# State of the Watershed

Annual Newsletter of the Big Dry Creek Watershed Association

December 2023 Volume 25


## Big Dry Creek Water Quality Monitoring Program

Local governments participating in the Big Dry Creek Watershed Association (BDCWA) continue to maintain their commitment to the long-term water quality and biological monitoring program for Big Dry Creek. 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 water quality analysis conducted during 2023, based on analysis of sampling completed during 2022.

In 2022, city staff collected and analyzed over 3,000 instream water quality samples for analytes including general water quality indicators, nutrients, metals and bacteria. Sampling is conducted on a monthly basis, with some constituents analyzed quarterly (e.g., some metals). BDCWA communities also funded operation of the USGS gauging station at Westminster behind Front Range Community College.

Key findings and recommendations based on the 2023 analysis include:

1. Water quality in Big Dry Creek attained many, but not all, applicable stream standards. *E. coli* concentrations remain elevated above the stream standard throughout the stream. For new stream standards assigned by the Water Quality Control Commission in 2020 related to addition of a Water Supply classification, Big Dry Creek exceeds the dissolved manganese, nitrate and chloride standards and may potentially exceed sulfate standards, depending on the time peri-

*(Continued on page 2)*

*BDCWA enjoyed an in-person meeting in December 2023 at the Broomfield Wastewater Reclamation Facility.*

## Inside this Issue:

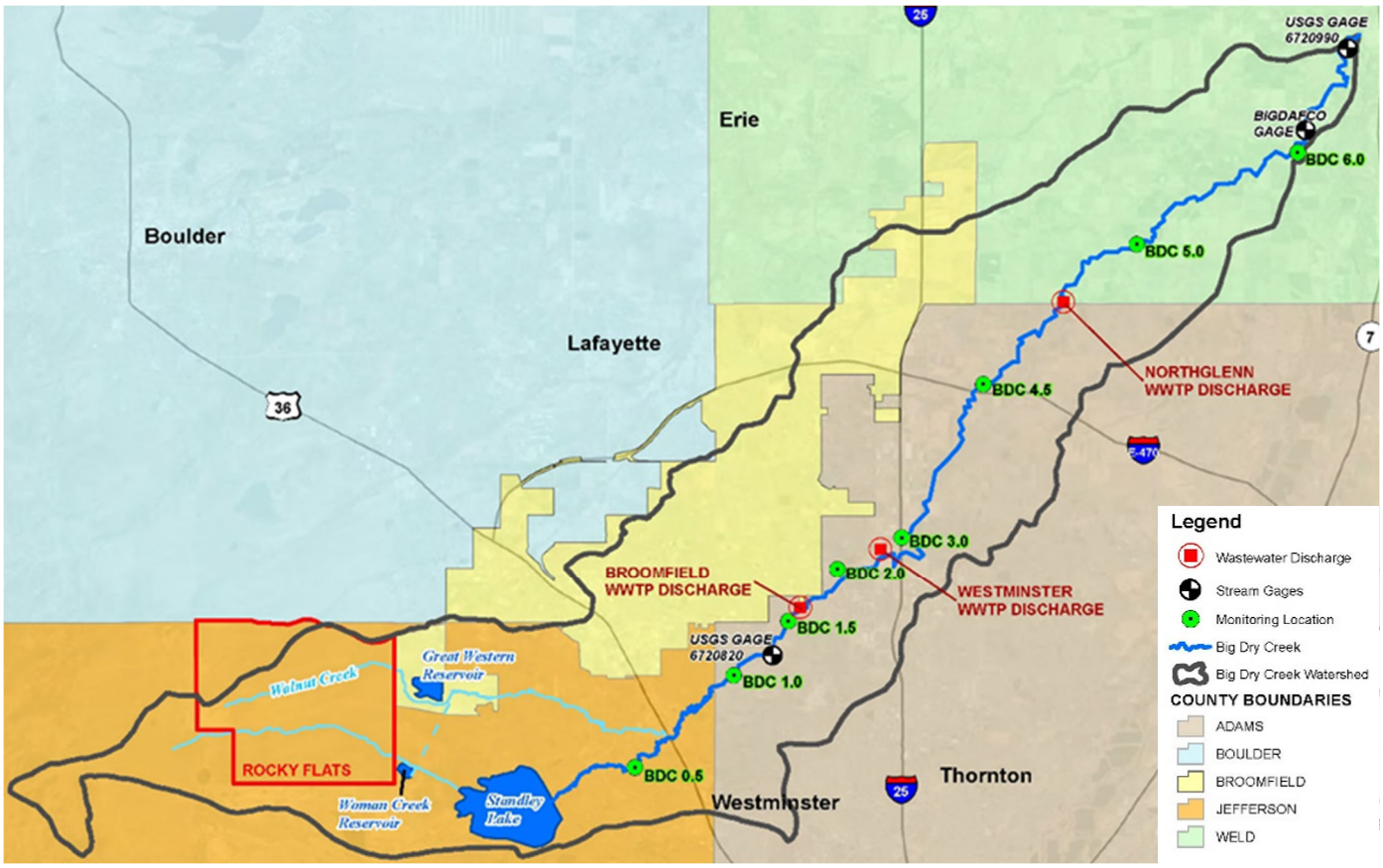


*All Watershed Association general membership meetings are open to the public.*

*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)*

od used for assessment and the assessment methodology (e.g., individual site vs. entire stream). These pollutants could become future impairment listings for Big Dry Creek. With the exception of nitrate, the new potential impairments are related to secondary drinking water standards (e.g., taste, odor, staining) rather than human health concerns. There are no public water supply intakes on Big Dry Creek.

2. *E. coli* concentrations are elevated at multiple instream locations. *E. coli* concentrations in the Wastewater Treatment Plant (WWTP) discharges are very low and do not exceed stream standards. Efforts are underway to identify sources of *E. coli* upstream of I-25.

3. Big Dry Creek below Weld County Road 8 is listed as impaired on the 2022 303(d) List for total recoverable iron. Elevated iron concentrations are expected to be due to stream bank and soil erosion in the lower watershed. For the last five-year period, total recoverable iron attains the stream standard; however, this attainment status is expected to vary year-to-year depending on the extent to which water quality samples coincide with storm events sufficient to generate erosion.

4. Sources of chloride, sulfate and dissolved manganese in the watershed include groundwater inflows in the upper watershed, as evidenced by seasonal patterns in the data set. These constituents are secondary drinking water parameters not related to human health risk. For chloride, the most recent 5-year period does not attain the stream standard, and a trend of increasing chloride concentrations over time is suggested by the data. For sulfate, a targeted spatial assessment approach (individual sites or reaches) may be appropriate as sources other than groundwater may be present in the lower watershed. Exploration of previously existing quality conditions as of January 1, 2000 for sulfate could also be helpful.

5. For the most recent five-year analysis period (2018-2022), Big Dry Creek attained its site-specific selenium standard.

*(Continued on page 3)*

6. Big Dry Creek exceeds the recently assigned nitrate standard of 10 mg/L for a few sampling events below the Broomfield and Westminster WWTPs. Compliance plans in the 2019 WWTP discharge permits are expected to address this issue in the next several years.

7. Big Dry Creek does not attain the interim warm water instream nitrogen "interim values" below municipal WWTP discharges (from the Broomfield WWTP to the South Platte River). The same has historically been true for the "interim value" for total phosphorus; however, the reach of stream between the Broomfield and Westminster WWTPs has begun to meet the phosphorus standard over the past few years due to significant investments in WWTP upgrades. Although the nutrient interim values are not expected to be adopted as stream standards on the main stem of Big Dry Creek prior to December 31, 2027, addressing nutrient sources to Big Dry Creek continues to be an area of focus for BDCWA. More stringent discharge permit limits with compliance schedules have been included in the 2019 permit renewal for the WWTPs. CWQCC Policy 17-1 established a Voluntary Incentive Program for Early Nutrient Reductions. The Incentive Program allows enrolled WWTPs to accrue time under a post-2027 compliance schedule through trading or watershed nutrient reductions as part of a nutrient reduction plan. All three municipal WWTP dischargers to Big Dry Creek are enrolled in the program.

8. Phosphorus loads in the lower watershed have decreased by 78 percent since 2003. This substantial load reduction demonstrates that the Big Dry Creek watershed has met its load reduction target defined in the downstream Barr Lake-Milton Reservoir TMDL.

9. Aquatic life monitoring is conducted in even years for Big Dry Creek, so the most recent monitoring results are for 2022. Big Dry Creek does not show impairment of aquatic life uses in 2022, based on calculation of MMI scores in accordance with CWQCC's Aquatic Life Use Attainment Policy 10-1.

10. Stream flows were average during 2022 at the Fort Lupton gauge, but lower than average at the Westminster gauge. Stream flow is a significant factor influencing instream water quality and pollutant loads. WWTP discharges from Northglenn were higher than historic discharges.

For a copy of the 2022 Annual Report, visit http://www.bigdrycreek.org/.

## BDCWA Outreach Activities 2023

In addition to this annual newsletter, BDCWA conducts several public education and outreach activities, partnering with its participating local governments to promote water quality protection in the watershed. BDCWA's website (bigdrycreek.org) provides the most current monitoring information and resources related to topics such as nutrient reduction and regulatory issues.

In 2022, BDCWA began developing an "ArcGIS StoryMap" to serve as an interactive resource for those interested in learning more about the Big Dry Creek Watershed. The Story Map will be accessible on the bigdrycreek.org website in the spring of 2024.

ArcGIS StoryMaps is a story-authoring web-based application that will allow BDCWA to share our maps in the context of narrative text and other multimedia content. This tool will enable users from students to government officials to become better oriented to the watershed, key water quality issues and land use features. In particular, we hope that this resource will be useful to students and citizens.

BIG DRY CREEK

**2023-2024 BDCWA Board of Directors**

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John Winterton, City of Northglenn

Tara Wilson, City of Westminster

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## Broomfield Water Recovery Treatment Facility Upgrades Planned

Broomfield's Water Recovery Treatment Facility was originally constructed in 1954 with a capacity of 0.8 million gallons per day (MGD). The facility has been expanded five times and now has the capacity to treat a hydraulic flow of 12 million gallons per day and an organic loading of 23,108 pounds per day.

| Project Driver | Total Cost | Percent of Total Cost |
|---|---|---|
| Capacity | $87,167,500 | 17% |
| Asset Renewal | $104,055,350 | 20% |
| Biosolids | $92,750,850 | 18% |
| Reuse | $33,348,300 | 6% |
| Regulatory | $206,170,000 | 39% |
| **Total** | **$523,492,000** | |

To ensure continued compliance with Colorado Department of Public Health and Environment (CDPHE) regulations and the City and County of Broomfield's wastewater treatment requirements, the Broomfield Water Recovery Treatment Facility's Wastewater Utility Plan (also referred to as a Master Plan) was updated by Carollo Engineers in 2023. The plan reviews the facility's capacity, regulatory, and asset needs and develops a plan for implementing capital improvements. The updated plan outlines a 13-year, $524 million capital improvement plan and was approved by the City and County of Broomfield City Council on October 10, 2023. The improvements and upgrades will need to be completed in five phases. Key drivers in the costs are capacity, asset renewal, biosolids, reuse, and regulatory requirements.

| Project Phase | Construction Schedule | Key Considerations | Estimated Cost |
|---|---|---|---|
| 1 | 2024-2025 | Site preparation for solids; flow equalization; aeration blowers and optimization | $36,843,000 |
| 2 | 2026-2028 | Capacity drivers, performance, resource recovery | $176,368,000 |
| 3 | 2029-2030 | Timing of load growth, asset upgrades, reuse approach, timing of PFAS limits | $118,656,000 |
| 4 | 2031-2032 | Timing of flow growth, treatment approach, temperature limits | $63,514,000 |
| 5 | 2037-2038 | Timing of Regulation 31 limits, and approach to treatment and reuse | $128,111,000 |

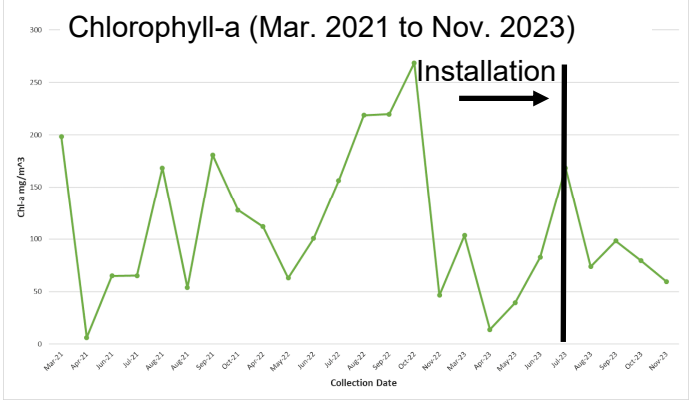
## Floating Islands Monitored in Trails Pond

Trails Pond in Broomfield's Westlake neighborhood is the centerpiece of a local park that includes a playground, paved walking trails, mature trees, and turfgrass. It is popular with residents, waterfowl, and fish! Trails Pond is about 6.5 feet deep, and its surface area is roughly three acres. Its main water source is stormwater runoff. Shallow ponds can be prone to water quality issues such as algal blooms.

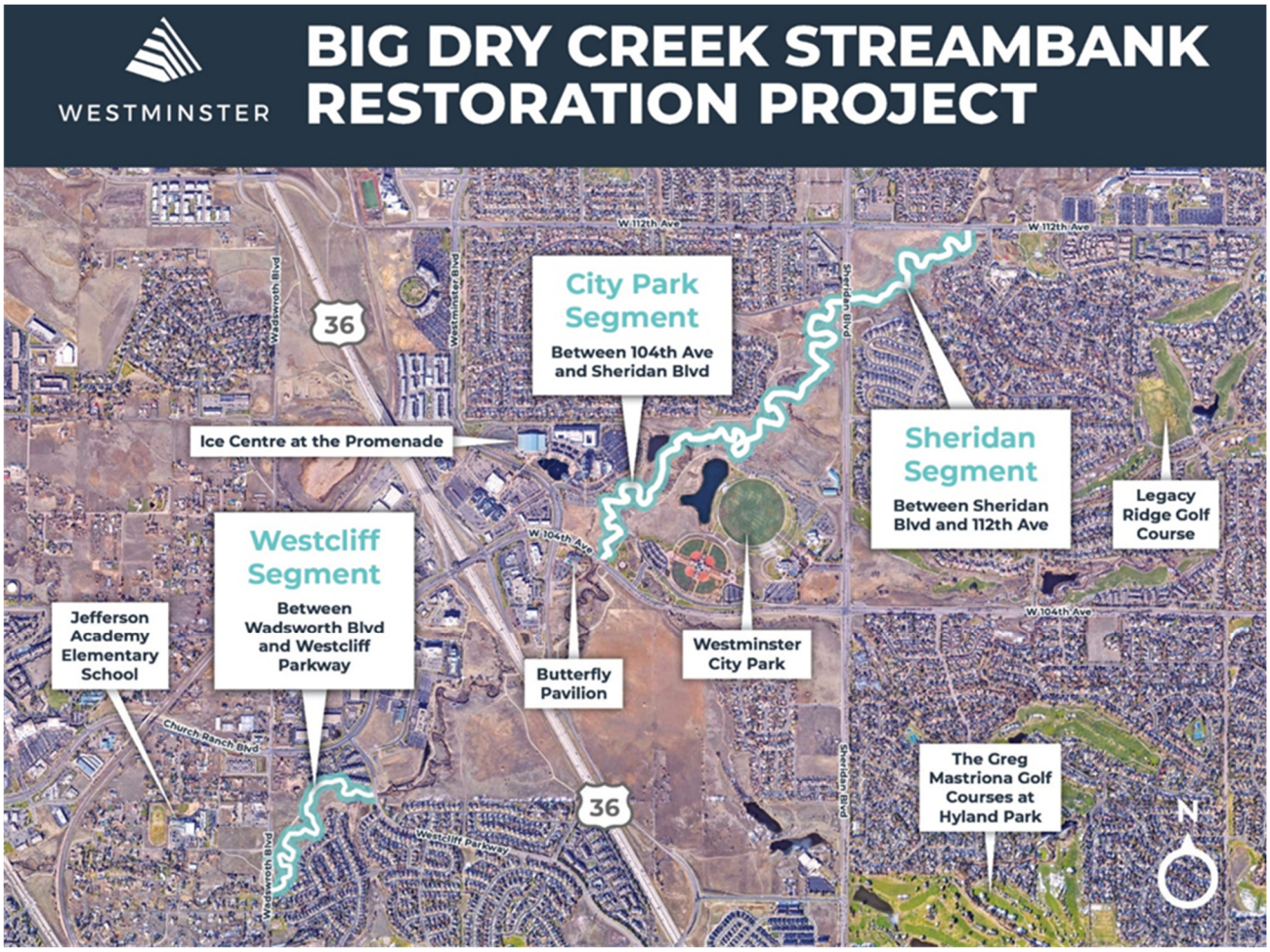
Trails Pond is green and turbid year-round, and cyanobacteria blooms occur every summer. Concentrations of microcystin, a common cyanotoxin, have been high enough that Broomfield has posted signs warning people to keep their pets and children out of the water. Over the years, several approaches have been taken to improve its water quality: mechanical aeration, chemical algaecide, and barley straw.

On July 27, 2023, staff from Broomfield's Parks Division installed "floating islands" of aquatic and semi-aquatic plants from two different companies to see if these could improve its water quality. The concept is that the plants in the floating islands remove nutrients (N and P) from the water as they grow, add oxygen to the water, and provide shade for fish during the hot summer months.

Broomfield's Environmental Lab staff monitor this pond every two weeks and are evaluating water quality trends for signs of water quality improvement. Staff are tracking changes to Secchi depth, chlorophyll a, algae, total inorganic nitrogen and orthophosphate. These parameters vary seasonally and can be affected by multiple variables such as temperature, rainfall and wind; therefore, several years of data collection are needed to evaluate effectiveness.




*Algal blooms in Trails Pond (upper) and installation of floating wetlands (lower).*




## Big Dry Creek Stream Restoration Project in Westminster

The City of Westminster, aided by the Mile High Flood District, is continuing with its Big Dry Creek Streambank Restoration Project. In 2024, phase 2 of the Wadsworth Boulevard to Westcliff Parkway Segment will continue, and construction of the City Park Segment will begin. The streambank restoration project is being implemented with goals of restoring the degraded channel to improve water quality and flood management as well as protecting critical infrastructure like sewers and trails from impacts due to bank erosion. The Sheridan Segment portion of the project is currently postponed due to funding.

Both the Wadsworth Boulevard to Westcliff Parkway and City Park portions of the project include construction and vegetation establishment and growth phases. Construction for phase 1 of the Westcliff Segment was completed in 2023 and vegetation establishment and growth is expected to continue through 2026. Construction of phase 2 of the Westcliff Segment is expected to wrap-up in 2024, and vegetation establishment will begin in 2025 and continue through 2030.

Construction of the City Park Segment is expected to last through 2026, with vegetation establishment occurring shortly thereafter. This portion of the project will target Big Dry Creek between W. 104th Ave and Sheridan Boulevard and Highlands Creek near W. 104th Ave. In addition to water quality and flood management benefits, nine new pedestrian bridges will be constructed as part of the project. Big Dry Creek Trail detours are expected as construction occurs.

Construction activities include grading and stabilization of the channel and floodplain, trash and debris cleanup, sediment removal, and replacement of grade control structures, culverts, and retaining walls. For more information, see the City's webpage: https://www.westminsterco.gov/ stream-bank restoration.

# Big Dry Creek Biological Monitoring Program 2022 Sampling Results

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 2022. Biological monitoring in the Big Dry Creek Watershed has now been conducted for 25 years, with the next round of sampling scheduled for 2024.

Results are highlighted below from the 2022 monitoring program along with findings from four previous sampling events from 2014 to 2020. Data summaries for fish and macroinvertebrates for 2022 were presented at the December 2023 BDCWA meeting.

Overall, fish numbers were relatively good in 2022, within typical year to year variability. As in 2020, the highest fish numbers were at bdc3.0 (I-25) where 1,880 fish were collected. Johnny darters were collected at all sites except bdc0.5. They were most numerous at site bdc3.0 where 68 were collected compared to three fish in 2020 when they were first collected at this site. Several were also collected at site bdc2.0 (n=20), but were less abundant at the other three sites: site bdc1.0 (n=4) and sites bdc1.5C and bdc5.0 with only one individual each collected.

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.

All samples for the five years with available data (2014-2022) 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 temporal trends were noted. All sites attained the HBI and SDI thresholds for these five sampling years; therefore, scores in the gray zone (shown in yellow in the table) were not considered impairments.

*Aquatics Associates staff and volunteers conducted biological monitoring on the creek during October 2022.*

| MMI Scores | | | | | |
|---|---|---|---|---|---|
| **Site** | **2014** | **2016** | **2018** | **2020** | **2022** |
| 0.5 | 50.9 | **52.9** | **55.2** | 49.9 | **55.8** |
| 1 | 50 | 41.4 | **55.9** | 50.8 | **54.6** |
| 1.5C | **58.3** | 43.4 | 46.3 | 40.2 | 46.3 |
| 2 | **52.4** | 46.7 | 44.8 | 43.2 | 36.3 |
| 3 | 41.7 | 42 | 39.3 | 50 | 44.7 |
| 5 | 41.1 | 24.9 | 43.8 | 48.7 | 46.3 |
| **Shannon Diversity Index (SDI) Scores** | | | | | |
| **Site** | **2014** | **2016** | **2018** | **2020** | **2022** |
| 0.5 | 3.6 | 3.63 | 3.63 | 3.28 | 3.3 |
| 1 | 3.78 | 4 | 4.13 | 3.97 | 3.66 |
| 1.5C | 3.83 | 3.75 | 3.41 | 3.34 | 2.44 |
| 2 | 3.73 | 3.73 | 3.69 | 3.63 | 3.54 |
| 3 | 4.06 | 3.2 | 3.73 | 3.44 | 3.3 |
| 5 | 3.25 | 2.25 | 3.58 | 3.11 | 2.53 |
| **Hilsenhoff Biotic Index (HBI) Scores** | | | | | |
| **Site** | **2014** | **2016** | **2018** | **2020** | **2022** |
| 0.5 | 6.15 | 6.62 | 6.45 | 5.79 | 6.26 |
| 1 | 6.31 | 6.17 | 6.45 | 6.18 | 6.14 |
| 1.5C | 6.92 | 6.74 | 7.27 | 6.68 | 6.66 |
| 2 | 6.43 | 6.87 | 7.1 | 6.37 | 6.27 |
| 3 | 7.29 | 7.9 | 7.11 | 6.95 | 6.21 |
| 5 | 5.65 | 7.77 | 6.56 | 6.38 | 5.48 |

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

# 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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