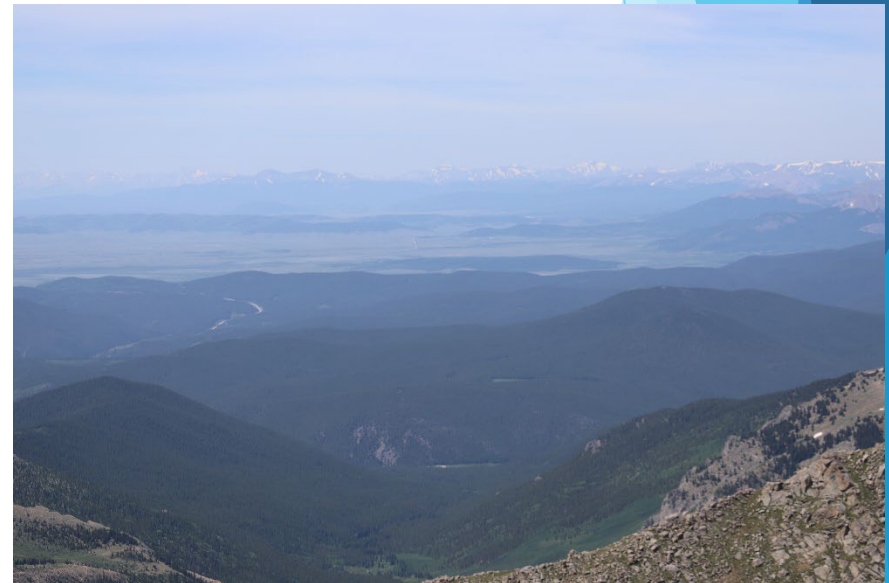


# Bear Creek Watershed: OneWater(shed)



*Russell Clayshulte*

Manager Bear Creek Watershed Association

Director Bear Creek Watershed Foundation

The Association protects & restores water & environmental quality within the Bear Creek Watershed from the effects of land use



The Foundation provides education, partnerships and resources to protect, restore, and preserve the Bear Creek Watershed

# BCWA

Bear Creek (combined with Turkey Creek) discharges into the South Platte River

Diverse membership of general-purpose governments, special districts, wastewater dischargers, water providers, businesses, youth camps, homeowner associations, plus invited local, regional, state and federal agencies

water quality management agency

12 Wastewater Dischargers

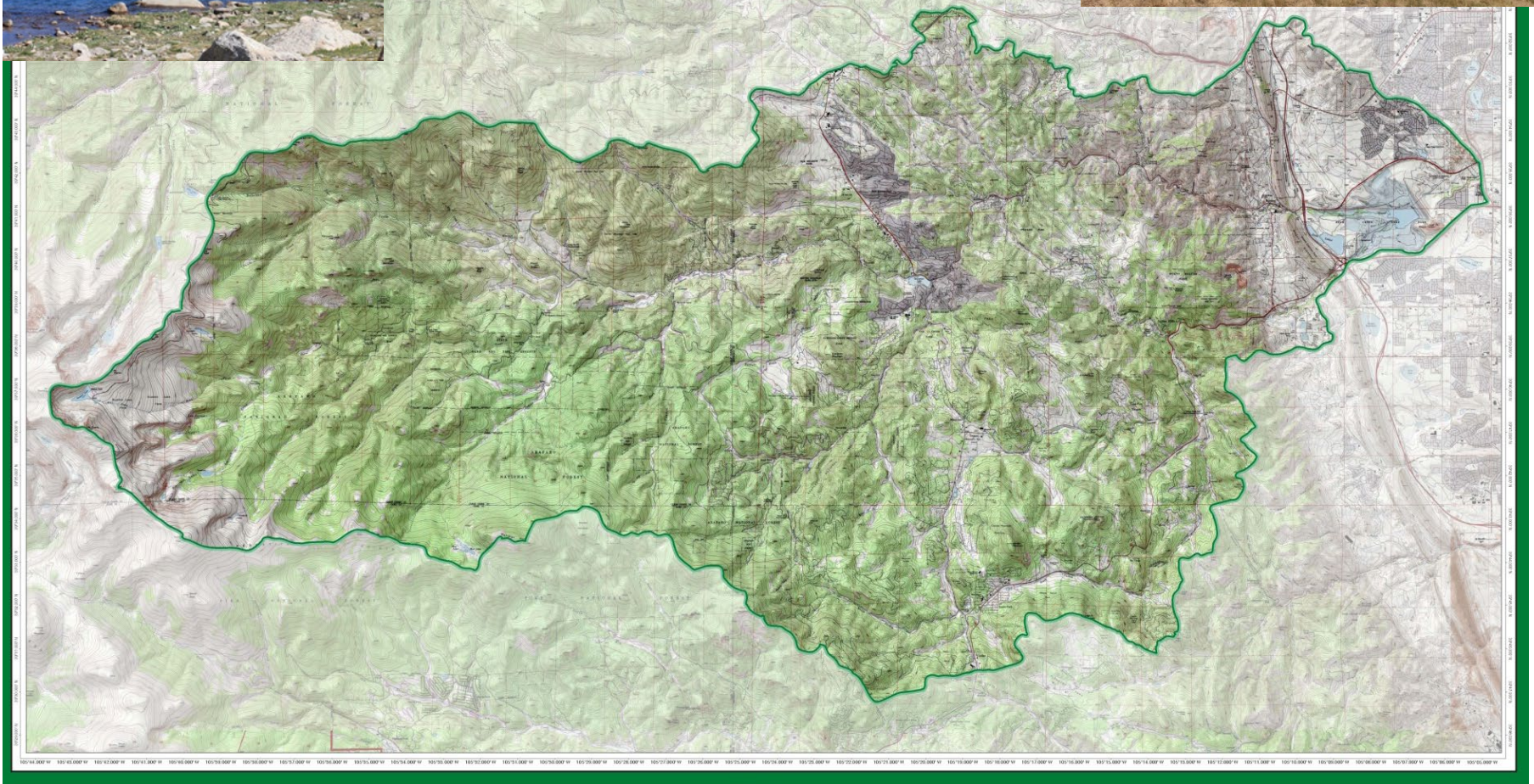
4 Counties

Two cities and a town



| Control Regulation Members & Participants   | Wastewater Discharger | Participation                          |
|---|-----------------------|--|
| <b>Counties</b>                             |                       |  |
| Jefferson County                            |                       | Active                                 |
| City and County of Denver                   |                       | Active                                 |
| Clear Creek County                          |                       | Active                                 |
| Park County                                 |                       | Non-Member                             |
| <b>City and Towns</b>                       |                       |  |
| City of Lakewood                            |                       | Active                                 |
| Town of Morrison                            | Yes                   | Active                                 |
| <b>Water &amp; Sanitation Districts</b>     |                       |  |
| Aspen Park Metropolitan District            | Yes                   | Active                                 |
| Bear Creek Cabins                           | No                    | OWTS (Non-Member)                      |
| Brookforest Inn                             | No                    | Non-active permit Hauling (Non-Member) |
| Conifer Metropolitan District               | Yes                   | Non-Member                             |
| Conifer Sanitation Association              | Yes                   | Active                                 |
| Evergreen Metropolitan District             | Yes                   | Active                                 |
| Fort Restaurant                             | No                    | OWTS (Non-Member)                      |
| Forest Hills Metropolitan District          | Yes                   | Active                                 |
| Genesee Water & Sanitation District         | Yes                   | Non-Member                             |
| Geneva Glen                                 | Yes                   | Active                                 |
| Jefferson County School District            | Yes (Two Plants)      | Active                                 |
| Kittredge Water & Sanitation District       | Yes                   | Active                                 |
| Tiny Town Foundation, Inc.                  | Yes (Hauling)         | Active                                 |
| West Jefferson County Metropolitan District | Yes                   | Active                                 |
| <b>Other Member</b>                         |                       |  |
| Denver Water Department                     |                       | Active                                 |
| <b>Participant Agencies</b>                 |                       |  |
| U.S. Army Corps of Engineers                |                       | Active                                 |
| Jefferson Conservation District             |                       | Active                                 |
| WQCD  |                       | Attended                               |
| Evergreen Trout Unlimited                   |                       | Attended                               |

# Operational Bear Creek Watershed



# Bear Creek Reservoir Park

BCWA Sampling Sites

Legend



Google Earth

© 2021 Google



## Bear Creek Reservoir Potential Storage Reallocation

- Normal Pool
- +5,000 acre-feet
- +10,000 acre-feet
- +20,000 acre-feet
- Government Boundary

0 0.13 0.25 0.5 Miles



# Major Challenge Recreation Use BCW >4.6 Million

|   | Estimated Recreation Visitation<br>Bear Creek Watershed |                        |
|---|---|------------------------|
|   | Annual<br>Visitation                                    | Seasonal<br>Visitation |
| Bear Creek Lake Park                    | 1,000,000   |                        |
| Evergreen Lake                          | 375,000   |                        |
| Forest Service Lands                    | 45,000  |                        |
| Trail Run Events                        |   | 20,000                 |
| Traveling to Mt. Evans                  |   | 370,000                |
| Mt. Evans Wilderness Access             |   | 25,000                 |
| Users Denver Mountain Parks             | 250,000   |                        |
| Jefferson County Open Space             | 95,000  |                        |
| Attendees & Visitors Red Rocks/Morrison | 2,350,000   |                        |
| Fishing                                 |   | 75,000                 |
| <b>Total</b>                            | <b>4,115,000</b>  | <b>490,000</b>         |
|   | <b>4,605,000</b>  |                        |

BCWA Fact Sheet 35  
Recreational Uses in BCW

## BCW Total Fish Species

*Common Sport Fish*      *Other Reported Fish*

16

14





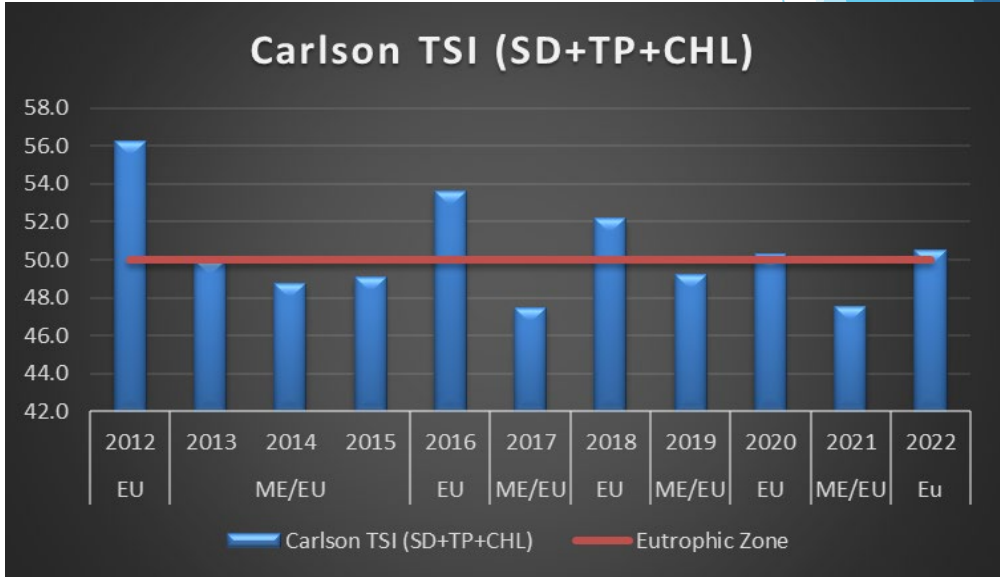
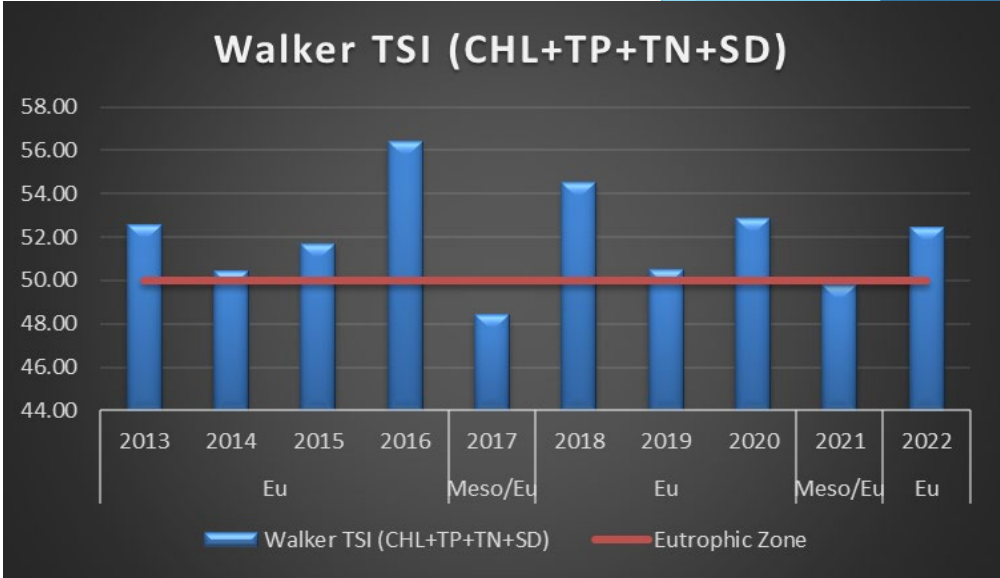
# Current Regulatory and Water Quality Goals and Challenges



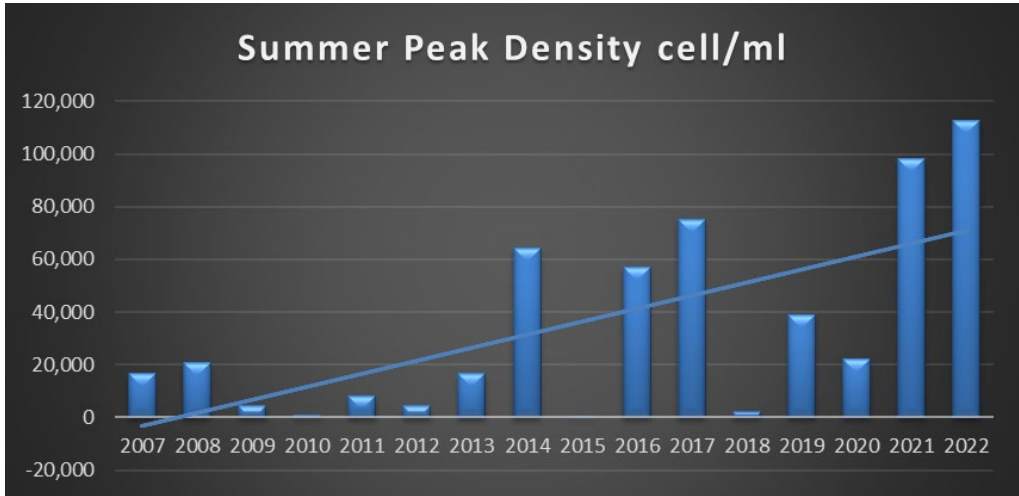
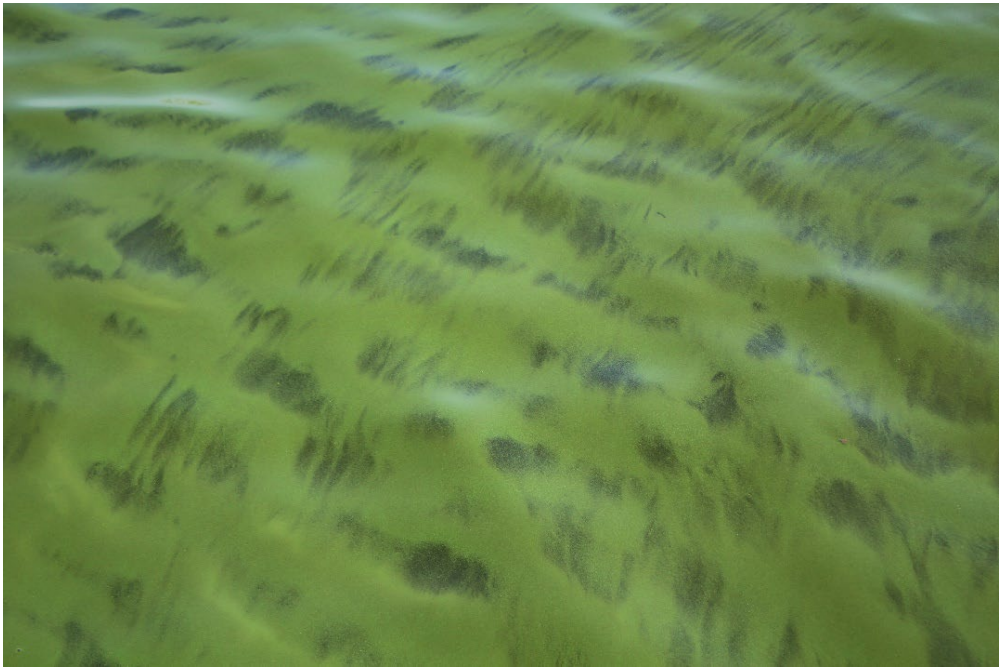
- ▶ Control Regulation #74 (Update within 5-yrs)
- ▶ New TMDL in process of completion by WQCD (2024)
- ▶ Wasteload Allocations reducing from 5,255 lbs to about 455 lbs (Permit changes < 5-yrs)
  - ▶ Permit limit for facility Total Phosphorus changing from 1.0 mg/l to 0.1 mg/l
- ▶ Total Phosphorus nonpoint source reduction within watershed set to about 53% (5-yrs)
- ▶ Total Phosphorus internal load reduction within Bear Creek Reservoir to be about 95%
  - ▶ Phase 1 within 1-3 years
- ▶ Continued legacy nutrient loading at Summit Lake area
- ▶ Climate models are predicting drier and hotter conditions in both upper and lower watershed with significant increase in large storm activity
- ▶ Continued growth equates to increased nutrients
- ▶ Groundwater mining linked with increasing total dissolved solids
- ▶ Problematic Eutrophic shift in Evergreen Lake
- ▶ Harmful algal blooms increasing in magnitude and duration
- ▶ Regulatory compliance for Temperature Standards not achievable



Evergreen Lake is generally nutrient balanced with some earlier years showing nitrogen limitation. Carlson and Walker indexes are showing similar trends towards advancing eutrophication.



| <b>Bear Creek Reservoir</b> |                               |                                 |
|-----------------------------|-------------------------------|---------------------------------|
|                             | <b>Peak Density, cells/ml</b> | <b>Potential HAB Toxin Risk</b> |
| <b>2007</b>                 | 16,603                        | Low                             |
| <b>2008</b>                 | 20,960                        | Moderate                        |
| <b>2009</b>                 | 4,476                         | Low                             |
| <b>2010</b>                 | 945                           | Low                             |
| <b>2011</b>                 | 8,350                         | Low                             |
| <b>2012</b>                 | 4,510                         | Low                             |
| <b>2013</b>                 | 16,695                        | Low                             |
| <b>2014</b>                 | 64,431                        | Moderate                        |
| <b>2015</b>                 | 356                           | Low                             |
| <b>2016</b>                 | 57,081                        | Moderate                        |
| <b>2017</b>                 | 75,154                        | Moderate                        |
| <b>2018</b>                 | 2,137                         | Low                             |
| <b>2019</b>                 | 38,843                        | Moderate                        |
| <b>2020</b>                 | 22,370                        | Moderate                        |
| <b>2021</b>                 | 98,365                        | Moderate                        |
| <b>2022</b>                 | 112,750                       | High                            |



# Big Soda Harmful Algal Blooms

| Date            | TN Top (-1/2m) | TP Top (-1/2m) | Ortho P | Chlorophyll a | WC Avg Dissolved Oxygen | WC Min Dissolved Oxygen | Secchi (m) |
|-----------------|----------------|----------------|---------|---------------|-------------------------|-------------------------|------------|
| 9/31/2019       | 542            | 49             |         | 20.3          | 7.6                     | 5.04                    | 3.0        |
| 7/26/2022       | 1681           | 168            |         | 48.2          | 6.9                     | 5.93                    | 1.0        |
| 8/2/2022        | 700            | 36.2           | 14.2    | 22.9          |                         |                         |            |
| <b>8/8/2022</b> | <b>5,116</b>   | <b>869</b>     |         | <b>70.2</b>   | <b>4.3</b>              | <b>0.65</b>             | <b>0.5</b> |



- Water column about 50 ug/L TP = 216 lbs. Phosphorus
- Sediment = 1344 lbs. P
- Total = 1560 lbs. P

Before  
(8/2/2022)



After (9/1/2022)



## 2022/ 2023 HAB Mitigation

### Large cyanobacteria scums closed Big Soda Lake Swim Beach for >30 days

- Peroxide Algaecide application 8/15-16
- Achieved full initial control of cyanobacteria, lasting reductions
- Proven reactive tool if needed in future

### Water column P stripping application

- More phosphorus in lake than dosed
- Phosphorus varied spatially

### Sediment P-inactivation

# Major Goal BCWA Trading Program

- ▶ **nutrient water quality trading** is essential long-term nutrient (nitrogen and phosphorus) control strategy for the Bear Creek Watershed
- ▶ The association maintains and periodically updates **Nutrient Trading Guidelines**
- ▶ The Association has an administrative **trading process** (*BCWA Policy 26 - Point to Point Trade Administration*)
- ▶ The current poundage fee **value is \$5,000 per pound** of trade phosphorus
- ▶ Established **Successful Trade Pound Pilots** and Ongoing Projects
- ▶ **New TMDL will greatly reduce the total phosphorus wasteload allocations FOR ALL treatment facilities (existing and proposed), requiring more nutrient trading**

# Adaptive Nutrient Reduction Projects

- ▶ Nutrient Reduction Projects
  - ▶ Wilmot Drainage
  - ▶ Horseshoe Drainage and Pond
  - ▶ Big Soda
  - ▶ Coyote Gulch
  - ▶ Coyote Crossing
  - ▶ Rooney Gulch





# Barr/Milton Watershed (BMW) Association

## BMW Association

Formed in 2005 to Help with TMDL  
401(c)3

Board of Directors (Sustaining & At-large)

Executive Director

Technical and Info/Ed Committees

## WatersHed

850 Sq. Miles (50/50 Urban & Ag.)

2.6 Million People (Half the State)

500 Miles of Streams

550 Miles of Ditches & Canals

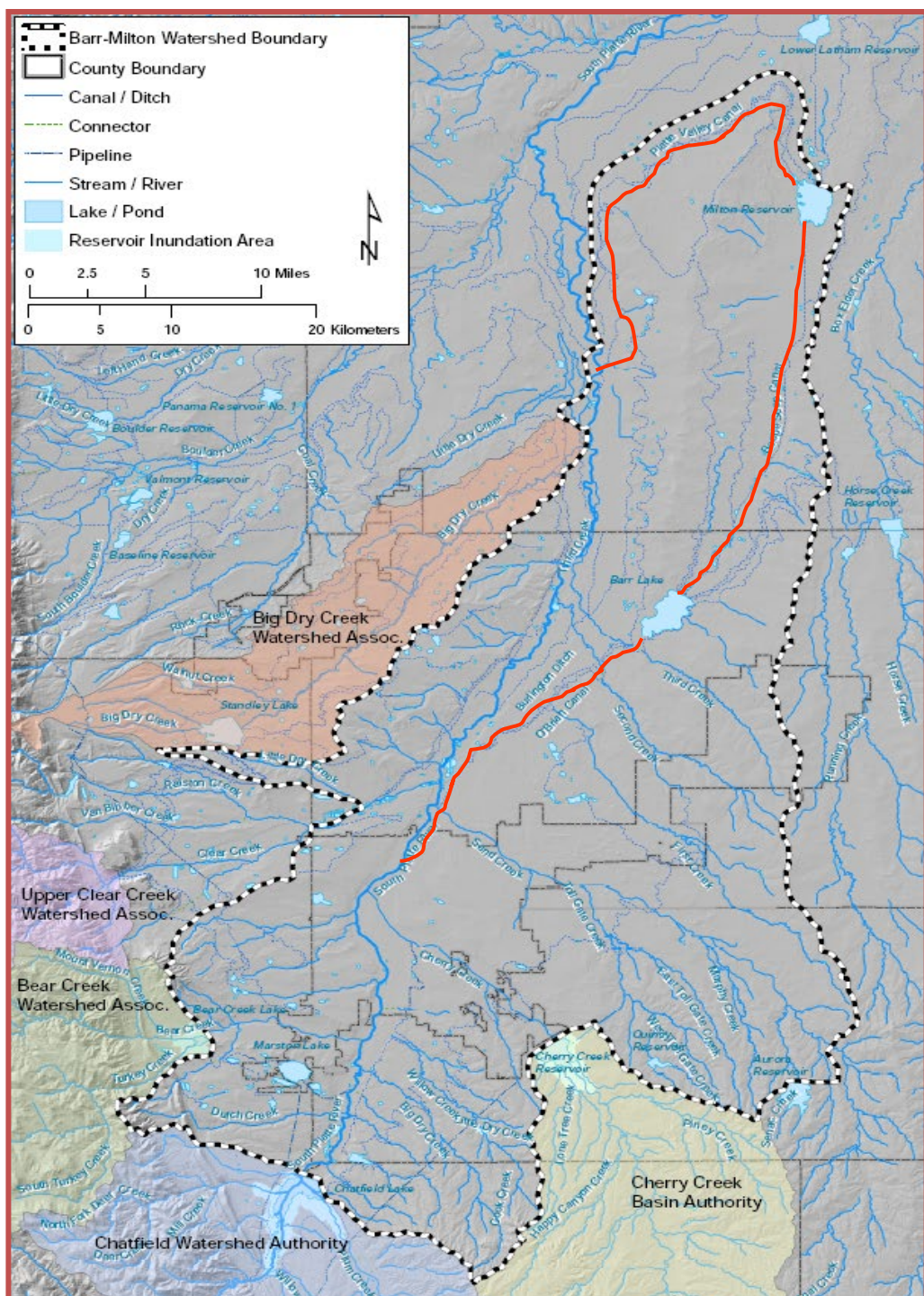
100+ NPDES

21+ MS4s

80,000 Cows & 70 Sq. Miles of Lawn



**BARR MILTON**  
Watershed Association





# BMW Association

## Barr Lake (FRICO)

1886 When Oasis Lake was Built  
1,835 Acres @ 34' Depth  
30,060 Acre-feet  
1975 Became a State Park  
Burlington Ditch (60% of SPR Diverted)  
8 Months Residence Time

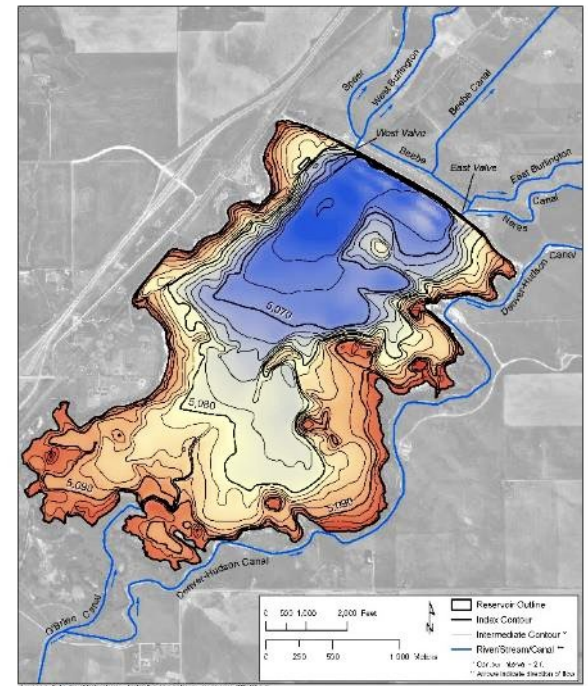
## Milton Reservoir (FRICO)

1909 aka Pelican Lake  
1,835 Acres @ 27' Depth  
26,000 Acre-feet  
Private Recreational Club  
Platte Valley Canal & Beebe Draw  
8 Months Residence Time



**BARR MILTON**  
Watershed Association

Uses  
*Agriculture*  
*Aquatic Life, Warm Class 2*  
*Recreation, Class E*  
*Domestic Water Supply*



# BMW Association

## BMW pHurDOse (Purpose)

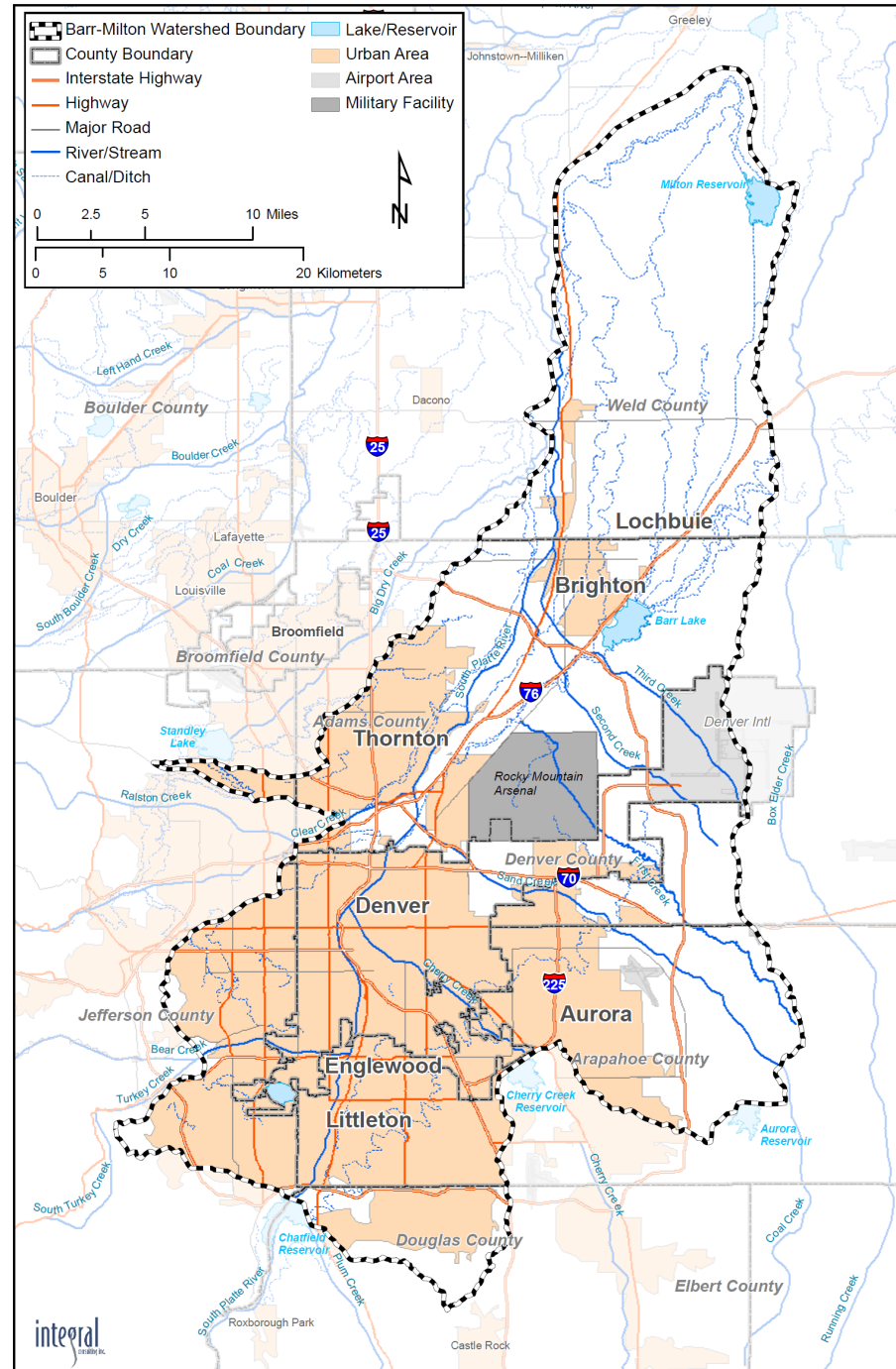
Get Partners to Reduce Nutrient Loads to meet standards (pH and DO)

- Third-Party Phased pH & DO TMDL
- TMDL Implementation Plan
- Adaptive Management
- Collaboration & Consensus
- Public Information & Outreach

**Curb Cultural Eutrophication Through Partnerships To Meet Water Quality Regulations**



**BARR MILTON**  
Watershed Association



# BMW Association

## BMW Goals

Continue Monitoring

Plan for TP, TN, Chl-a Standards

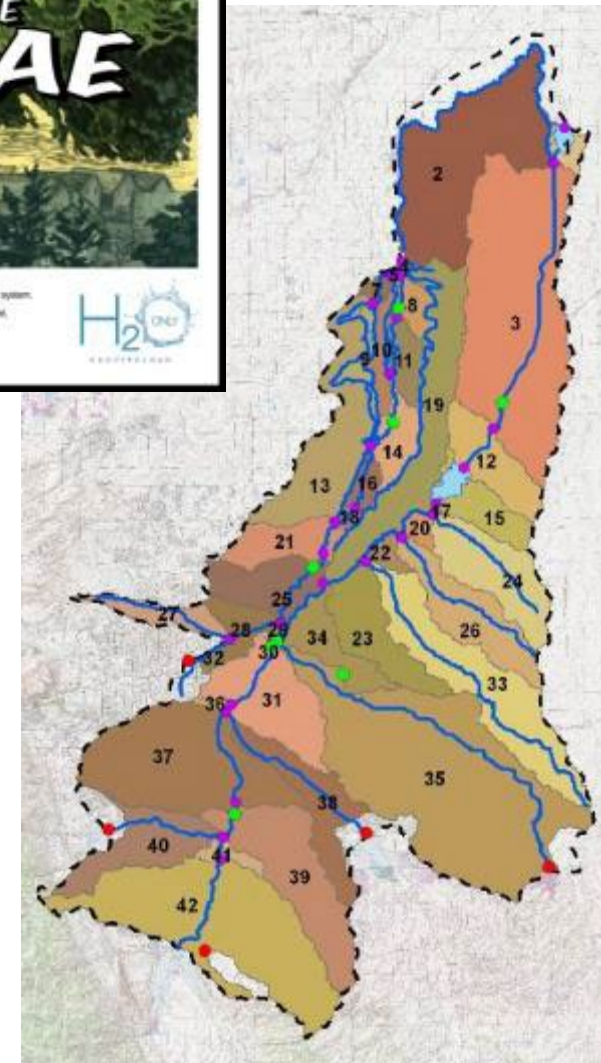
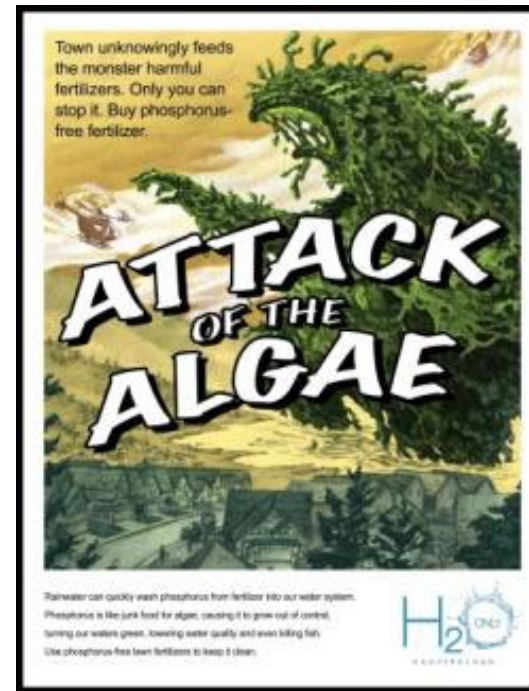
Update SWAT & WASP Models

Coordinate Implementation

- In-canal Treatment
- NPS Efforts
- In-Reservoir Projects
- PS Upgrades & Results
- Regulations that Fit
- Phosphorus Free Lawn Fertilizers



**BARR MILTON**  
Watershed Association

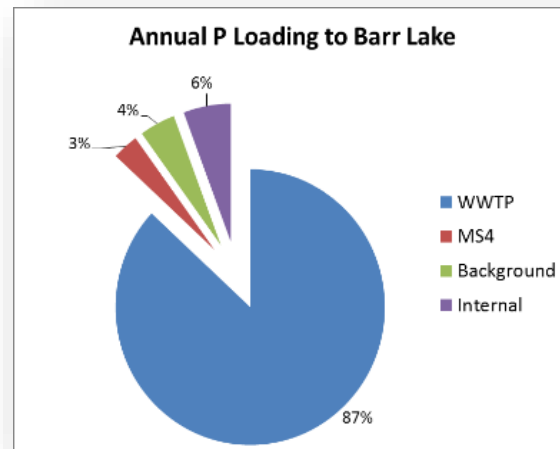


# BMW Association

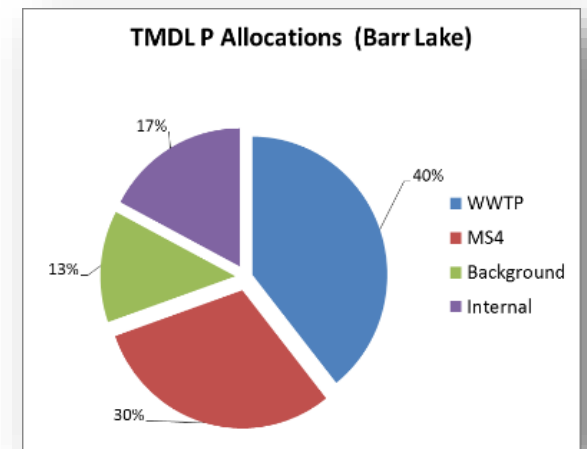
## Challenges

- Funding of Watershed Projects
- Using our Time Wisely
- Public Interest
- Privately Owned Reservoirs
- Water Quality vs Water Quantity
- Show WQ Improvements
- Meet TMDL Load Reductions

**(92% reduction)**



**70,000 Kg/yr**



**5,800 Kg/yr**





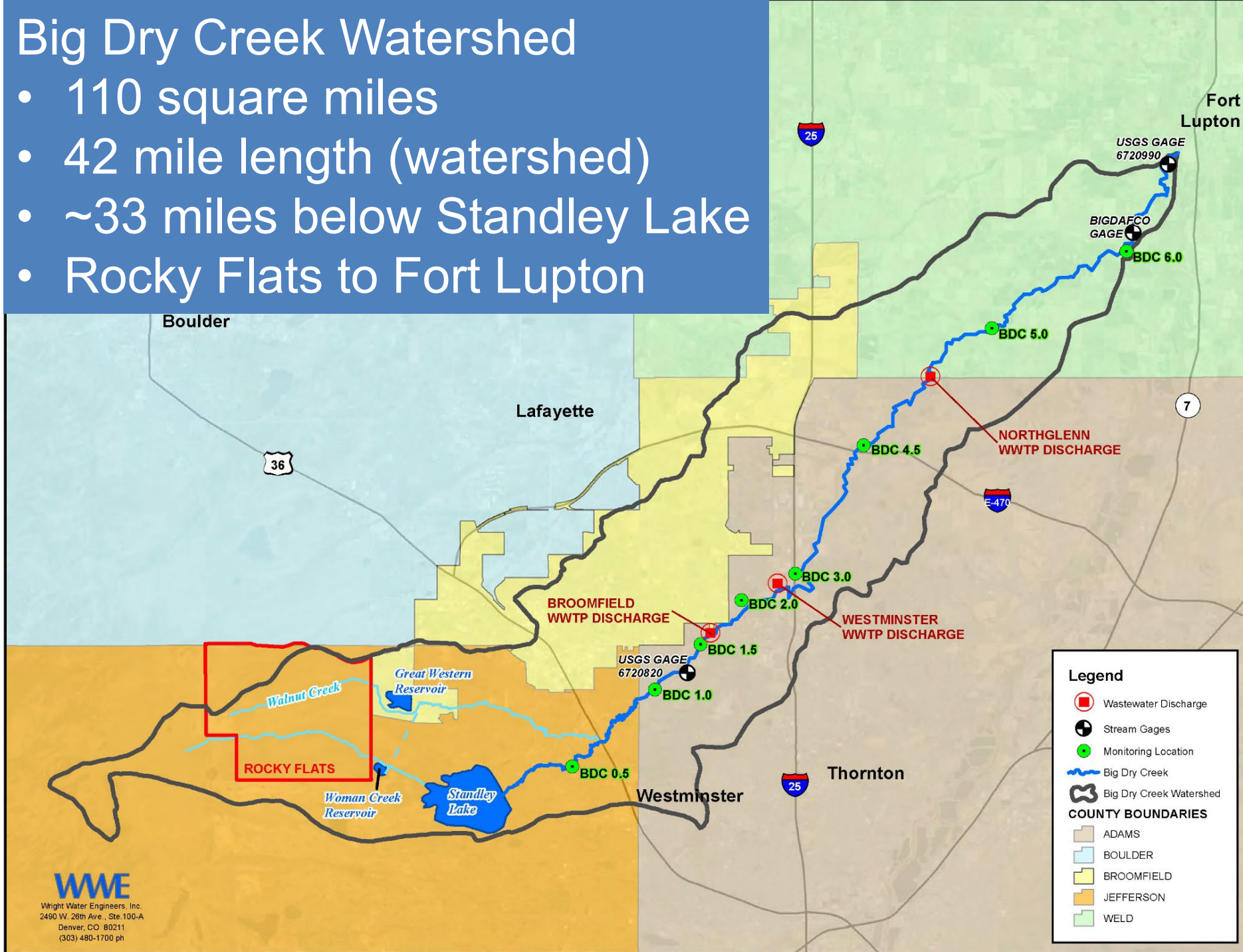
Jane Clary,  
Big Dry Creek Watershed Coordinator  
Wright Water Engineers

Confluence at the Confluence  
October 2023



# Big Dry Creek Watershed

- 110 square miles
- 42 mile length (watershed)
- ~33 miles below Standley Lake
- Rocky Flats to Fort Lupton



**WWE**

Wright Water Engineers, Inc.  
2490 W. 26th Ave., Ste.100-A  
Denver, CO 80211  
(303) 480-1700 ph



# Big Dry Creek Watershed Association

- Formed 501(c)(3) in 2004; active since 1997
- Financially Contributing Members
  - Board of Directors
    - City and County of Broomfield
    - City of Westminster
    - City of Northglenn
    - City of Thornton (no WWTP discharge to BDC)
    - Adams County (no WWTP discharge to BDC)
    - Weld County (no WWTP discharge to BDC)
  - Woman Creek Reservoir Authority

**25+**

# Major Activities from April 2022 – April 2023

- Collaborative instream monitoring program
- Support of Westminster USGS gage
- Database management
- Annual water quality analysis
- Biological Monitoring
  - 2022 Biological Fieldwork
  - Made possible by WCRA funding
- E. coli Study Support between Standley Lake and I-25 (on-going)
- BDCWA meetings
- Annual newsletter
- Website
- Other activities
  - Working on Story Map identifying key watershed features
  - Participation in regional/state efforts
  - P-free fertilizer campaign



# Highlights of Annual Water Quality Analysis for 2022 Data

- Key constituents of interest
  - *E. coli*
  - Iron & selenium
  - Nutrients
  - New Water Supply stds.
- Working on:
  - Story Map
  - Watershed Plan Update
  - *E. coli* issues



# E. coli TMDL

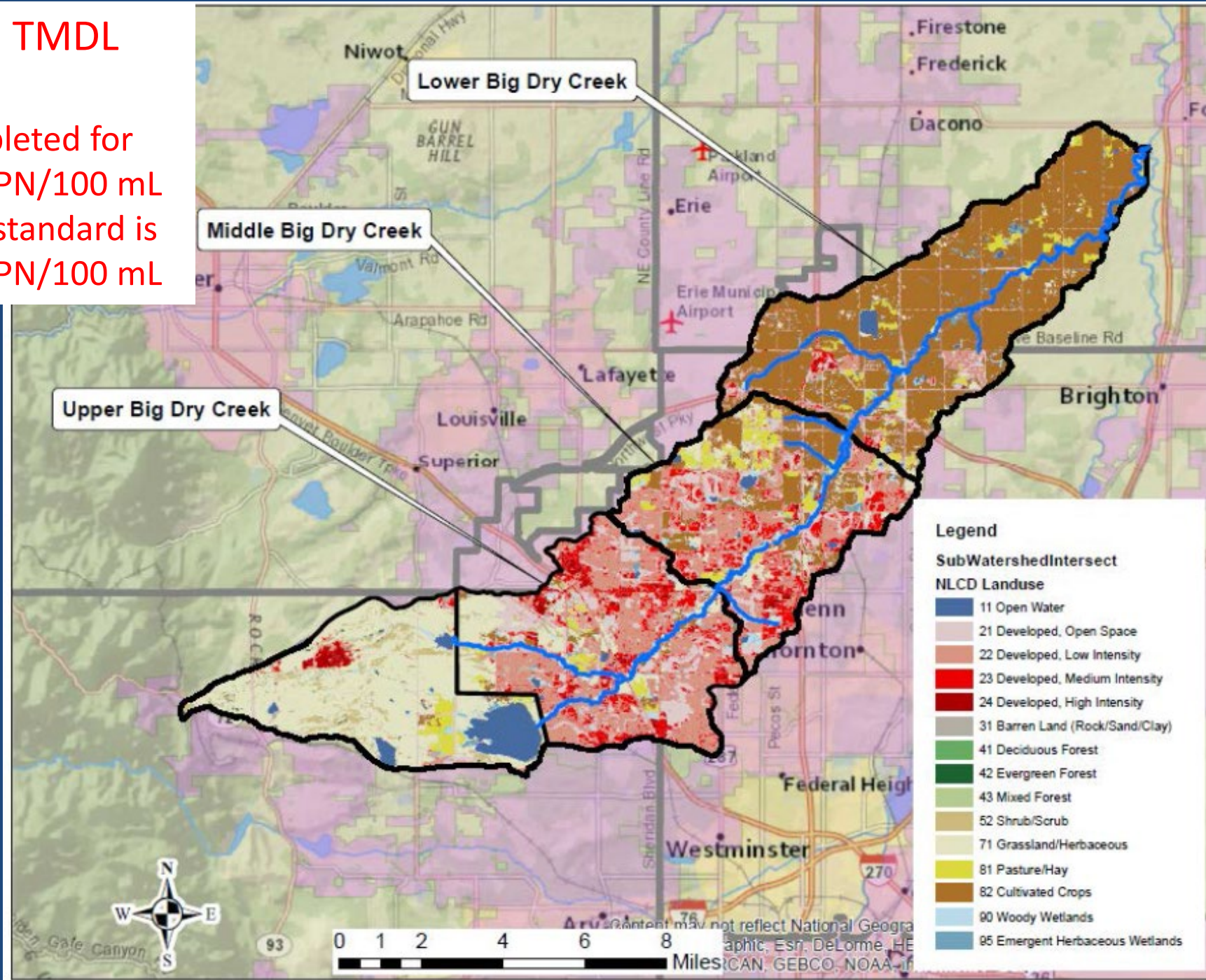
2016

--completed for

205 MPN/100 mL

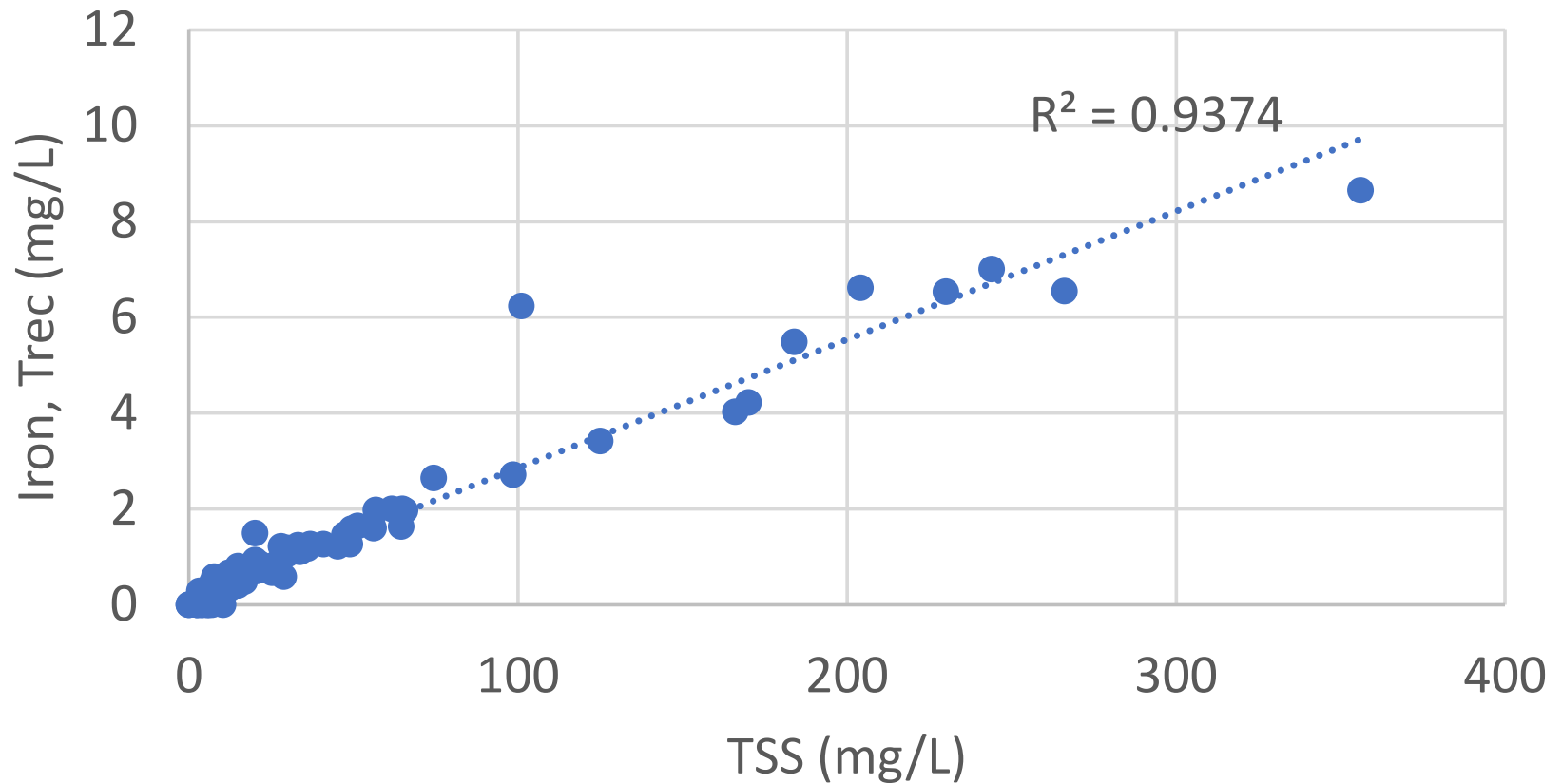
--new standard is

126 MPN/100 mL



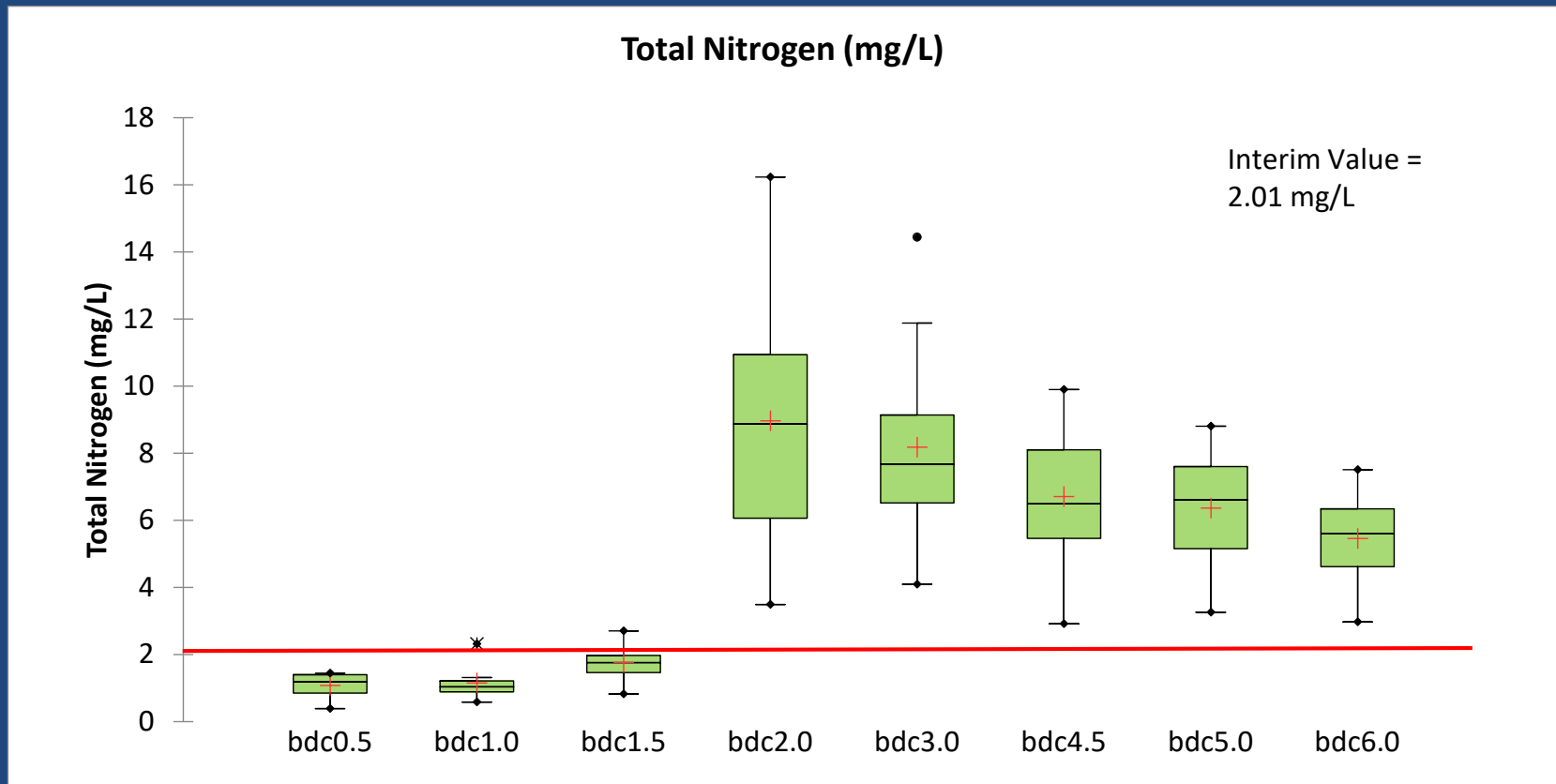
# 2022 Instream Iron vs. TSS

BDC 2022 IRON, Trec (mg/L) vs. TSS (mg/L)



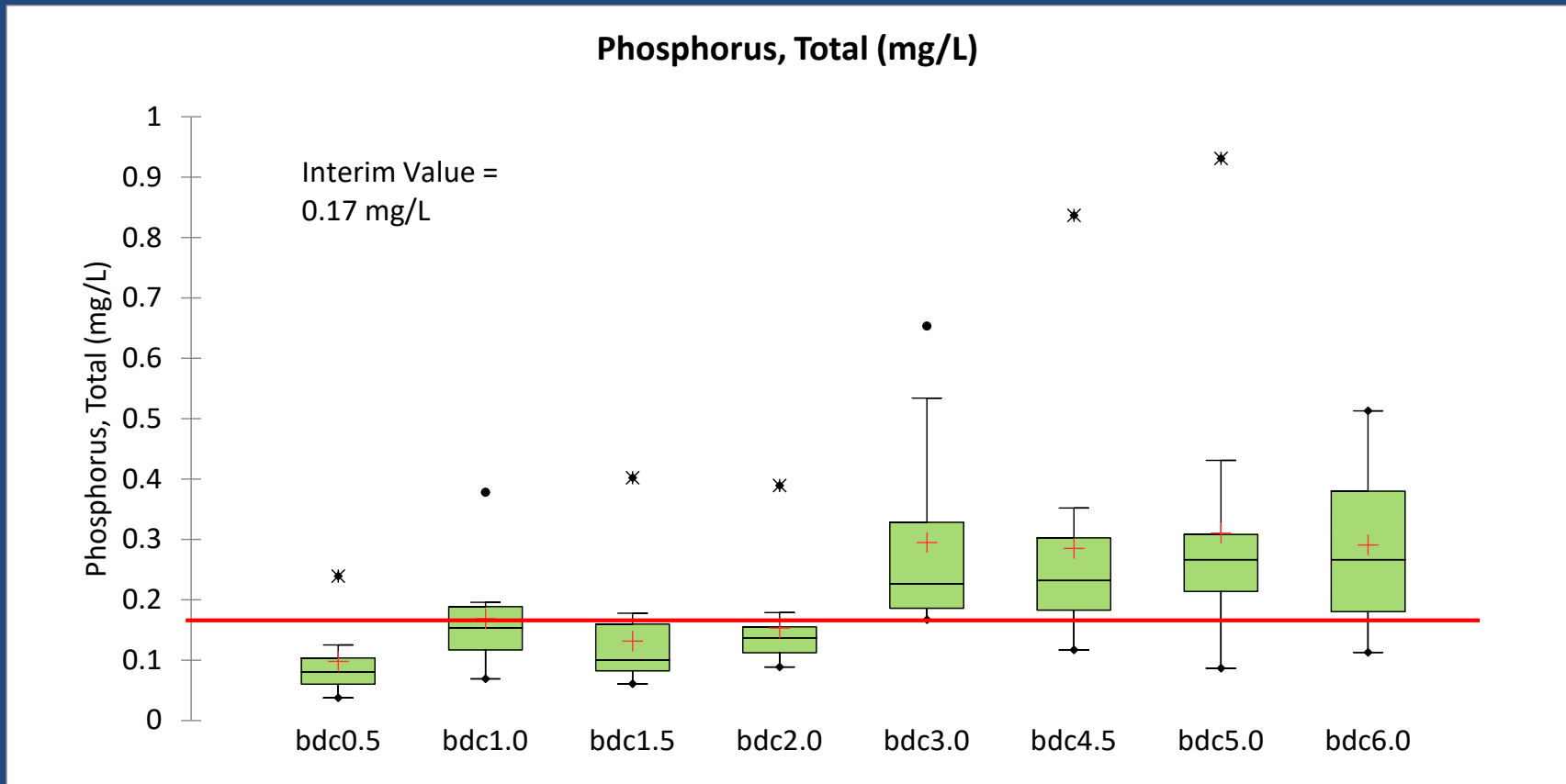
# Big Dry Creek Total Nitrogen (2022)

- Does not meet interim values below WWTPs to South Platte.
- 4/1/2025 compliance schedule for WWTPs: 15 mg/L annual running median and 20 mg/L 95<sup>th</sup> percentile.



# Big Dry Creek Total Phosphorus (2022)

## “Interim Value” = 0.17 mg/L



- Above WWTPs, stream can meet standard.
- Currently not meeting interim value below Westminster WWTP & agricultural area. (bdc2.0 attained 3 of last 5 yrs below Broomfield WWTP)

# Median Annual Total Phosphorus (mg/L) (2000-2022)

| Year | bdc0.5 | bdc1.0 | bdc1.5 | bdc2.0 | bdc3.0 | bdc4.0/4.5 | bdc5.0 | bdc6.0 |
|------|--------|--------|--------|--------|--------|------------|--------|--------|
| 2000 | 0.00   | 0.07   | 0.04   | 0.43   | 1.85   | 1.60       | 1.45   | 1.25   |
| 2001 | 0.00   | 0.06   | 0.06   | 0.47   | 1.90   | 1.10       | 1.20   | 0.93   |
| 2002 | 0.00   | 0.06   | 0.07   | 1.20   | 2.25   | 1.50       | 1.80   | 1.60   |
| 2003 | 0.04   | 0.04   | 0.05   | 0.75   | 2.25   | 1.55       | 1.40   | 1.15   |
| 2004 | 0.04   | 0.05   | 0.05   | 0.23   | 1.75   | 1.15       | 1.10   | 0.94   |
| 2005 | 0.09   | 0.12   | 0.12   | 1.32   | 2.54   | 1.68       | 1.68   | 1.40   |
| 2006 | 0.12   | 0.13   | 0.15   | 0.48   | 2.04   | 1.38       | 1.30   | 1.13   |
| 2007 | 0.12   | 0.16   | 0.18   | 0.85   | 2.21   | 1.24       | 1.29   | 1.23   |
| 2008 | 0.14   | 0.23   | 0.20   | 0.90   | 1.73   | 1.18       | 1.10   | 1.22   |
| 2009 | 0.03   | 0.07   | 0.06   | 0.84   | 0.76   | 0.57       | 0.77   | 0.60   |
| 2010 | 0.06   | 0.09   | 0.08   | 0.13   | 0.34   | 0.31       | 0.33   | 0.44   |
| 2011 | 0.07   | 0.10   | 0.10   | 0.17   | 0.55   | 0.49       | 0.32   | 0.49   |
| 2012 | 0.11   | 0.13   | 0.15   | 0.27   | 0.96   | 0.85       | 0.68   | 0.62   |
| 2013 | 0.04   | 0.07   | 0.07   | 0.27   | 0.78   | 0.64       | 0.52   | 0.48   |
| 2014 | 0.04   | 0.04   | 0.05   | 0.48   | 0.52   | 0.63       | 0.58   | 0.53   |
| 2015 | 0.04   | 0.09   | 0.05   | 0.20   | 0.66   | 0.50       | 0.45   | 0.55   |
| 2016 | 0.04   | 0.06   | 0.03   | 0.21   | 0.72   | 0.68       | 0.56   | 0.43   |
| 2017 | 0.08   | 0.06   | 0.05   | 0.30   | 0.99   | 0.78       | 0.64   | 0.55   |
| 2018 | 0.05   | 0.07   | 0.06   | 0.16   | 0.36   | 0.46       | 0.35   | 0.40   |
| 2019 | 0.15   | 0.14   | 0.09   | 0.24   | 0.34   | 0.36       | 0.32   | 0.28   |
| 2020 | 0.07   | 0.11   | 0.09   | 0.15   | 0.31   | 0.39       | 0.45   | 0.43   |
| 2021 | 0.07   | 0.11   | 0.10   | 0.13   | 0.25   | 0.23       | 0.21   | 0.24   |
| 2022 | 0.08   | 0.15   | 0.10   | 0.14   | 0.23   | 0.23       | 0.27   | 0.27   |

Pink-shaded cells exceeded the interim value of 0.17 mg/L total phosphorus.

# Decreases in TP @ Broomfield and Westminster WWTPs

- Biological nutrient removal at Broomfield and Westminster WWTPs.
- Compliance plans for new permits limits to reach 1 mg/L TP as annual median

Figure 24. Decreases in Total P Concentrations in Broomfield WWTP Discharge (2002-2022)

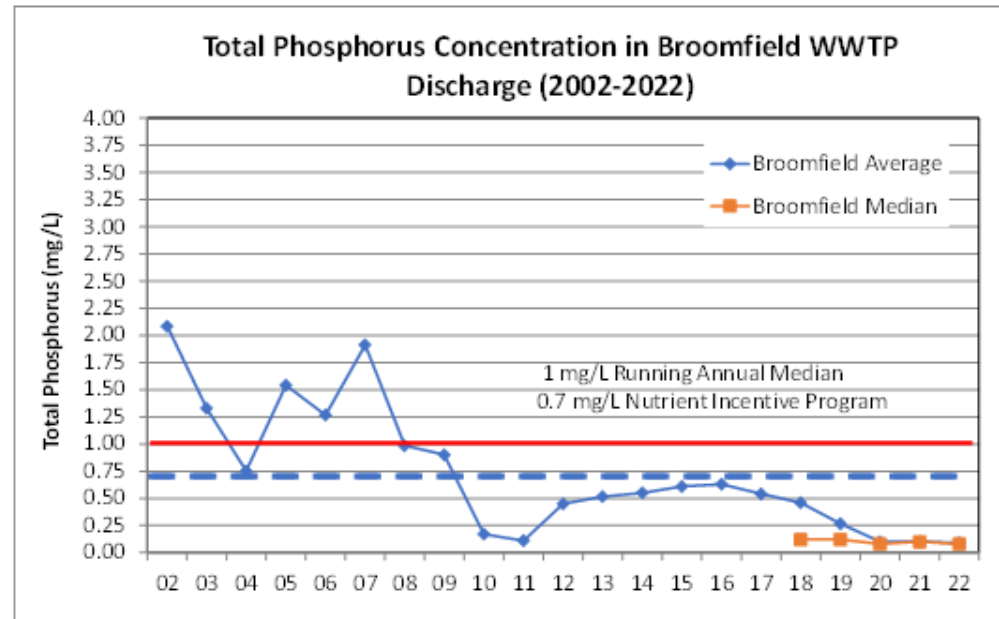
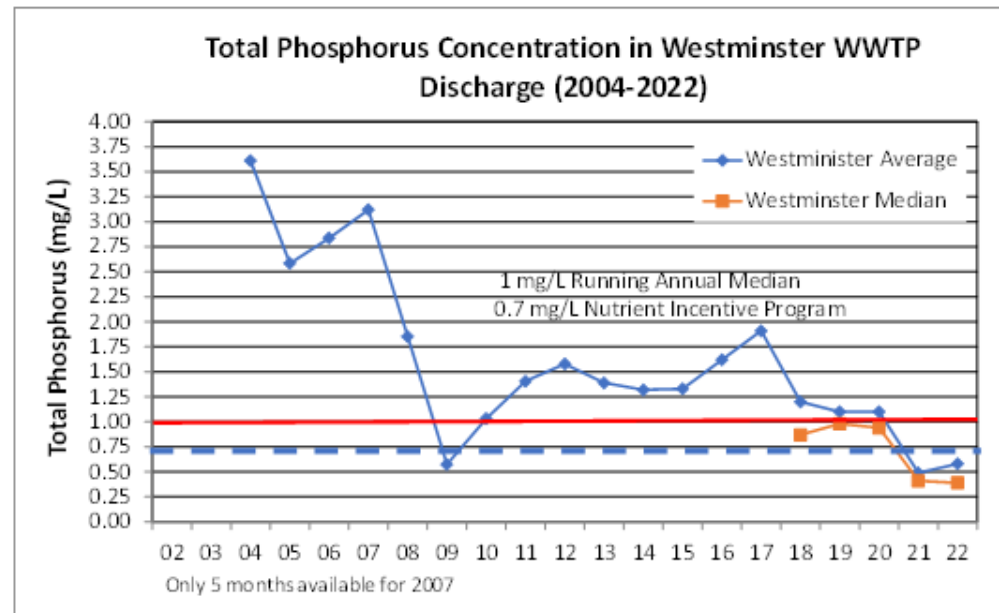
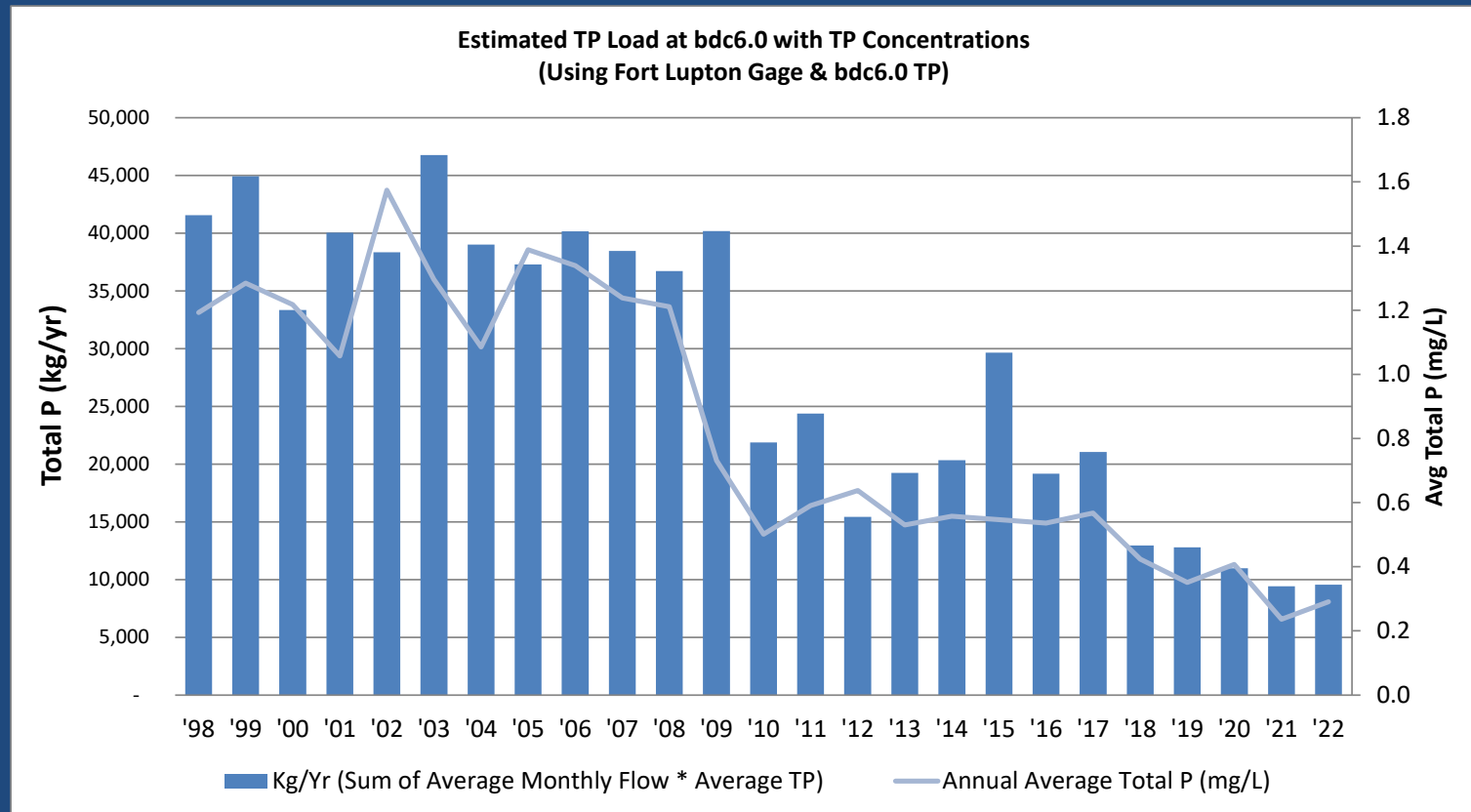


Figure 25. Decreases in Total P Concentrations in Westminster WWTP Discharge (2004-2022)



# TP Load Reductions at bdc6.0

- BMW Target 20% load reduction relative to 2004.
- 2022 load is 73 and 78% lower than 2004 and 2003, respectively.
- Flow variations affect load.
- WWTP decreases affect TP load.





# Pollutant Trends Related to Stormwater

| Watershed Portion     | Bacteria       | Iron    | Nutrients |          | Secondary Drinking Water Params. |                   |       | Se**  |
|-----------------------|----------------|---------|-----------|----------|----------------------------------|-------------------|-------|-------|
|                       | <i>E. coli</i> | Iron    | TP        | TN & NO3 | Mn                               | Cl                | SO4   | Se**  |
| Upper (bdc1.5)        | Higher         | Higher* | Higher*   | Lower*   | Lower                            | Lower/<br>Neutral | Lower | Lower |
| WWTP-Urban (bdc3.0)   | Higher         | Higher  | Higher    | Lower    | Lower                            | Neutral           | Lower | Lower |
| Agricultural (bdd6.0) | Higher         | Higher  | Higher    | Lower    | Lower                            | Neutral           | Lower | Lower |

\*Meets stream standard. \*\*Site-specific standard in place.

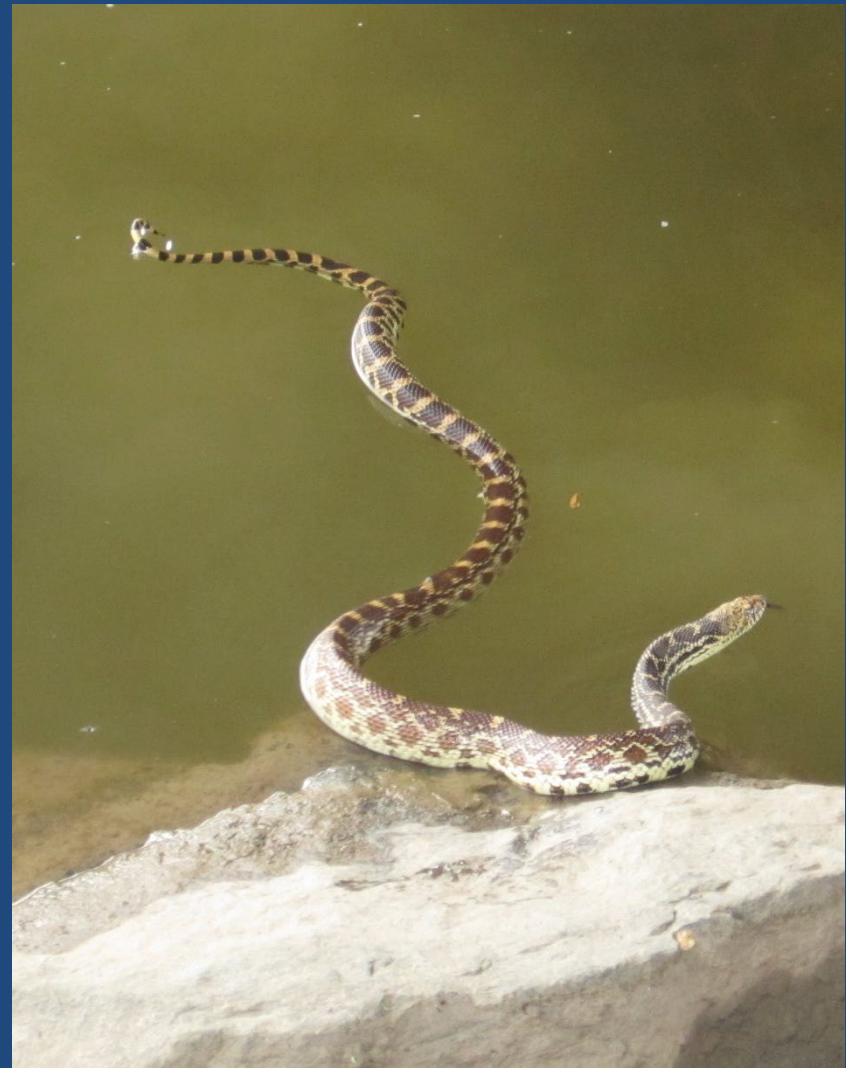
- Important to understand pollutant source(s) and transport mechanisms in order to identify solutions

Questions?

Jane Clary

Wright Water Engineers  
clary@wrightwater.com

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



# CHATFIELD WATERSHED AUTHORITY



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

# CHATFIELD WATERSHED AUTHORITY



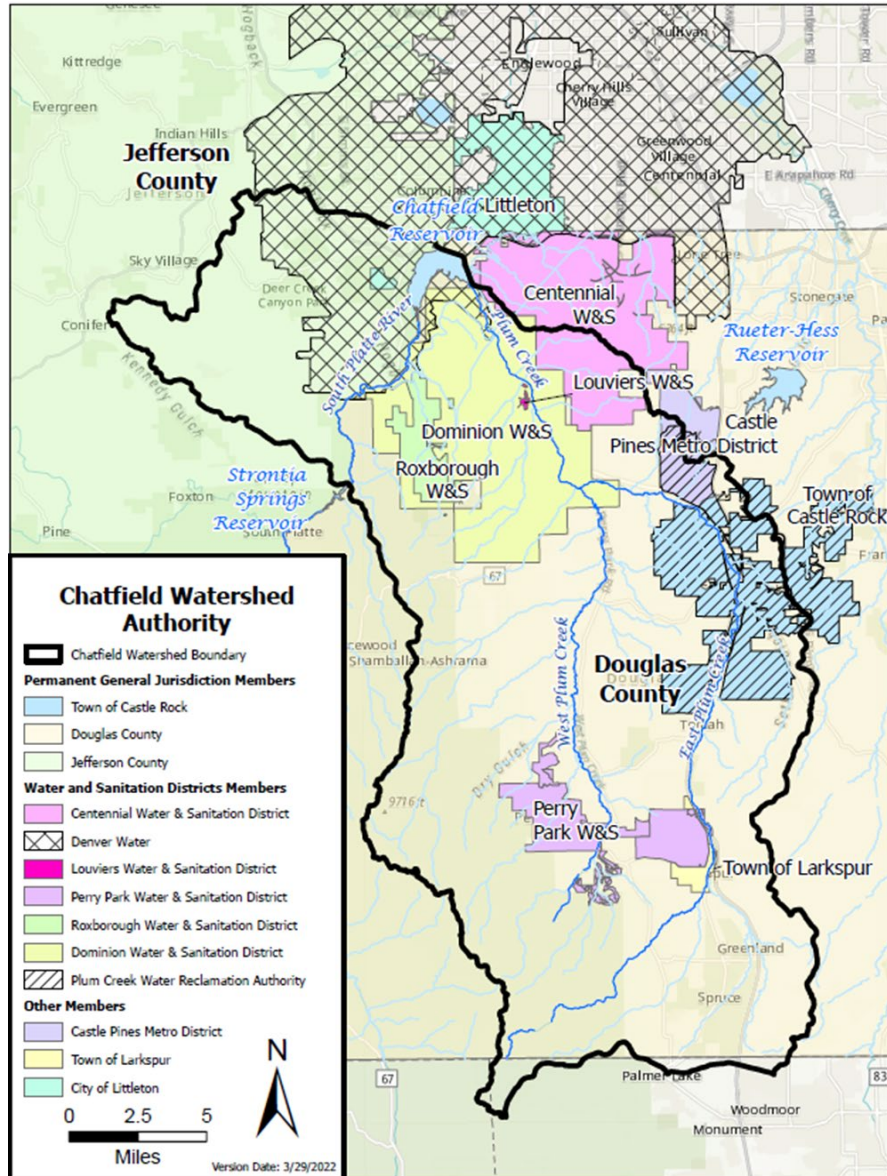
**The Chatfield Watershed Authority was established in 1984 when the Governor of Colorado designated the Authority as a 208 Management Agency for the Chatfield Watershed, in accordance with the Federal Clean Water Act.**



**The Authority purpose is to preserve the beneficial uses in Chatfield Reservoir and Watershed through the promotion of point source, nonpoint source, and stormwater controls that reduce phosphorus and chlorophyll  $\alpha$ .**

**The Authority is a voluntary organization formed through an Intergovernmental Agreement and funded with voluntary dues assessed yearly on the Authority members.**

# CWA MEMBERSHIP



- **Permanent General Jurisdiction Members**

- Douglas County
- Jefferson County
- Town of Castle Rock

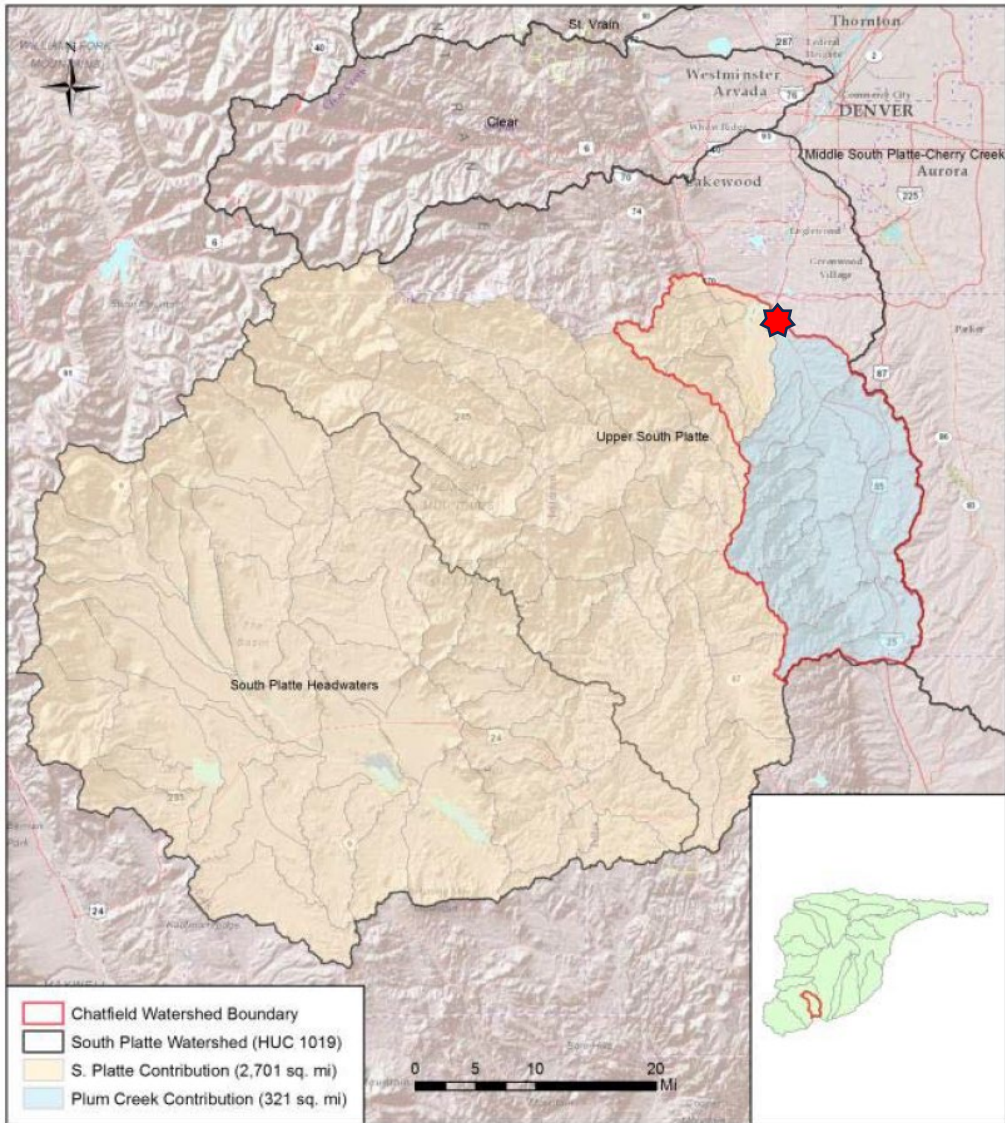
- **Water and Sanitation Members**

- 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

# CHATFIELD RESERVOIR /WATERSHED



- ❖ Total Watershed Area: 3022 sq. mi.(excludes transmountain diversions from the Arkansas and Colorado River Basins).
- ❖ Total Regulatory Watershed Area: 440 sq. mi.
- ❖ Average Annual Inflow: 100,860 af/yr.  
Over 75% from Cold South Platte River.  
Less than 25% from Warm Plum Creek.
- ❖ Regulated as a Cold-Water Reservoir.
- ❖ Storage Volume: 20,046 af historic plus up to 20,600 af of additional reallocation storage.



# REGULATORY FRAMEWORK

## COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT WATER QUALITY CONTROL COMMISSION 5 CCR 1002-73 REGULATION NO. 73 CHATFIELD RESERVOIR CONTROL REGULATION

### Regulation #73 Requirements :

- **208 MANAGEMENT AGENCY:** Conduct reviews and provide recommendations to the Division on Site Applications and Phosphorus Trades.
- **TMAL:** A total maximum annual load (TMAL) for phosphorus of 19,600 lbs/yr under a median inflow of 100,860 AF/yr has been identified to attain the water quality standards for 10 µg/l chlorophyll α and 0.030 mg/l total phosphorus, as described in Regulation No. 38. Attainment of the TMAL may require progressive development of point source and nonpoint controls. ***Chlorophyll α and Total Phosphorus each exceeded the standard values in 8 the last 40 years but only 1 year out-of-compliance exceedance in the last 10 years.***
- **EFFLUENT LIMITATIONS AND POINT SOURCE WASTELOAD ALLOCATIONS:**
  - 1.0 mg/l total phosphorus as a 30-day average concentration
  - The allowed annual wasteload of point source phosphorus is limited to 7,533 lbs/yr,
- **PHOSPHORUS TRADING:** The regulation provides the opportunity for non-point to point source and inter- agency phosphorus trades.
- **MONITORING AND REPORTING:** Annually review and submit a water quality monitoring plan and an annual report. ***40 years of data for Chatfield Reservoir and tributary streams and creeks.***

# WATER QUALITY CHALLENGES AND STRATEGIES



## CHALLENGES:



Funding (with limited funds for matching grants):  
Current budget allows for only \$29,000/year in funding of non-point source projects



Watershed Risks: Wildfires are the number one risk for impairment of water quality in Chatfield Reservoir (remember the Hayman fire in 2002)?



Growth: Douglas County was the fastest growing exurb in the US from 1990- 2019 at 481% population growth.



# WATER QUALITY CHALLENGES AND STRATEGIES



## STRATEGIES:

- Obtain Approval for Implementing a Water Quality Fee for Users of Chatfield Reservoir



- Significant Funding of Improvements from Local Jurisdictions and CRMC

- Watershed Modeling to Assess Wildfire



PLUM CREEK ENVIRONMENTAL MITIGATION SITE

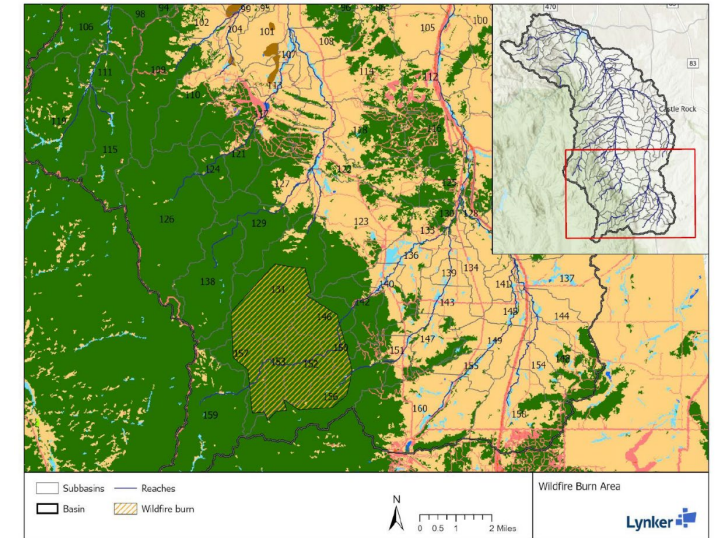
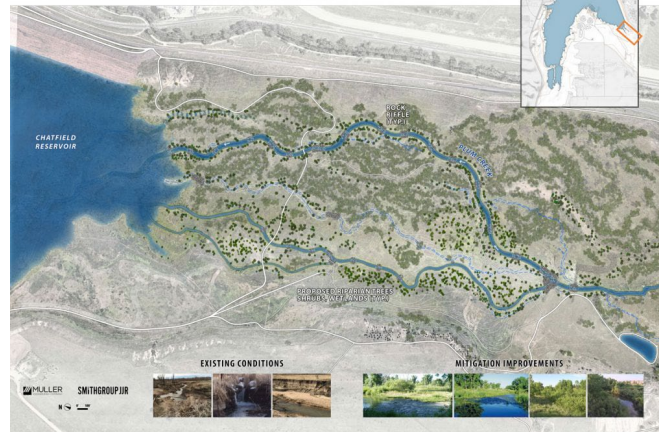


Figure 8: Modeled Wildfire Burn Area

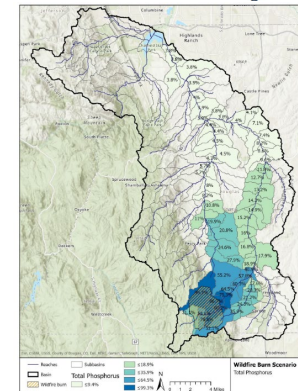


Figure 11: Annual Average Percent Change in Total Phosphorus due to Wildfire Burn

Table 8: 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 (% / A/F) |
|--|------------------------------|---------------------------------|-------------------------------|--------------------------------|----------------------|
| <b>Percent Increase (%)</b>            |                              |                                 |                               |                                |                      |
| Reach 131                              | West Plum Creek (burned)     | 99.3                            | 103.1                         | 238.5                          | 36.9                 |
|  | East Plum Creek (burned)     | 86.7                            | 92.5                          | 189.5                          | 34.2                 |
| Reach 146                              | 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                           | 6.1                  |
| 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                  |
| <b>Absolute Increase (lbs or tons)</b> |                              |                                 |                               |                                |                      |
| Reach 131                              | West Plum Creek (burned)     | 85.8                            | 3430                          | 62.8                           | 195.7                |
| Reach 146                              | East Plum Creek (burned)     | 167.5                           | 6490                          | 130.7                          | 373.4                |
| Reach 156                              | Cook Creek (burned)          | 34.0                            | 1330                          | 31.0                           | 76.4                 |
| Reach 92                               | West Plum Creek              | 80.9                            | 3310                          | 66.4                           | 195.9                |
| Reach 53                               | West Plum Creek (confluence) | 78.3                            | 3260                          | 67.5                           | 195.9                |
| Reach 76                               | East Plum Creek (confluence) | 195.0                           | 7450                          | 173.7                          | 449.1                |
| Reach 46                               | East Plum Creek              | 231.8                           | 7370                          | 218.4                          | 449.0                |
| Reach 45                               | Plum Creek at Sedalia        | 304.0                           | 10620                         | 251.0                          | 644.9                |
| Reach 28                               | Plum Creek at Titan Rd       | 297.0                           | 10500                         | 245.2                          | 644.7                |



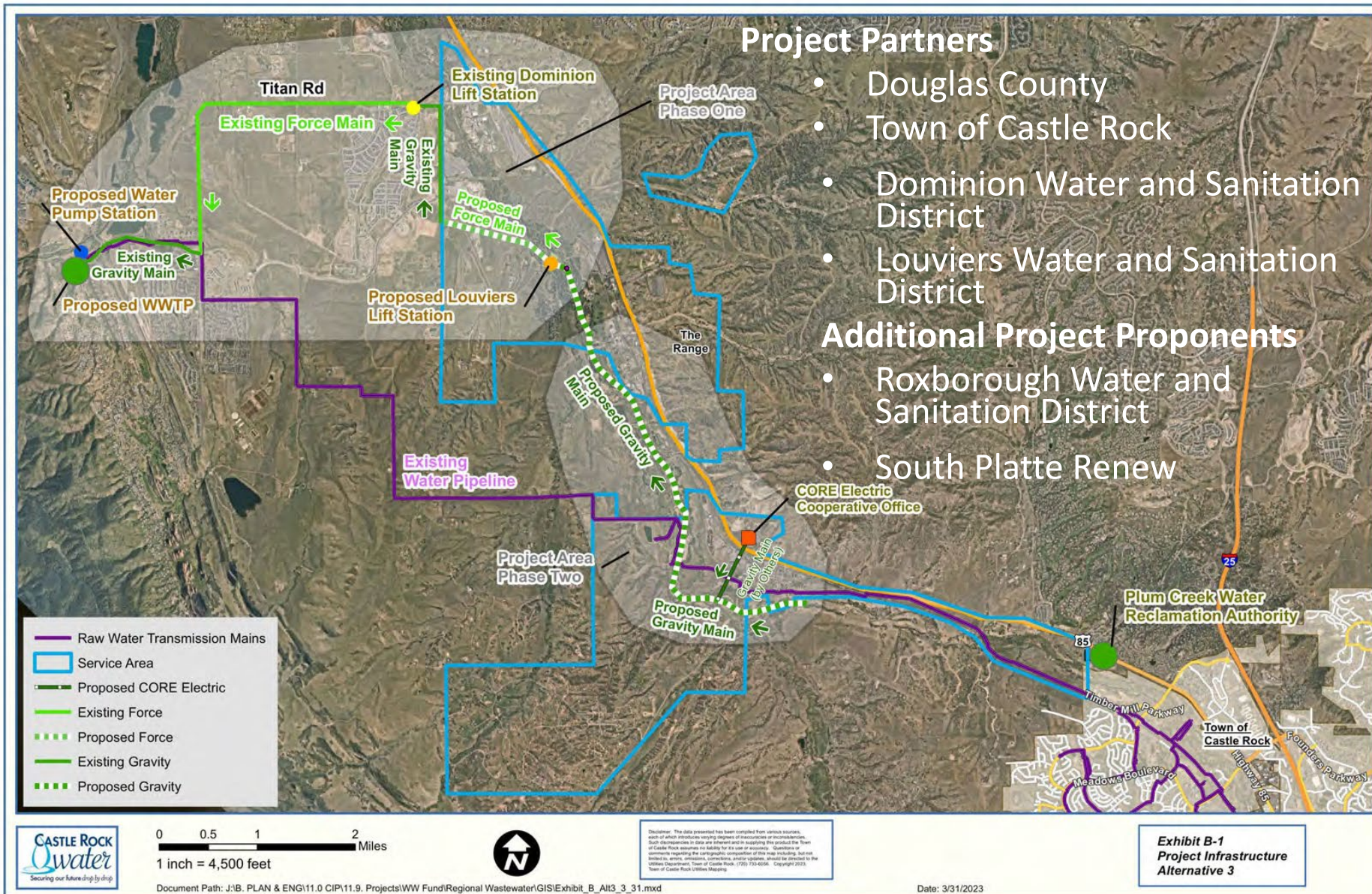
SENATE BILL 23-267

BY SENATOR(S) Van Winkle and Cutter, Kolker, Sullivan; also REPRESENTATIVE(S) Titone and Bradley, Brown, Duran, Frizzell, Garcia, Hamrick, Hartsook, Jodeh, Lieder, Lindsay, Marshall, McCormick, Snyder, Story, Taggart.

CONCERNING A WATER QUALITY FEE TO BE PAID FOR ADMISSION TO CHATFIELD STATE PARK, AND, IN CONNECTION THEREWITH, REQUIRING THE DIVISION OF PARKS AND WILDLIFE TO COLLECT THE FEE AND TRANSFER THE AMOUNT OF THE FEE TO THE CHATFIELD WATERSHED AUTHORITY.



# REGIONAL WASTEWATER SOLUTION



# Cherry Creek Basin Water Quality Authority



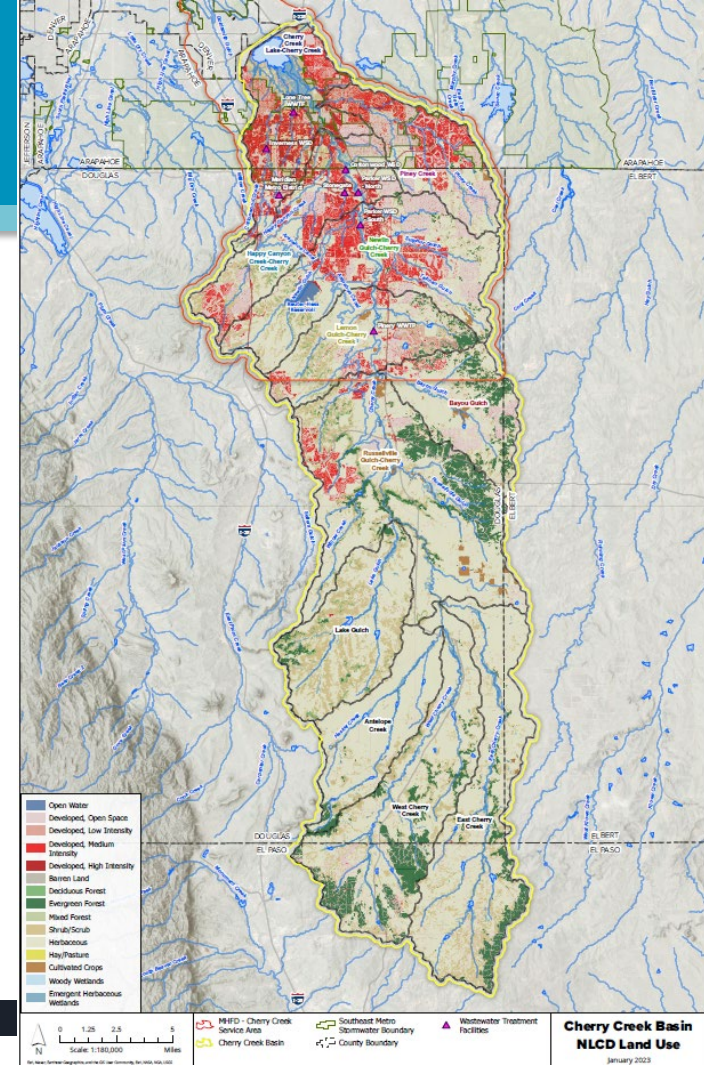
Jane Clary, CCBWQA Technical Manager

Confluence at the Confluence  
October 17, 2023

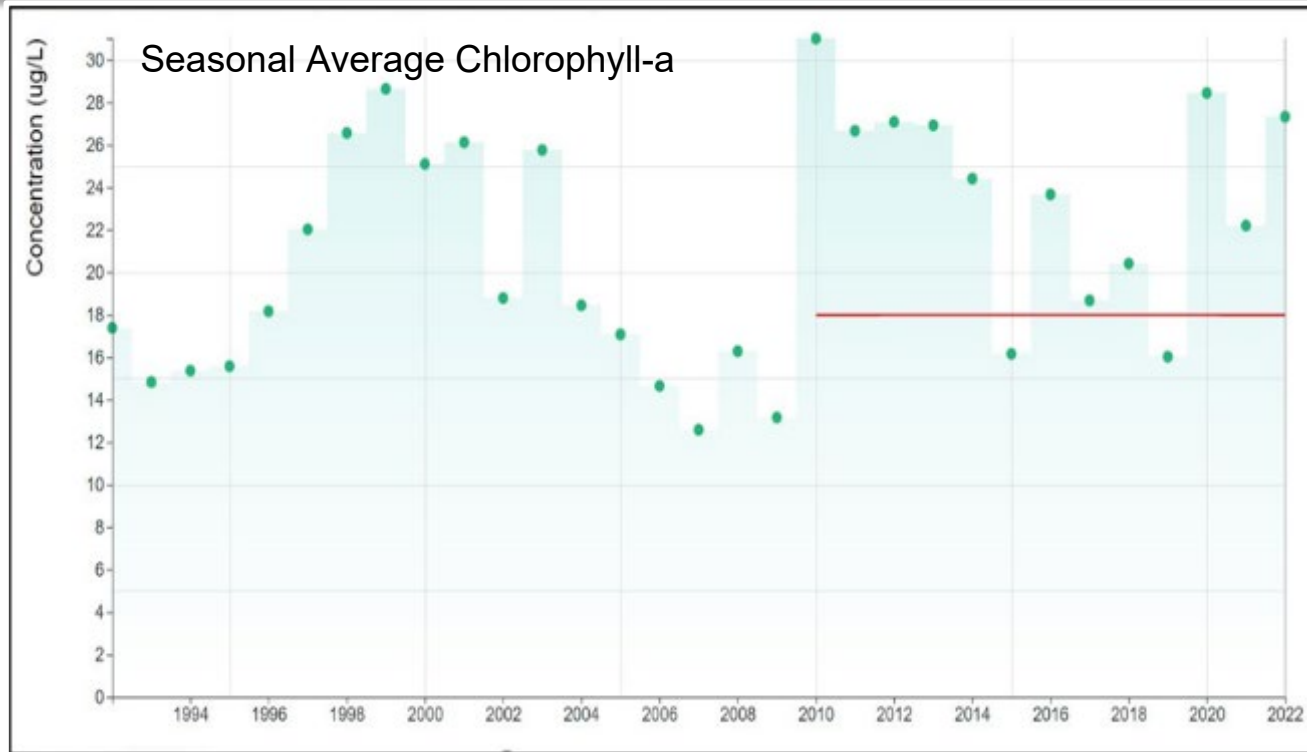


# Cherry Creek Reservoir Basics

- Reservoir constructed for flood control by U.S. Army Corps of Engineers (1950)
- Cherry Creek State Park created (1959)—now ~1.5 million visitors per year
- Clean Lakes Study showed eutrophication (1984)
- CCBWQA (Authority) created by the Colorado Legislature in 1988, with activities funded primarily through property tax
- Watershed Size: ~386 square miles
- Reservoir Size: 850 acres with 13,000 AF of storage



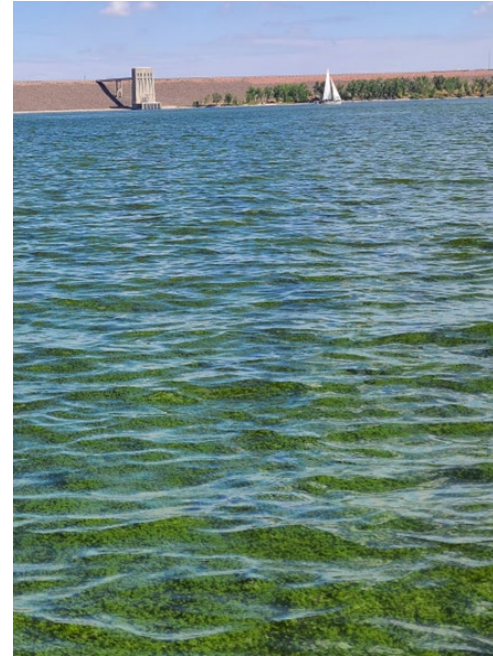
# Status for 2023: Status Quo Will Not Meet the Chlorophyll-a Standard



18 ug/L standard

# Established Vision & Mission

- **Vision:** Restore and maintain the chemical, physical, and biological integrity of the nation's waters and specifically those in the Cherry Creek Basin.
- **Mission:**
  - Improve, protect, and preserve water quality in Cherry Creek and Cherry Creek Reservoir for recreation, fisheries, water supplies, and other beneficial uses.
  - Provide for effective efforts by counties, municipalities, special districts, and landowners within the basin in the protection of water quality.
  - Promote public health, safety, and welfare.



# Currently Active Mitigation Toolbox

## Reg. 72 Minimum Requirements:

- WWTP/Point Source Limits (Reg 72.4; CDPHE)
- Non-point Source/ISDS/Education “Source Controls” (Reg. 72.6)
- Stormwater requirements (Reg. 72.7; MS4s)

## Related Efforts:

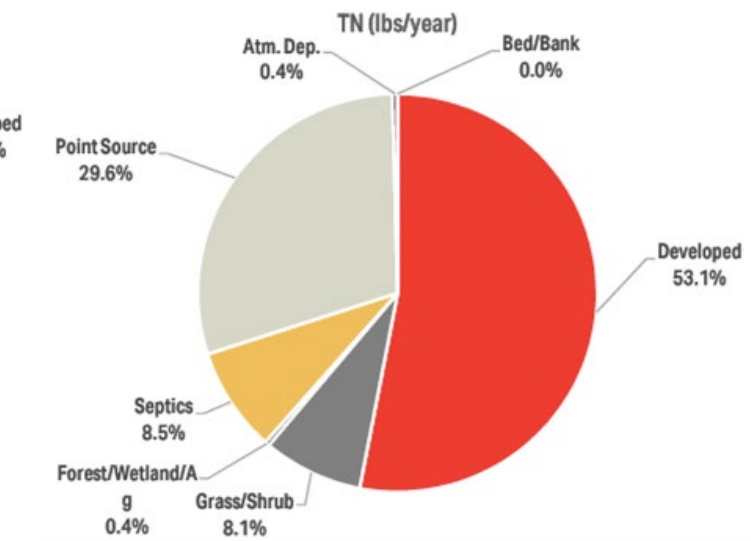
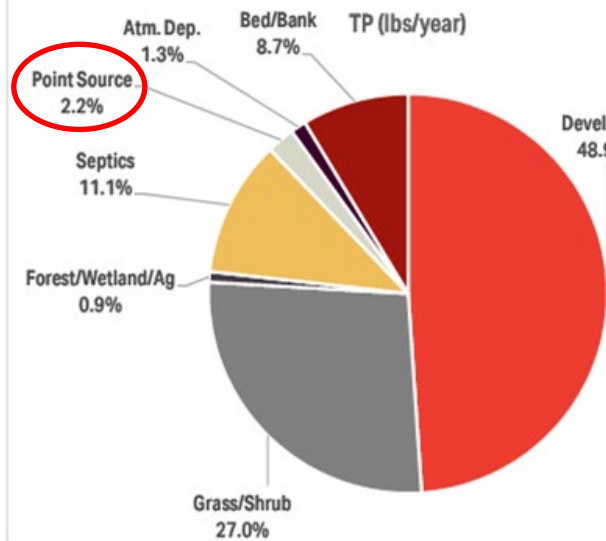
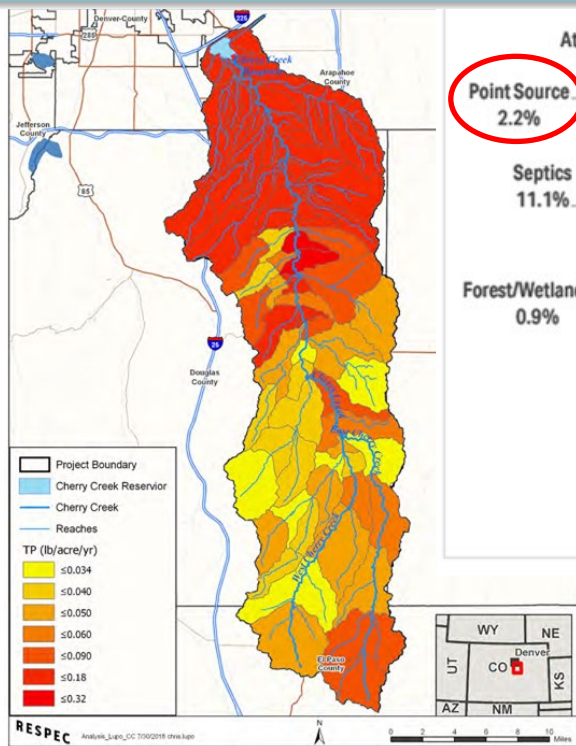
- Stream Reclamation PRFs (72.6)
- Treatment Train PRFs (72.6)
- RDS (in reservoir) (25-8.5-115)
- Site App/Development Reviews (25-8.5-111)

\*

25-8.5-111.(1)(s) Review and approve water quality control projects of any entity other than the authority within the boundaries of the authority)



# Understanding Relative Source Contributions



TP and TN Relative Source Contributions  
RESPEC HSPF Watershed Model: Baseline Conditions

Simulated Total Phosphorus Loading Rates by Sub-watershed

*Watershed Plan:*

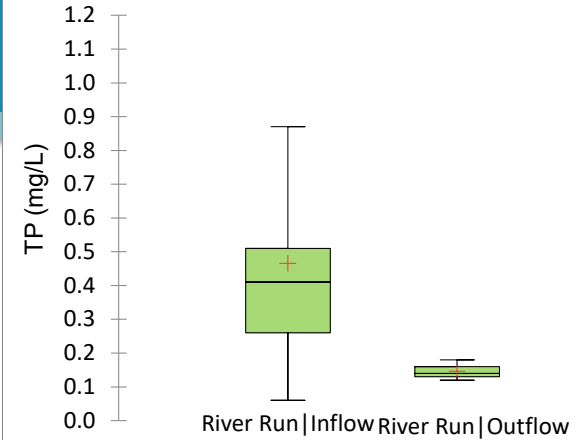
- Leverage Watershed Model results



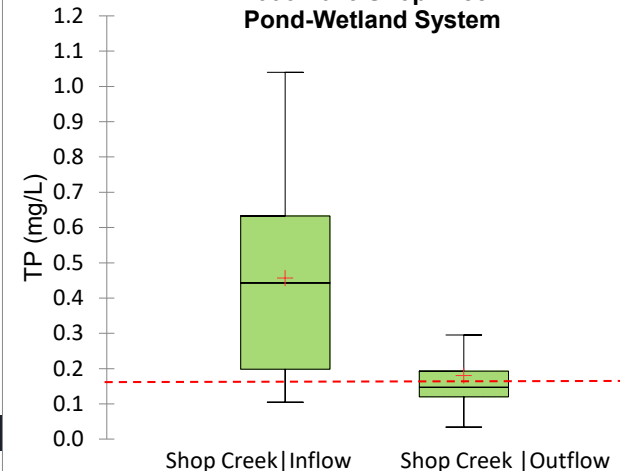
# Stormwater Controls

- Tools/Resources
  - Reg 72 Construction & Post Construction Requirements
  - MS4 Permits (enforceable)
  - Criteria Manuals: MHFD Volume 3, SEMSWA, Others
  - BMP Database/NSQD
  - Regional Facilities
  - Effective PRFs
- Opportunities
  - Encouraging selection of effective BMPs
  - BMP-specific demonstrations (e.g., quantifying runoff reduction, bioretention media amendments)
  - Retrofits of flood detention to provide water quality
  - Retrofits of existing facilities to improve function/maintenance (e.g., forebays)
  - Encouraging runoff reduction/dendritic development in new developments
- Data Gaps
  - Current “level of service”
  - GIS integration

2017-2021 MHFD River Run  
Bioretention



1995-2013 Shop Creek  
Pond-Wetland System





# Reservoir Destratification System (RDS)

- Controlling internal P loading is part of the solution
- RDS limits stratification when temperatures are not extreme
- When dissolved oxygen is high at the bottom of the reservoir, internal loading is reduced
- Artificially mixes cyanobacteria
- Benefit to fishery
- But, it has design limitations



# Source Controls/Public Outreach

- Tools/Resources
  - CC Stewardship Partners
  - Activities
  - MS4s/SEMSWA
  - City utilities—water conservation
  - MHFD
- Opportunities
  - New landscape conversion ordinances
  - Parks & Open Space
  - HOAs
  - Landscape Industry (ALCC, GreenCO)
- Challenges
  - Hard to measure/quantify



<https://www.auroragov.org/cms/One.aspx?portalId=16242704&pageId=16534576>

# Using Our Tools to Inform Our Actions

- **GIS/Dashboard Tools**
  - Understanding “level of service”
  - Current opportunities & future opportunities
- **Watershed Model**
  - Useful for prioritization and relative comparisons of benefits of options
  - Informs “Big number-Small number”
  - Concentrations vs. loads
- **Reservoir Model**
  - Opportunity to run the watershed model scenarios
  - Hydros recommends using the existing calibrated model
  - Will also use Reservoir Model to some extent for site-specific standard

# Questions?

Jane Clary, CCBWQA Technical Manager  
([clary@wrightwater.com](mailto:clary@wrightwater.com))



# This is Clear Creek...



**Loveland uses 34 million gallons of water from Clear Creek on average a year for snowmaking**



this is Clear Creek  
(somewhere)

US 6 on ramp and  
EB I-70 auxiliary lane

I-70 elevated  
on viaduct

US 6 to I-70 westbound  
on ramp

Clear Creek  
Greenway Trail

US 6 off ramp



this is Clear Creek...

Since 2020,  
the number of  
visitors tubing and  
kayaking on Clear  
Creek has increased  
dramatically



this is Clear Creek...



this is Clear Creek ...

"5 REASONS IDAHO SPRINGS IS THE  
PERFECT DAY TRIP FOR DENVERITES"

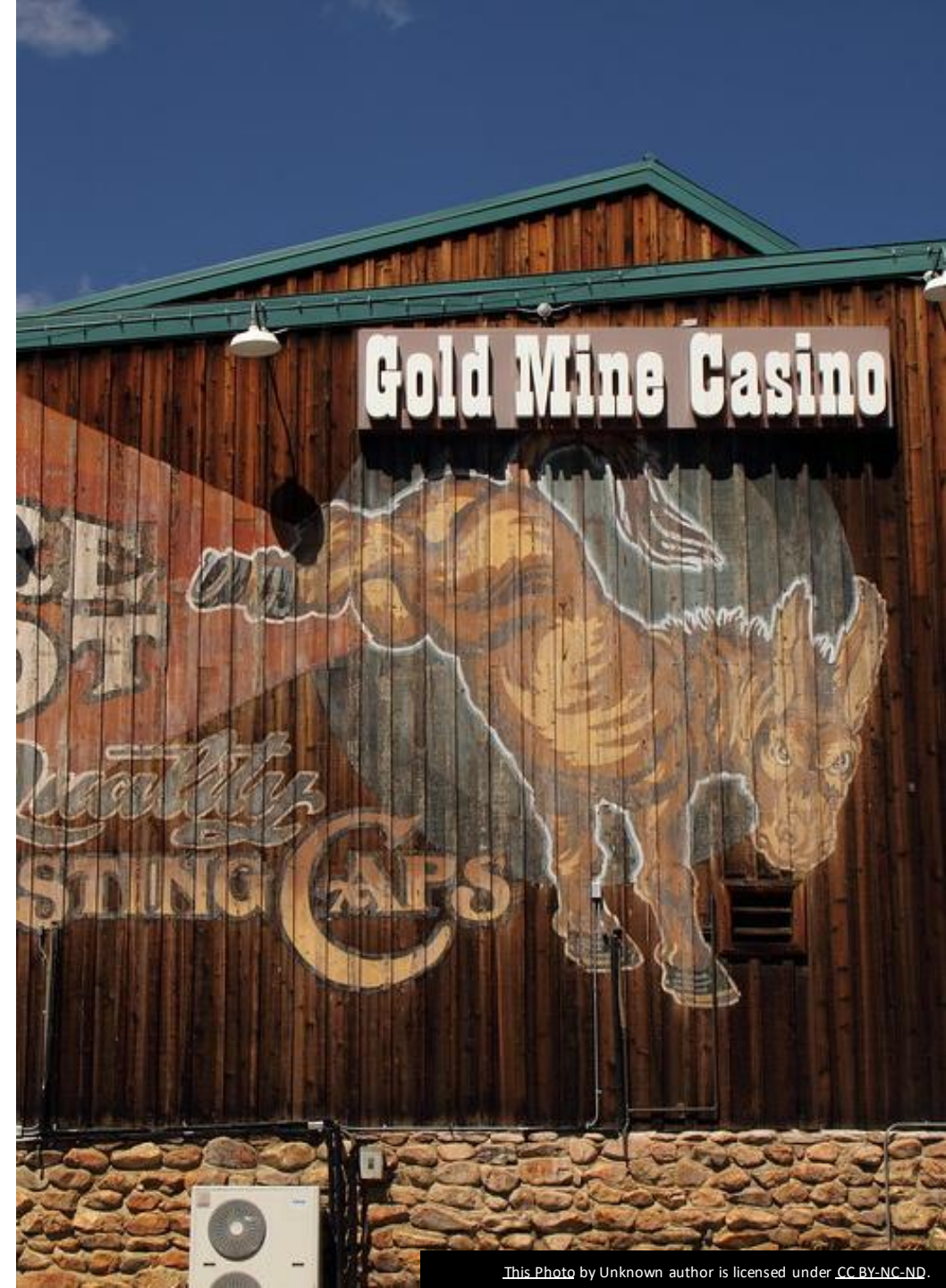
In 2022, the EPA and the CDPHE established the Central City/Clear Creek Superfund Site that consists of 400-square-miles extending from the Continental Divide to Golden



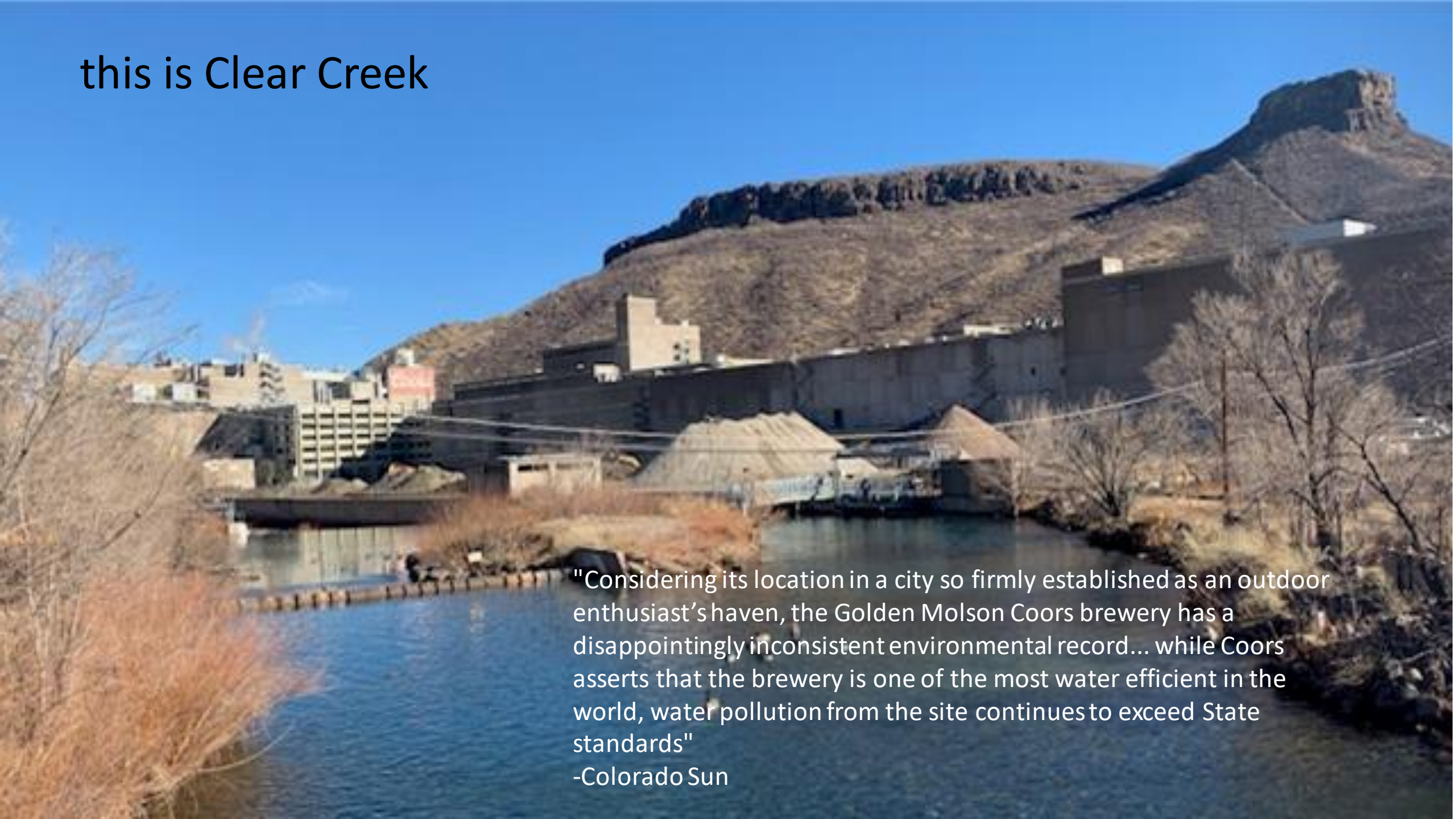
this is Clear Creek ...

The EPA and CDPHE signed an agreement in 2010 with Black Hawk and Central City to build a cleanup plant with a primary objective of restoring fish habitat to North Clear Creek. The mining towns-turned-gambling meccas have asserted that, under Colorado's water appropriation system, they can use senior water rights that they own to tap the cleaned creek.

Black Hawk plans to build thousands more hotel rooms, hiking and biking trails, a reservoir and, possibly, a golf course.

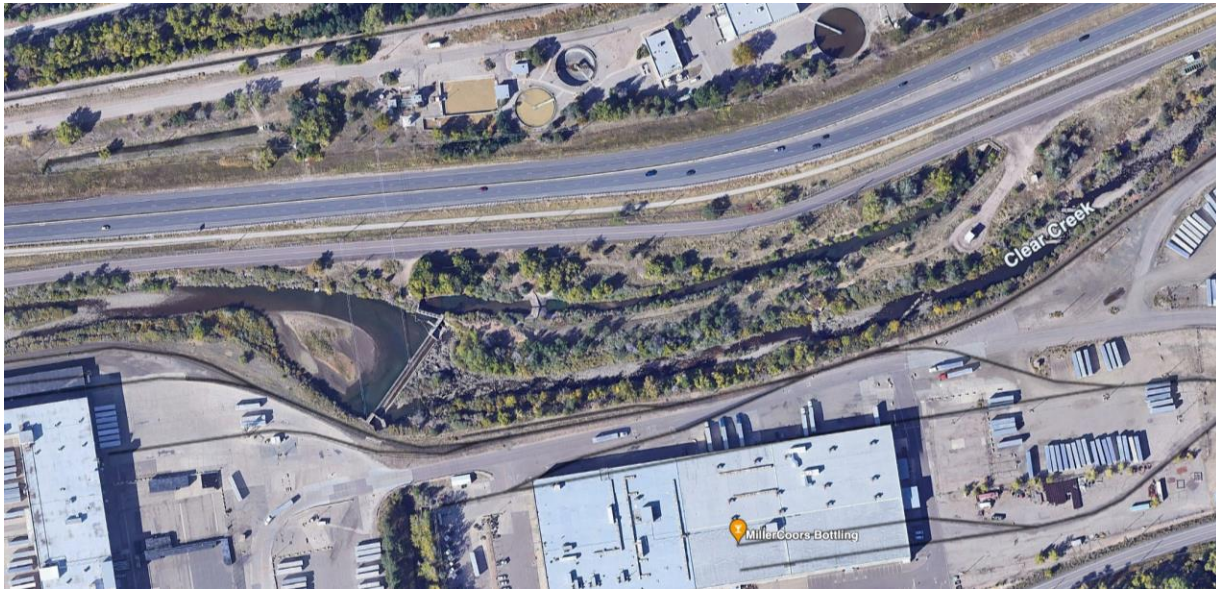
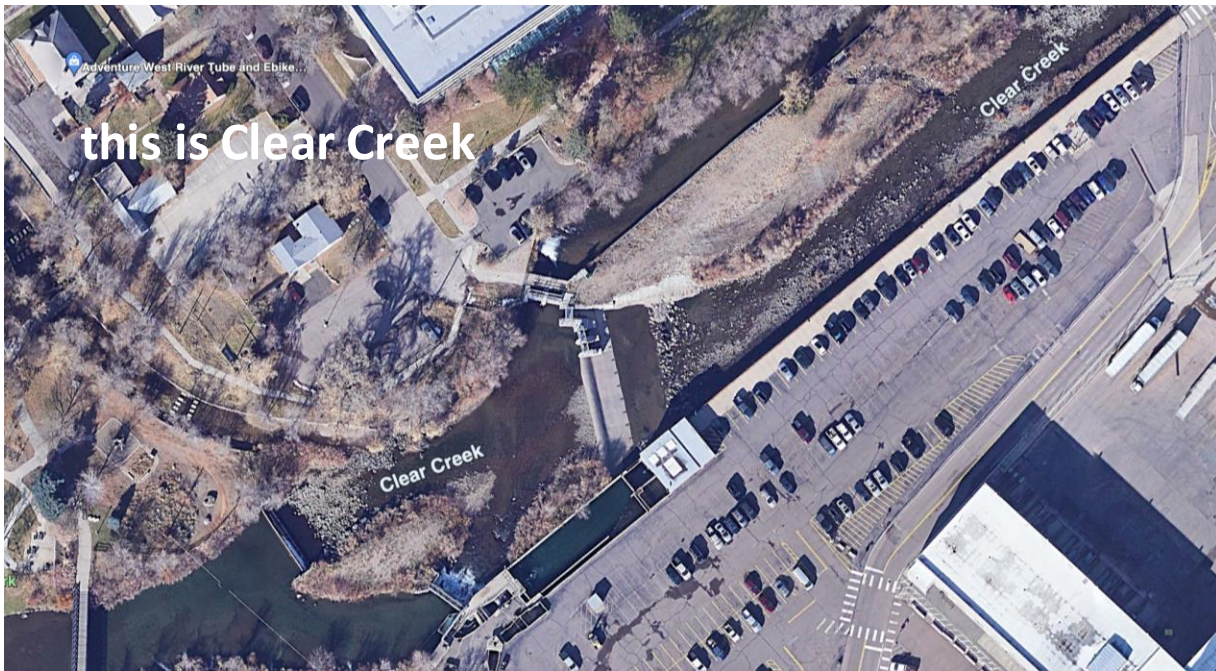


this is Clear Creek



"Considering its location in a city so firmly established as an outdoor enthusiast's haven, the Golden Molson Coors brewery has a disappointingly inconsistent environmental record... while Coors asserts that the brewery is one of the most water efficient in the world, water pollution from the site continues to exceed State standards"

-Colorado Sun

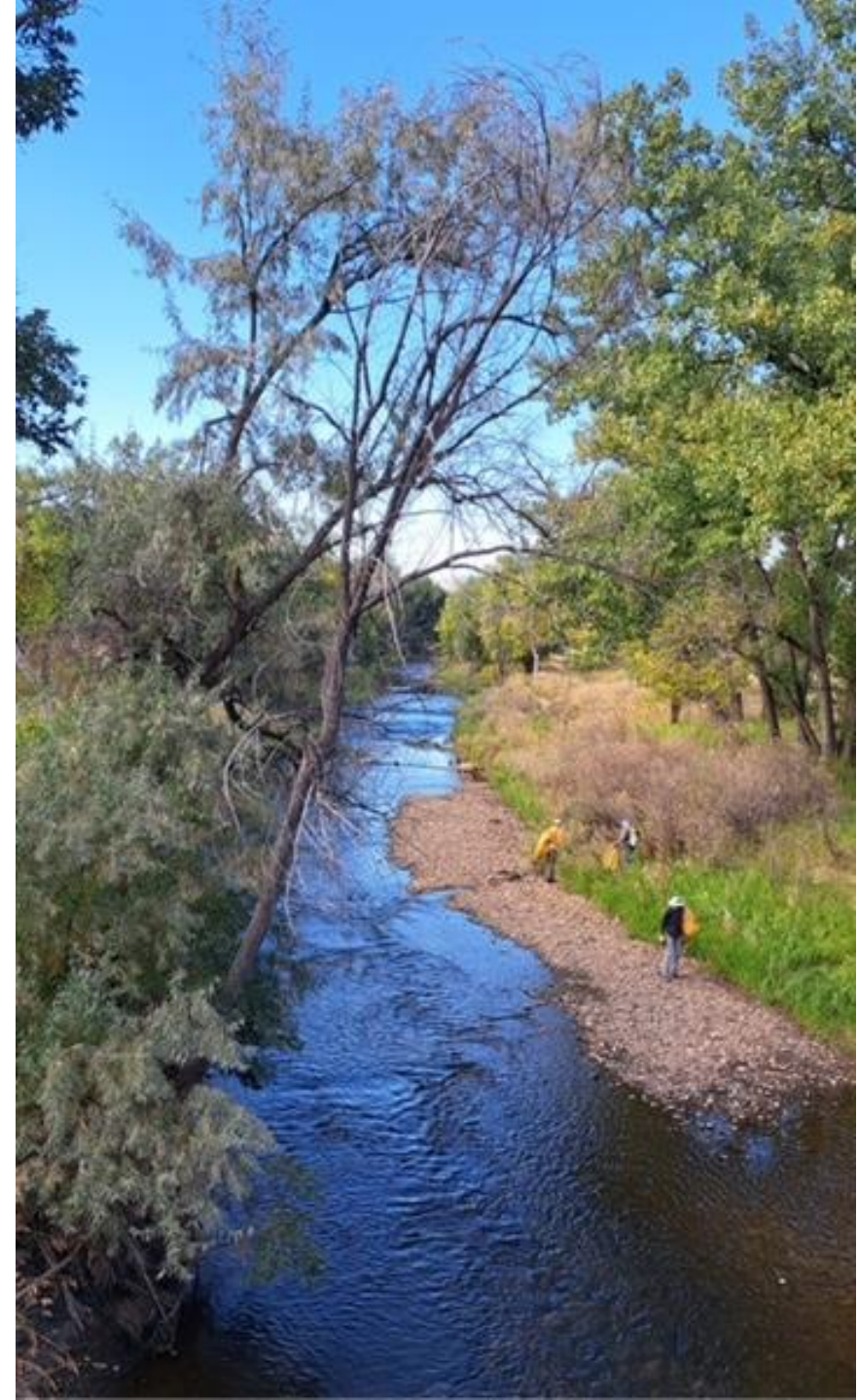


# Clear Creek

## Integrated Water Management Plan

2019-2023

Colorado's Water Plan goal that **80 percent of locally prioritized rivers be covered by stream management plans (SMP) by 2030**. This objective builds on years of conversation, research, and some action to devise a methodology to develop data-driven water management and physical project recommendations capable of **protecting or enhancing environmental conditions and recreational opportunities** on streams and rivers.





## Step One- Identify Stakeholders

- 75 stakeholders from the Continental Divide to the Confluence
- Lessons Learned: history of a divided watershed (over-allocated, water quality/delivery concerns, storage concerns; need to educate the greater watershed community on Water Plan/SMPs and Clear Creek; the SMP is not an SMP)

## Step Two- Outreach and Engagement

- Procure grants for facilitation and planning
- Determine geographic scope
- Identify Phase I priorities: improve watershed collaboration and communication; identify existing plans and projects; identify gaps and project opportunities

## Step Three- Planning

- Establish a Focus Group
- Watershed Mapping to facilitate Step Two priorities



# Meanwhile

- Participate in the environmental Technical Team (SWEEP) providing oversight of the CDOT I-70 expansion
- Support UCCWA partners with their 1041 permitting process
- Support Jeffco with annual Clear Creek Clean Up
- Partner with Golden Water on potential fish passage and screening opportunities
- Prioritize Environmental Justice concerns such as the dispute of Regulation 38 antidegradation designations
- Develop future watershed coalition



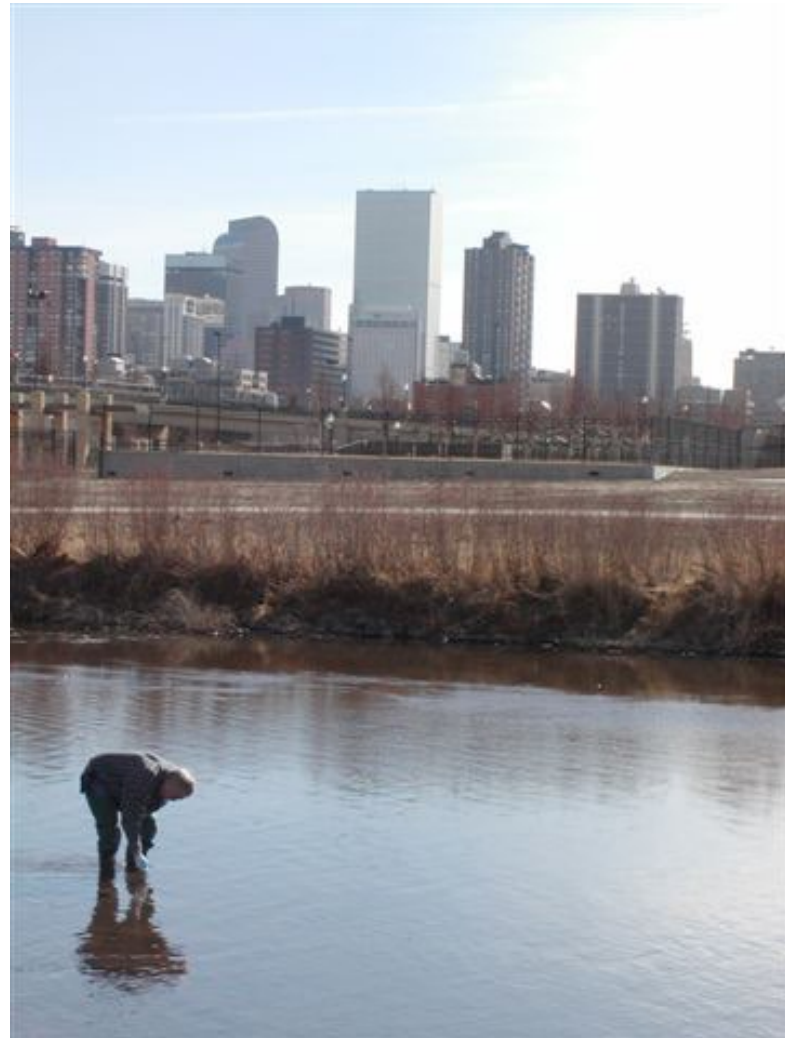
# SP CURE

SOUTH PLATTE COALITION  
FOR URBAN RIVER EVALUATION

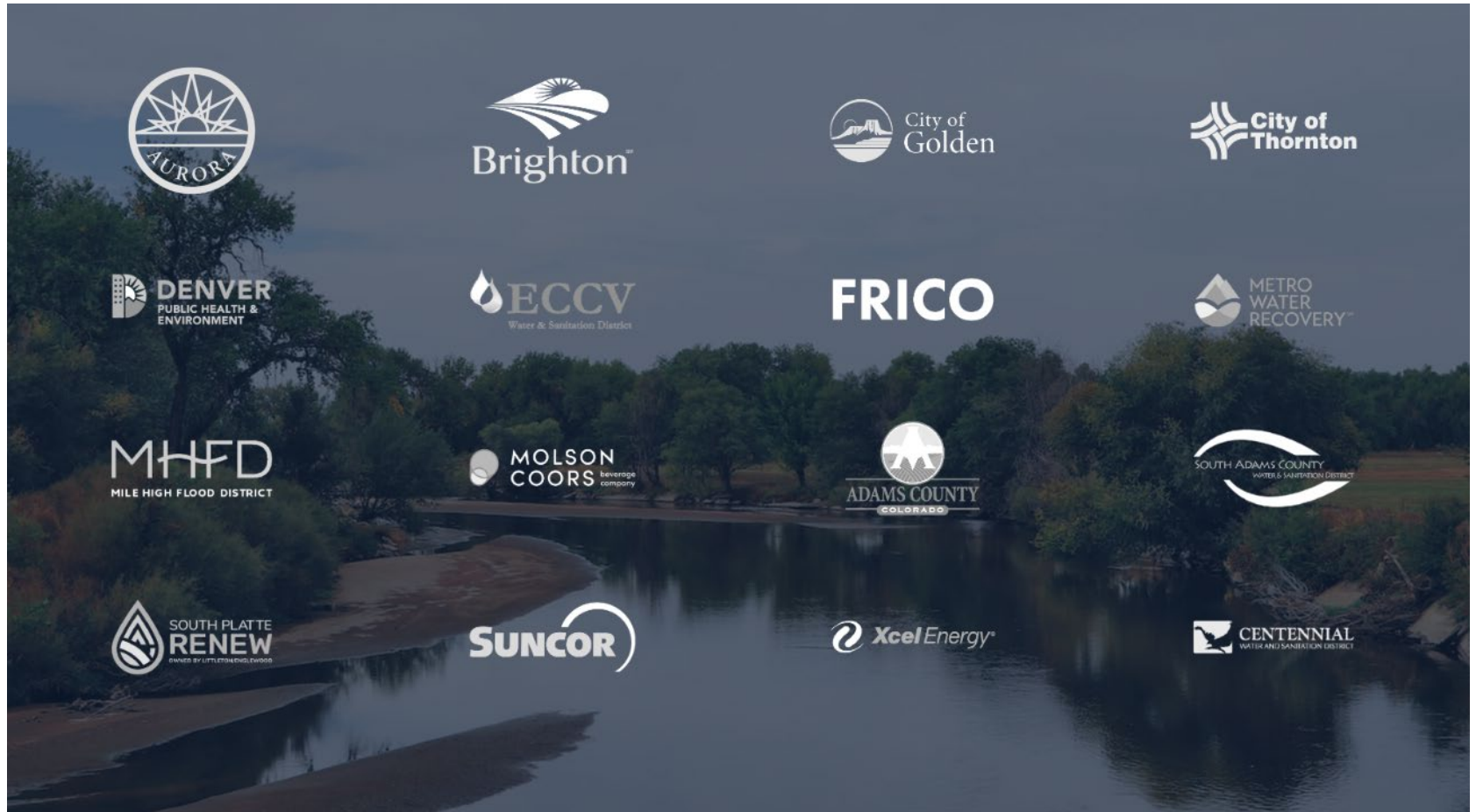


# WHO ARE WE?

- A collaborative association that prioritizes addressing water quality issues in the Greater Denver metro area
- Annual Confluence at the Confluence stakeholder meeting



# Our Members



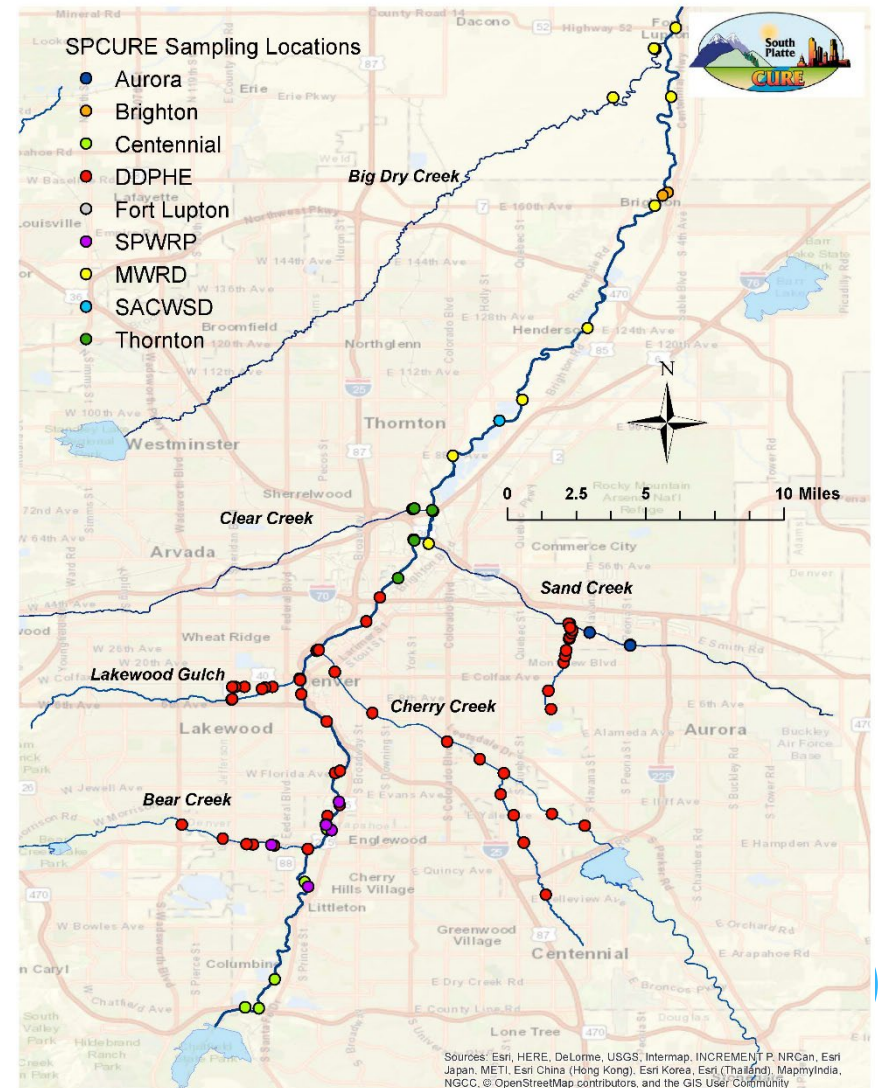
# BOARD OF DIRECTORS

- Christine Johnston, Chairperson, Xcel Energy
- Jim Dorsch, Vice Chairperson, Metro Water Recovery
- Dan DeLaughter, Treasurer, South Platte Renew
- Curt Bauers, Secretary, FRICO
- Sherry Scaggiari, Director-at-large, Aurora Water



# MONITORING COMMITTEE

- Coordinate bi-monthly sampling events across the metro area
- All entities work under the same Quality Assurance Project Plan
- Sites identified by WQCD as priority for continuous monitoring and associated with flow gages
- Data publicly available on Colorado Data Sharing Network
- Annual round robin to confirm accuracy and precision across participating laboratories



# PURPOSE

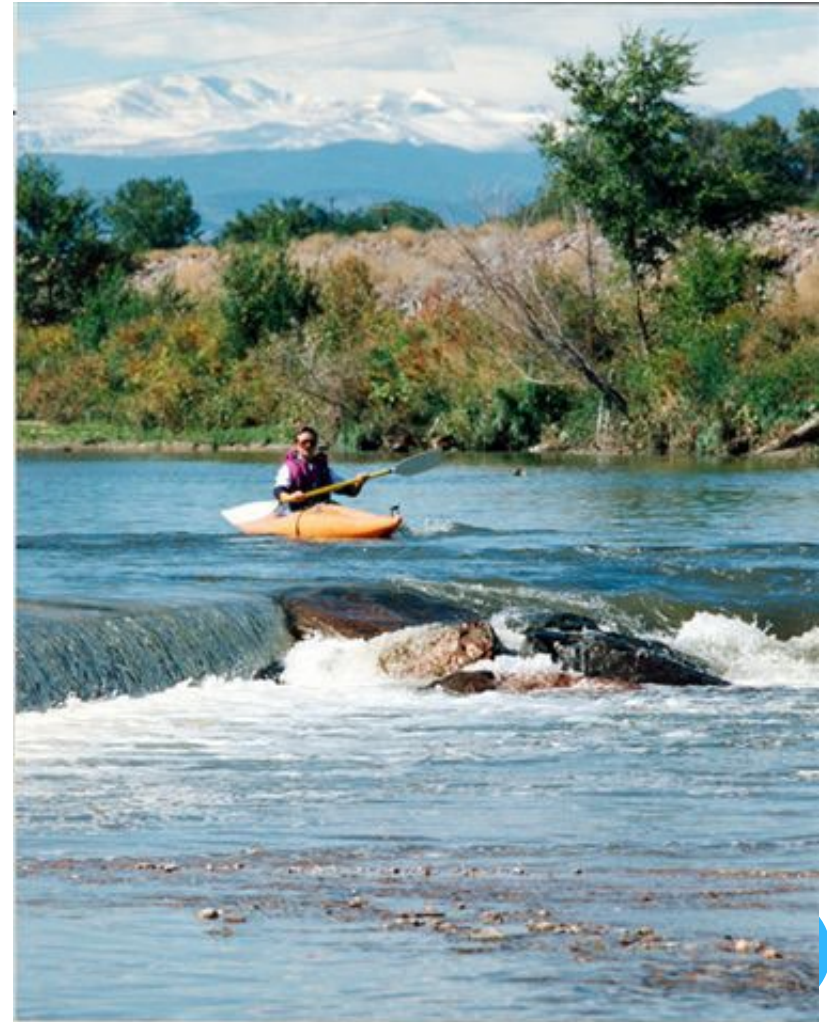
- Forum to discuss and consider local water quality issues
- Collaborate with other stakeholders to be efficient in addressing and solving water quality issues in the watershed
- Implement coordinated monitoring program
- Develop water quality modeling tools to make scientifically sound decisions
- Support work related to total maximum daily load assessments (TMDLs) and waste load allocations (WLAs)





# GOALS

- Create networks/partnerships
- Use data intentionally
- Engage the science side of the regulatory organization so we can better understand each other's point of view to inform the process
- Create external visibility
- Continually revisit goals as a watershed group
- Debrief regulatory hearings
- Current Focus - water quality issues associated with low flows and nonpoint source issues



## CHALLENGES

- Engaging new and diverse stakeholder groups
- Informing others about us to leverage SP CURE's strengths with regard to science and water quality
- Volunteer organization – members need to balance work and volunteer hours

