



2019 Annual Report  
Big Dry Creek  
Watershed Association

Jane Clary,  
Wright Water Engineers  
June 17, 2020



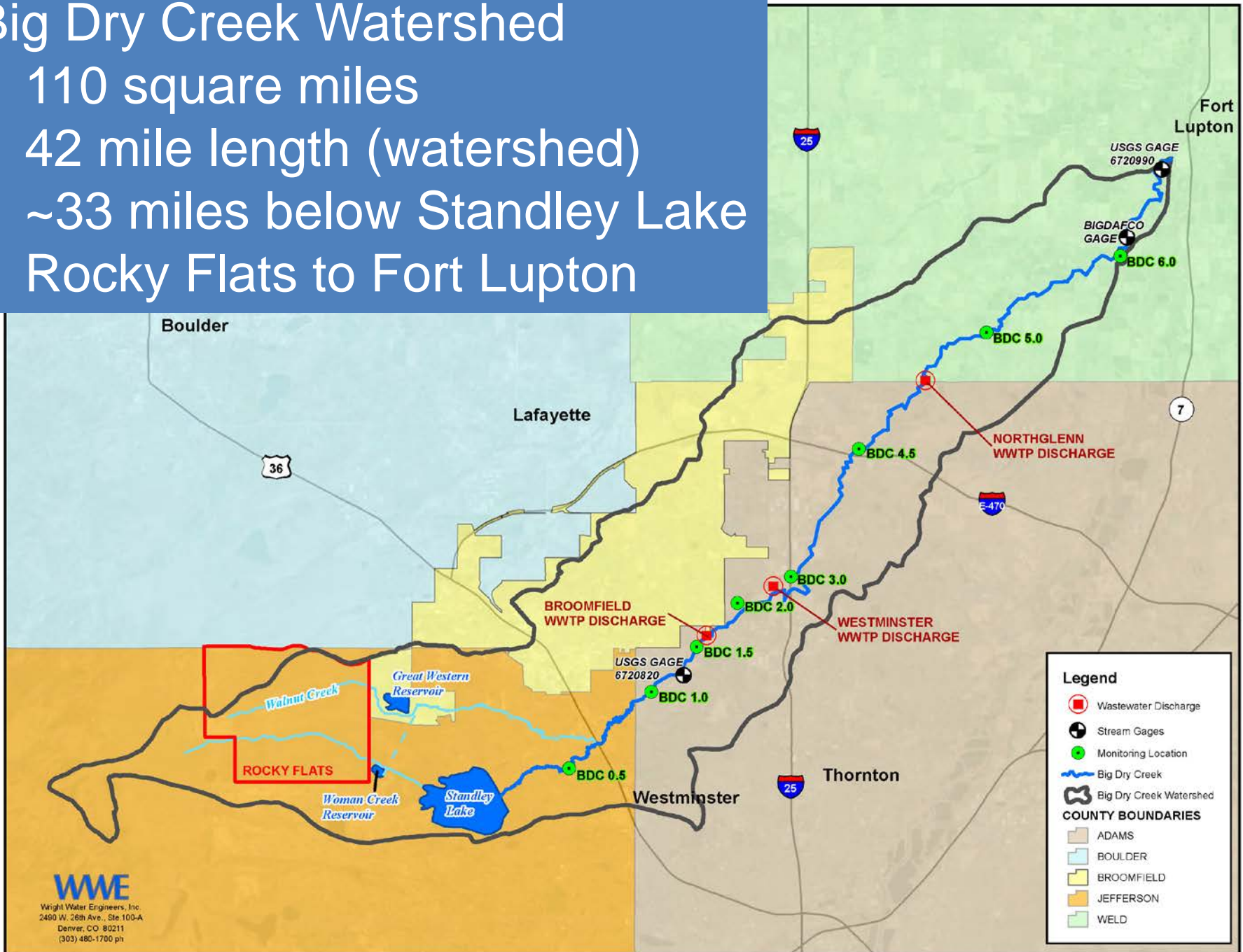


# Big Dry Creek Watershed Association

- 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
    - Adams County (no WWTP)
    - Weld County (no WWTP)
  - Woman Creek Reservoir Authority

# 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

# Station Locations

Station ID	Description
bdc0.5	Downstream of Old Wadsworth; Church Ranch Open Space
bdc1.0	Downstream of 112th Ave.
bdc1.5	Downstream of 120th Ave.
bdc & 120th	Low detection limit mercury sampling location
<i>WWTP: bdc10.0</i>	<i>Broomfield WWTP</i>
bdc2.0	Upstream of 128th Ave
<i>WWTP: bdc11.0</i>	<i>Westminster WWTP Discharge</i>
bdc3.0	I-25 & Thorn Creek Golf Course
bdc4.5	0.5 miles downstream of York Street (replaces bdc4.0)
<i>WWTP: bdc12.0</i>	<i>Northglenn WWTP to BDC</i>
bdc5.0	Downstream of Weld County Road 4
bdc6.0	Weld County Road 8

# Major Activities from June 2019 – June 2020

- Collaborative instream monitoring program
- Support of Westminster USGS gage
- Database management
- Annual water quality analysis
- Biological Monitoring
  - 2018 Biological Monitoring Data Report (December 2019)
- Progress on Watershed Plan (still in progress)
- Comments on Non-standard MS4 Permit
- E. coli Special Study (in progress)
- Participation in Reg. 38 Hearing
- New Website (posting Friday)
- Collaboration with CSU on Agricultural Modeling Study (AGES)
- Data sharing with CPW
- WWTP permit renewals
- BDCWA meetings
- Annual newsletter

# Monitoring and Analysis: Making Sure We Have Scientifically Defensible Information

- Monitoring plan on website:  
[www.bigdrycreek.org](http://www.bigdrycreek.org)
- 8 locations monitored monthly for water quality and/or flow
- Nutrients, metals, *E. coli*, other
- Macroinvertebrate, fish and habitat assessment—now biennially at 6 sites in October 2018; planned for 2020
- USGS Gage at Westminster (funding)



# Highlights of Annual Water Quality Analysis for 2019 Data

- Data summary and comparison to stream standards
- Key constituents of interest
  - a. *E. coli*
  - b. Iron
  - c. Nutrients
  - d. New Water Supply stds.
- Biological Overview (MMI) *(for 2018)*
- Flow conditions
- Quality assurance/quality control



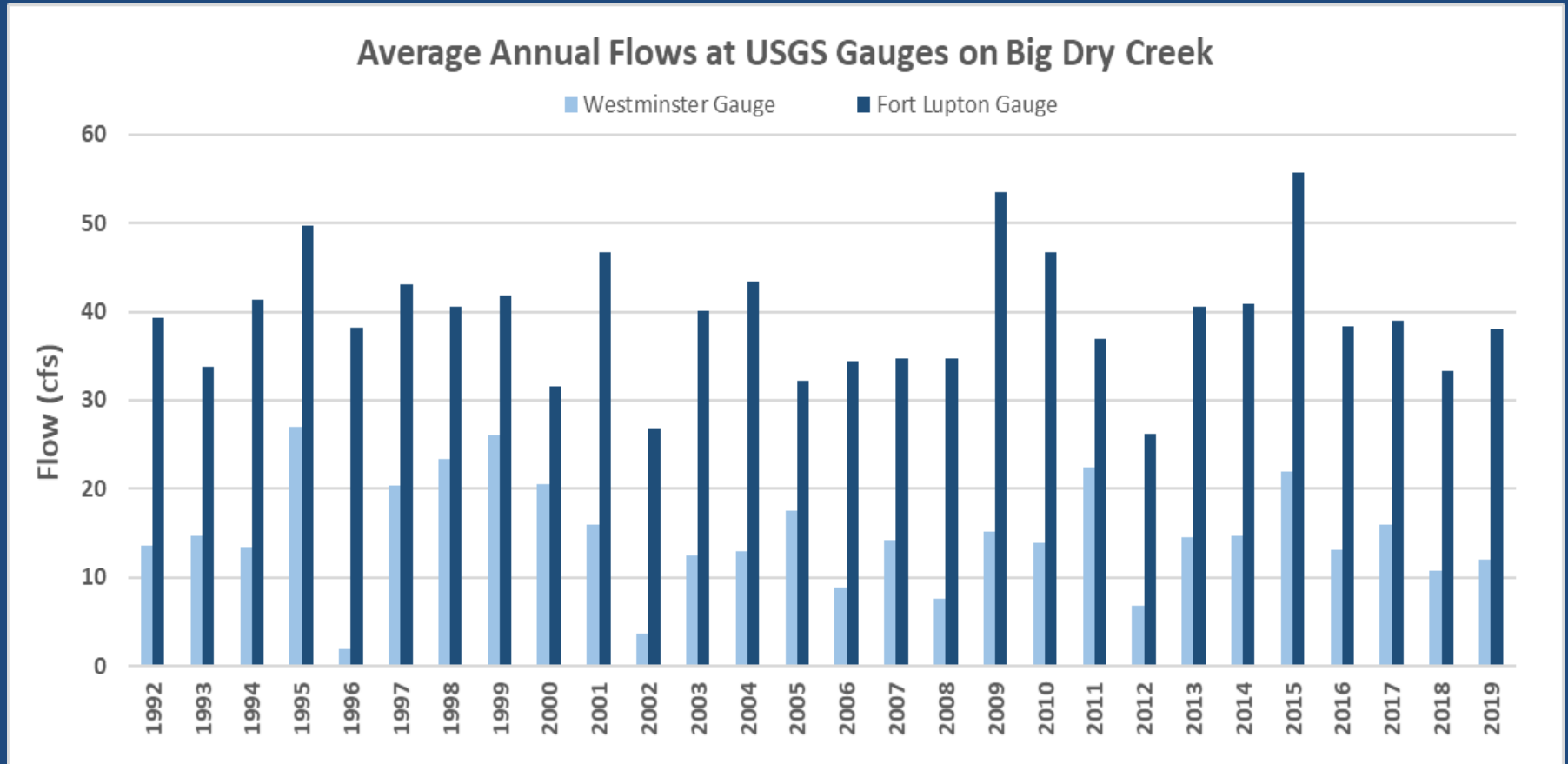
# Highlights of Field Conditions

- Standley Lake releases:
  - June through October
- Regular discharges from Northglenn
- Some missing samples due to winter ice
- Storm-influenced samples limited to May--~0.7 inches from 5/7-5/10.



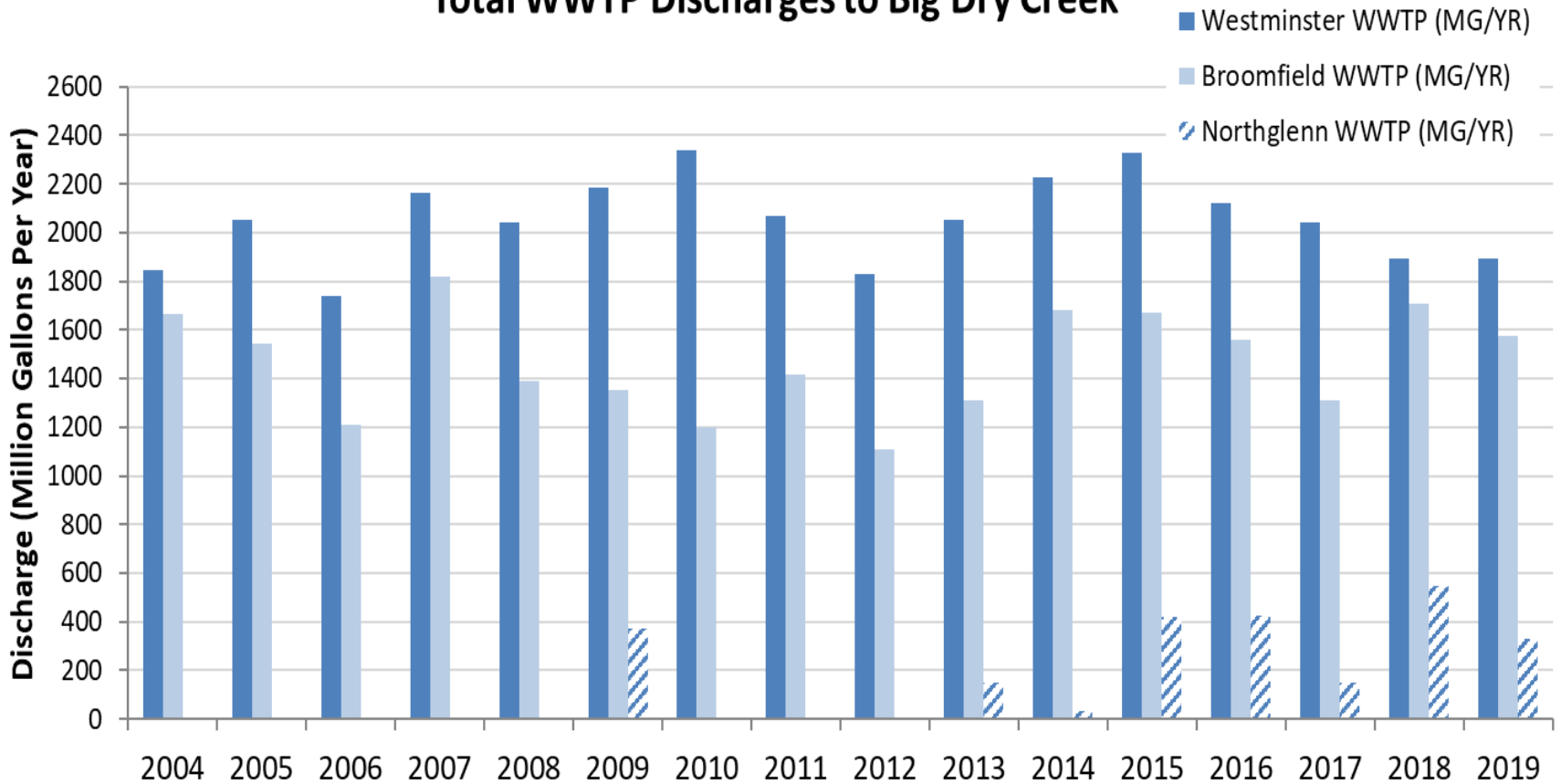


# Annual Streamflow (1992-2019)




# Annual WWTP Discharges (2004-2019)

## Total WWTP Discharges to Big Dry Creek



# June 2020 Regulation 38 Standards

1. Mainstem of Big Dry Creek, including all tributaries and wetlands, from the ~~source~~ outlet of Standley Lake to the confluence with the South Platte River, ~~except for specific listing in Segments 4a, 4b, 5, Walnut Creek, including tributaries and wetlands, from the outlet of Great Western Reservoir to the confluence with Big Dry Creek.~~

COSPB01	Classifications	Physical and Biological		Metals (ug/L)	
Designation	Agriculture	DM	MWAT	acute	chronic
UP	Aq Life Warm <del>2</del> <u>Water Supply</u> Recreation <del>PE</del>	Temperature °C	WS-I WS-I	<del>Aluminum</del>	—
			acute	chronic	—
		D.O. (mg/L)	—	5.0	Arsenic
		pH	6.5 - 9.0	—	Arsenic(T) <b>0.02-10</b>
Qualifiers:		chlorophyll a (mg/m <sup>2</sup> )	—	150*	<del>Beryllium</del>
Other:		E. Coli (per 100 mL)	—	<del>205</del> <u>126</u>	Beryllium(T)
<u>Temporary Modification(s):</u>		Inorganic (mg/L)			Cadmium
<u>Arsenic(chronic) = hybrid</u>		acute	chronic		Cadmium(T)
<u>Expiration Date of 12/31/2024</u>		Ammonia	TVS	TVS	Chromium III
*chlorophyll a (mg/m <sup>2</sup> )(chronic) = applies only above the facilities listed at 38.5(4).		Boron	—	0.75	Chromium III(T)
*Phosphorus(chronic) = applies only above the facilities listed at 38.5(4).		Chloride	—	<del>250</del>	Chromium VI
*Selenium(acute) = 19.1 ug/L from 11/1 - 3/31 TVS from 4/1 - 10/31.		Chlorine	0.019	0.011	Copper
Refer to Section 38.6(4)(d).		Cyanide	0.005	—	Iron
*Selenium(chronic) = 15 ug/L from 11/1 - 3/31 7.4 ug/L from 4/1 - 10/31.		Nitrate	<del>100</del> <u>10</u>	—	Iron(T)
Refer to Section 38.6(4)(d).		Nitrite	—	4.5	Lead
<u>*Uranium(acute) = See 38.5(3) for details.</u>		Phosphorus	—	0.17*	Lead(T)
<u>*Uranium(chronic) = See 38.5(3) for details.</u>		Sulfate	—	<del>WS</del>	Manganese
		Sulfide	—	0.002	Mercury(T)
					Molybdenum(T)
					Nickel
					Nickel(T)
					Selenium
					Selenium
					Silver
					Uranium
					Zinc

# Overall Comparison to Designated Uses and Standards (new)

Designated Uses	Use Attained?
Aquatic Life Life Warm <b>1</b>	Partial*
Recreation <b>E</b> ( <b>Existing</b> Primary Contact)	no
Agriculture	yes
<b>Water Supply</b>	<b>no</b>
Parameter Groups	Standards Attained?
Physical (e.g., DO, pH)	yes
Biological (E. coli)	no
Inorganics (e.g., CN, NH3, <b>NO3, SO4, Cl</b> )	<b>no (for some)</b>
Metals (e.g., Cu, Cd, Zn, Se)	Partial (*Fe below WCR 8)
Other	Comments
Interim Nutrient Values (e.g., TP, TN)	Future Issue
Aquatic Life Policy 10-1 (e.g., MMI <b>with HBI &amp; SDI</b> )	Currently Attains (2018)

# 2020 303(d) List

Listed portion: <sup>1</sup> **COSJSJ10\_A** Mainstem of the Rito Blanco River from Echo Ditch to the confluence with the Rio Blanco River.

Affected Use	Analyte	Category / List <sup>2</sup>	Priority
Aquatic Life Use	Temperature	3b. - M&E list	NA
Recreational Use	E. coli	3b. - M&E list	NA

**COSPBD01** 1. Mainstem of Big Dry Creek, including all tributaries and wetlands, from the source to the confluence with the South Platte River, except for specific listing in Segments 4a, 4b, 5 and 6.

Listed portion: <sup>1</sup> **COSPBD01\_B** Mainstem of Big Dry Creek From Weld County road 8 to the confluence with the South Platte River

Affected Use	Analyte	Category / List <sup>2</sup>	Priority
Aquatic Life Use	Iron (Total)	5. - 303(d)	M

**COSPBE01a** 1a. Mainstem of Bear Creek from the boundary of the Mt. Evans Wilderness area to the inlet of Evergreen Lake.

Listed portion: <sup>1</sup> **COSPBE01a\_B** Bear Creek below Yankee Creek to the inlet of Evergreen Lake

Affected Use	Analyte	Category / List <sup>2</sup>	Priority
Aquatic Life Use	Temperature	5. - 303(d)	H

**COSPBE01b** 1b. Mainstem of Bear Creek from Harriman Ditch to the inlet of Bear Creek Reservoir.

Listed portion: <sup>1</sup> **COSPBE01b\_A** Mainstem of Bear Creek from Harriman Ditch to the inlet of Bear Creek Reservoir.

Affected Use	Analyte	Category / List <sup>2</sup>	Priority
Aquatic Life Use	Temperature	5. - 303(d)	M

# Summary List

- **Attains:** DO, pH, CN, NO<sub>2</sub>, NH<sub>3</sub>, B, As, Cd, Cr (III & VI), Cu, Fe(Trec),\* Pb, Hg, Ni, Se, Zn.
- **Does Not Attain:** Cl, NO<sub>3</sub>, SO<sub>4</sub>, Mn, E. coli
- **Does Not Attain Future Standards:** TP, TN
- **New Stds. Not Assessed:** total forms of Cd, Pb, Ni. Dissolved form of Fe.
- **Others Not Monitored** chlorophyll-a (mg/m<sup>2</sup>), sulfide, beryllium, uranium, molybdenum.
- **Not Assessed:** Temperature (WWTPs conduct intensive monitoring independently)

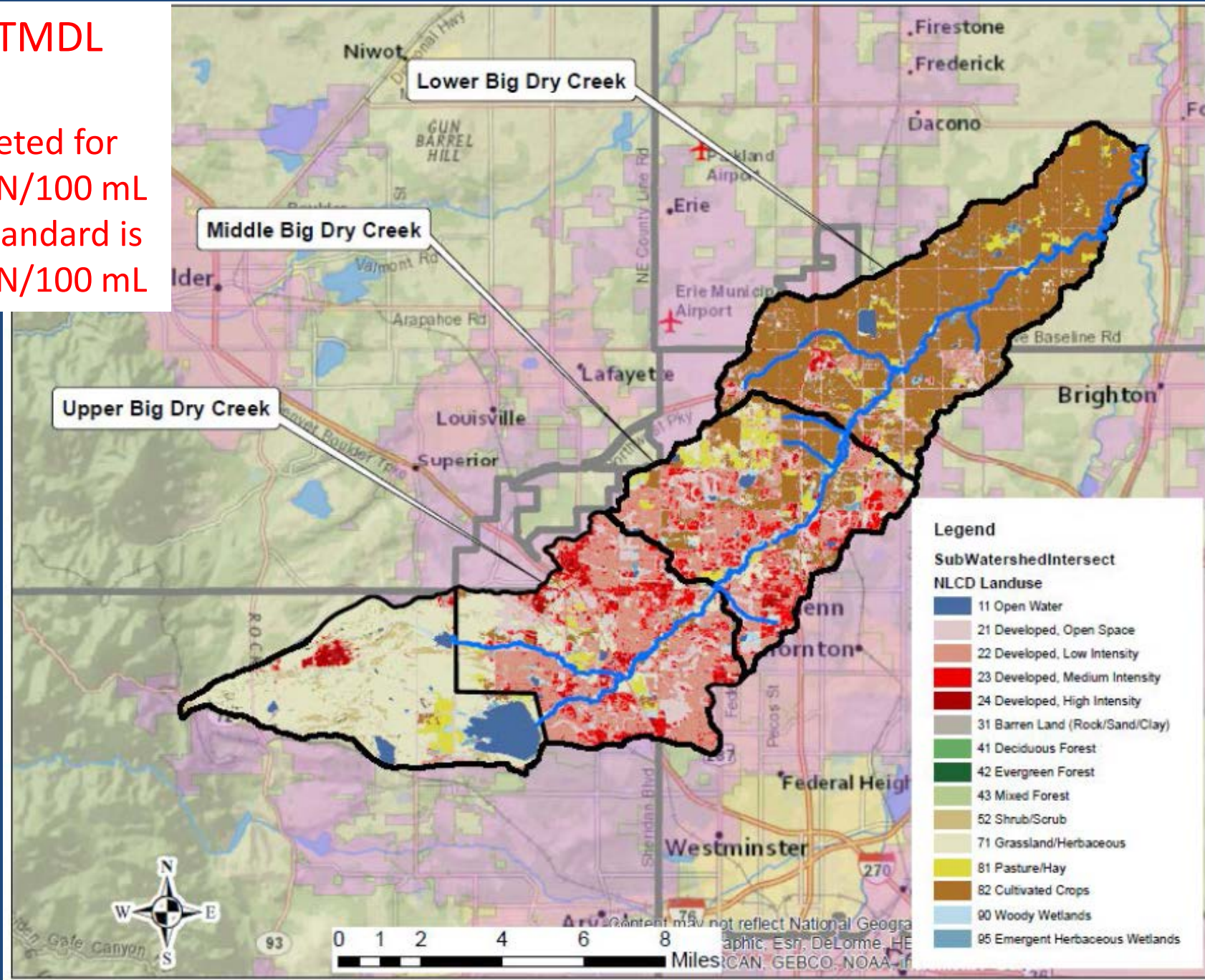
\*BDCWA's Trec. Iron data attains the standard, but Metro's sampling does not.

# E. coli TMDL

2016

--completed for  
205 MPN/100 mL

--new standard is  
126 MPN/100 mL



# Changes to 2018 303(d) Listing Methodology for E. coli

- Rolling 61-day geometric mean
  - No more fixed bi-monthly evaluations
  - No more combining multiple years of data for bimonthly period
- Sample size requirements for listing
  - 5 or more for normal 303(d) listing
  - 4 or more for “overwhelming evidence”
  - 2&3 M&E List
- Delisting
  - Attain standard (based on geometric mean of 5 samples/61 days) for same time period during which impairment was identified for most recent 2 years.

## Standard Components

- Magnitude: **126 cfu/100 mL**
- Duration: 61-day rolling average
- Frequency: Geometric mean cannot exceed standard

**Monthly sampling not adequate, so using Rec. Season Geomean for 2020 Report**

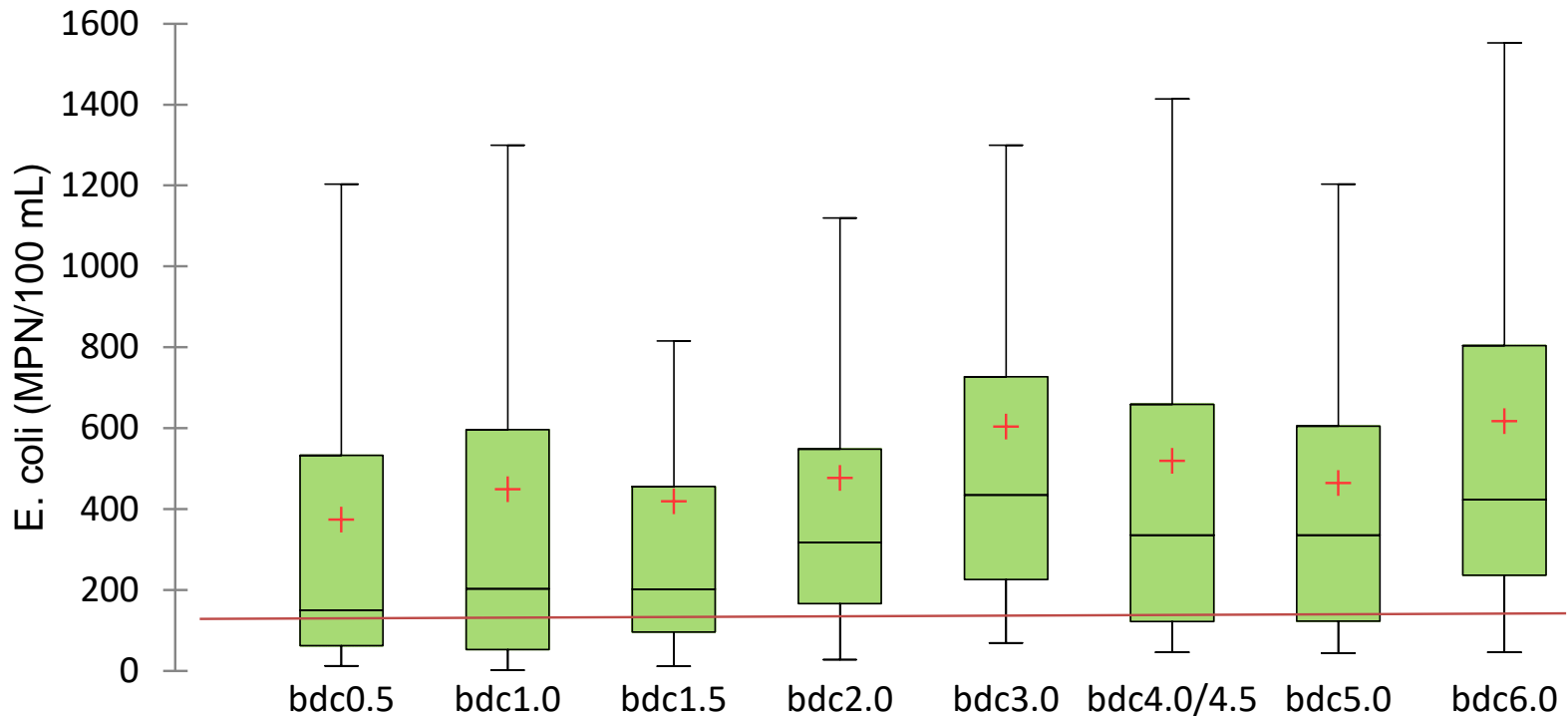


# Historical Annual E. coli Summary (2000-2019)

Year	bdc0.5	bdc1.0	bdc1.5	bdc10.0 (Broom. WWTP) <sup>2</sup>	bdc2.0	bdc11.0 (West. WWTP) <sup>2</sup>	bdc3.0 (I-25)	bdc4.5	bdc5.0	bdc6.0
2000	212	151	389	--	574	--	294	500	212	323
2001	477	118	332	215	649	68	387	634	442	510
2002	858	230	363	364	934	16	536	441	451	572
2003 <sup>3</sup>	191	210	293	27	615	24	382	225	249	339
2004	279	181	217	18	346	28	205	187	156	377
2005	152	122	281	26	328	35	204	113	182	301
2006	76	241	316	20	309	48	214	163	179	333
2007	196	177	257	14	324	66	230	231	198	364
2008	266	197	267	10	461	6	439	376	290	380
2009 <sup>4</sup>	61	78	147	5	207	14	251	137	149	197
2010	111	191	193	12	483	16	376	280	235	368
2011	64	228	323	6	622	8	518	537	380	730
2012	267	397	260	7	555	8	544	497	390	545
2013	239	214	292	3	398	10	424	342	272	505
2014	119	269	254	5	323	9	371	410	287	1085
2015	257	251	230	4	311	9	528	415	266	490
2016	207	254	221	5	312	18	358	315	300	536
2017	178	194	217	5	327	19	444	392	349	371
2018	81	89	194	3	277	15	352	273	314	300
2019	163	117	157	2	192	25	490	204	275	350

# 5-year E. coli: 2015-2019 Boxplots

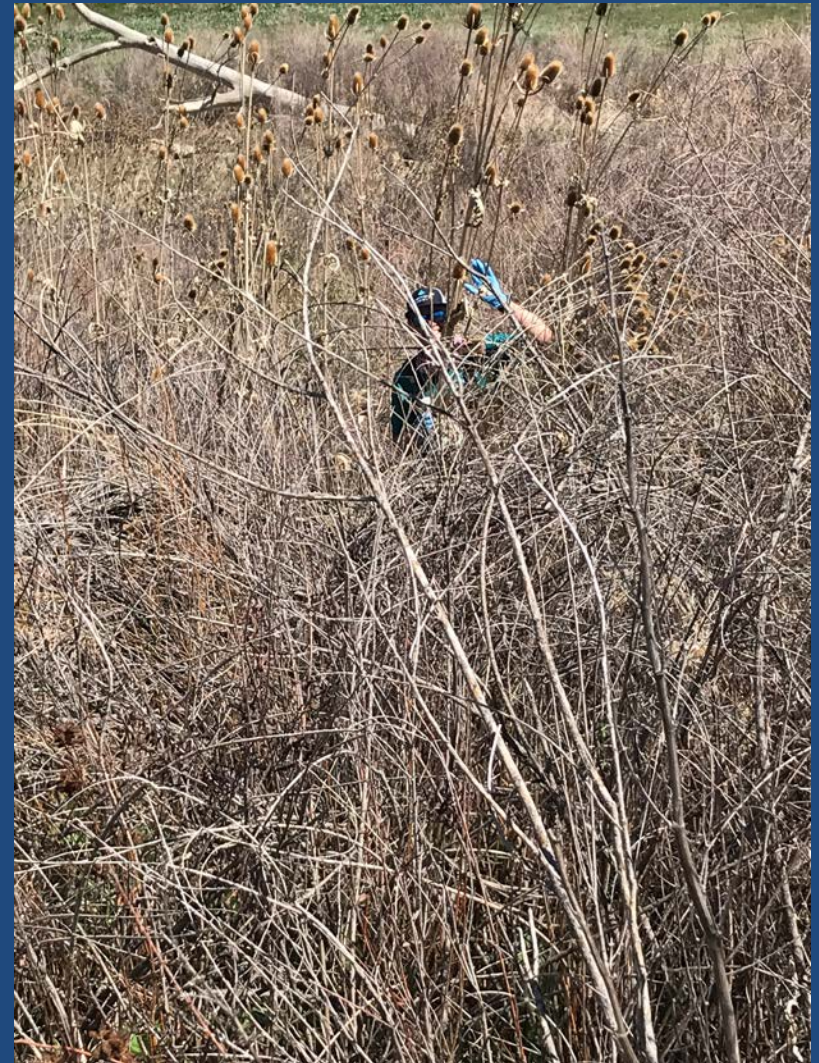
2015-2019 Big Dry Creek E. coli



Outliers not displayed for simplicity; >2,419 MPN/100 mL present at each location.

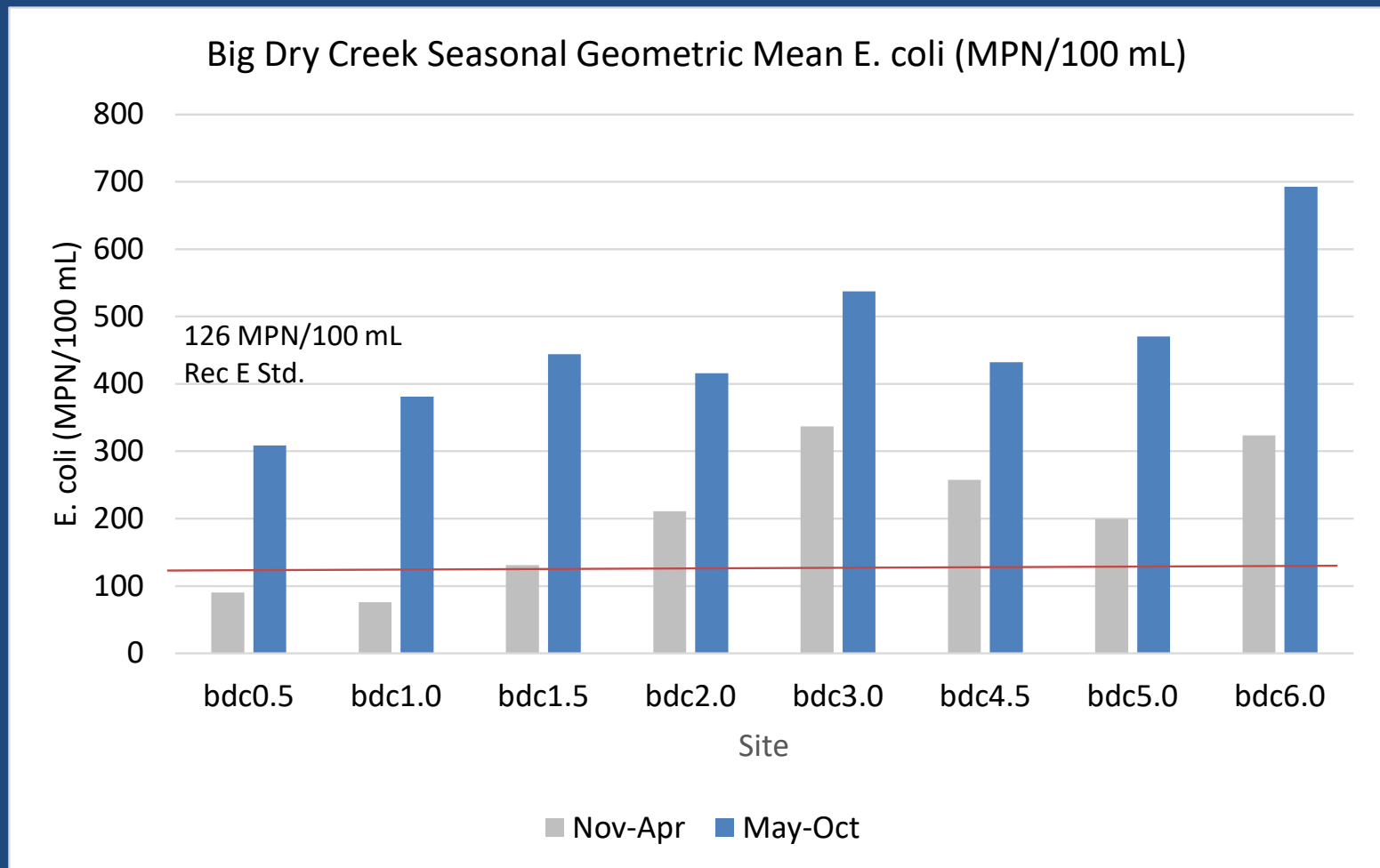
# 2019 Seasonal Geometric Mean E. coli (MPN/100 mL)

Station	May-Oct	Nov-Apr
bdc0.5	309	90
bdc1.0	381	76
bdc1.5	444	131
bdc2.0	416	211
bdc3.0	538	337
bdc4.5	432	258
bdc5.0	471	200
bdc6.0	693	323
All Sites	449	179

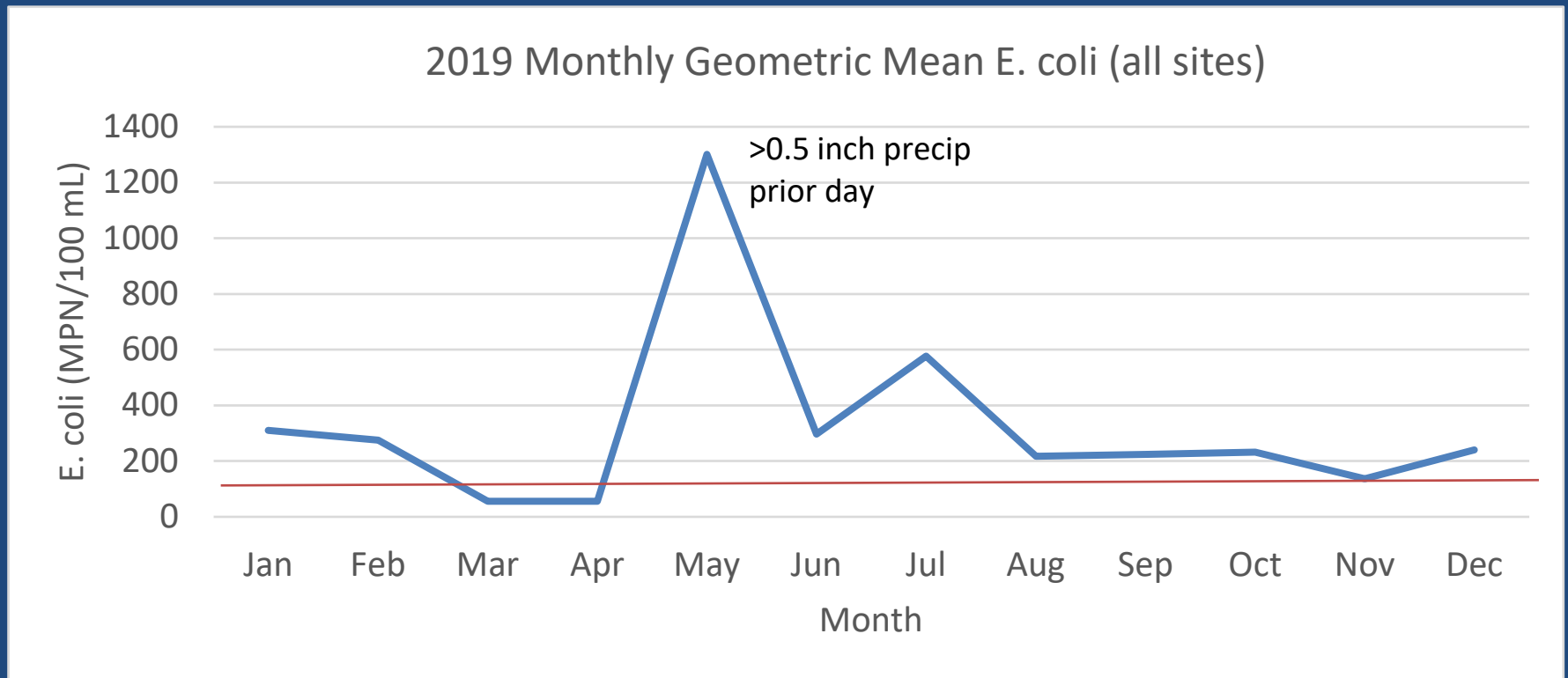


# 5-year Recreational Season Summary of Instream Big Dry Creek *E. coli* Data

(Values are geometric means [# / 100 mL] of 2015-2019 data set at each location)

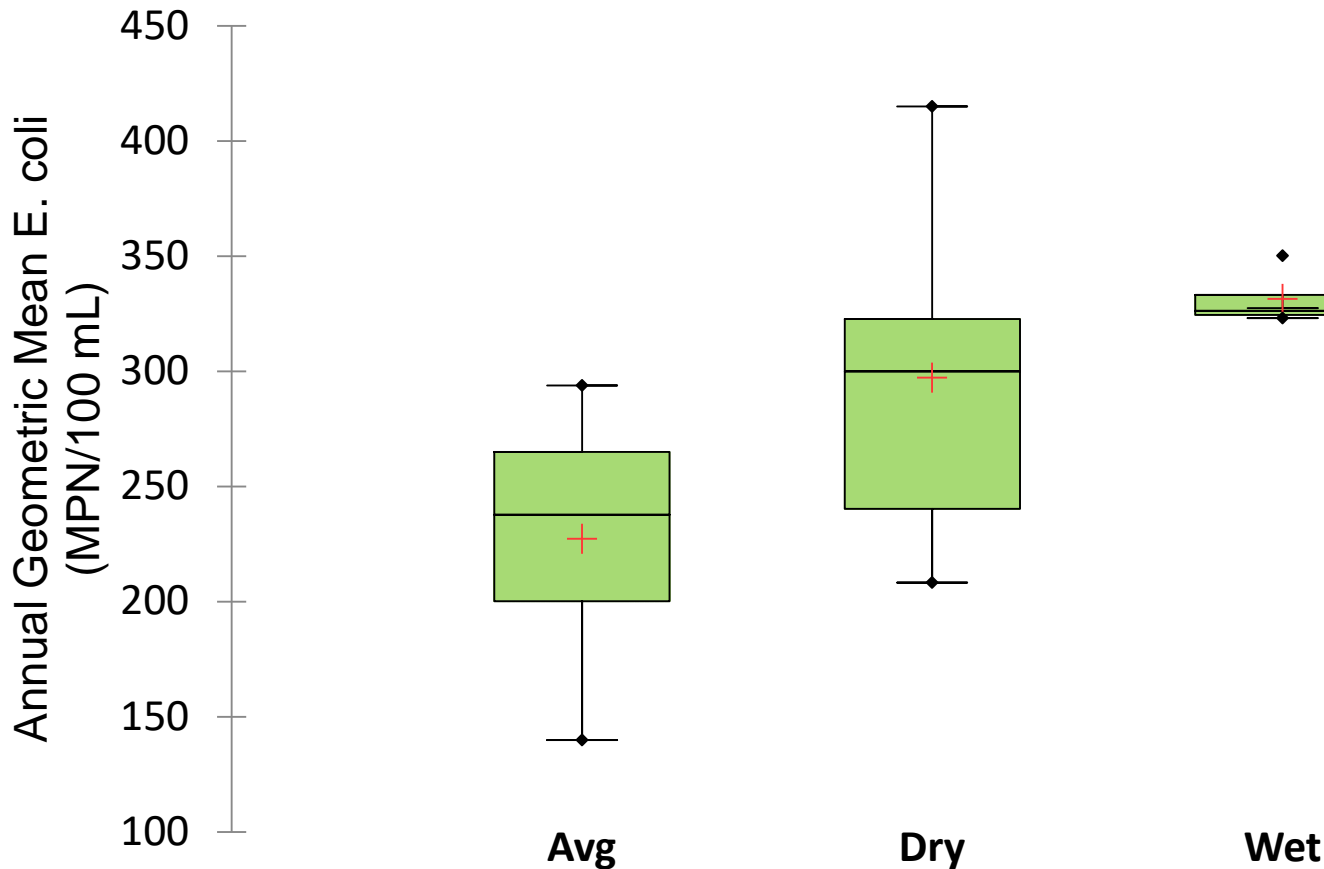


# Influence of May Storm Event Geometric Mean All Sites on Sample Dates



# Worth Exploring? (2007-2019 Hydrologic Year Bins)

Geometric Mean E. coli by Hydrologic Year



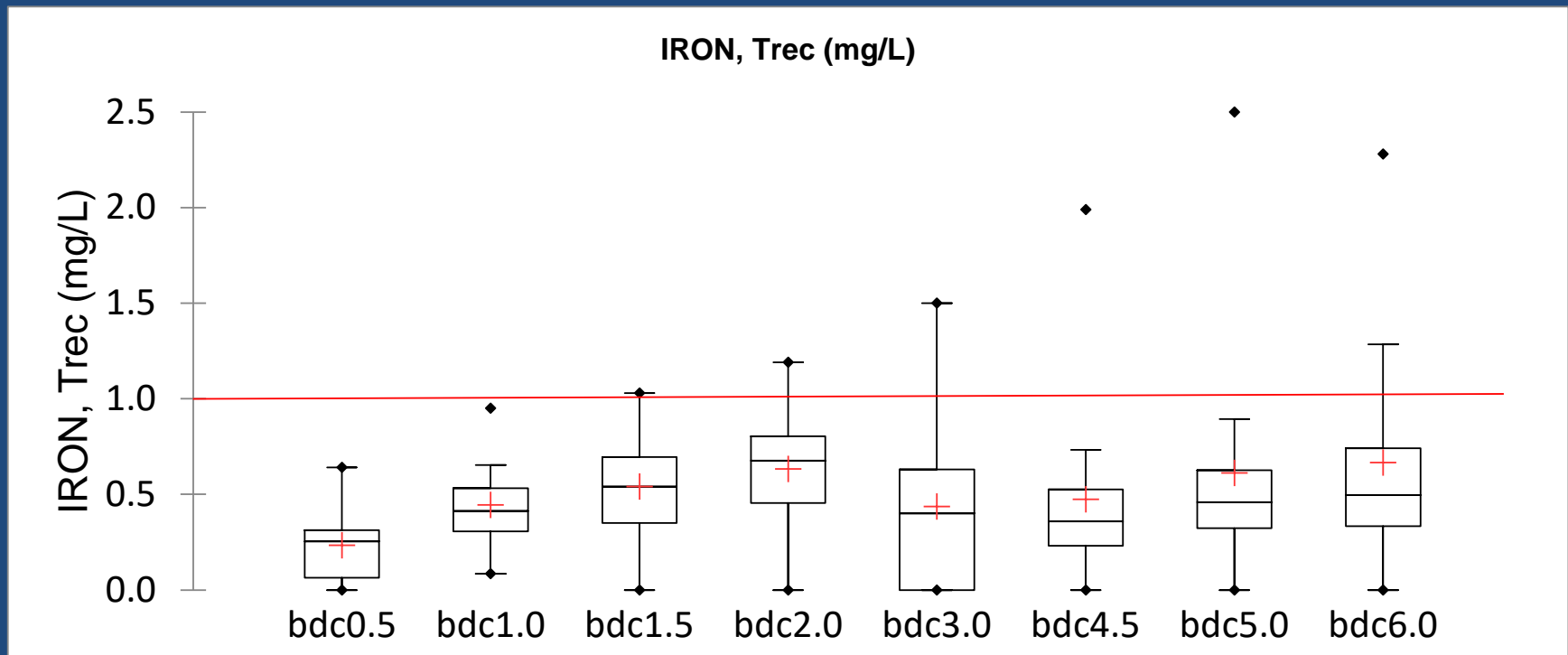
# Selenium

Selenium ( $\mu\text{g/L}$ )				
	Irrigation Season		Non-irrigation Season	
	2015-2019 (Apr-Oct)	Reg. 38 Standard	2015-2019 (Nov-Mar)	Reg. 38 Standard
<b>All Sites (85<sup>th</sup> %)</b>	6.8	N/A	7.7	N/A
<b>bdc1.5, 2.0, 4.5 (85<sup>th</sup> %)</b>	6.6	7.4 (ch)	9.2	15.0 (ch)
<b>bdc1.5, 2.0, 4.5 (Max)</b>	13.4	18.4 (ac)	13.0	19.1 (ac)

- 5-year analysis meets stream standards.
- Sampling frequency switched to quarterly in 2013, consistent with other metals.
- Removed from 303(d) List in 2016.

# BDCWA Total Recoverable Iron

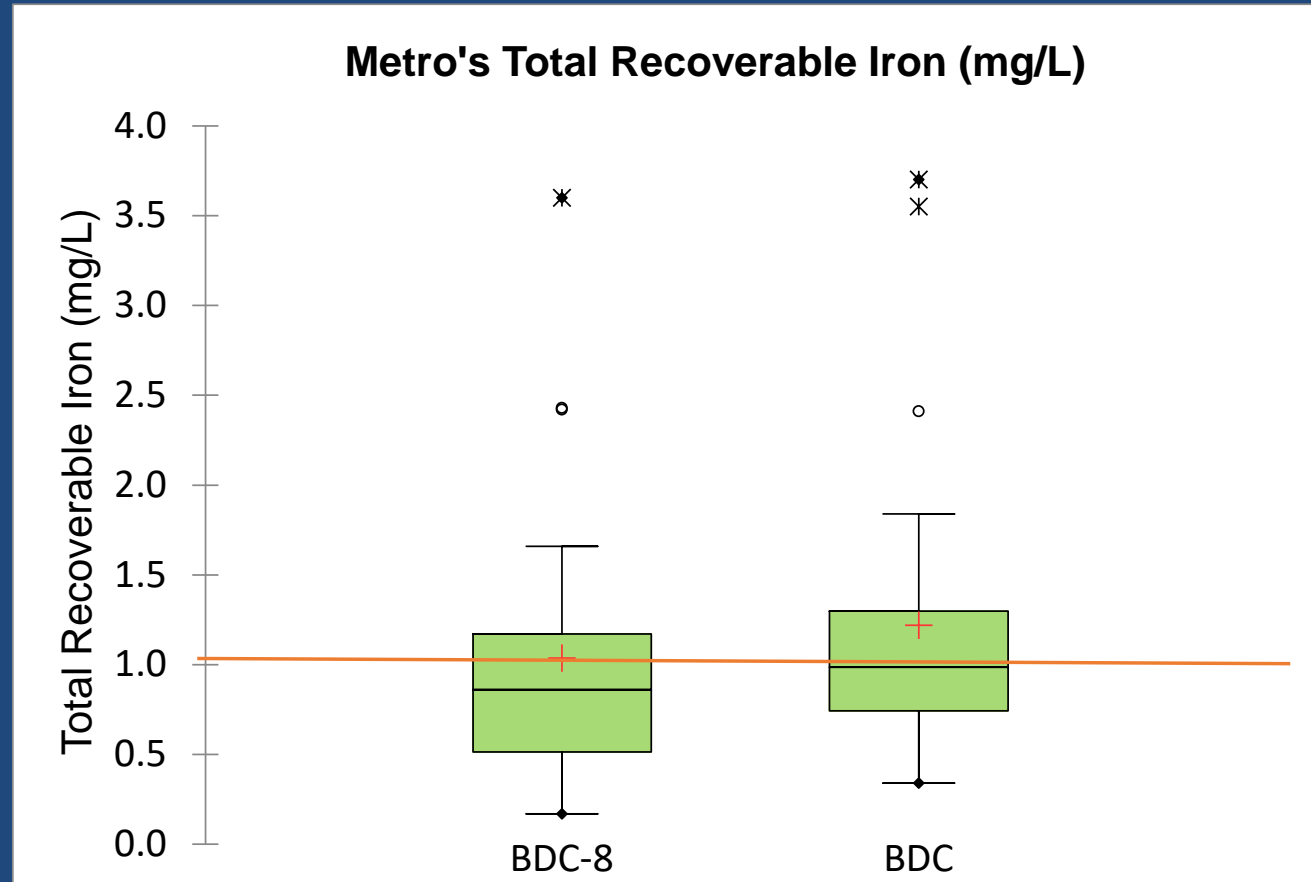
- Quarterly sampling program switched to monthly in spring 2018.
- Occasional elevated values during storm flows (e.g., May 19, 2019 storm).



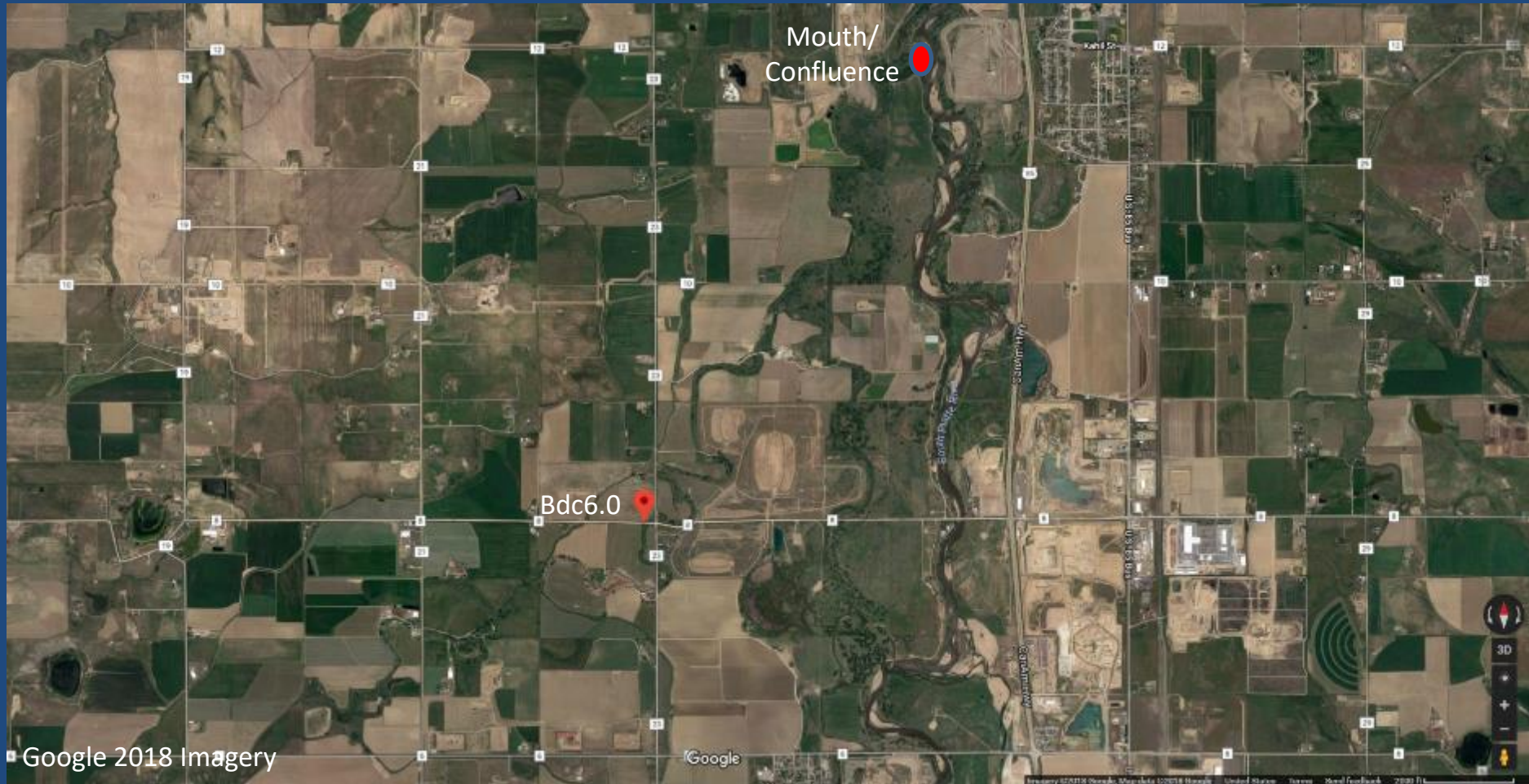


# Metro's 2019 Data Below WCR 8 & at Mouth

- Bi-monthly sampling frequency
- Both sites slightly below 1 mg/L stream std in 2019.



# bdc6.0 (WCR 8) to Mouth



# Big Dry Creek @ WCR 8



Google 2018 Imagery

Google

Imagery ©2018 Google, Map data ©2018 Google, United States, Terrain, Road Footprint, 3031 ft

# Other Metals

- Aquatic Life metals attain standards other than Trec Iron.
- Sample fractions not available for some Water Supply metals standards.
- See appendices for data plots.
- Mercury: attained standard 2017-2019.

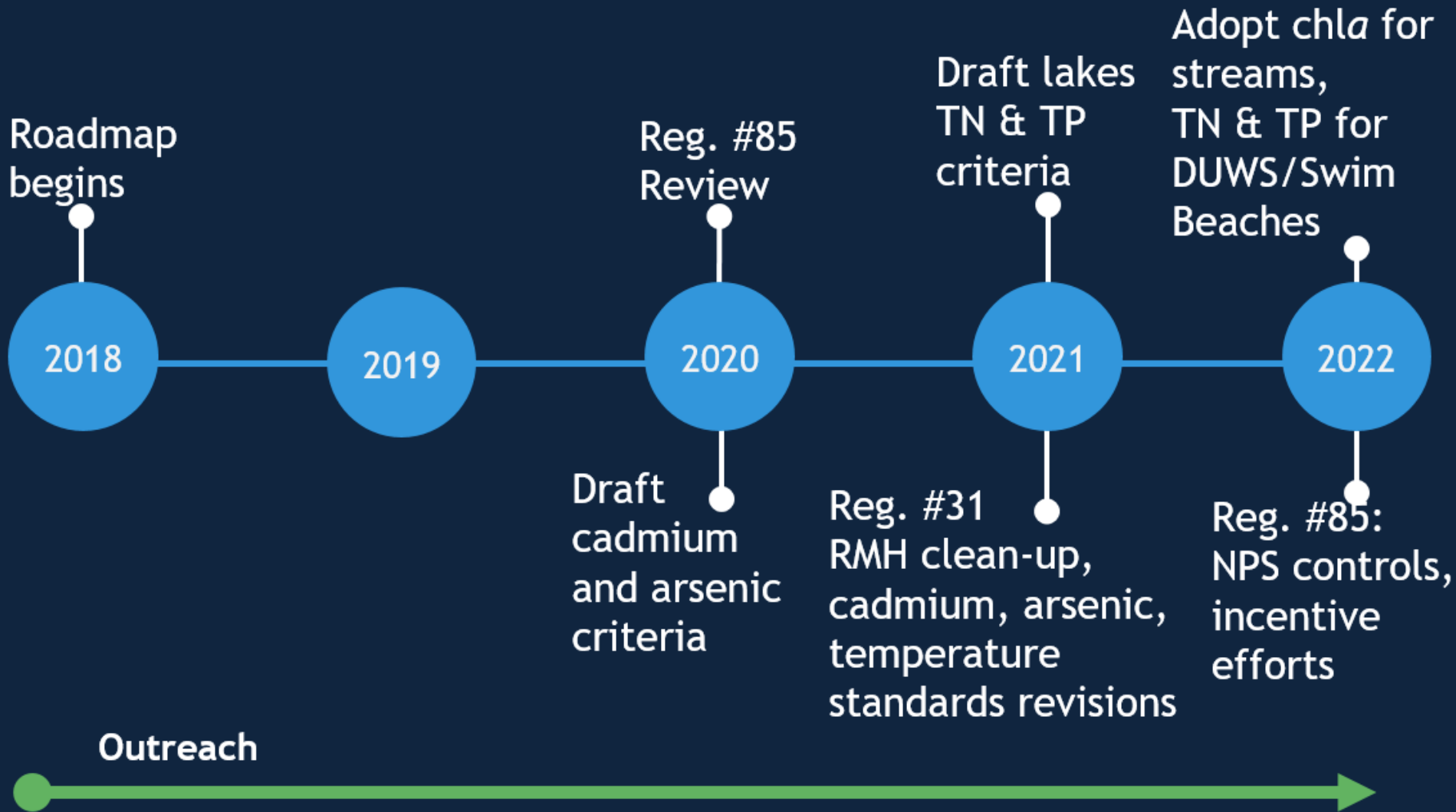


Longnose Dace is the only intolerant species in the BDC system for Fish IBIs

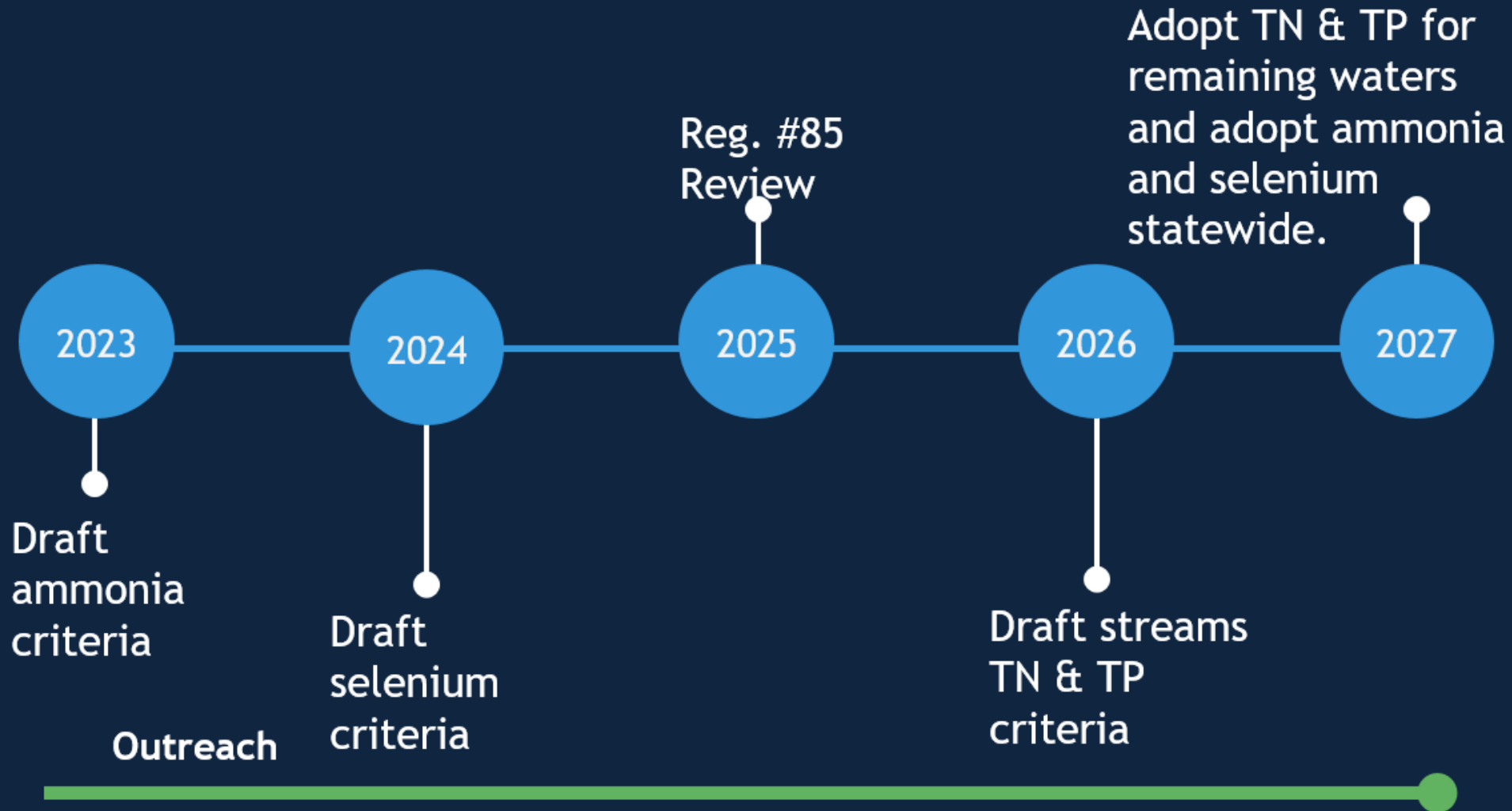


Johnny Darter

# 10-Year Water Quality Roadmap

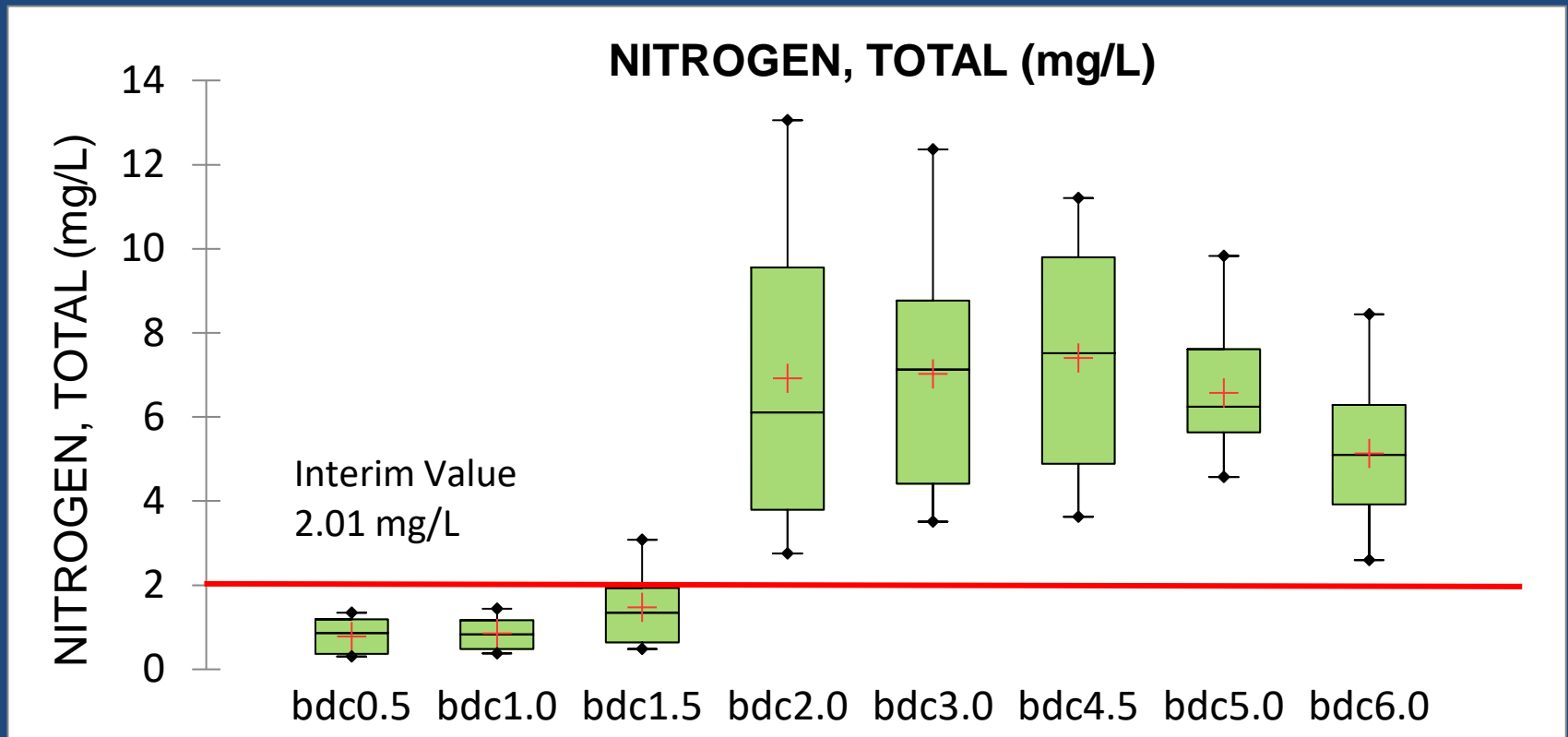


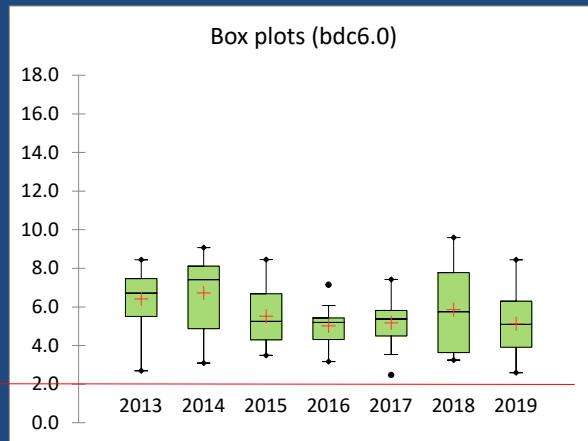
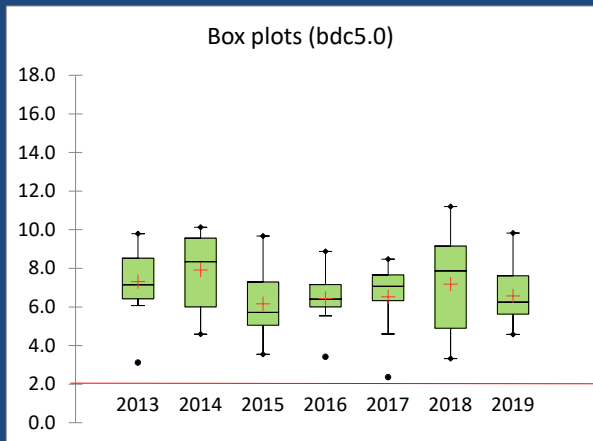
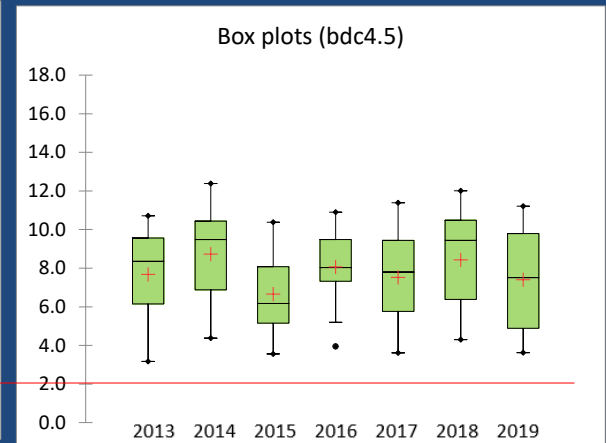
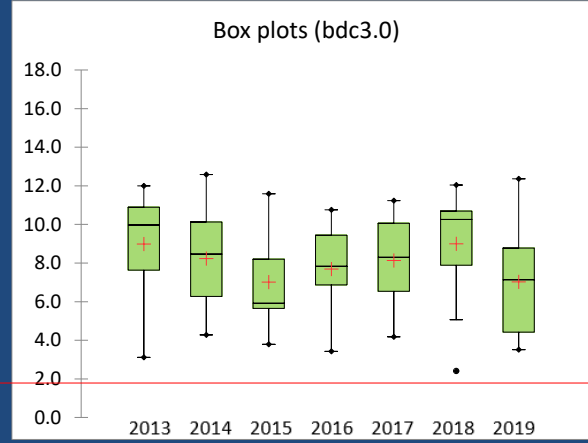
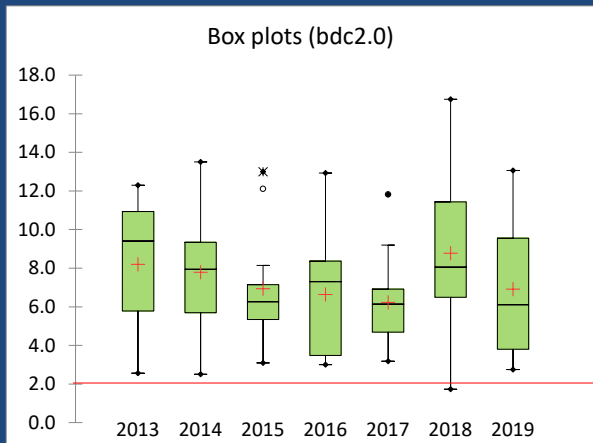
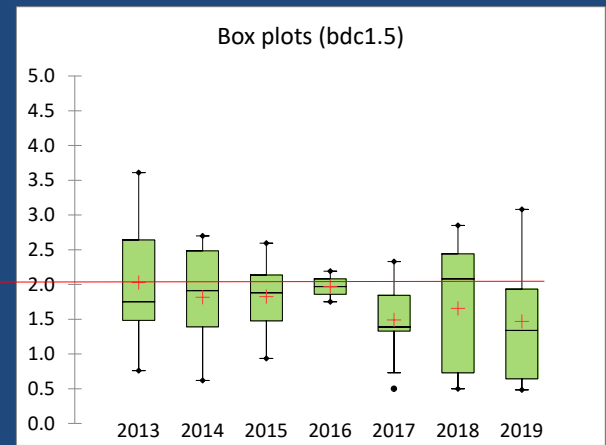
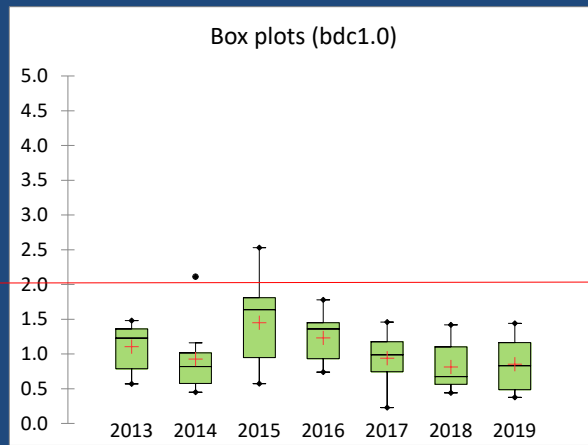
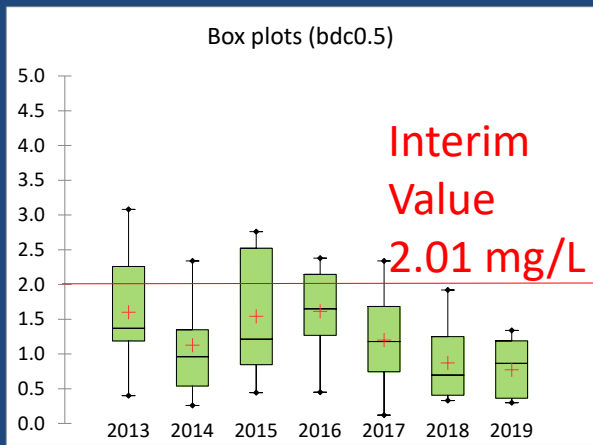
# 10-Year Water Quality Roadmap



# Big Dry Creek Total Nitrogen (2019)

- 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.



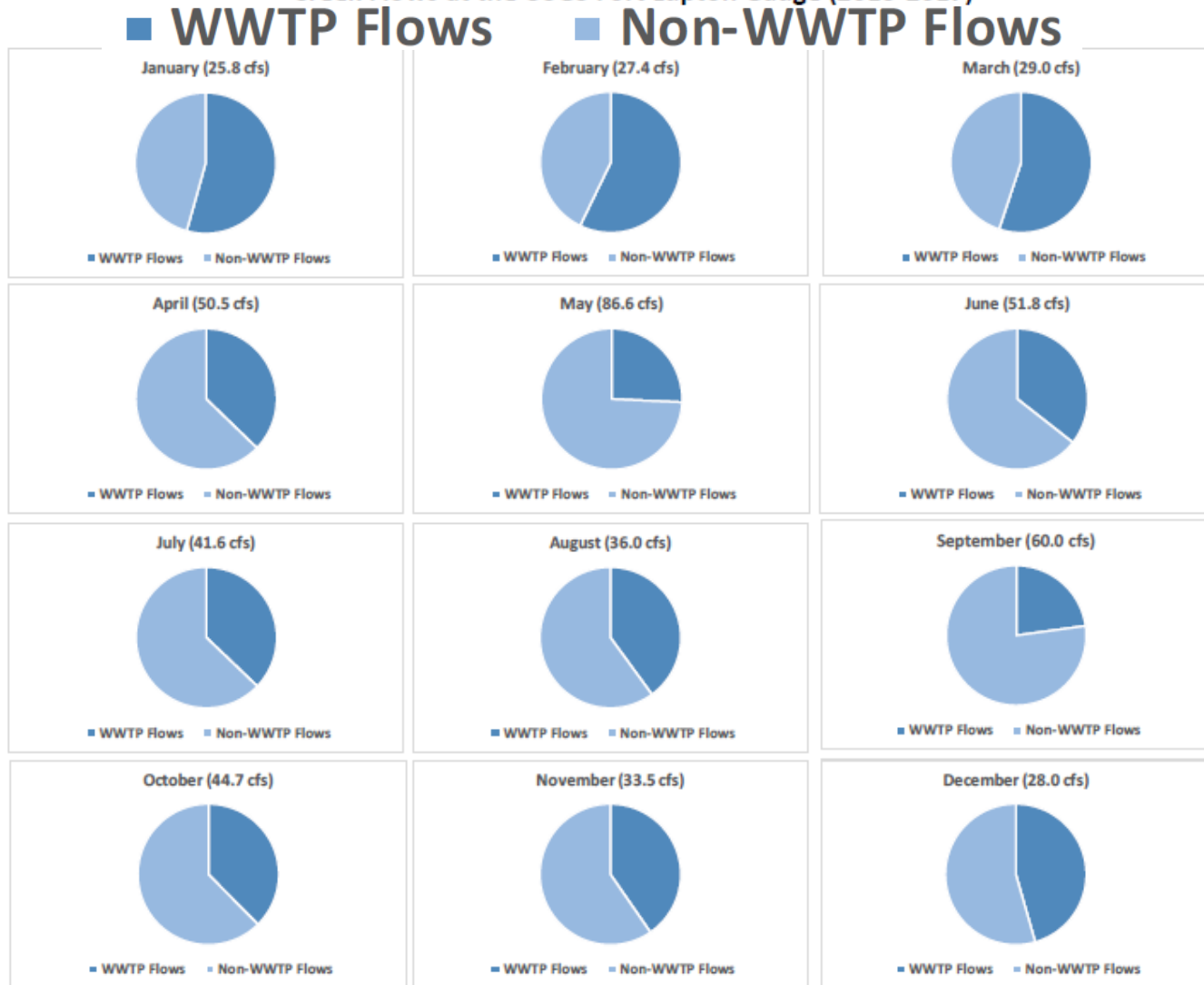


2013-2019  
BDCWA TN  
(mg/L)



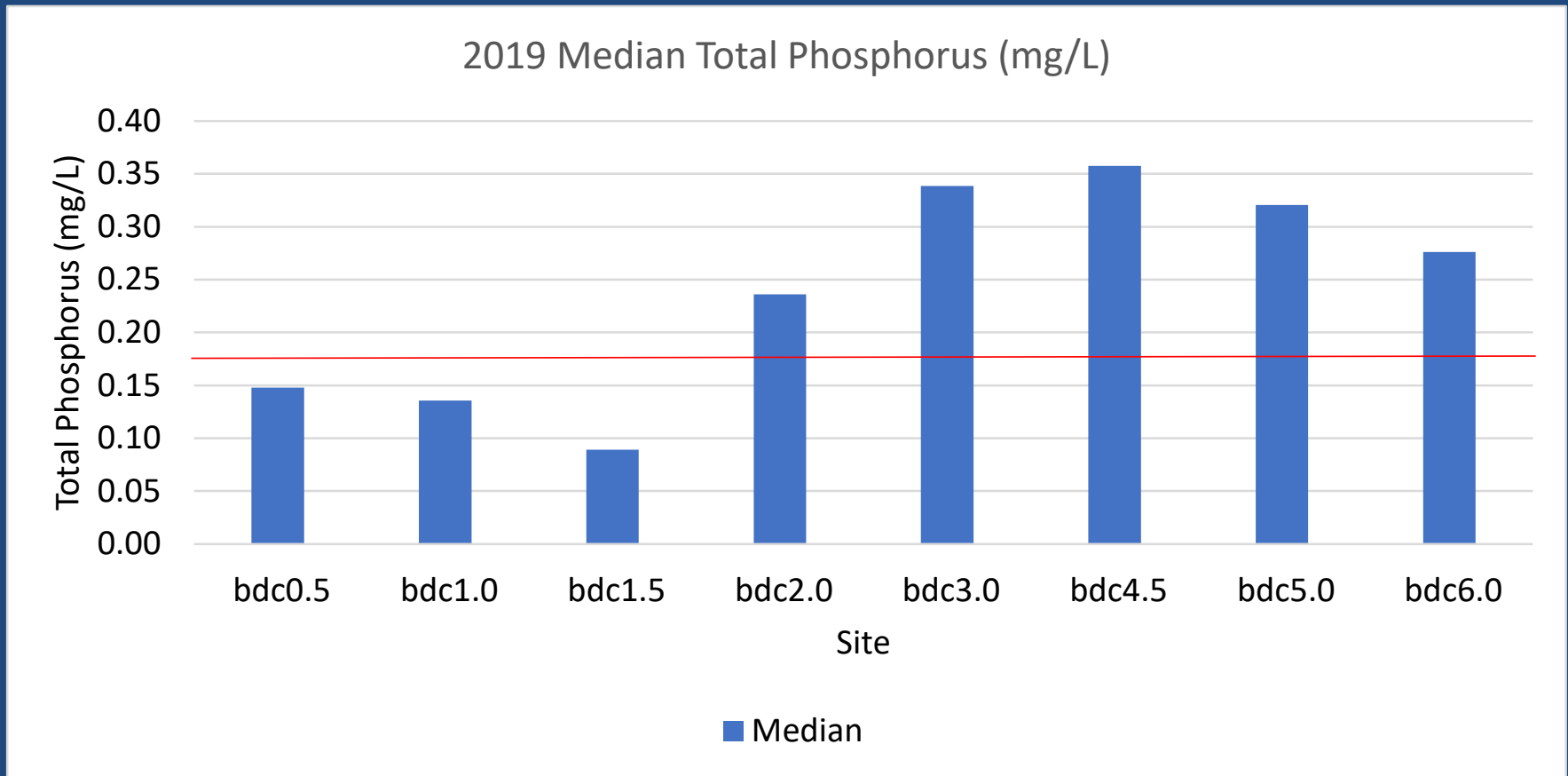
# Influence of WWTP Discharges Lower Watershed

Figure 33. Average Monthly Percentage of Municipal WWTP Releases Relative to Big Dry Creek Flows at the USGS Fort Lupton Gauge (2013-2017)



# Big Dry Creek Total Phosphorus (2019)

## “Interim Value” = 0.17 mg/L



- Above WWTPs can meet standard.
- Despite significant reductions over time, currently not meeting interim value below WWTPs & agricultural area.

# Total Phosphorus (1999-2019)

Year	bdc0.5	bdc1.0	bdc1.5	bdc2.0	bdc3.0	bdc4.0/4.5	bdc5.0	bdc6.0
1999	0.04	0.07	0.08	0.72	1.81	1.27	1.45	1.21
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	0.05	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

# Regulation 85 Effluent Limits for Existing and New Facilities

(compliance plans now in BDC permits)

PARAMETER	PARAMETER LIMITATIONS	
<b>Existing Facility</b>	Annual Median <sup>1</sup>	95 <sup>th</sup> Percentile <sup>2</sup>
(a) Total Phosphorus	1.0 mg/L	2.5 mg/L
(b) Total Inorganic Nitrogen as N <sup>3</sup>	15 mg/L	20 mg/L
<b>New Facility</b>	Annual Median <sup>1</sup>	95 <sup>th</sup> Percentile <sup>2</sup>
(a) Total Phosphorus	0.7 mg/L	1.75 mg/L
(b) Total Inorganic Nitrogen as N <sup>3</sup>	7 mg/L	14 mg/L

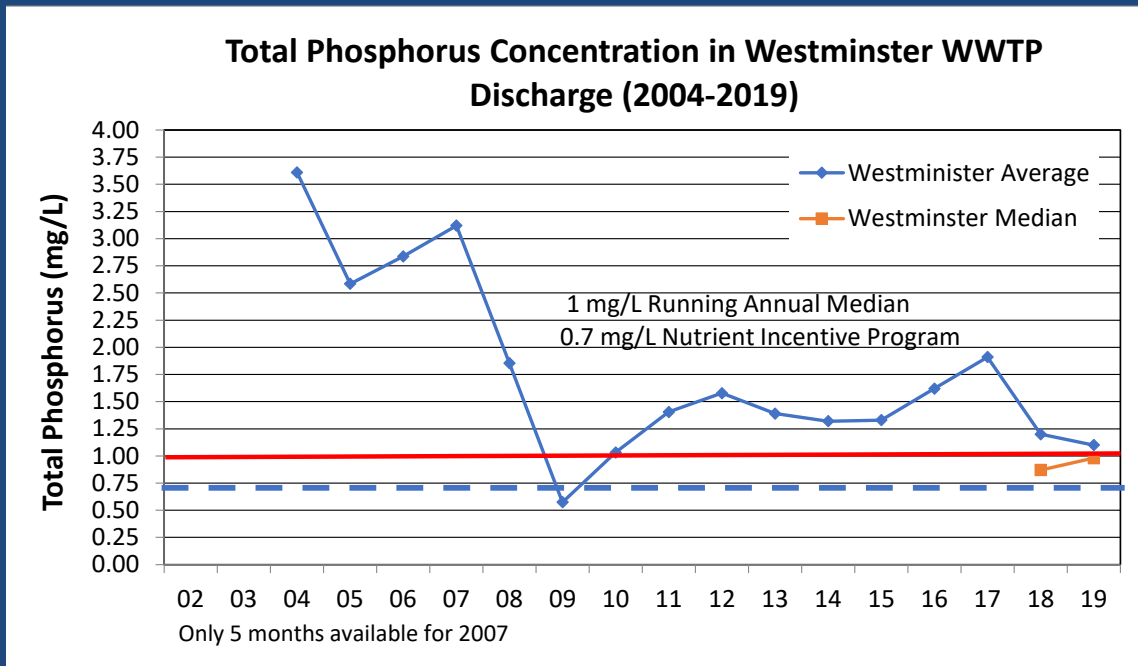
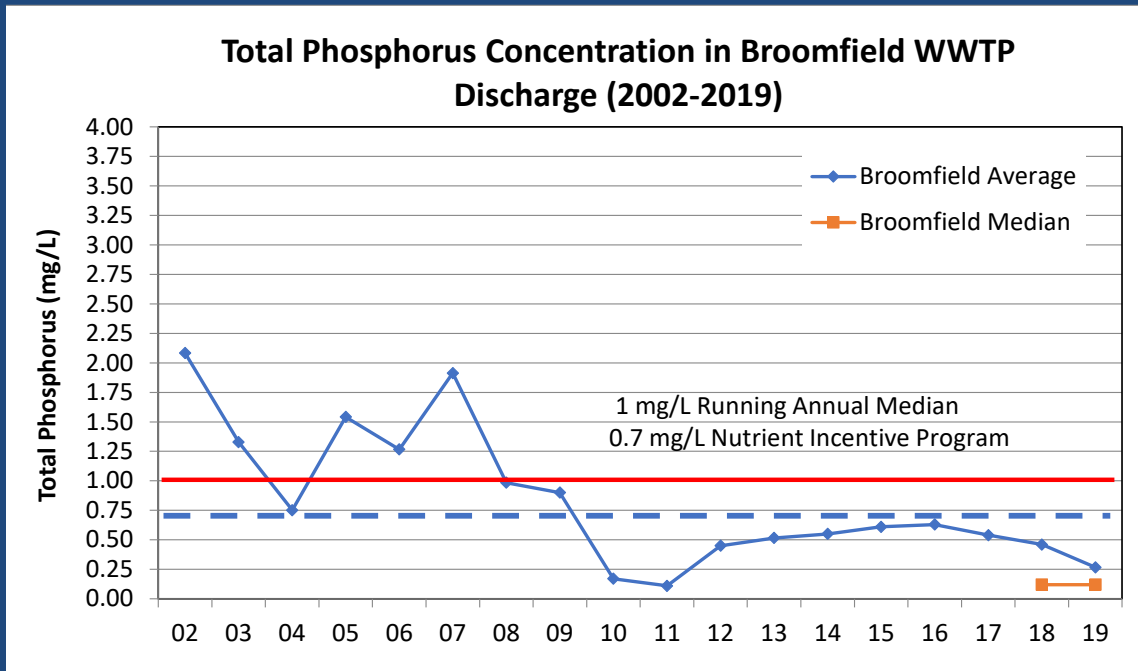
1 Running Annual Median: The median of all samples taken in the most recent 12 calendar months.

2 The 95<sup>th</sup> percentile of all samples taken in the most recent 12 calendar months.

3 Determined as the sum of nitrate as N, nitrite as N, and ammonia as N.

# Decreases in TP @ Broomfield and Westminster WWTPs

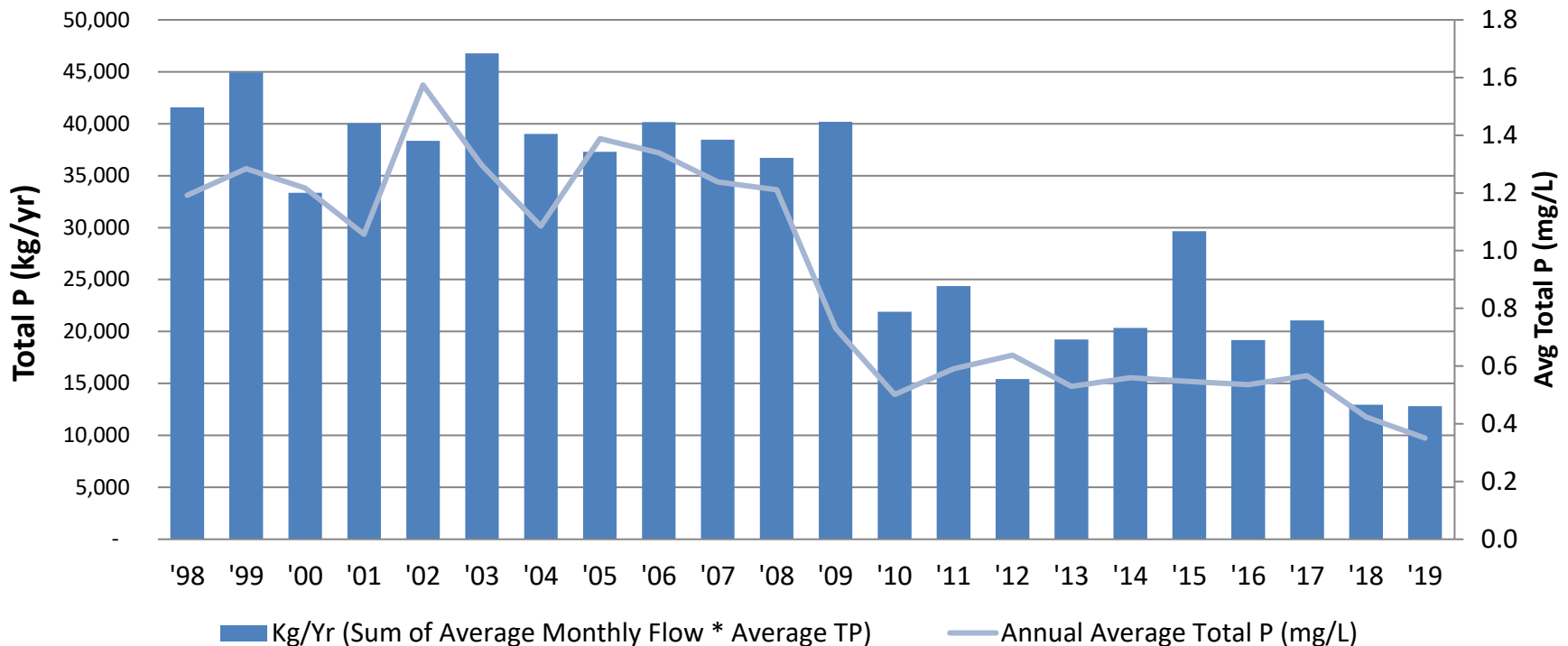
- Biological nutrient removal at Broomfield and Westminster WWTPs.
- Compliance plans for new permits limits to reach 1 mg/L TP as annual median



# TP Load Reductions at bdc6.0

- BMW Target 20% load reduction relative to 2004.
- Mean 2018-2019 loads 61-67% lower than 2004 and 2003, respectively.
- Flow variations affect load.
- WWTP decreases affect TP load.

Estimated TP Load at bdc6.0 with TP Concentrations  
(Using Fort Lupton Gage & bdc6.0 TP)

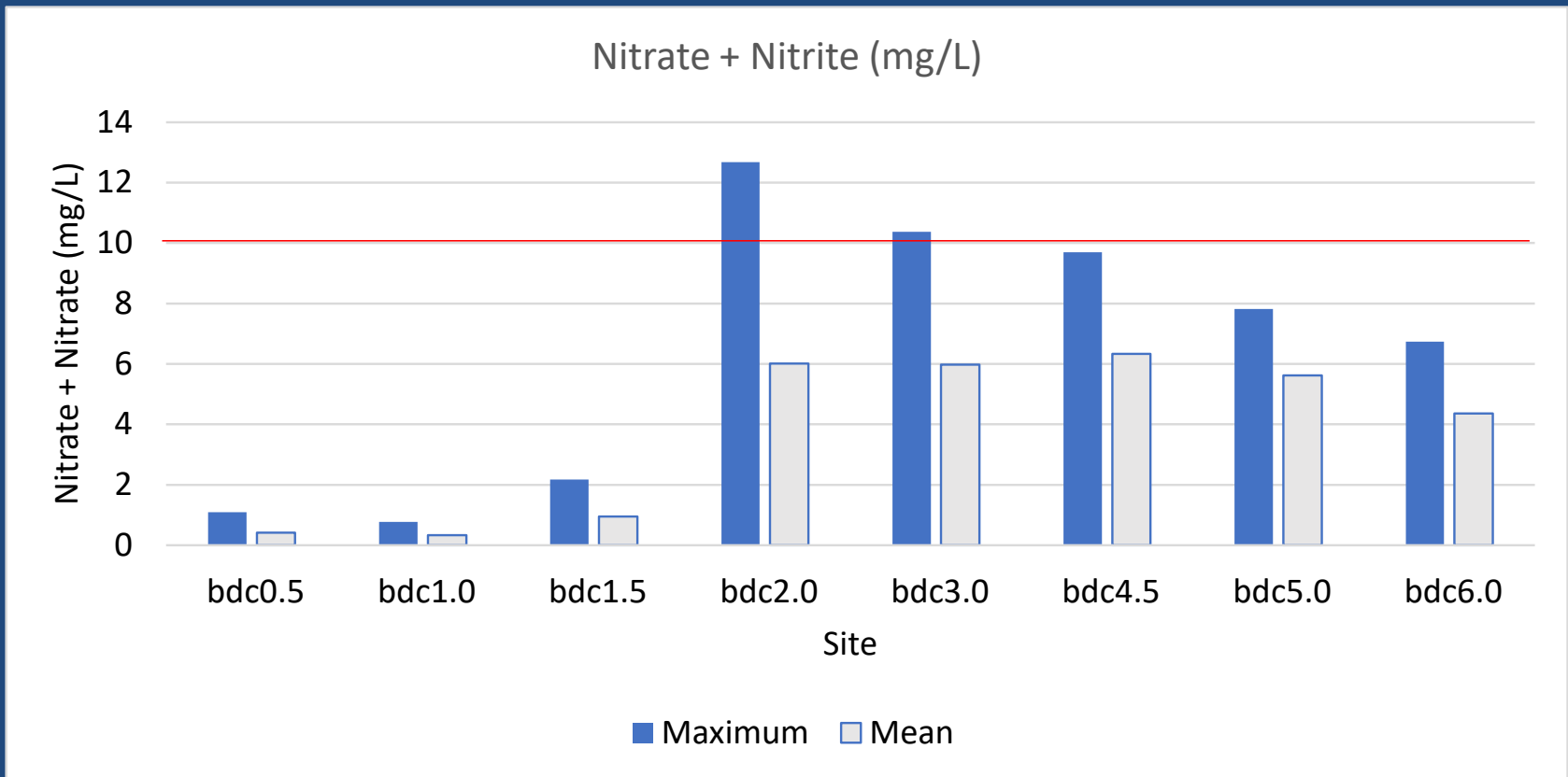


# Nutrients Voluntary Incentive Program

- WQCC Policy 17-1 continues tech-based approach to initial nutrient reductions
- Allows facilities to make nutrient reductions in exchange for an extended compliance schedule (up to 10 years) for criteria adopted in 2027
- Creates certainty regarding the year the facility will need to meet water quality based effluent limits

Accumulation of incentive months		
Total phosphorus annual median (mg/L)	$\geq 1$	$\leq 0.7$
Months earned	0	12
Total inorganic nitrogen annual median (mg/L)	$\geq 15$	$\leq 7$
Months earned	0	12

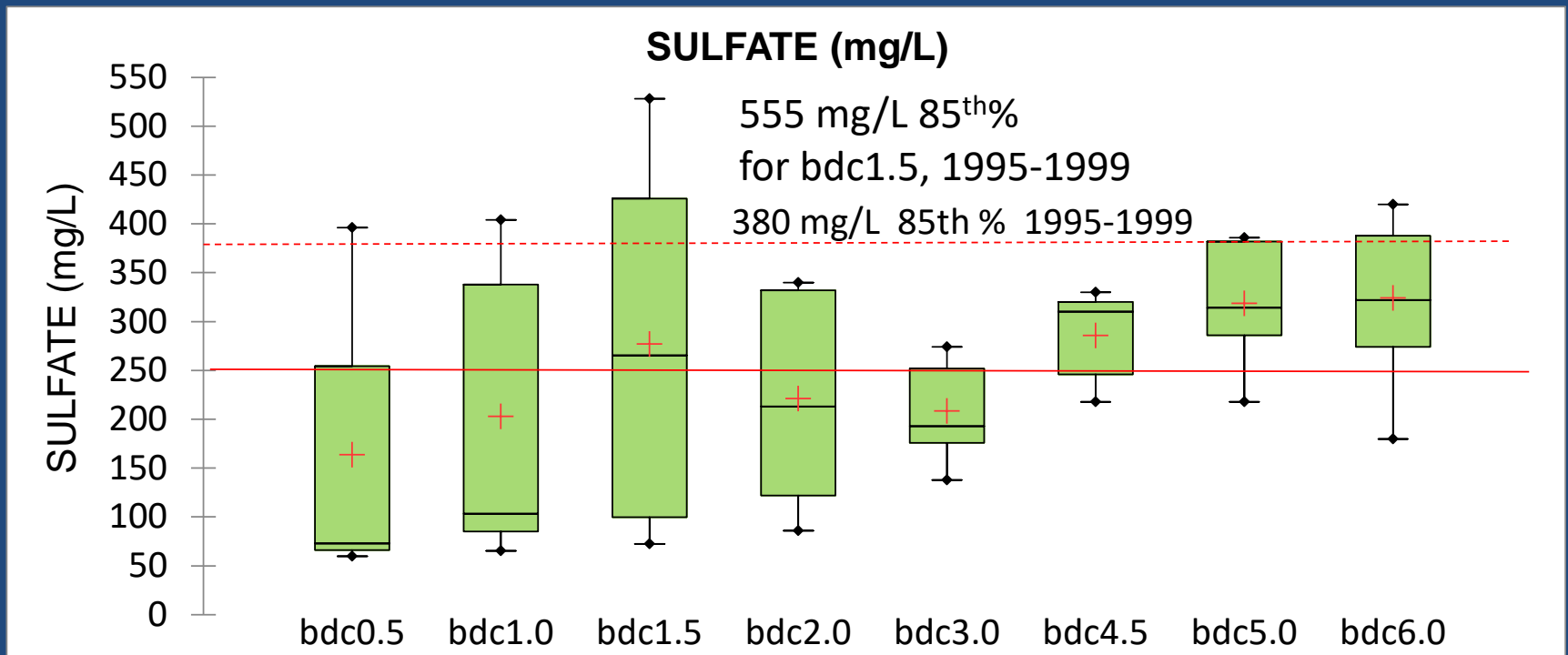
# New Water Supply Standard: Nitrate @ 10 mg/L (instead of 100 mg/L)



2019 Data Set for NO<sub>3</sub> + NO<sub>2</sub> displayed against NO<sub>3</sub> standard.  
Standard assessed based on maximum concentration.  
3 values > 10 mg/L, bdc2.0 Apr & Oct, bdc3.0 Oct.



# New Water Supply Standard: Sulfate

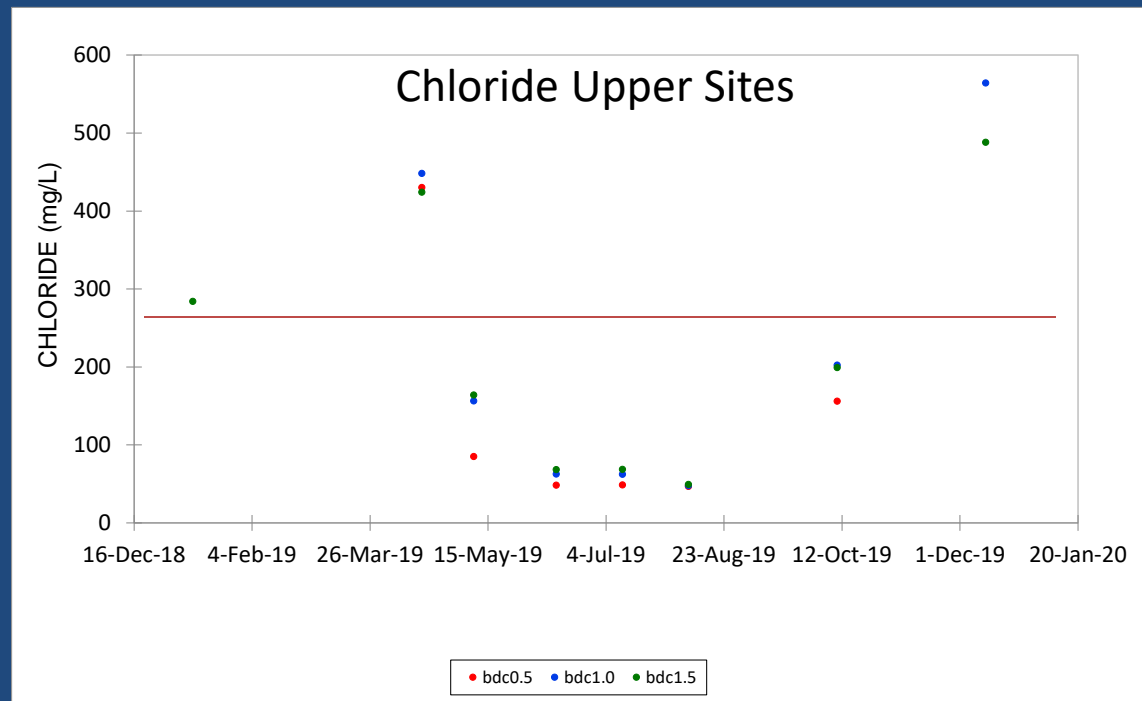
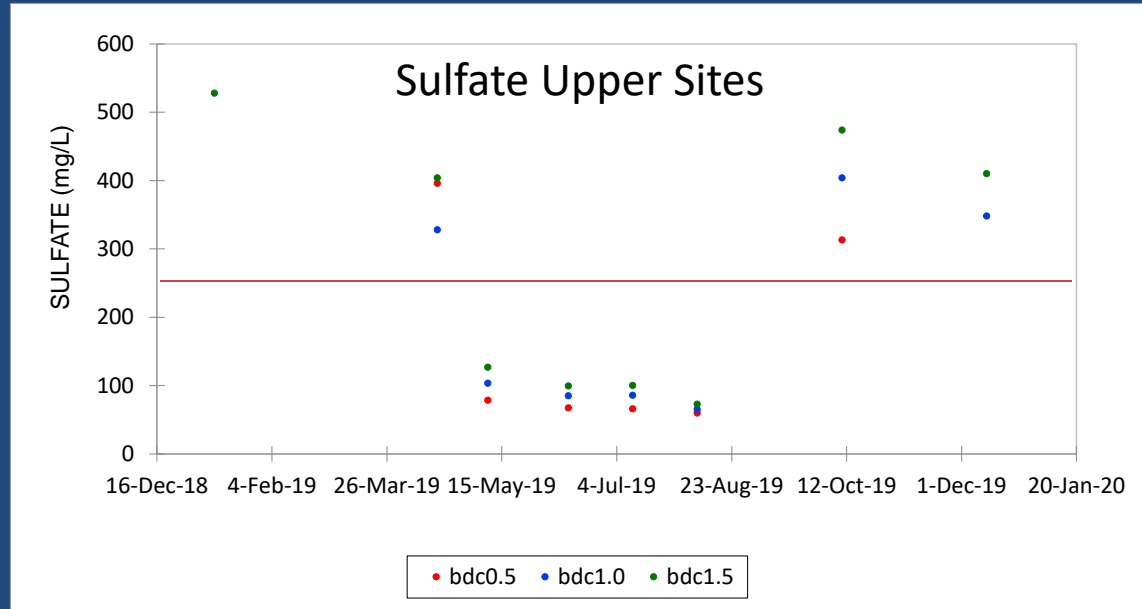


2019 Data Set 85<sup>th</sup> percentile for stream segment = 386 mg/L

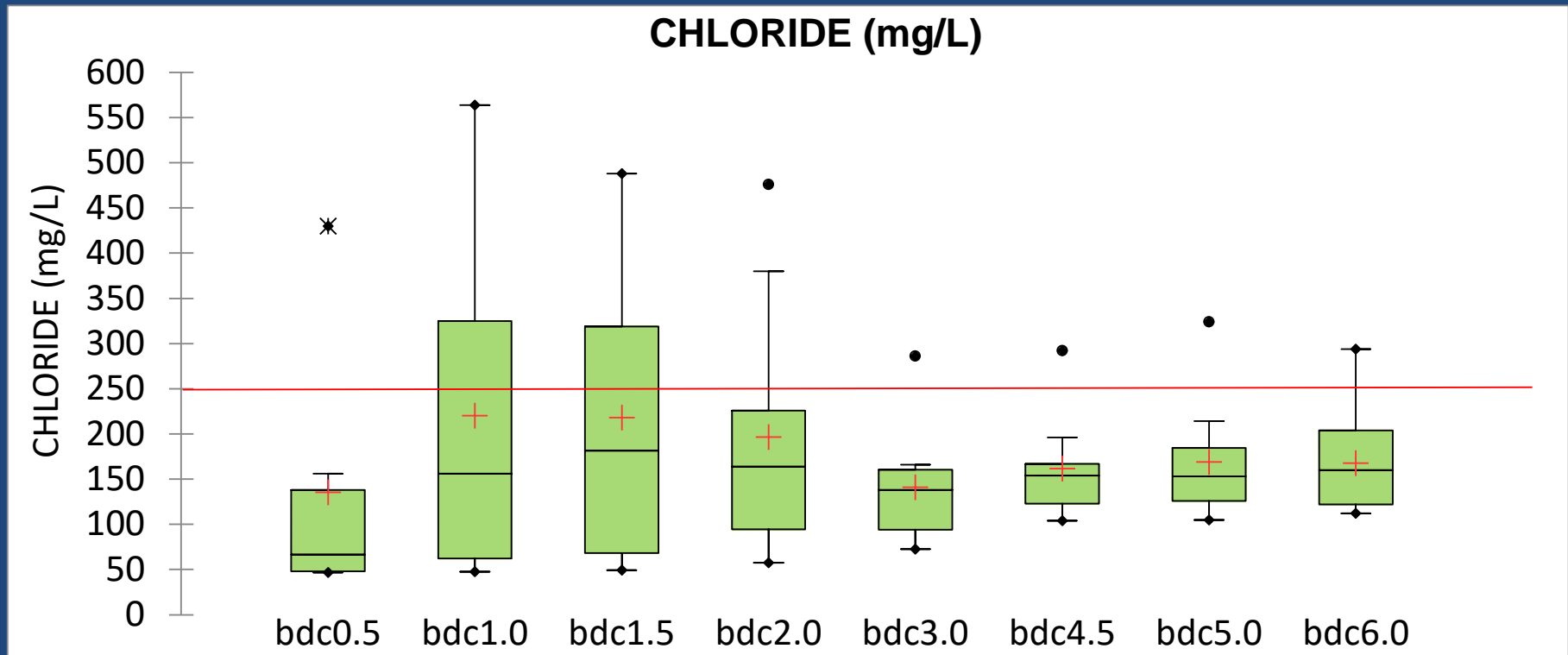
Underlying standard = 250 mg/L, Existing Condition as of 1/2000 = 380 mg/L

# Seasonal Trend Examples

- When Standley is not releasing, poorer groundwater quality dominates stream above WWTPs.



# New Water Supply Standard: Chloride

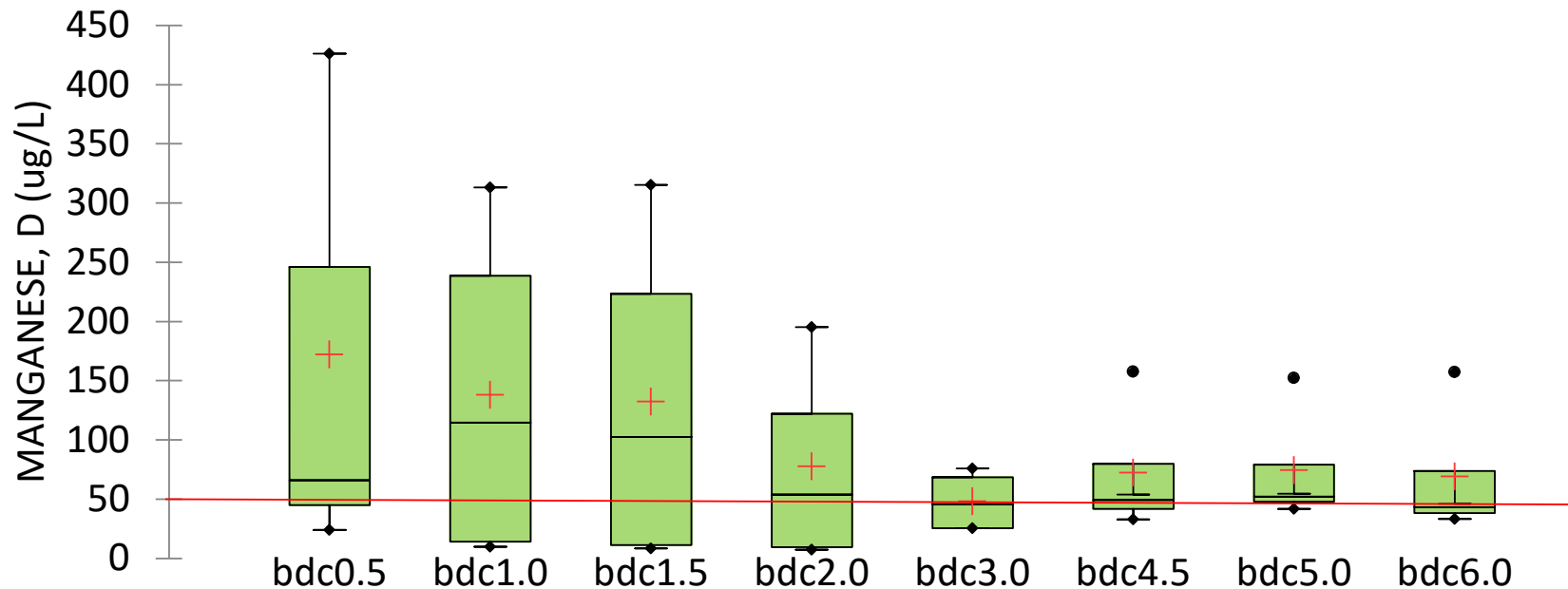


2019 Data Set: 85<sup>th</sup> Percentile = 288 mg/L.

Note: bdc0.5 is missing data for some winter months.

# New Water Supply Standard: Dissolved Manganese

MANGANESE, D (ug/L)



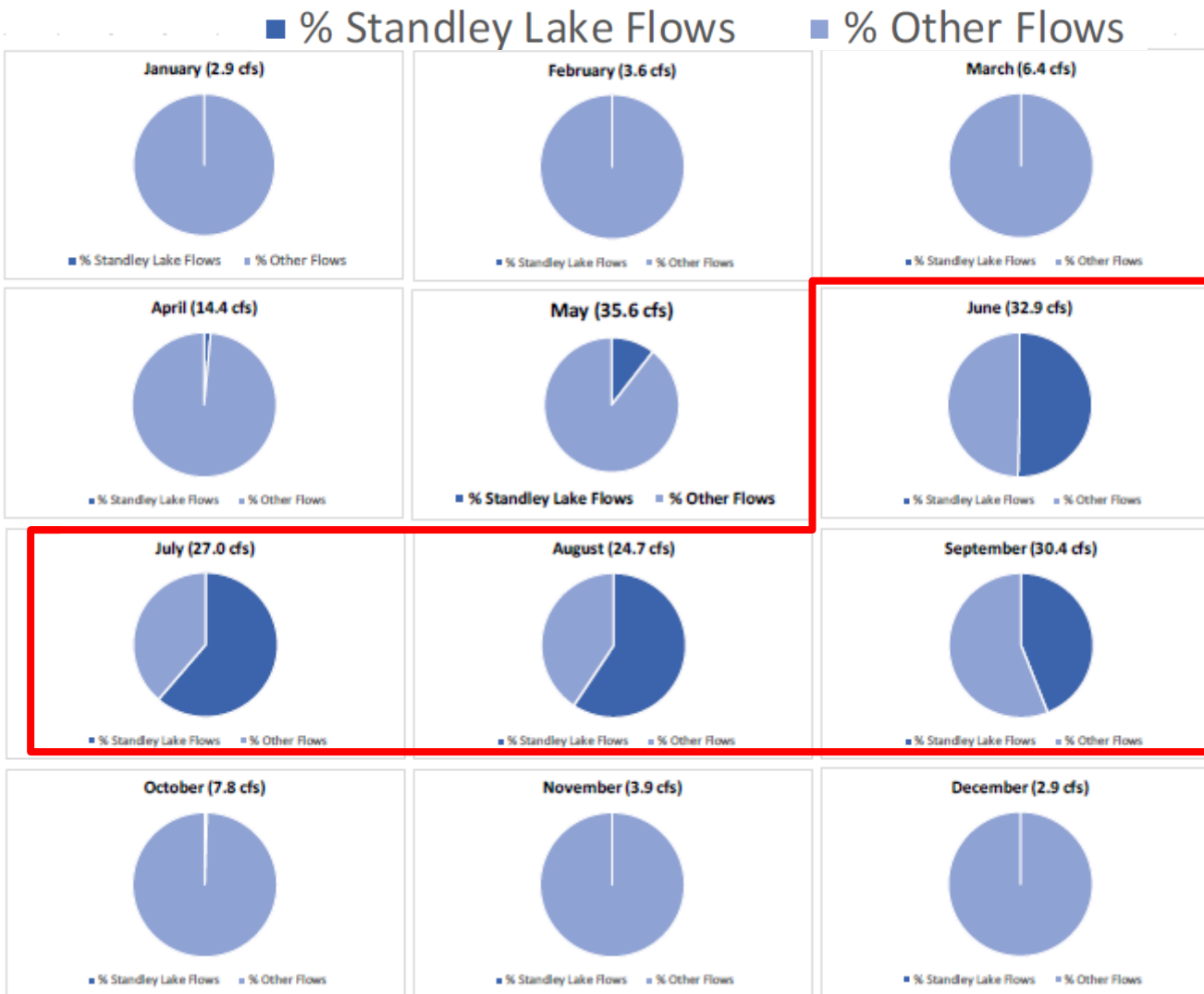
2019 Data Set 85<sup>th</sup> percentile = 194 ug/L

Underlying Standard: 50 ug/L

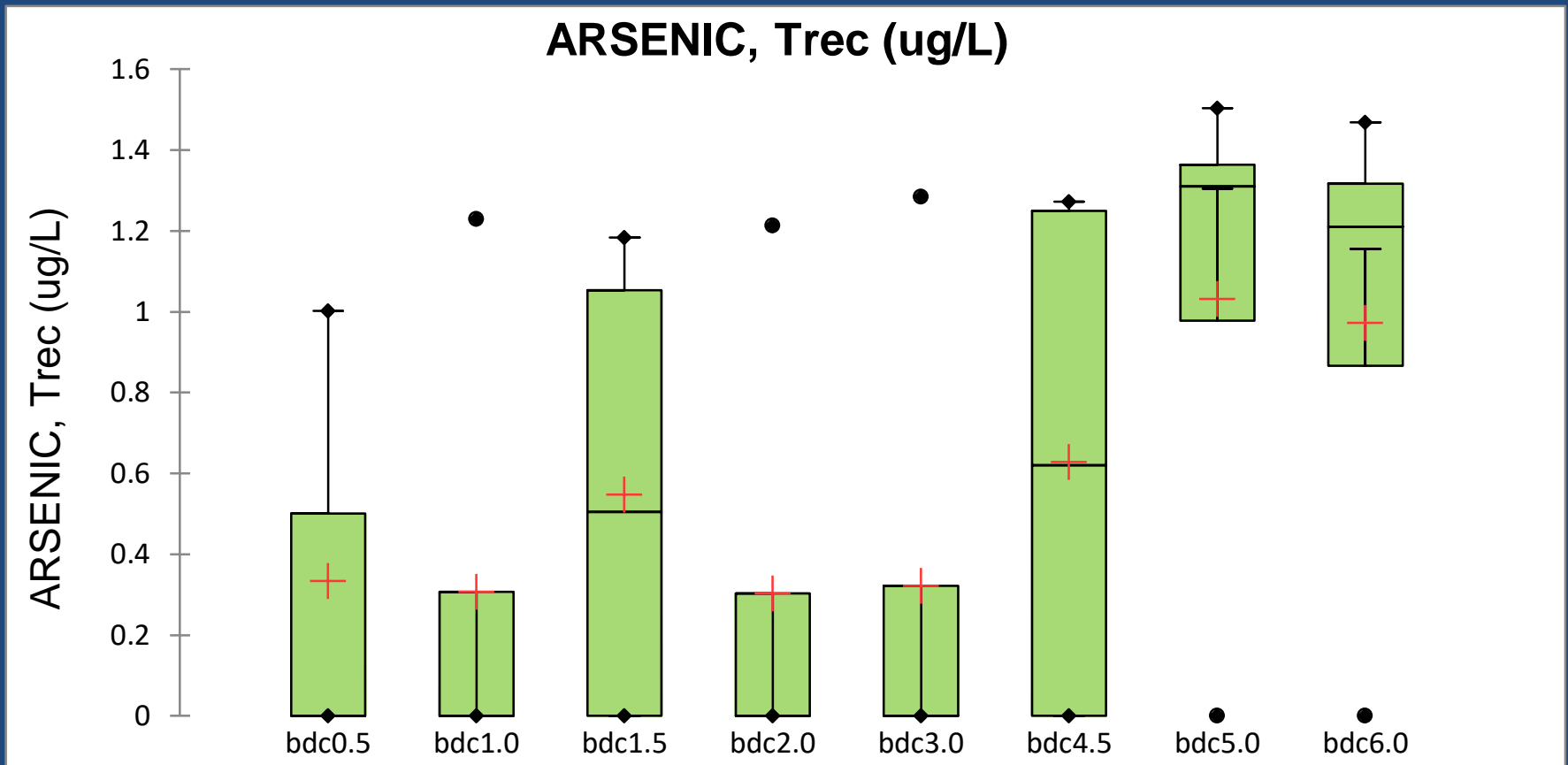
Existing Condition as of 1/1/2000: 85<sup>th</sup> percentile = 57 mg/L for 30 values in 1999.

# Influence of Standley Lake Discharges Upper Watershed

Figure 32. Average Monthly Percentage of Standley Lake Releases Relative to Big Dry Creek Flows at the USGS Westminster Gauge (2013-2017)



# New Water Supply Standard: Arsenic: 0.02-10 ug/L (No Fish + Water or Fish Ingestion)



Previous standard = 100 ug/L

# 2019 QC Program

Month	Analyte	Type <sup>1</sup> /Site	Lab
March	All WQ (incl CN-)	FB @ bdc6.0	All
	Nutrients	FB/FD @ bdc2.0	Westminster
June	Se and Fe(Trec)	FD @ bdc1.5	Broomfield WW
	<i>E. coli</i>	FD @ bdc2.0	Thornton
	Nutrients	FD @ bdc2.0	Westminster
September	All WQ (incl CN-)	FD @ bdc5.0	All
	Nutrients	FB/FD @ bdc2.0	Westminster
December	Se and Fe(Trec)	FD @ bdc1.5	Broomfield WW
	<i>E. coli</i>	FD @ bdc2.0	Thornton
	Nutrients	FD @ bdc2.0	Westminster

- High field blank 9/19/2019 for TP @ 0.15 mg/L
- Missing 12/2019 *E. coli* replicate @bdc2.0
- Missing June & Dec Fe (Trec) replicate @bdc1.5
- Somewhat high RPD 6/13/2019 for TP (24%)

# Biennial Biological Monitoring (presented in December 2019)

- 2018 Sampling
- Fish
- “Bugs”
- Habitat
- Overall trends in aquatic life health
  - Over time
  - By location
- Not discussed in detail today





# New Aquatic Life Warm 1 Policy 10-1 Evaluation

MMI Scores for Big Dry Creek Sites, 2012, 2014, 2016 and 2018

		MMI Scores					
Site	Location	Biotype	2012	2014	2016	2018	4-yr mean
BDC 0.5	d/s from Old Wadsworth Ave., at Church Ranch Open Space	3	<b>60.2</b>	50.9	52.9	55.2	54.8
BDC 1.0	u/s from 112th Ave.	3	47.5	50.0	41.4	55.9	48.7
BDC 1.5C	d/s from 120th Ave., immediately u/s Broomfield WWTP	3	<b>59.5</b>	<b>58.3</b>	43.4	46.3	51.9
BDC 2.0	u/s from 128th Ave., d/s from Broomfield WWTP	3	37.2	52.4	46.7	44.8	45.3
BDC 3.0	at I-25, d/s from Westminster WWTP	3	45.5	41.7	42.0	39.3	42.1
BDC 5.0	d/s from Weld County Rd. 4	3	<b>58.2</b>	41.1	24.9	43.8	42.0
Annual Mean			51.4	49.1	41.9	47.6	

MMIs per EDAS v4 and Policy Statement 10-1 (CWQCC 2017).

**Bold** indicates High Scoring Water (MMI >51 for Biotype 3).

MMI Impairment threshold for Class 2 streams is ≤29.

All analyses performed by Aquatics Associates, Inc.

impaired

### Comments for 2018









MMI values for 2018 met use attainment all six sites on Big Dry Creek (MMIs >29 threshold for Class 2 streams).

Sites bdc0.5 and bdc1.0 were High Scoring waters.

Lowest score in 2018 was at site bdc3.0.

- Grey Zone: 29-42
- For Grey Zone, assess auxiliary Metrics: HBI <7.6 and SDI >2.4.

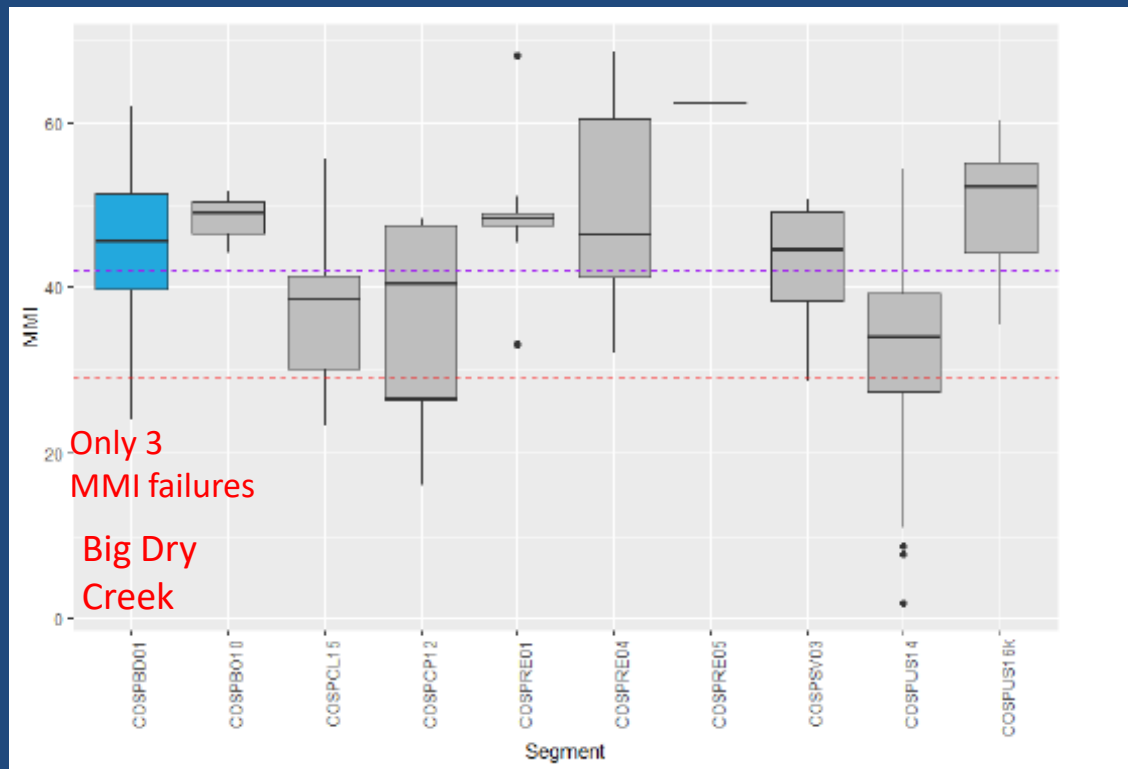
# BDCWA Disagreed with Division's Upgrade to Warm Water 1 Use

Table 2. Summary of evidence supporting that COSPBD01 is attaining Warm 1 use.			
Test	Lines of Evidence		Source of evidence
	Fish	Macroinvertebrates	
Sustaining a wide variety of species?	 	 	Fish - CPW fish survey data Macroinvertebrates - MMI scores (overall health); SDI scores (diversity of taxa observed)
Sustaining sensitive species?	  (thermally sensitive species)	 	Fish - CPW fish survey data - Johnny Darters sustained in COSPBD01 Macroinvertebrates - MMI scores (overall health); HBI scores (predominance of pollution tolerant organisms)

# Pre-2020 Classification: Aquatic Life Warm 2

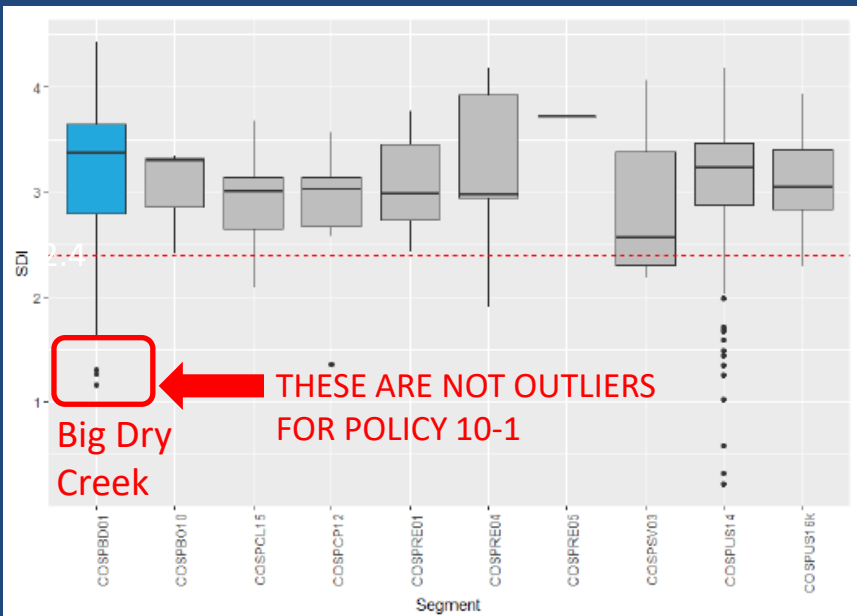
- Biotype 3, Warm Water 2: Assessed based on MMI only: 96% of samples attain
- Biotype 3, Warm Water 1: Also applied SDI & HBI to “grey zone”
  - Policy 10-1 based impairments go from 3 failures to 14 failures

MMI Scores (higher is better)  
Division’s Rebuttal Figure 4

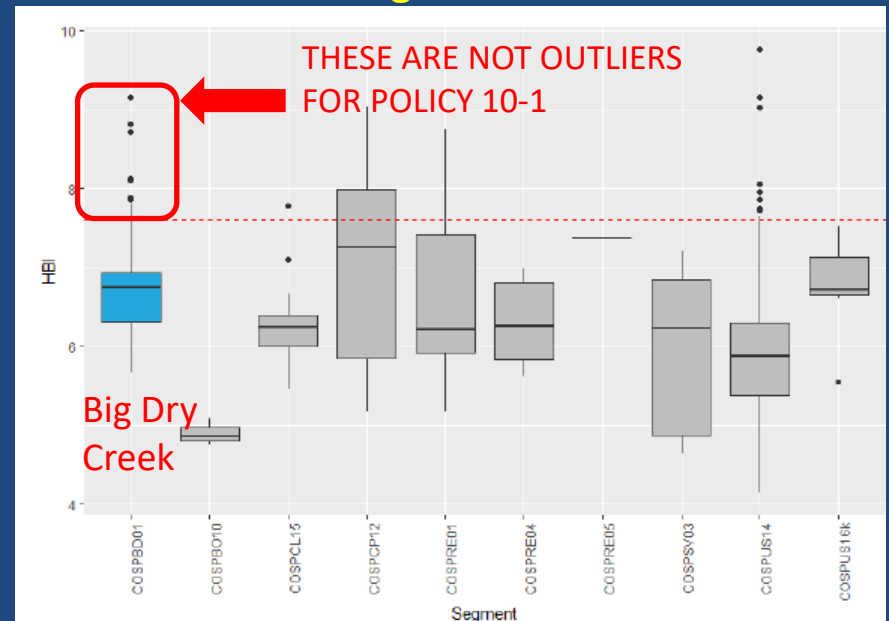


# Warm Water 1: Auxiliary Scores for SDI & HBI Applied

SDI Scores--Diversity (higher is better)  
Division's Rebuttal Figure 5



HBI Scores—Pollution Tolerance (lower is better)  
Division's Rebuttal Figure 6



MMI attainment is NOT assessed based on central tendency, so Big Dry Creek will bounce on-off 303(d) List

# Monitoring Gaps Due to New Standards and Other Issues

- Metals
  - Additional sample fractions needed
  - Mercury—quarterly vs. monthly
- E. coli
  - Sample frequency
  - Upper quantitation limit
- Northglenn lat/long coordinates under Reg 85 conflict with BDCWA coordinates (believed to have been resolved in fall 2019)

Metal	Fraction
Cadmium	Total
Lead	Total
Nickel	Total
Iron	Dissolved

# Water Quality Conclusions

1. Water quality in Big Dry Creek attained stream standards for criteria applicable in 2019, with the exception of E. coli (entire stream) and iron below WCR 8. The E. coli TMDL was finalized in 2016.
2. Addition of a Water Supply classification in the 2020 Rulemaking Hearing results in impairment for chloride, dissolved manganese, sulfate, chloride and nitrate. Mainly driven by groundwater above WWTP discharges, except nitrate driven by WWTP discharges.
3. A special study is underway between Standley Lake and I-25 to identify sources of E. coli. Standard now 126 MPN/100 mL.
4. Selenium—removed from 303(d) List in 2016.
5. Iron—elevated/impaired below Weld County Rd 8 based on Metro sampling, but better in 2019.

# Water Quality Conclusions

4. Phosphorus concentrations and loads to Big Dry Creek are generally decreasing due to enhanced treatment processes at the Broomfield and Westminster WWTPs, along with reuse programs that continue to be implemented at these WWTPs.
5. Big Dry Creek does not attain interim TP and TN standards below the WWTPs. Although these standards would not be expected to affect Big Dry Creek until 2027 below WWTPs, addressing nutrient sources on Big Dry Creek should be an increasing area of focus for BDCWA.
6. Significant TP load reductions have occurred relative to Barr-Milton TMDL objectives. The Barr Milton model is being updated.
7. As of 2018, Big Dry Creek did not show aquatic life impairment. Upgrade of the stream to Aquatic Life Warm 1 in 2020 changes the assessment methodology. MMI scores vary substantially both temporally and spatially.

Questions?

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