# STATE OF THE WATERSHED

Annual Newsletter of the Big Dry Creek Watershed Association

December 2020 Volume 22


## Big Dry Creek Water Quality Monitoring Program

The COVID-19 pandemic posed many challenges to local governments in the Big Dry Creek watershed during 2020. Nonetheless, local governments participating in the Big Dry Creek Watershed Association (BDCWA) maintained their commitment to the long-term water quality and biological monitoring program for the stream. Masks, social distancing, and limited staff in the city labs became the norm. BDCWA extends its thanks to the many city staff who worked under challenging conditions to maintain this program. Results of the 2020 monitoring program will be provided in the spring of 2021.

*Big Dry Creek field work during 2020 COVID pandemic.*

A key focus of BDCWA is annual assessment of water quality conditions in Big Dry Creek. In the spring of each year, BDCWA uploads the results of the instream water quality monitoring program into a long-term water quality database and compares the results to applicable water quality standards for Big Dry Creek. Biennially, biological monitoring is also conducted at a subset of the water quality monitoring sites. This brief article highlights some of the key findings of the 2019 water quality analysis, based on analysis of the data completed during 2020 and presented at the June 2020 BDCWA meeting.

In 2019, water quality samples were collected and analyzed for a variety of constituents. Metals were monitored on a quarterly basis, with the exception of iron, which was monitored monthly. All other constituents were monitored on a monthly basis. BDCWA communities also funded operation of the USGS gauging station at Westminster behind Front Range Community College.

Key findings and recommendations regarding Big Dry Creek water quality and aquatic life conditions based on analysis of the 2019 data set compared to stream standards applicable in 2019 and new standards adopted in 2020 follow.

- Water quality in Big Dry Creek attained stream standards for stream standards applicable in 2019, with the exception of *E. coli* for the entire stream and iron for the reach below Weld County Road 8. For new stream standards assigned in 2020 related to addition of a Water Supply classification, Big Dry Creek is expected to have future attainment issues for sulfate, chloride, nitrate and manganese.

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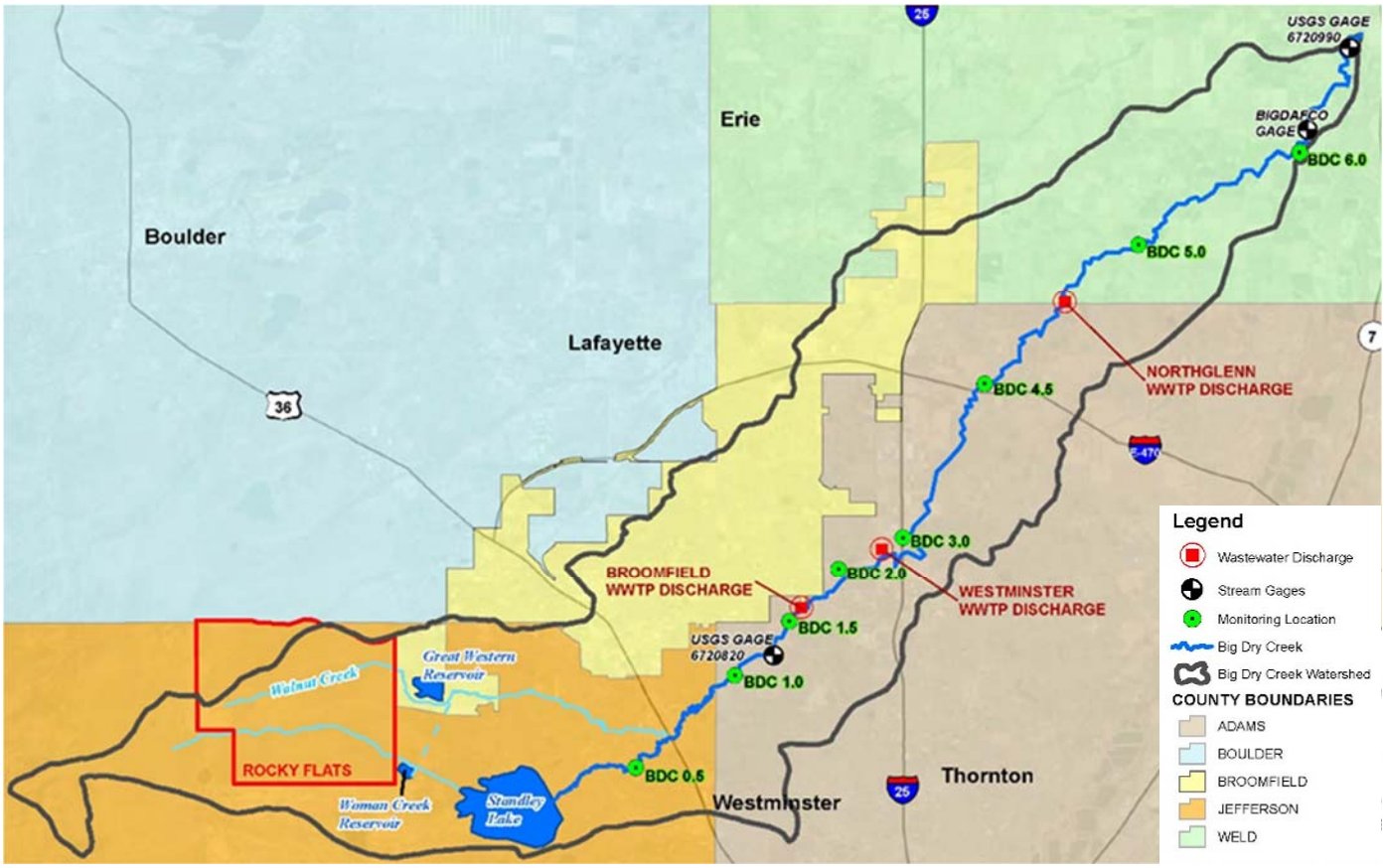
*All Watershed Association general membership meetings are open to the public.*

*Meetings are typically held on a quarterly basis in March, June, September and December.*

*For More Information on the next BDCWA meeting, contact Jane Clary (clary@wrightwater.com) or visit our website: www.bigdrycreek.org*

*The Big Dry Creek Watershed Association is a 501(c)(3) corporation.*




*(Big Dry Creek Water Quality Monitoring Program, Continued from page 1)*

- *E. coli* concentrations are elevated at multiple instream locations. *E. coli* concentrations in WWTP discharges are very low. Additional efforts to identify sources of *E. coli* are underway, including a microbial source identification study on the creek.
- Big Dry Creek below Weld County Road 8 is listed as impaired on the 2020 303(d) List for elevated total recoverable iron concentrations, which are expected to be due to streambank and soil erosion in the lower watershed.
- For the most recent five-year analysis period (2015-2019), Big Dry Creek attained its site-specific selenium standard. In 2016, the stream was removed from the 303(d) List of impaired waters.
- Big Dry Creek does not attain the warm water instream nitrogen and phosphorus "interim values" below WWTP discharges (from the Broomfield WWTP to the South Platte River). Although these values are not expected to be adopted as stream standards on the main stem of Big Dry Creek below WWTP discharges prior to 2027, addressing nutrient sources on Big Dry Creek is an increasing area of focus for BDCWA. Phosphorus loads to Big Dry Creek have decreased over time as a result of WWTP upgrades at the Broomfield and Westminster WWTPs, along with reuse programs that continue to be implemented at these WWTPs.
- Sources of sulfate, chloride and dissolved manganese in the watershed include groundwater inflows in the upper watershed, as evidenced by seasonal patterns in the data set. Other sources of sulfate may also be present in the lower watershed. These constituents are secondary drinking water parameters, not related to human health risk. All of these constituents are expected to have exceedances of the stream standards resulting in impairment listing on future 303(d) lists. Further exploration of existing quality conditions as of January 1, 2020 may provide regulatory relief for sulfate.
- Big Dry Creek exceeds the recently assigned nitrate standard of 10 mg/L for a few

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sampling events below the Broomfield and Westminster WWTPs. Compliance plans in the 2019 WWTP discharge permits are expected to address this issue.

- Big Dry Creek did not show impairment of aquatic life uses in 2020, based on assessment following Colorado's Aquatic Life Use Attainment Policy 10-1. Biological health scores were also calculated at six locations for fall monitoring conducted in even years from 2012 through 2018 for comparison. Scores vary substantially, both temporally and spatially.
- Stream flows were moderate during 2019. Stream flow is a significant factor influencing instream water quality, biological health, and pollutant loads. WWTP discharges from Northglenn were higher than historic discharges, as were discharges from Broomfield.

For a copy of the 2019 Annual Report, visit http://www.bigdrycreek.org/.

*As part of a dry weather E. coli study in 2020, stormwater outfalls were sampled for E. coli. Dry weather sampling requires tenacity due to often challenging access conditions like thick brush and steep slopes.*

## June 2020 South Platte River Basin (Regulation 38) Rulemaking

In June 2020, the Colorado Water Quality Control Commission held a triennial review rulemaking hearing for Regulation 38, which establishes designated uses and associated stream standards for Big Dry Creek and other streams in the South Platte River basin. The Commission adopted major changes to stream standards for Segment 1 of Big Dry Creek. Changes included an upgrade of the stream from Warm Water Aquatic Life 2 to Aquatic Life 1, upgrade from Potential Recreational use to Existing Recreation use, and addition of a Water Supply use, based on identification of a few alluvial wells used for drinking water in Weld County. Agricultural use standards continue to apply. Big Dry Creek also continues to be identified as a "Use Protected" stream, which means that it is not subject to anti-degradation review.

As a result of the new Water Supply classification, a more stringent total recoverable arsenic standard of 0.02-10 ug/L (compared to 340 ug/L) applies, as does a more stringent nitrate standard of 10 mg/L (compared to 100 mg/L). The hyphenated arsenic standard sets a 0.02 ug/L goal instream, but discharge permit limits are based on 10 ug/L. "Secondary" drinking water standards developed pursuant to the federal Safe Drinking Water Act now apply for chloride, sulfate, dissolved iron, and dissolved manganese. These secondary standards are not health based, but rather are based upon welfare impacts such as taste, odor and discoloration of laundry or fixtures. Stream standards for these parameters can either be based on the "table value standards" in Regulation 31, or they can be based on "existing conditions" as of January 1, 2000, with the exception of chloride.

Changes to the recreational use classification result in the *E. coli* stream standard decreasing from 205 cfu/100 mL to 126 cfu/100 mL. Even though Big Dry Creek is not used for swimming or boating, the recreational standard changed due to potential for access for waterplay by children in the Big Dry Creek open space.

The aquatic life use classification change affects the methodology used to evaluate attainment of Colorado's Policy 10-1 aquatic life criteria (see p.4).

# Big Dry Creek Biological Monitoring Program

BDCWA conducts a biennial macroinvertebrate and fish monitoring program during the month of October in even years. The most recent sampling was completed in October 2020. Biological monitoring in the Big Dry Creek Watershed has now been conducted for over 20 years, with the next round of sampling scheduled for 2022.

Initial results are highlighted below from the 2020 monitoring program along with findings from four previous sampling events from 2012 to 2018.

*Aquatics Associates staff and volunteers conducted biological monitoring on the creek during October 2020.*

Benthic Macroinvertebrate ("bug") Results

For benthic macroinvertebrate monitoring, several types of evaluation are completed, including calculation of the invertebrate community index (ICI) and Colorado's multi-metric index (MMI), along with other metrics. For purposes of evaluating compliance with Colorado's Aquatic Life Use Attainment Policy 10-1, MMI scores are the primary focus. Big Dry Creek is a Biotype 3 Plains stream under Policy 10-1.

As a result of changes to Big Dry Creek stream standards in 2020, the new Warm Water 1 stream classification required re-evaluation of historic data presented in previous annual reports. The main difference in evaluation methodology for Class 1 and Class 2 streams is that MMI values between the attainment (MMI = 42) and impairment (MMI = 29) thresholds require evaluation of two auxiliary metrics (the HBI and SDI). If either the SDI is >7.6 or the HBI is < 2.4 for values in the "gray zone", then the stream is considered impaired for aquatic life under Policy 10-1.

All samples for the five years met or were better than the impairment threshold (MMI score of 29) with the exception of bdc5.0 in 2016 (shown in red in the table). No consistent upward or downward trends were noted. All sites attained the HBI and SDI thresholds for these four sampling years; therefore, scores in the gray zone (shown in yellow in the table) were not considered impairments.

| MMI Scores | | | | | |
|---|---|---|---|---|---|
| **Site** | **2012** | **2014** | **2016** | **2018** | **2020** |
| 0.5 | **60.2** | 50.9 | **52.9** | **55.2** | 49.9 |
| 1.0 | 47.5 | 50.0 | 41.4 | **55.9** | 50.8 |
| 1.5C | **59.5** | **58.3** | 43.4 | 46.3 | 40.2 |
| 2.0 | 37.2 | **52.4** | 46.7 | 44.8 | 43.2 |
| 3.0 | 45.5 | 41.7 | 42 | 39.3 | 50.0 |
| 5.0 | **58.2** | 41.1 | 24.9 | 43.8 | 48.7 |
| **Shannon Diversity Index (SDI) Scores** | | | | | |
| **Site** | **2012** | **2014** | **2016** | **2018** | **2020** |
| 0.5 | 4.23 | 3.60 | 3.63 | 3.63 | 3.28 |
| 1.0 | 3.64 | 3.78 | 4.00 | 4.13 | 3.97 |
| 1.5C | 3.00 | 3.83 | 3.75 | 3.41 | 3.34 |
| 2.0 | 2.75 | 3.73 | 3.73 | 3.69 | 3.63 |
| 3.0 | 3.44 | 4.06 | 3.20 | 3.73 | 3.44 |
| 5.0 | 3.78 | 3.25 | 2.25 | 3.58 | 3.11 |
| **Hilsenhoff Biotic Index (HBI) Scores** | | | | | |
| **Site** | **2012** | **2014** | **2016** | **2018** | **2020** |
| 0.5 | 6.44 | 6.15 | 6.62 | 6.45 | 5.79 |
| 1.0 | 6.66 | 6.31 | 6.17 | 6.45 | 6.18 |
| 1.5C | 6.61 | 6.92 | 6.74 | 7.27 | 6.68 |
| 2.0 | 7.02 | 6.43 | 6.87 | 7.10 | 6.37 |
| 3.0 | 8.01 | 7.29 | 7.90 | 7.11 | 6.95 |
| 5.0 | 6.40 | 5.65 | 7.77 | 6.56 | 6.38 |

*Big Dry Creek MMI scores calculated using EDAS V. 4 for Biotype 3. Values in bold are high-scoring waters. Values below 29 are considered impaired. MMI values in yellow would be impaired if the SDI or HBI did not meet Policy 10-1 thresholds.*

| Site | Location | Johnny Darter Count | | | | |
|---|---|---|---|---|---|---|
| | | 2010 | 2012 | 2014 | 2016 | 2018 |
| **BDC 0.5** | d/s from Old Wadsworth Ave., at Church Ranch Open Space | 40 | 3 | 2 | 0 | 1 |
| **BDC 1.0** | u/s from 112th Ave. | 2 | 1 | 0 | 9 | 63 |
| **BDC 1.5C** | d/s from 120th Ave., u/s Broomfield WWTP | 0 | 0 | 1 | 4 | 60 |
| **BDC 2.0** | u/s from 128th Ave., d/s from Broomfield WWTP | 0 | 0 | 0 | 1 | 19 |
| **BDC 3.0** | at I-25, d/s from Westminster WWTP | 0 | 0 | 0 | 0 | 0 |
| **BDC 5.0** | d/s from Weld County Rd. 4 | 0 | 0 | 0 | 11 | 1 |

During 2016, the MMI at bdc5.0 was the lowest on record; however, field observations did not identify unusual conditions that would be contributing to these scores. Review of the raw data suggested that the score may have been due in part to relatively high numbers of aquatic worms. Results improved dramatically in 2018 and 2020 at this site.

Based on the MMI results for the six sampling sites for the five most recent years analyzed, the aquatic macroinvertebrate community in Big Dry Creek is generally healthy and meets MMI use attainment criteria for Aquatic Life Class 1 warm water streams. Additionally, the long-term data set demonstrates the significant year-to-year variability that can occur at individual sites.

Fish Results

The 2020 fish data are still in the process of being analyzed, but the most recent completed analysis in 2018 indicated good numbers of fish (e.g., 1,000 or more fish) were collected at all sites except bdc1.5c, where only about 300 fish were collected. The most fish (over 2,200) were collected at bdc0.5. Also notable in 2018 was high fish numbers at bdc2.0 (below the Broomfield WWTP) occurring for the fourth consecutive sampling event. The abundant fish population in 2018 was also generally in good health as indicated by the low mean disease rating for “black spot” disease.

Fathead minnows are the most abundant species system-wide with white suckers, creek chubs, longnose dace, and sand shiners relatively abundant as well. Johnny darters appear to have had resurgence in numbers (see table above). Initial fish data for 2020 also included Johnny darters at all sites except bdc5.0. Johnny darters were collected for the first time at bdc3.0 in 2020. This species is important because of Regulation 31 temperature standards for Big Dry Creek Segment 1.

Results from the 2020 monitoring program will be presented to stakeholders in December 2021 and the program will be continued in 2022. Biological monitoring is a significant financial investment and is made possible in part by the Woman Creek Reservoir Authority.

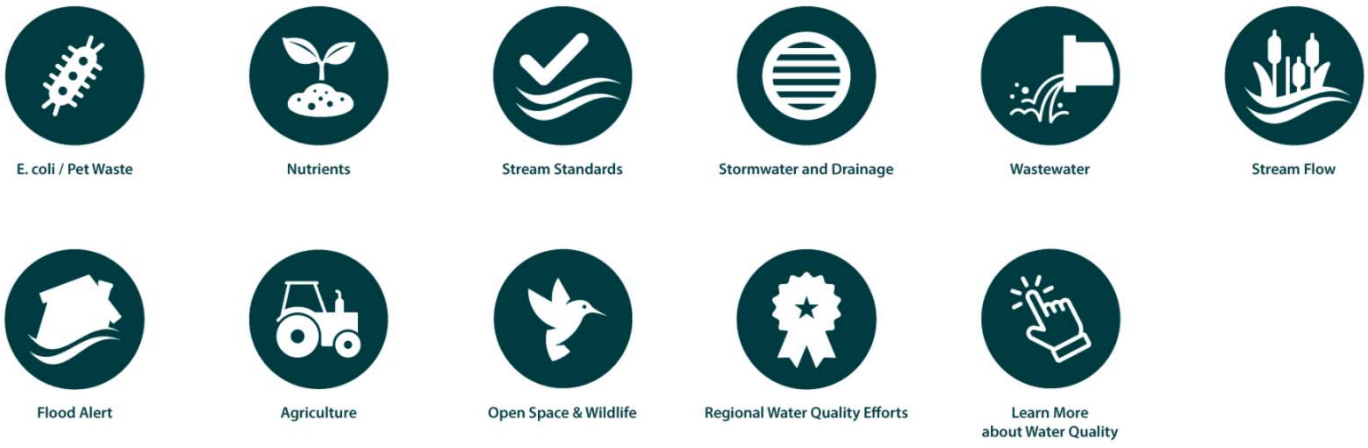
*Johnny darter collected from Big Dry Creek.*


## Visit Our Updated Website at www.bigdrycreek.org

During 2020, BDCWA completed a major update to its website that included an overall facelift, decluttering and new content. The website continues to provide notice of meetings and the most current reports related to watershed efforts. Additionally, we've added a Contact Us link if you would like to be added to our email list or have questions about the watershed.

A new feature of the website is our Resources page, which summarizes a wide range of technical information pertinent to the watershed and quick links to related websites. Some highlights include:

- *E. coli*/Pet Waste—provides information on the Big Dry Creek Total Maximum Daily Load for *E. coli* and steps that residents can take to reduce *E. coli* loading, such as picking up pet waste.
- Nutrients—provides information on nutrient criteria for nitrogen and phosphorus pertinent to Big Dry Creek and ways that citizens can help reduce nutrient loading.
- Stream Standards—provides links to key water quality regulatory and permitting information.
- Stormwater and Drainage—provides information on regional stormwater and drainage planning efforts and stormwater requirements for local governments in the watershed.
- Wastewater—provides information on the three municipal wastewater reclamation facilities serving the watershed.
- Stream Flow—provides links to data for three stream gauges on the creek.
- Flood Alert—provides a link to Mile High Flood District's Flood Alert system on Big Dry Creek.
- Agriculture—provides linkages to resources available through Colorado State University to support agricultural water quality efforts.
- Open Space and Wildlife—provides links to trail maps and open space information.
- Regional Water Quality Efforts—provides links to neighboring watershed organizations such as Barr-Milton Watershed Association and South Platte Cure.
- Learn More About Water Quality—provides a link to an EPA-sponsored project with understandable information about water quality.



## Are you a Big Dry Creek History Buff or Naturalist? We Would Like to Hear from You!

One of the best features of the Big Dry Creek watershed is the public open space along the creek from the Standley Lake dam through Thornton and Adams County, with a bike path along much of the creek.

In 2021, BDCWA will be putting together a map of Big Dry Creek for use by the public that highlights key features in both the built and natural environment. These features will include information on wildlife, trails, parks and history of irrigation features like the Bull Canal.

Do you have a favorite bird-watching spot on the creek that you would like to share? Is there special history of the watershed that we should include in our map? We would like to hear from you! Please contact Juliana Archuleta (MJArchuleta@adcogov.org) at Adams County to share your unique knowledge of Big Dry Creek!

## Big Dry Creek Microbial Source Identification Study Underway

In 2020, BDCWA and the City of Westminster began a microbial source identification study to better understand potential sources of elevated *E. coli* in the watershed, with particular emphasis on human sources. In 2021, the study involved five rounds of dry weather sampling of stormwater outfalls between Standley Lake dam and I-25, along with supplemental instream sampling. Both *E. coli* and human DNA markers (HF183) were included. Study objectives included:

- Do stormwater outfalls flowing under dry weather conditions have elevated *E. coli* concentrations?
- Do flowing outfalls with elevated *E. coli* under dry weather conditions have human source contributions?
- What are potential sources of *E. coli* upstream of WWTP discharges in the stream segment?

An interim update on the study was provided at the BDCWA December 2020 meeting, with work continuing into 2021.

*Dry weather flows from a storm drain under a bridge with swallow nests under the bridge deck. E. coli can originate from both human and natural sources.*

# What is the Big Dry Creek Watershed Association?

The Big Dry Creek Watershed Association (BDCWA) is a non-profit corporation consisting of individuals and entities who dedicate time and resources to developing a sound scientific understanding of water quality, flow, aquatic life and habitat conditions in the Big Dry Creek watershed and act to improve these conditions.

The Big Dry Creek Partnership, which included the City and County of Broomfield, the Cities of Northglenn and Westminster, and Rocky Flats Environmental Technology Site (RFETS), founded the BDCWA in 1997. These entities have been heavily involved in monitoring stream conditions for many years. Since 1997, the Association has expanded to include representatives from other cities, counties, farmers, ditch companies, citizens and regulatory and resource agencies. The BDCWA is open to those interested in cooperatively working towards understanding and prioritizing efforts to improve basin conditions.

In 2004, the BDCWA formed a non-profit corporation with a Board of Directors currently consisting of representatives of the Cities of Westminster, Northglenn and Thornton, the City and County of Broomfield, Weld County and Adams County. Activities of the BDCWA during the last twenty years have been funded through the contributions from these entities, as well as the U.S. Department of Energy, the Woman Creek Reservoir Authority, the Colorado Water Conservation Board, the U.S. Environmental Protection Agency's 319 program (as administered by the Colorado Department of Public Health and Environment) and the Regional Geographic Initiative grant program.

For more information on the Big Dry Creek Watershed Association, please visit the BDCWA's website at www.bigdrycreek.org or contact Jane Clary, Watershed Coordinator, Wright Water Engineers, Inc., 303-480-1700 or clary@wrightwater.com.

BIG DRY CREEK

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