STATE OF THE WATERSHED

Annual Newsletter of the Big Dry Creek Watershed Association

December 2022 Volume 24

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 2022, based on analysis of sampling completed during 2021.

In 2021, city staff collected and analyzed instream water quality samples for over 40 water quality 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 2022 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 and nitrate standards and may potentially exceed sulfate and chloride standards, depending on the time period used for assessment and the assessment methodology (e.g., individual site vs. entire stream). These pollutants could

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Johnny darters are a sensitive native minnow found in the South Platte River Basin. Over the last 25 years, BDCWA has observed increases in Johnny darter populations in Big Dry Creek at multiple sampling locations. For example, in October 2022, 20 Johnny darters were collected below the Broomfield Water Reclamation Facility.

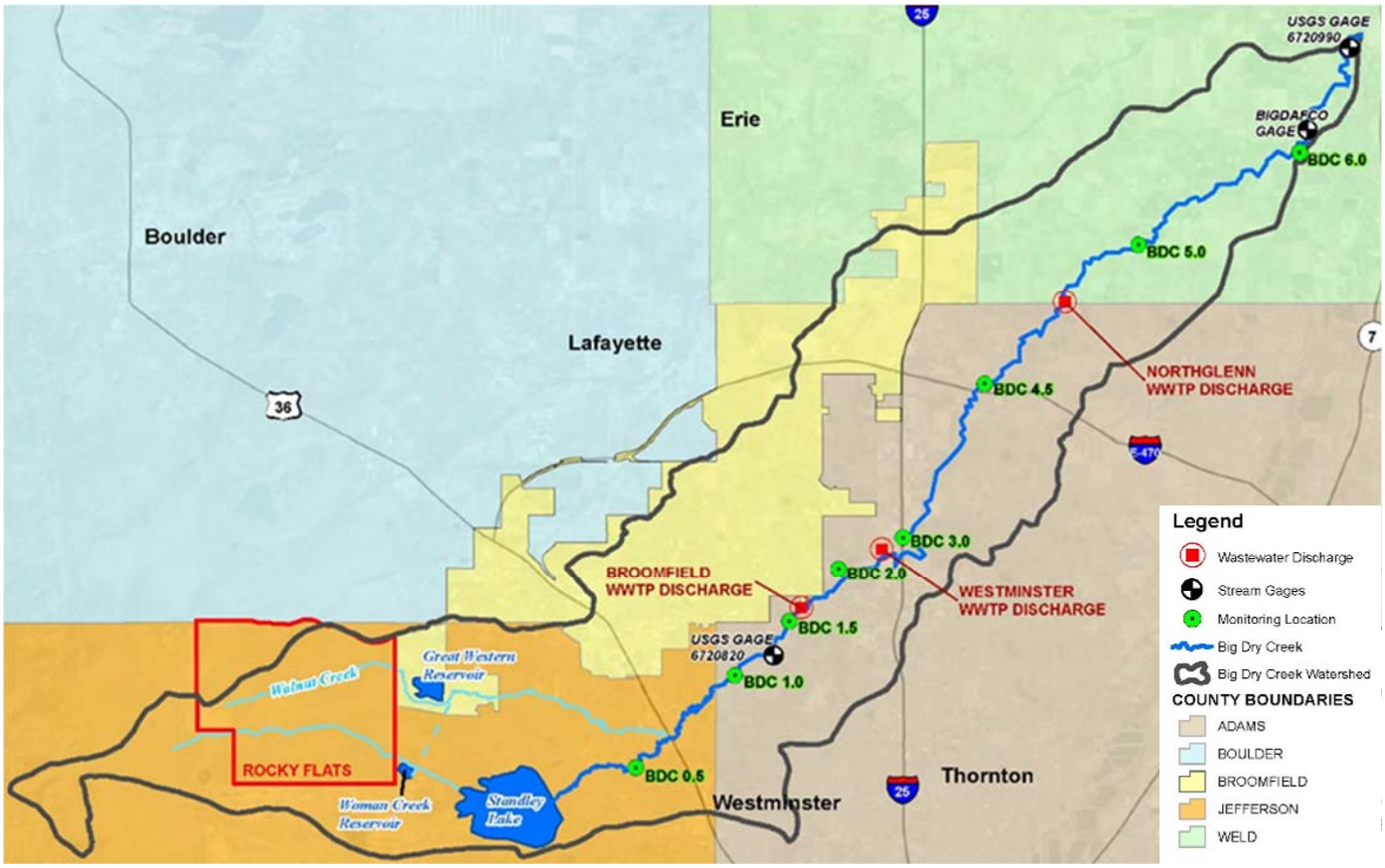
Inside this Issue:

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)

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.

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 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, but at levels below the stream standard. These constituents are secondary drinking water parameters, not related to human health risk. For chloride, the most recent 5-year period attains the stream standard; however, a trend of increasing chloride concentrations over time is suggested by the data. Further exploration of existing quality conditions as of January 1, 2000, and a targeted spatial assessment approach (individual sites or reaches) may be appropriate for sulfate.

5. For the most recent five-year analysis period (2017-2021), Big Dry Creek attained its site-specific selenium standard.

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.

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7. Big Dry Creek does not attain the interim warm water instream nitrogen and phosphorus "interim values" below municipal WWTP discharges (from the Broomfield WWTP to the South Platte River). However, the reach of stream between the Broomfield and Westminster WWTP has begun to meet the phosphorus standard over the past few years. 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 are enrolled in the program.
8. Phosphorus loads in the lower watershed have decreased by 82 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 2020. Big Dry Creek does not show impairment of aquatic life uses in 2020, based on calculation of MMI scores in accordance with CWQCC's Aquatic Life Use Attainment Policy 10-1.
10. Stream flows were average during 2021. Stream flow is a significant factor influencing instream water quality and pollutant loads. WWTP discharges from Northglenn were higher than historic discharges, as were discharges from Broomfield.

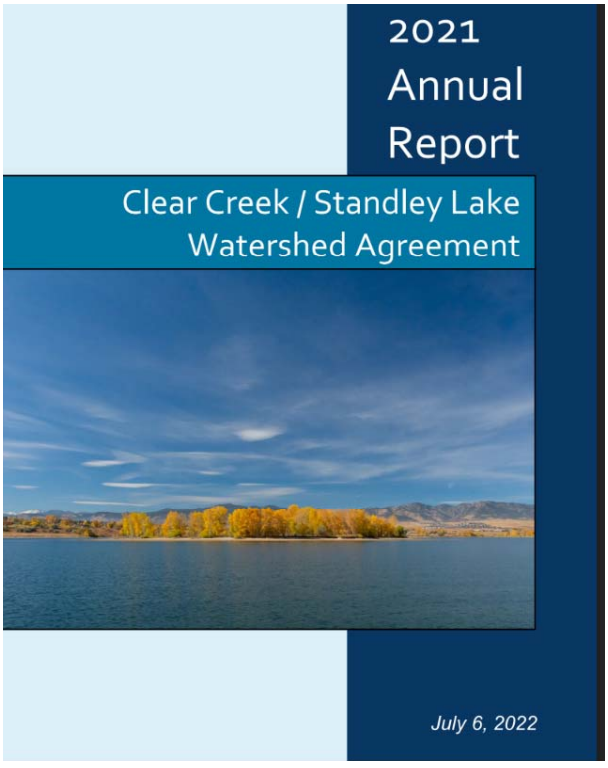
For a copy of the 2021 Annual Report, visit http://www.bigdrycreek.org/.

Clear Creek/Standley Lake 2021 Annual Report

In December 2022, the "Standley Lake Cities" presented an annual report that addressed the water quality in Standley Lake to the Colorado Water Quality Control Commission. Standley Lake is a municipal water supply and irrigation storage reservoir located in the headwaters of the Big Dry Creek Watershed. The reservoir provides drinking water to Westminster, Northglenn and Thornton, who are BDCWA stakeholders.

BDCWA generally focuses on water quality in the main stem of Big Dry Creek below the Standley Lake dam; however, the water released from Standley Lake to Big Dry Creek influences the water quality and quantity of flow in Big Dry Creek. For example, when Standley Lake is not releasing significant flows to Big Dry Creek during the winter, Big Dry Creek experiences increases in naturally occurring pollutants that are present in alluvial groundwater flows into the creek.

A key parameter monitored by the Standley Lake cities is chlorophyll-a. In 2021, average chlorophyll-a was 4.16 µg/L for the year, which came close to exceeding the chlorophyll-a assessment threshold of 4.4 µg/L. Using the Carlson trophic state index, Standley Lake continues to be well within the mesotrophic range. As such, Standley Lake met both the chlorophyll-a and narrative standard in 2021. The full report can be accessed here.



Westminster Sanitary Sewer Upgrades Continue through 2023

The City of Westminster is investing $32 million to repair and replace sections of large sewer pipe throughout the northern portion of Westminster beginning in 2020. Although mostly out of sight, this network of underground pipes is critical to protecting public health and the environment 24/7.

The majority of the Big Dry Creek interceptor sewer was installed in the 1970's and 1980's. Recent studies have indicated that sections of existing pipe need rehabilitation and additional sections of pipe are required to ensure adequate capacity for current and future wastewater flows.

Approximately half of this project involves lining existing pipes using cured-in-place pipe at various locations throughout Westminster. Cured-in-place pipe technology is a cost-effective and reliable alternative to excavating and replacing pipe which reduces both expense and disruption for residents and inconvenience for motorists and trail users.

The other half of this project involves excavating and installing a new section of pipe and excavating and replacing sections of existing pipe. most of this work will take place in the open space near City Park between 110th Ave and Sheridan Blvd on the northern end and east of the Butterfly Pavilion just south of 104th Ave near Westminster Blvd on the southern end. This new pipe will add resiliency and redundancy to the sewer pipe that serves as the main "artery" carrying wastewater to the Big Dry Creek Wastewater Treatment Facility from the northern two-thirds of the city as far west as Standley Lake. This work will impact trails in the open space surrounding City Park. Trail detour instructions will be provided throughout construction.

When this construction is complete, areas disrupted by this work will be fully restored to original conditions. There will be some long-awaited improvements made to the park and trail system above and beyond current conditions! Project wrap up work will continue through Summer 2023. For the latest information, see the City's webpage.

BDCWA Board Says Goodbye and Hello

As the Big Dry Creek Watershed Association (BDCWA) passes the 25 year mark, we are increasingly saying goodbye to Board members who have faithfully served and supported BDCWA.

In December 2022, David Carter, long-term BDCWA Treasurer, retired from the City of Westminster where he had served as a chemist in the Water Resources and Water Quality Division for the city for over 25 years. David meticulously kept BDCWA's financial records in order since BDCWA formed as a 501(c)(3) organization. David also participated in sampling and laboratory analysis for Big Dry Creek for many years. We appreciate David's many years of service and the support he provided during transition of the BDCWA Treasurer role to Tara Wilson, City of Westminster Laboratory Services Supervisor.

In the spring of 2022, Al Quintana, Stormwater Coordinator for the Stormwater City of Thornton Stormwater Compliance Group retired. Al played a key role in expanding the efforts of BDCWA into the broader stormwater quality realm. Al served on the BDCWA Board from 2019 to 2022. Keith Bisbe, Stormwater Coordinator for the City of Thornton, will be assuming Al's role on the BDCWA Board.

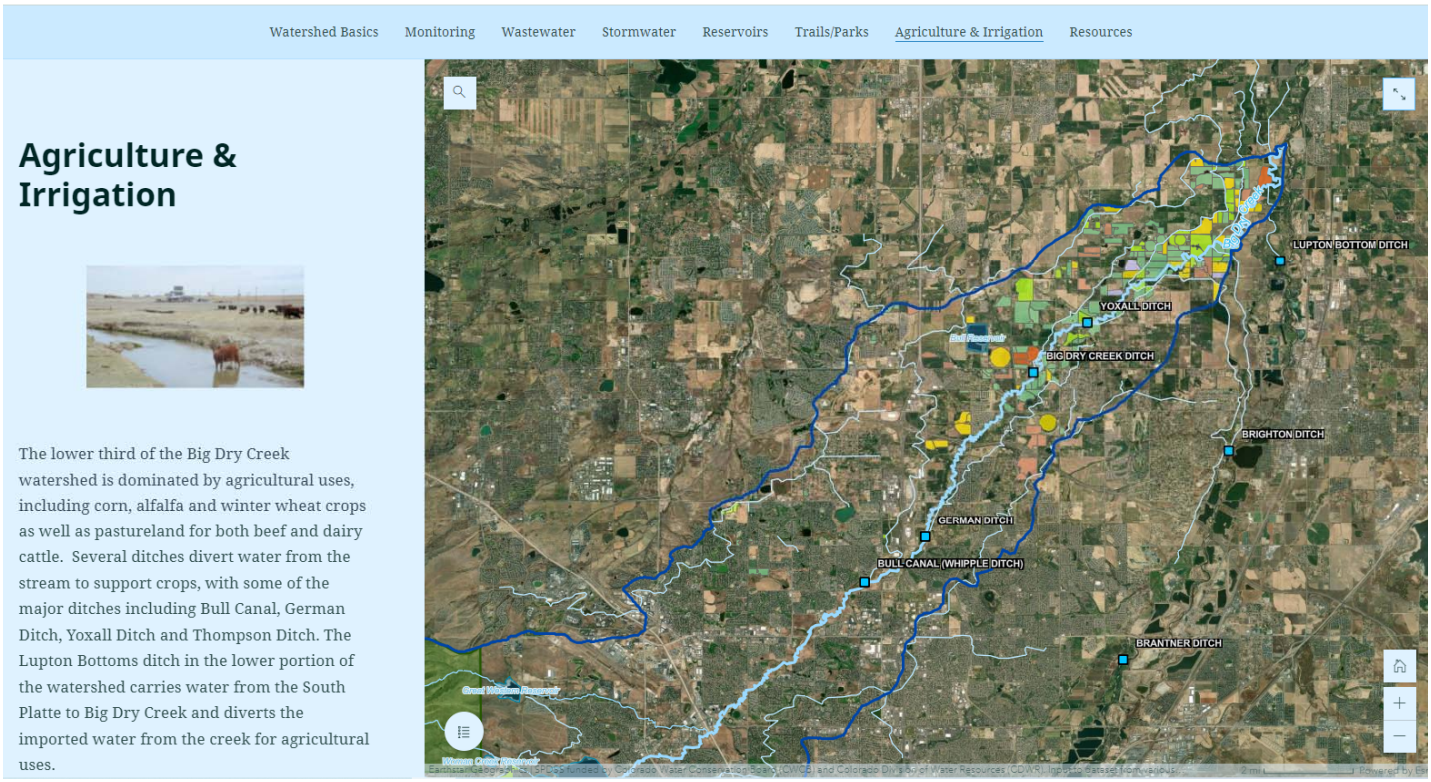
Many well wishes to David and Al for the future!

BDCWA in 2002: David Carter at Westminster Laboratory (upper). Kip Scott, Bob Fiehweg, Mary Fabisiak and David Carter at a 2002 BDCWA meeting (lower).

Al Quintana, Stormwater Coordinator for the City of Thornton Stormwater Compliance Group (retired).

2022-2023 BDCWA Board of Directors

Lesa Julian, City and County of Broomfield
John Winterton, City of Northglenn
Tara Wilson, City of Westminster
Juliana Archuleta, Adams County
Lyndsay Holbrook, Weld County
Keith Bisbe, City of Thornton



Big Dry Creek ArcGIS StoryMap Under Development

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 2023.

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 student and citizens.

Key themes that will be accessible to users in the navigation bar include:

- Watershed Basics: provides basic information about the key features of the watershed.
- Monitoring: identifies long-term water quality monitoring locations and enables dynamic access to USGS and DWR stream gauges.
- Wastewater: provides information on the three municipal wastewater reclamation facilities in the watershed.
- Stormwater: provides information on stormwater quality and drainage projects.
- Reservoirs: provides information on reservoirs such as Standley Lake, which is a key source of drinking water for communities in the watershed.
- Trails/Parks: provides interactive information about the extensive trail and park system in the watershed.
- Agriculture/Irrigation: provides information on crops grown and irrigation use in the lower watershed, based on mapping from the Colorado Division of Water Resources (see inset above).
- Resources: provides links to other sources of information that may be of use.

If you have photography or content related to interesting features in the watershed that you would like to see displayed in the StoryMap, please contact clary@wrightwater.com.

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 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.

A few initial results are highlighted below from the 2022 monitoring program along with findings from five previous sampling events from 2012 to 2020. Data summaries for fish and macroinvertebrates for 2022 are not yet available, but will be later in 2023.

Overall, fish numbers were relatively good in 2022, within the typical year to year variability. As in 2020, the highest fish numbers were at bdc3.0 (I-25) where 1,867 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 site bdc2.0 (n=20) while they 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 (2012-2020) 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.

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

Multi-metric Index (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.

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

Big Dry Creek Watershed Association
c/o Wright Water Engineers, Inc.
2490 W. 26th Ave., Suite 100A
Denver, CO 80211