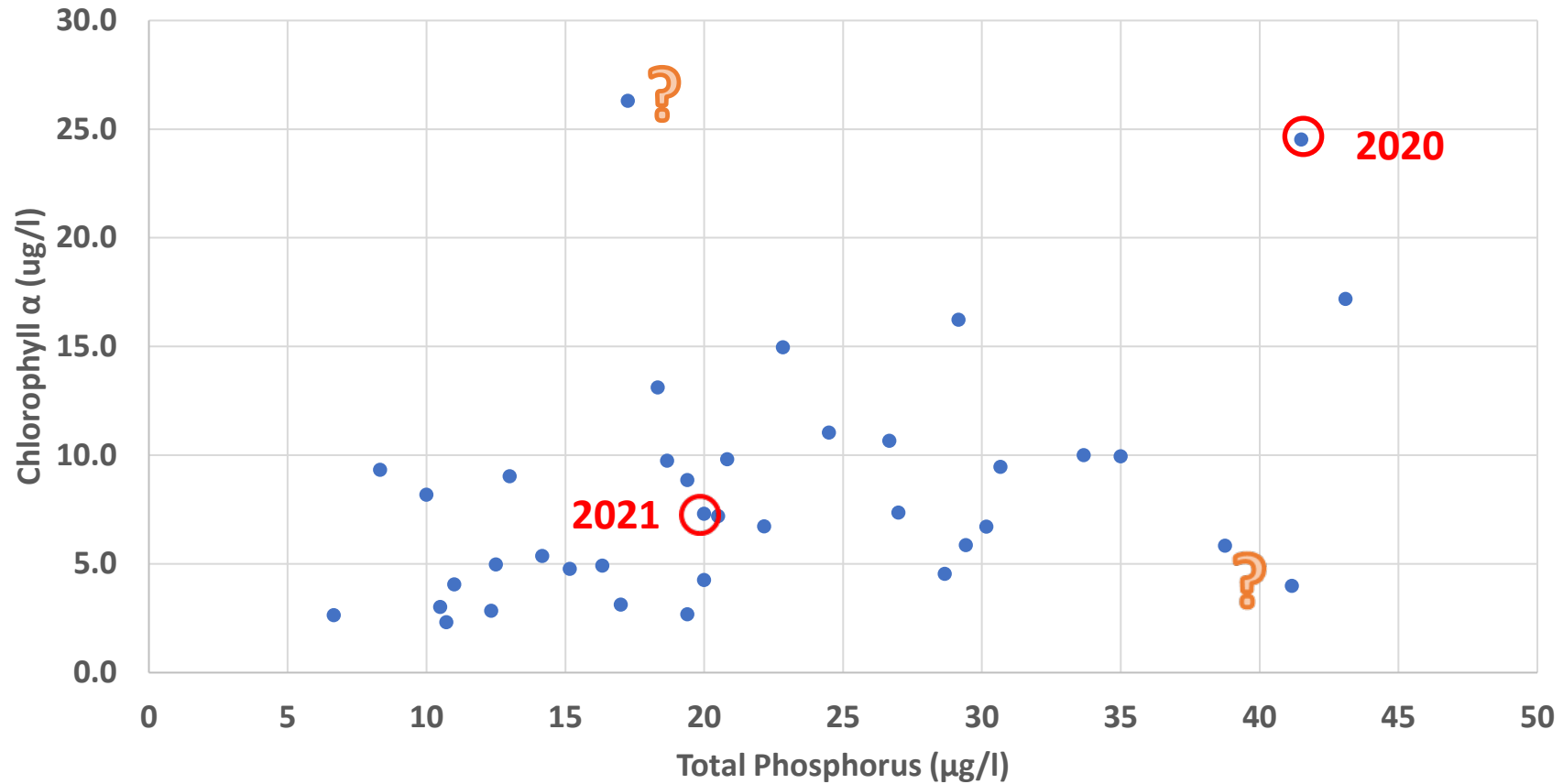


✘ TMAP = 19,600 pounds at an inflow of 100,860 acre-feet



# TOTAL PHOSPHORUS (Concentration) vs CHLOROPHYLL $\alpha$

Growing Season (1986-2021)

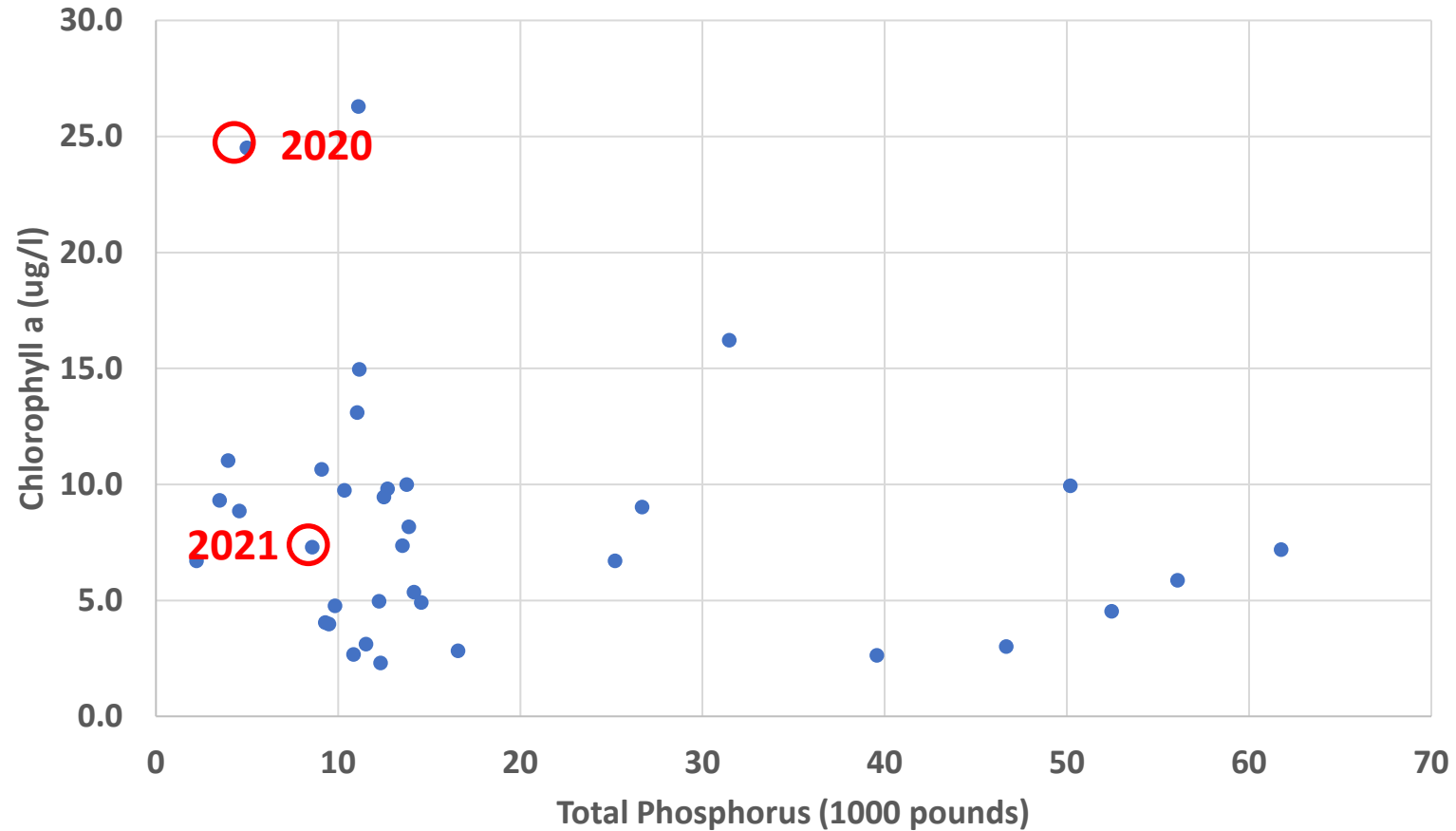


**No Reliable Correlation**



# TOTAL ANNUAL PHOSPHORUS (Load) vs GROWING SEASON CHLOROPHYLL $\alpha$

Growing Season (1986-2021)

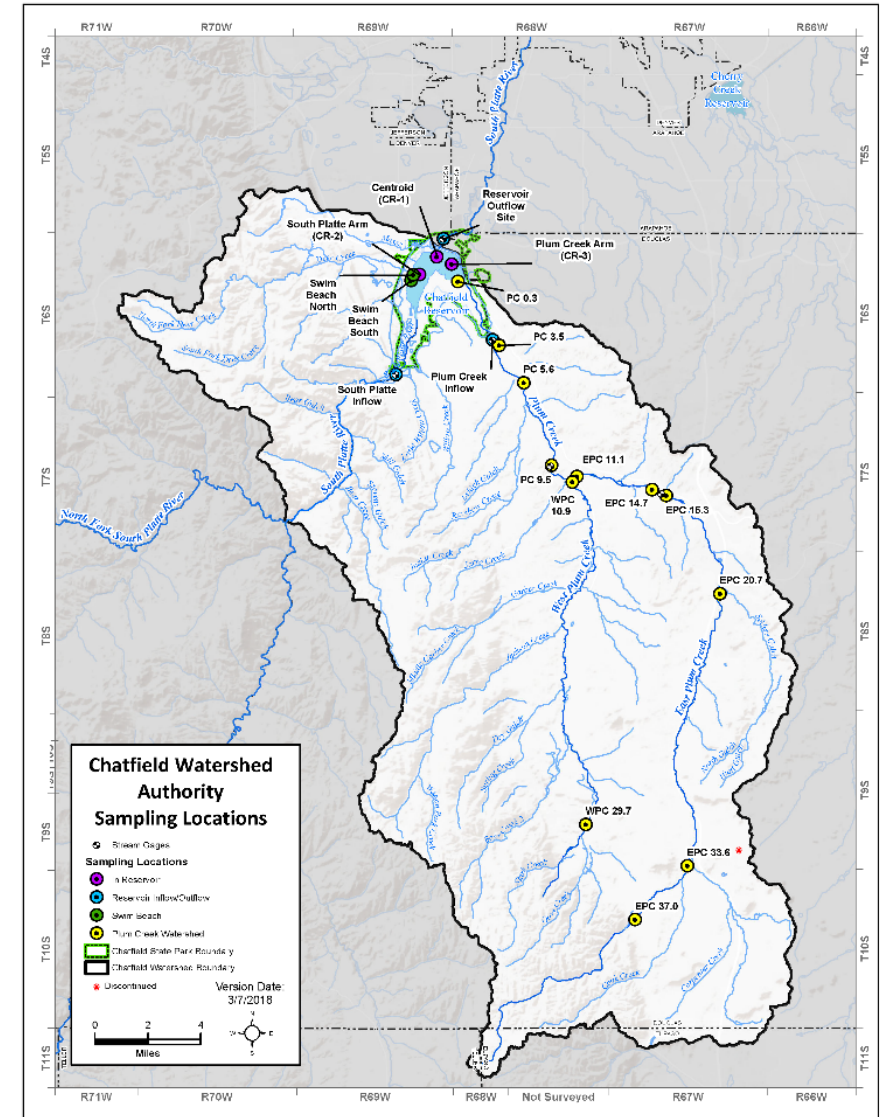


**No Reliable Correlation**



# RESERVOIR AND WATERSHED MONITORING PROGRAM

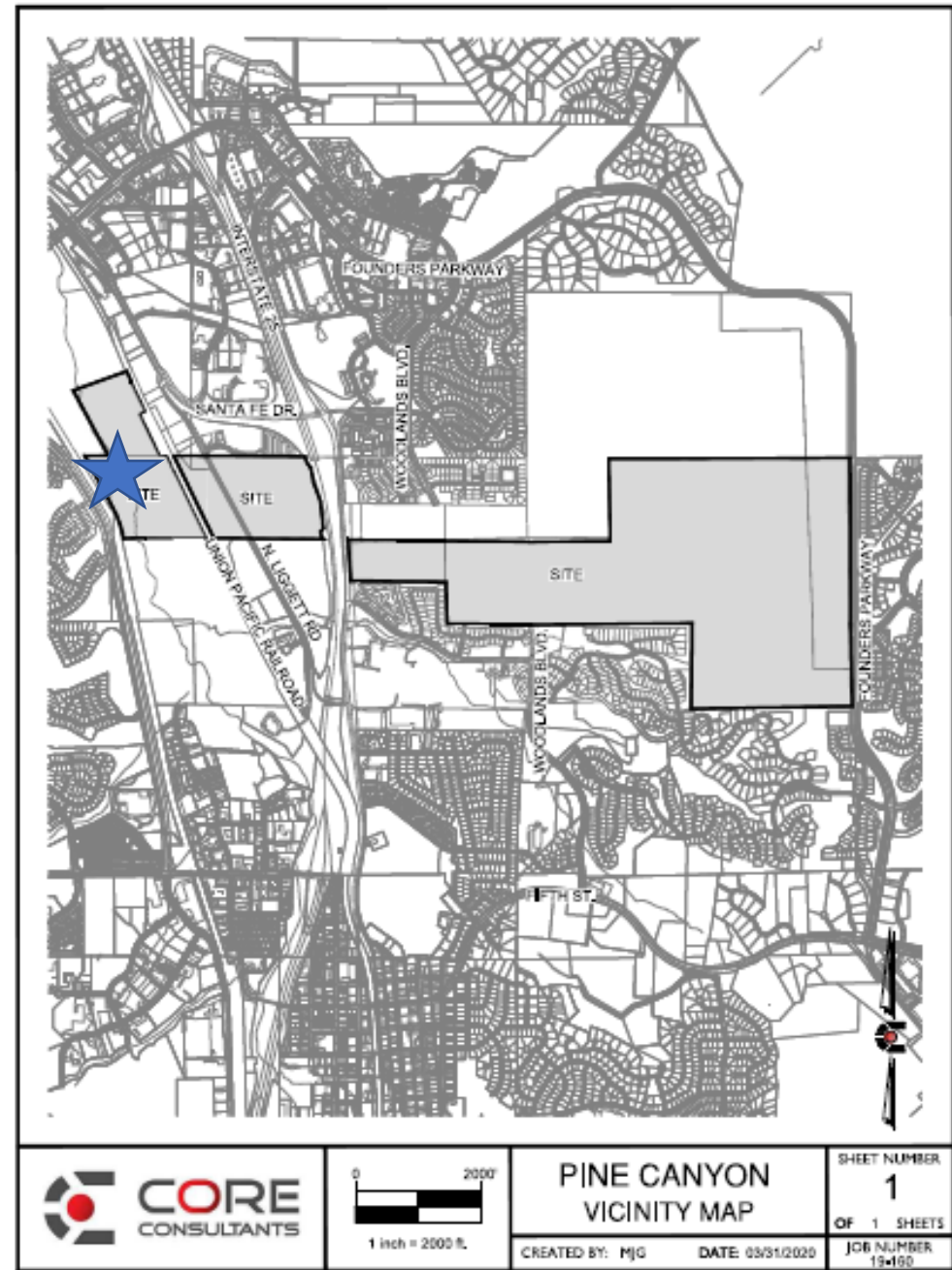
- The Authority has been monitoring water quality for over 35 years.
  - ✓ Monthly Monitoring at two Reservoir inflow locations, three locations in the Reservoir, and the Reservoir outflow
  - ✓ During the growing season (July through September), Reservoir sampling is conducted twice monthly.
  - ✓ Monthly Monitoring at 10 Watershed Locations



# SITE AND PHOSPHORUS TRADE APPLICATIONS

Pine Canyon Site Application and Phosphorus Trade Application (Initial application submitted in 2020)

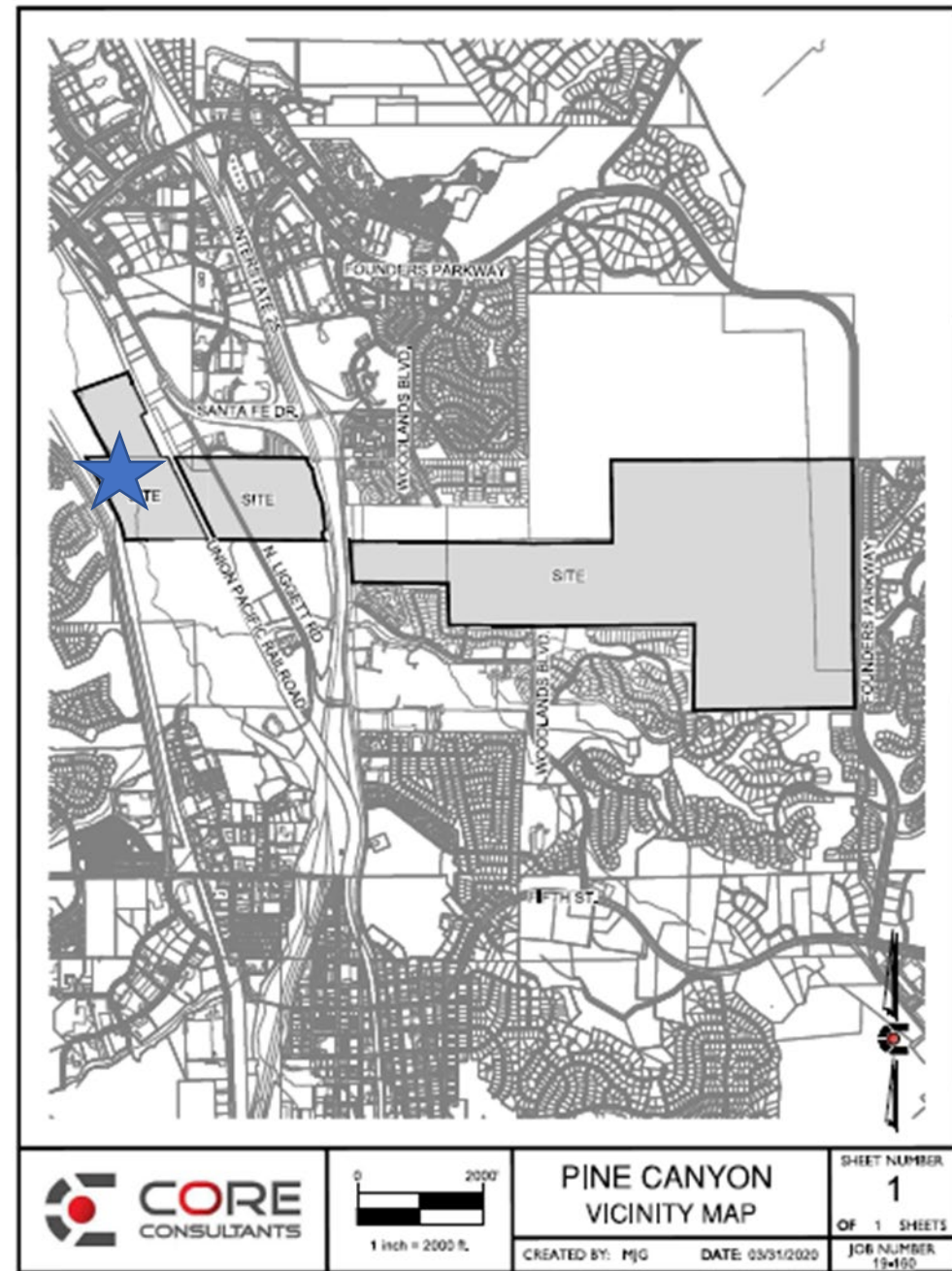
- / Located in the Middle of Castle Rock
- / Site Application for WWTF (0.405 mgd design capacity)
- / Initial Phosphorus Non-Point Source to Point Source Trade Application (1528 lbs/yr on-site cattle operations elimination to 763 lbs/yr WWTF discharging to East Plum Creek)



# SITE AND PHOSPHORUS TRADE APPLICATIONS

## Pine Canyon Site Application and Phosphorus Trade Application

- / In October 2020, the Division issued a Request for Information (RFI) asking the applicant to address the phosphorus allocation with respect to the MS4 requirements.
- / In December 2020, after CWA review, applicant revised their proposed nonpoint source phosphorus credit to 380.5 lbs./yr. based upon a calculated 761 lbs./yr. of phosphorus reaching East Plum Creek from the JRW property.

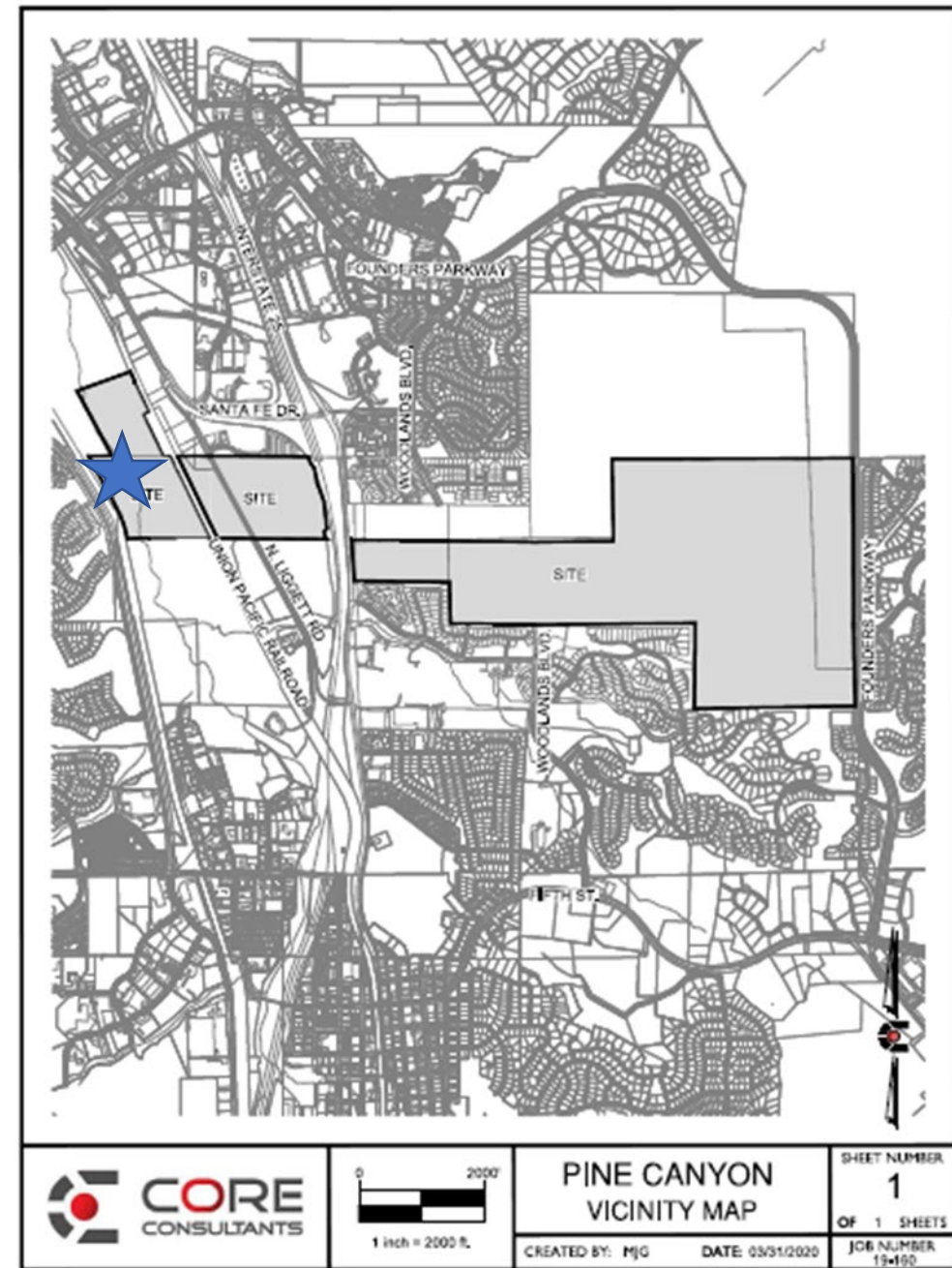




# SITE AND PHOSPHORUS TRADE APPLICATIONS

## Pine Canyon Site Application and Phosphorus Trade Application

- 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”.
- On January 28, 2021, the Division put their review of the Site Application on hold until the phosphorus allocation issue was resolved.



PINE CANYON  
VICINITY MAP

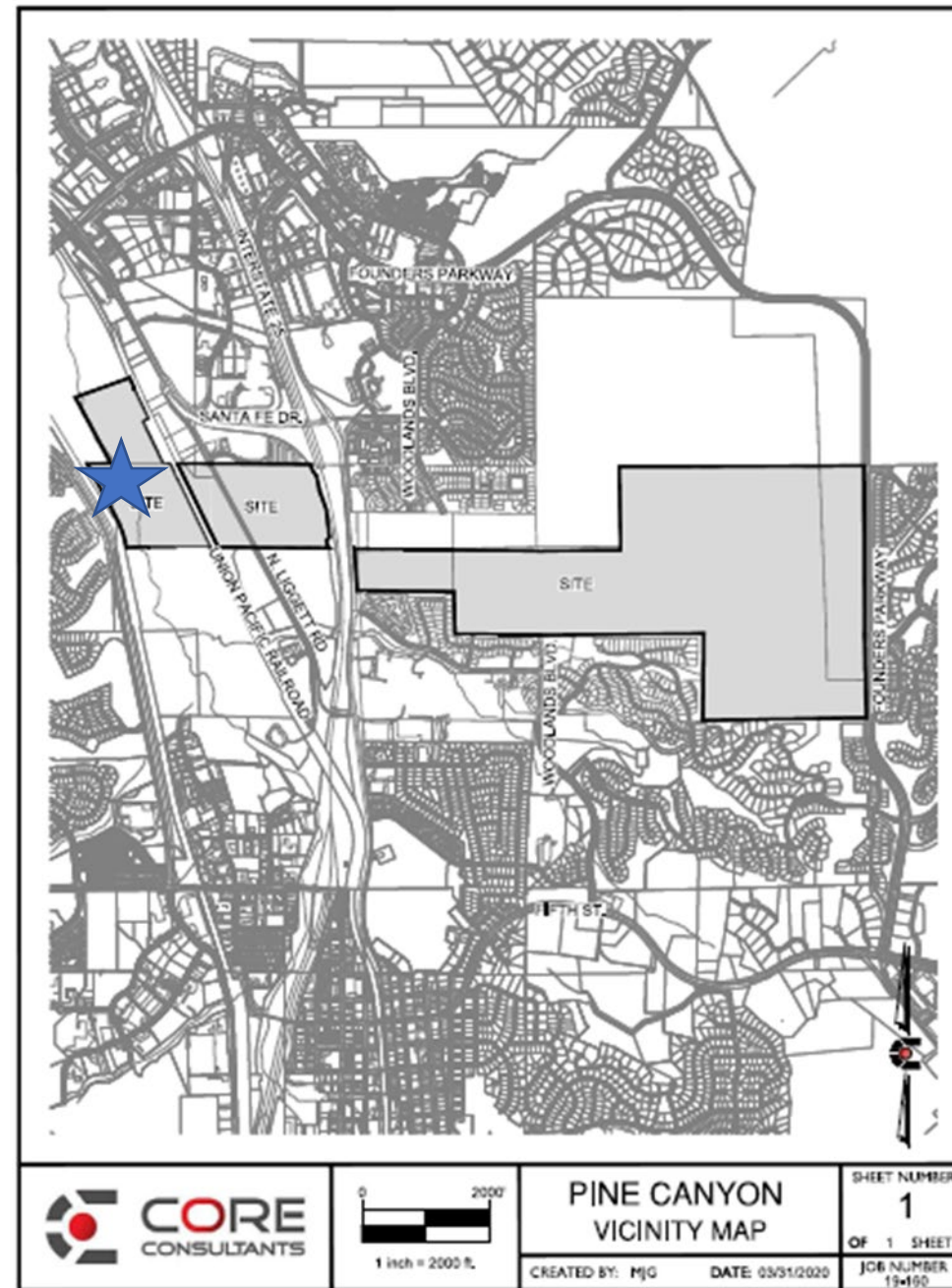
CREATED BY: MJC DATE: 05/31/2020

SHEET NUMBER  
1  
OF 1 SHEETS  
JOB NUMBER  
19-100

# SITE AND PHOSPHORUS TRADE APPLICATIONS

## Pine Canyon Site Application and Phosphorus Trade Application

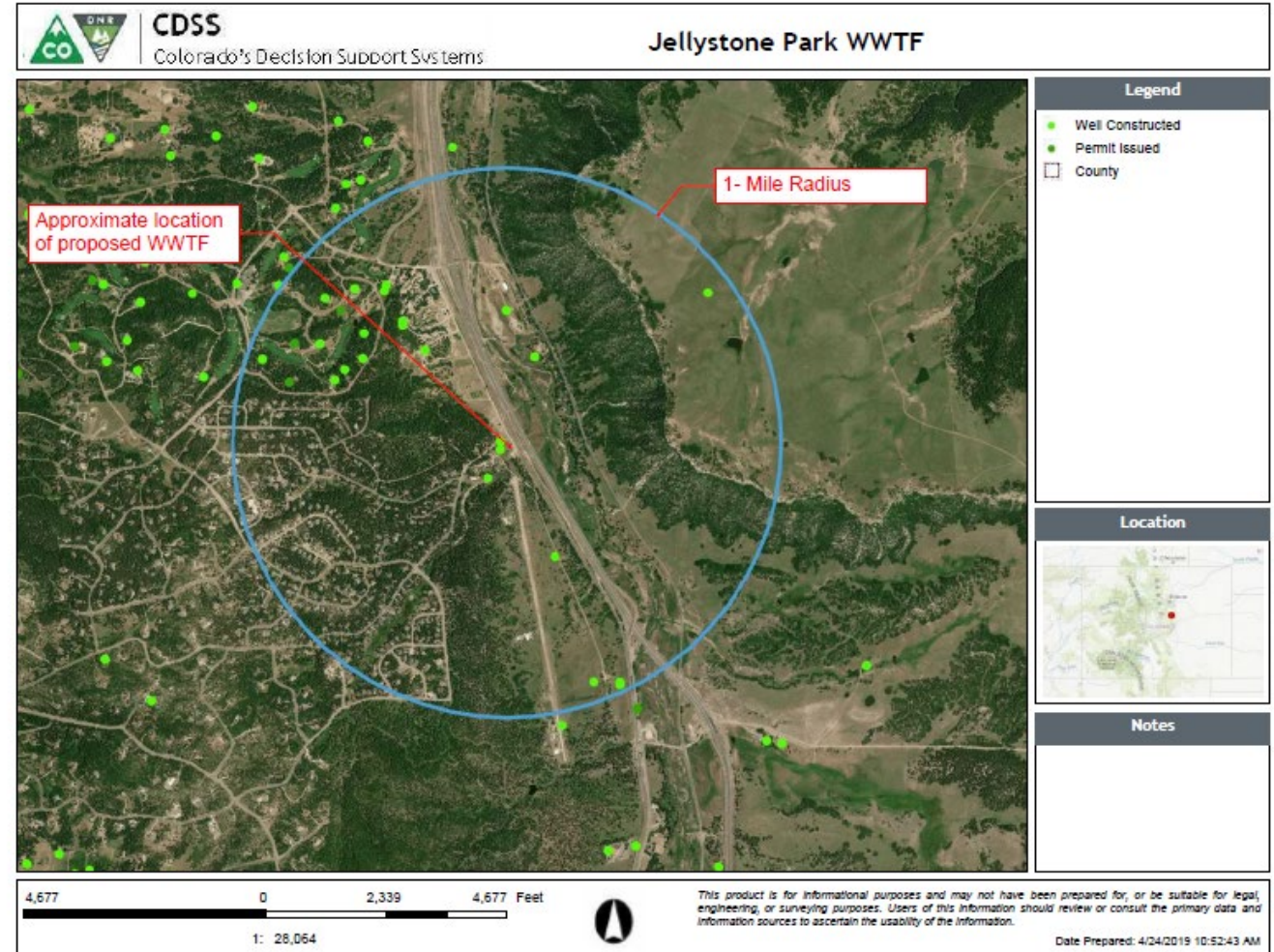
- / On February 2, 2021, the CWA Technical Advisory Committee (TAC) formally denied the proposed phosphorus trade based on the Division's January 24, 2021, determination that a phosphorus trade under an MS4 permit is not a feasible option at this time. The CWA documented the review process and its decision to deny the proposed phosphorus trade in a letter to the Division on February 18, 2021.
- / On May 4, 2021, the CWA TAC voted to deny the Pine Canyon Site Application on procedural grounds given that there is no phosphorus wasteload allocation available from the proposed phosphorus trade.
- / On December 2, 2021, the Division sent a letter to the applicant "to provide more detailed information on the underlying rationale behind our initial determination that the trade is not feasible".



# WASTELOAD ALLOCATION VIOLATION

## Jellystone RV Park – Jellystone Park at Larkspur WWTF

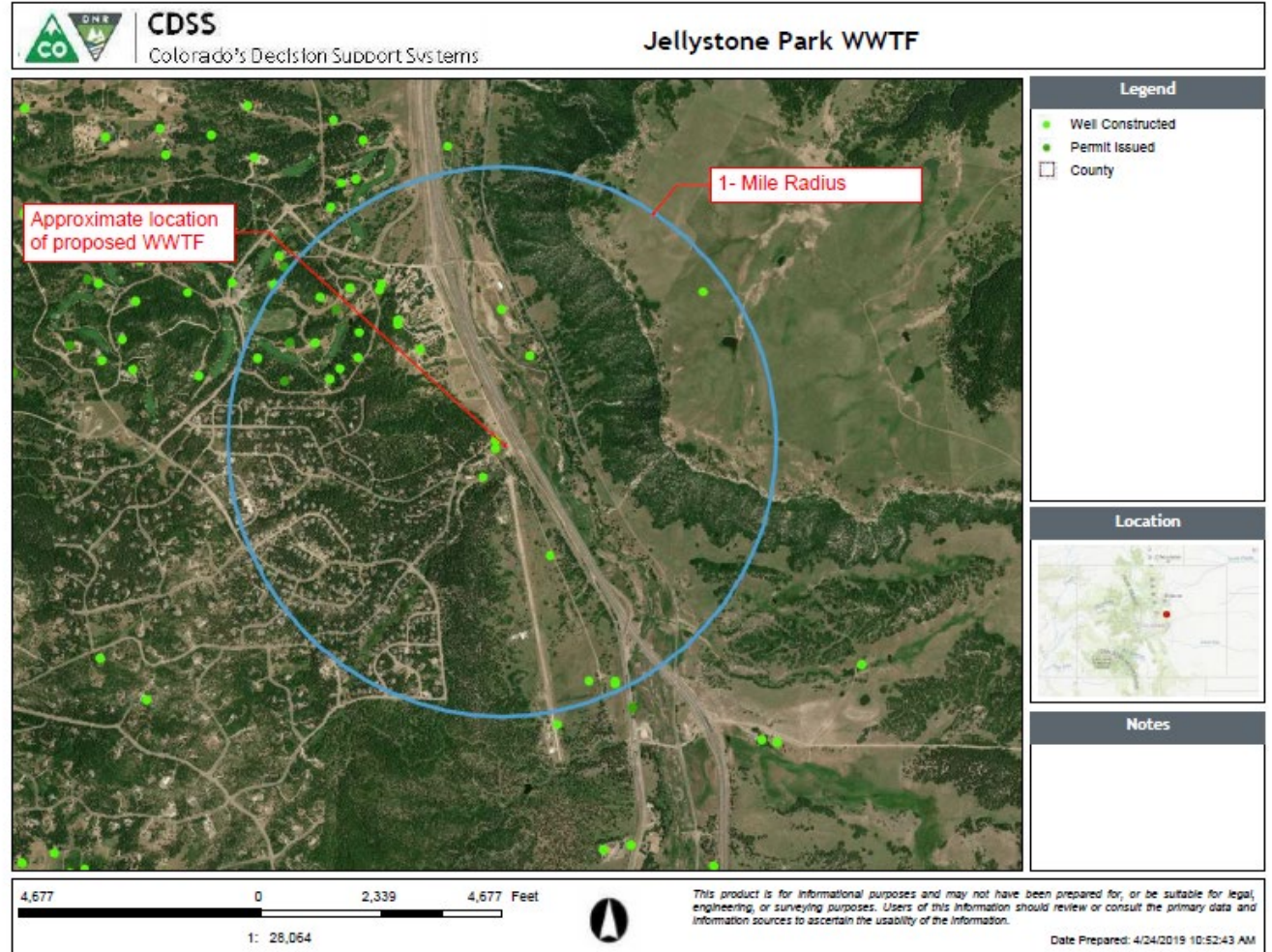
- On May 13, 2020, the Division, with CWA concurrence, approved a Phosphorus Trade of 145.2 lbs. from decommissioned OWTS's to 72.6 lbs. of WWTF discharge to groundwater.
- The Division ultimately approved the associated site application and WWTF design report and construction plans and on May 14, 2020, issued CDPS Certification COX631080.



# WASTELOAD ALLOCATION VIOLATION

## Jellystone RV Park – Jellystone Park at Larkspur WWTF

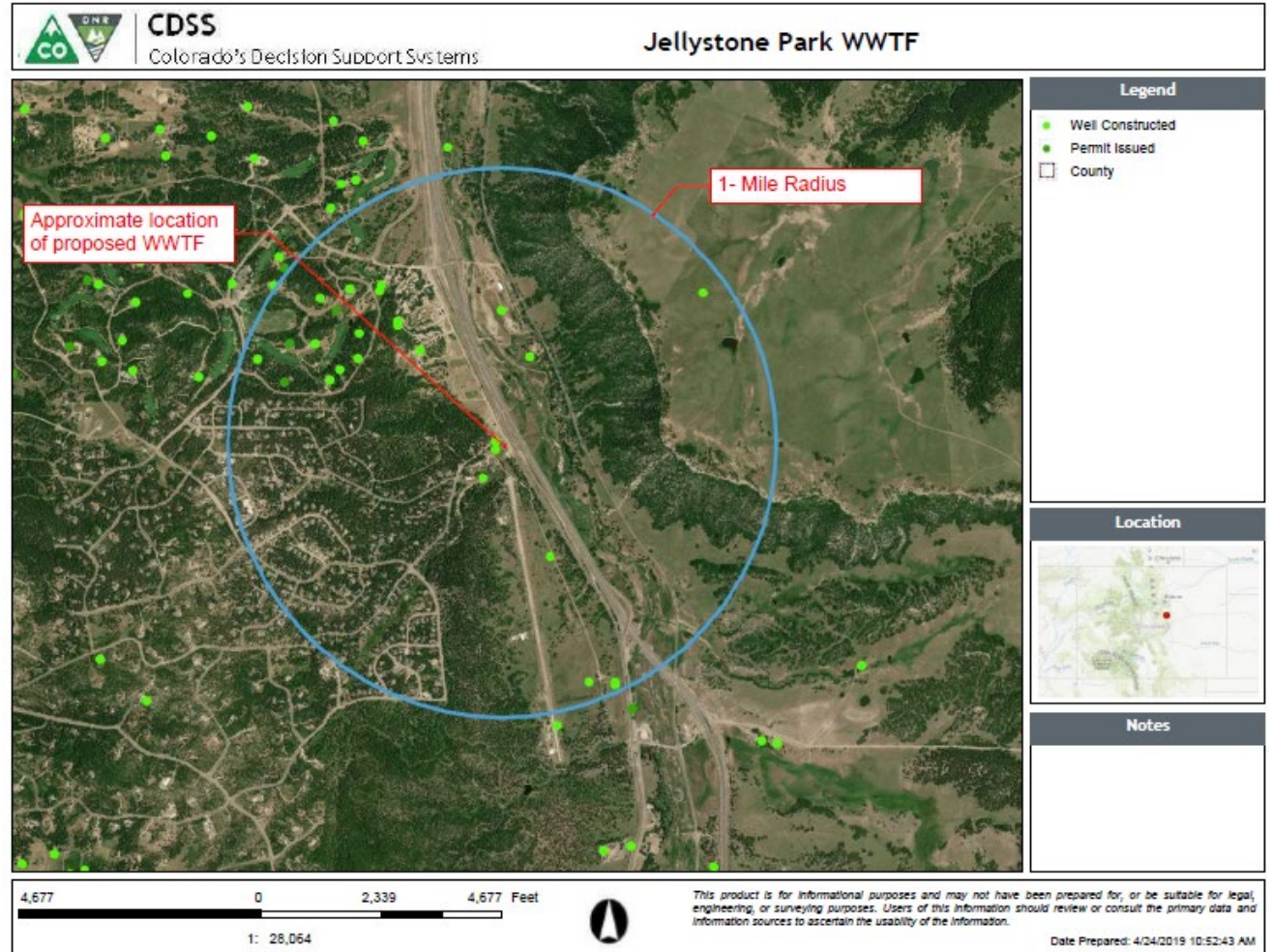
- After beginning operations in June of 2020, the WWTF encountered problems with meeting effluent permit limits. Specifically, the WWTF has at times exceeded its monthly average total phosphorus concentration limit, its monthly total inorganic nitrogen concentration limit, and, in 2021, exceeded its phosphorus wasteland allocation.



# WASTELOAD ALLOCATION VIOLATION

## Jellystone RV Park – Jellystone Park at Larkspur WWTF

- / On July 14, 2021, the Division issued a revised CDPS Certification which, among other conditions, requires the WWTF to achieve final compliance with discharge limits by 8/1/2024.
- / The CWA is monitoring the Division's actions regarding enforcement of the CDPS permit and, as of the end of 2021, had not taken any formal action against the facility owner.





## EFFORTS IN 2021 TO BETTER UNDERSTAND AND REDUCE POLLUTANT LOADS IN THE WATERSHED AND RESERVOIR

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- Member Activities
- Watershed Model Update Efforts
- Colorado School of Mines Project
- Funding of Non-point Source Projects
- Plans for 2022

# MEMBER ACTIVITIES

Many of the member entities' typical outreach programs were hampered by COVID-19 restrictions. However, some in-person events were able to resume in 2021, such as:

- / The City of Littleton conducted stream clean-ups.
- / Jefferson County participated in several public educational events for its MS4 and floodplain management programs.
- / Douglas County supported four Tri-County household chemical roundups.
- / The Town of Castle Rock resumed its annual Spring Up the Creek clean-up event.



# PROGRESS TO PROMOTE WATER QUALITY PROTECTION – TWO EXAMPLES FROM THE TOWN OF CASTLE ROCK

Industrial Tributary Stabilization (\$1,257,253): Stabilization improvements were aimed at reducing channel and bank degradation to control sediment runoff that contains phosphorus while protecting the loss of large pine trees.

Minor Drainageway Improvements (\$730,259): Castle Rock Water completed storm drainage improvements within the Woodlands open space (Hangmans Gulch Tributary B) and along Canyon Drive in Rock Park (Parkview Tributary) to control sediment releases to the stream and ultimately Chatfield Reservoir.





# PROGRESS TO PROMOTE WATER QUALITY PROTECTION – DOUGLAS COUNTY EXAMPLE

## Willow Creek Stream Improvements at Sterling Ranch

- Realigning and stabilizing 8,600 linear feet of streambank
- Constructing 33 riffle-pool stream features
- Planting 55 acres of native plant seed
- Planting 50 trees and nearly 2,000 shrubs
- Establishing 2 new acres of wetland habitat
- Creating 18 acres of high-quality riparian habitat
- Establishing a high functioning and more resilient stream corridor



# WATERSHED MODELING

The Authority contracted with Lynker to use the watershed model to further explore model assumptions and inputs on the model results. In addition, Denver Water funded updating the watershed model by adding additional years of analysis to the original period of analysis. The purposes of the modeling efforts started in 2021 were to:

- / Prepare a more robust model by expanding the model simulation period
- / Simulate the watershed response to removal of modeled point source discharges
- / Simulate the watershed response to wastewater facilities operating in the future at their full wasteload allocations

Reach ID	Description	Total Phosphorus Load (% / lbs)	Total Nitrogen Load (% / lbs)	Total Sediment Load (% / tons)	Total Flow (% / af)
<b>Percent Increase (%)</b>					
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
<b>Absolute Increase (lbs, tons, af)</b>					
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

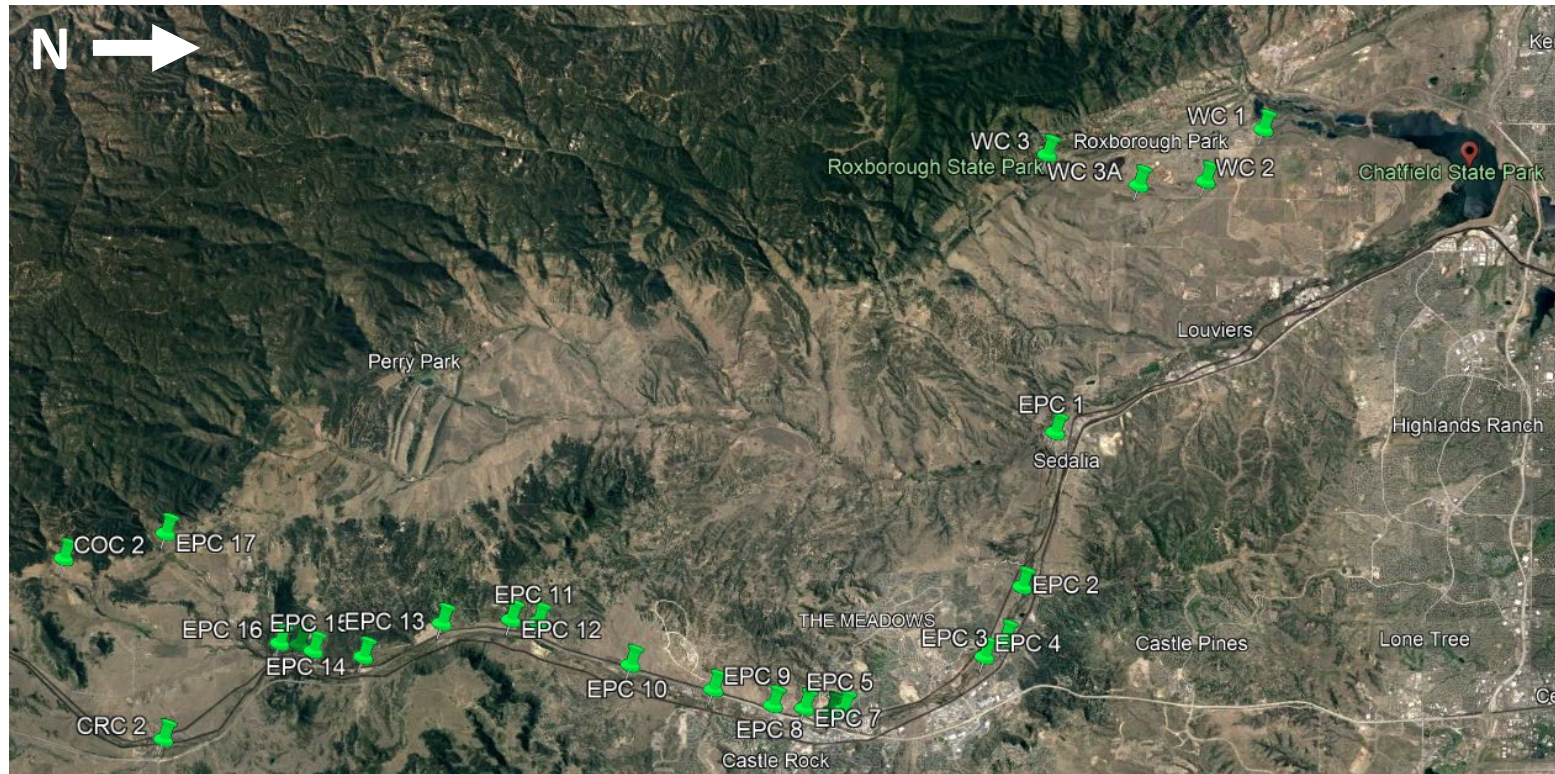
These model efforts are expected to be completed in 2022 and their results will be reported in CWA's 2022 Annual Report.



# COLORADO SCHOOL OF MINES FIELD STUDY

Colorado School of Mines conducted a two-day field session in May 2021 during which water quality samples and field observations were conducted at 25 sites within the Chatfield Watershed.

The purpose of the field session was to improve the understanding of water quality in the West Plum Creek and Willow Creek watersheds.



# COLORADO SCHOOL OF MINES FIELD STUDY

## Example Results

					Analyte (mg/L)								Anion (mg/L)	Pathogens (cfu/100mL)				
Standard					As	Se	P	Tl	Al	Fe	Zn	Pb	F-	Total Coliform	<i>E. coli</i>			
E Plum Creek above Larkspur Analysis 2021 Group 1: Torre Brown, Abby Bullard, Ashley Dunivan, Camila Garcia-Ferreira, Perla Lyon, Linh Vo					EPA Aquatic Life Chronic [1]	0.15	0.0031	0.01	N/A	N/A	1	0.12	0.0025	N/A	N/A	N/A		
					EPA Aquatic Life Acute [1]	0.34	N/A	0.01	N/A	N/A	N/A	0.12	0.065	N/A	N/A	N/A	N/A	N/A
					EPA Recreation [2]	1.8E-05	0.17	N/A	0.0002	N/A	N/A	7.4	N/A	N/A	N/A	N/A	N/A	N/A
					EPA Drinking [3]	0.01	0.05	N/A	0.002	N/A	N/A	N/A	0.015	4	N/A	N/A	N/A	N/A
					CDPHE Chronic [4]	2E-05	0.0046	0.17	N/A	N/A	WS	0.0082	N/A	N/A	N/A	200	126	
					CDPHE Acute [4]	0.34	0.0184	N/A	N/A	N/A	N/A	0.11	0.05	N/A	200	N/A		
					USDA Livestock [5]	0.01	0.05	N/A	N/A	5	0.3	25	0.015	2	200	N/A		
					Detection Limit	0.008	0.008	0.002	0.0006	0.0042	0.0003	0.0031	0.0057	0.1	1	1		
Site	Sample ID/Type	Date	Description	Location	BDL: below detection limit													
CRC2	G1.1 / water	5/18/2021	Creek by I-25	39.132494 -104.51613	2.1E-02	2.0E-02	BDL	6.6E-03	5.1E-02	4.5E-01	3.4E-03	BDL	0.27	1550	17.3			
CRC2	G1.2 / water	5/18/2021	Holding pond by I-25 (south entry ramp)	39.132494 -104.51613	3.3E-02	BDL	1.7E-01	2.3E-02	1.97	1.42	2.5E-02	1.1E-02	0.28	>2420	155			
COC2	G1.3 / water	5/18/2021	Creek with culvert going under road	39.93631 -104.545603	1.2E-02	BDL	4.8E-02	9.1E-03	5.8E-01	3.0E-01	BDL	BDL	1.52	238.2	10.1			
EPC17	G1.4 / water	5/18/2021	Creek running under bridge	39.111605 -104.552934	1.3E-02	BDL	2.6E-02	1.1E-02	6.8E-01	3.6E-01	1.3E-02	BDL	1.53	167	21.2			
EPC14a	G1.5 / water	5/18/2021	Creek by railroad	39.234081 -104.880302	1.6E-02	BDL	9.8E-03	6.0E-04	3.6E-01	3.6E-01	BDL	BDL	1.42	1986.3	6			
EPC14a	G1.6 / water	5/18/2021	Storm runoff under railroad	39.234081 -104.880302	2.3E-02	BDL	2.3E-01	2.2E-02	2.46	1.38	2.2E-01	6.0E-02	0.34	>2420	214			
EPC14a	G1 / soil	5/18/2021	Erosion bank by creek	39.234081 -104.880302	BDL	BDL	2.0E-01	6.6E-03	1.4E-01	1.1E-01	3.2E-02	BDL	X	X	X			
CRC2	G1.7 / water	5/21/2021	Holding pond by I-25 (south entry ramp)	39.132494 -104.51613	3.6E-02	2.3E-02	1.3E-01	1.4E-02	BDL	5.7E-01	1.6E-02	BDL	X	X	X			
CRC2	G1.8 / water	5/21/2021	Holding pond by I-25 (south exit ramp)	39.132494 -104.51613	2.6E-02	BDL	2.5E-01	8.3E-03	1.06	1.23	4.8E-02	1.2E-02	X	X	X			
COC2	G1.9 / water	5/21/2021	Creek with culvert going under road	39.93631 -104.545603	1.1E-02	BDL	1.5E-02	3.2E-03	3.6E-01	2.2E-01	6.5E-03	BDL	X	X	X			
EPC17	G1.10 / water	5/21/2021	Creek running under bridge	39.111605 -104.552934	BDL	BDL	2.6E-02	4.2E-03	4.1E-01	2.5E-01	9.7E-03	BDL	X	X	X			
EPC14a	G1.11 / water	5/21/2021	Creek by railroad	39.234081 -104.880302	BDL	BDL	4.7E-02	5.4E-03	2.4E-01	3.4E-01	7.3E-03	BDL	X	23.4	2			

[1] US EPA. O. (2015). "National Recommended Water Quality Criteria - Aquatic Life Criteria Table." US EPA, Data and Tools. <<https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table>>  
 [2] US EPA. O. (2015). "National Recommended Water Quality Criteria - Human Health Criteria Table." US EPA, Data and Tools. <<https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table>>  
 [3] US EPA. O. (2015). "National Primary Drinking Water Regulations." US EPA, Overviews and Factsheets. <<https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations>>  
 [4] "Water Quality Control Commission regulations | Department of Public Health & Environment." (n.d.). <<https://odphe.colorado.gov/water-quality-control-commission-regulations>>  
 [5] Copanhever, G. (n.d.). "United States Department of Agriculture." 31.





## FUNDING OF NON-POINT SOURCE PROJECTS

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- Hilldale Pines Fire Mitigation (Total Cost \$70,000 of which \$5,000 contributed by CWA).
- West Plum Creek Stream Management Plan (Total Cost \$265,786 with \$31,000 in-kind match funding, of which \$5,000 cash and \$5,000 in-kind services contributed by CWA).



## PLANS FOR 2022

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- Further explore the relationship of total phosphorus and chlorophyll  $\alpha$  in Chatfield Reservoir
- Continue to partner with the Colorado School of Mines for watershed sampling and analysis
- Perform additional watershed modeling and explore potential for linkage with the existing Chatfield Reservoir model
- Implement the NRCS NWQI grant

QUESTIONS?

