



STATE OF THE WATERSHED

Annual Newsletter of the Big Dry Creek Watershed Association

December 2021

Volume 23

Big Dry Creek Water Quality Monitoring Program

Despite the ongoing challenges of the COVID-19 pandemic, 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 2021, based on analysis of sampling completed during 2020.

In 2020, city staff collected and analyzed instream water quality samples 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 based on the 2021 analysis include:

1. Water quality in Big Dry Creek attained stream standards applicable in 2020, with the exception of *E. coli* for the entire stream and total recoverable iron for the reach below Weld County Road 8 in the agricultural portion of the stream. For new stream standards assigned by the Colorado Water Quality Control Commis-

(Continued on page 2)

Inside this Issue:

<i>Big Dry Creek Water Quality Monitoring Program</i>	1
<i>Westminster Interceptor Project</i>	3
<i>Homeowner Tips to Reduce Phosphorus Loading</i>	4
<i>Meeting Total Inorganic Nitrogen Limits Using Carbon Addition</i>	5
<i>Visit Our Website!</i>	6
<i>Big Dry Creek Biological Monitoring Program</i>	7
<i>What is the Big Dry Creek Watershed Association?</i>	8



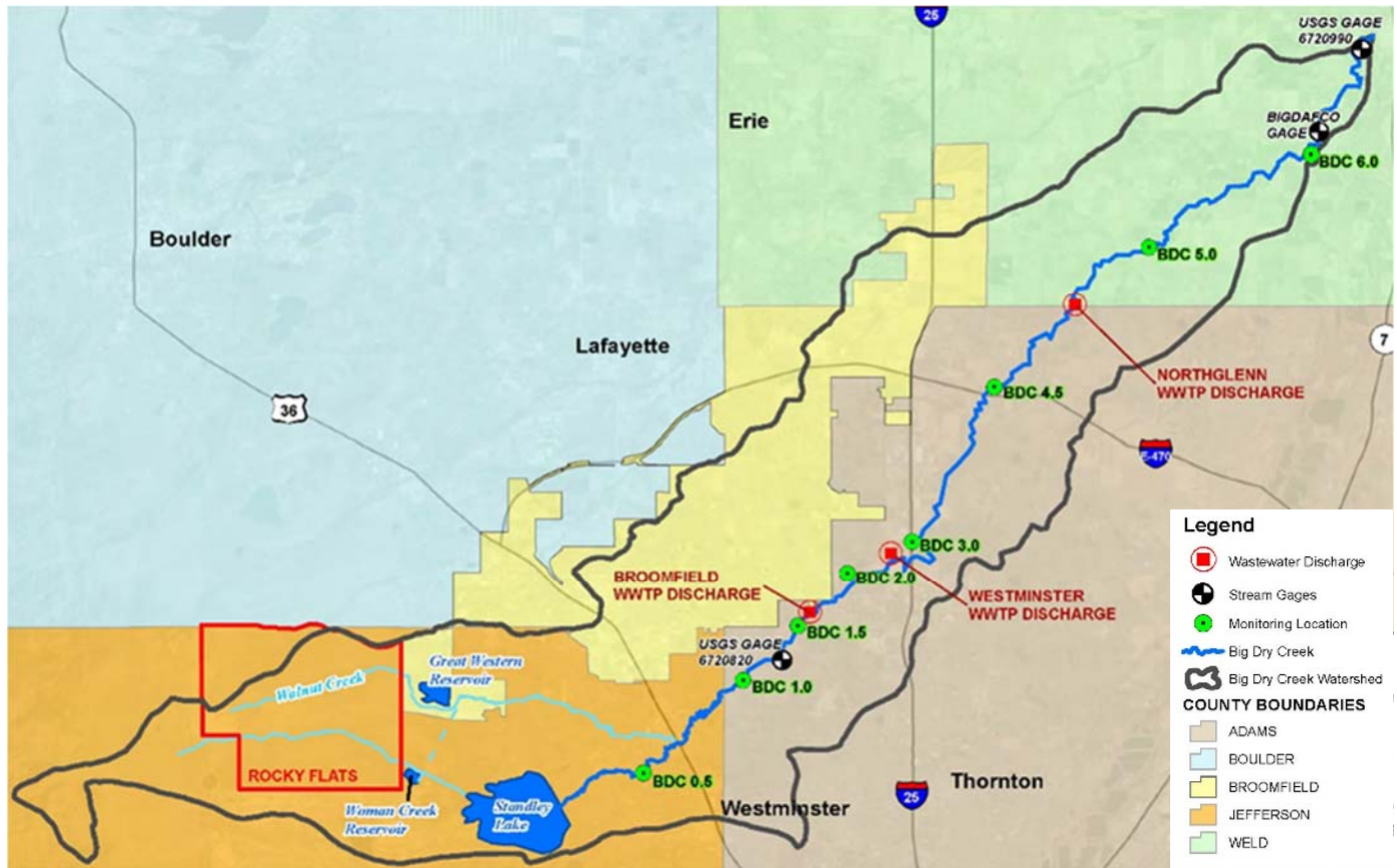
On-line meetings continued to be the norm for BDCWA leadership during 2021.

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)

sion 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 dissolved manganese.

2. *E. coli* concentrations are elevated at multiple instream locations. Additional efforts to identify sources of *E. coli* are underway through a microbial source identification study focused on the area between Standley Lake and I-25.
3. Although BDCWA's total recoverable iron samples show attainment of the stream standard at all monitoring locations, additional data collected by Metro Wastewater in the lower watershed show elevated iron concentrations. For this reason, Big Dry Creek below Weld County Road 8 is listed as impaired on the 2020 303 (d) List. Elevated iron concentrations are expected to be due to stream bank and soil erosion in the lower watershed.
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. Standards for these constituents are secondary drinking water parameters (e.g., taste, odor), 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, 2000 may provide regulatory relief for sulfate.

5. For the most recent five-year analysis period (2016-2020), Big Dry Creek attained its site-specific selenium standard. From a longevity plan perspective related to the site-specific standard, a site-specific standard for selenium is still needed in order for the stream to attain selenium standards.
6. Big Dry Creek exceeds the recently assigned nitrate standard of 10 mg/L for a few sampling events below the Broomfield and Westminister WWTPs. Compliance plans in the 2019 WWTP discharge permits are expected to address this issue.

(Continued on page 3)

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). Although these 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 on Big Dry Creek is an increasing area of focus for BDCWA. More stringent CDPS permit limits with compliance schedules have been included in the 2019 permit renewal for the WWTPs. Under the new CWQCC Policy 17-1, a Voluntary Incentive Program for Early Nutrient Reductions was established. The Incentive Program allows enrolled WWTPs to accrue time under a post-2027 compliance schedule through trading or watershed nutrient reductions as part of its nutrient reduction plan. All three of the municipal WWTP dischargers are enrolled in this program.
8. Phosphorus concentrations and loads to Big Dry Creek have decreased over time as a result of treatment plant upgrades at the Broomfield and Westminster WWTPs, along with reuse programs that continue to be implemented at these WWTPs. Despite these improvements, the stream would not meet the interim total phosphorus criteria from below the Broomfield WWTP to the confluence with the South Platte River. Recent sampling at bdc2.0 below the Broomfield WWTP indicates possible attainment at this location in the future, but currently more than one year has a median total phosphorus value above the interim limit.
9. Aquatic life monitoring 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

For a copy of the 2020 Annual Report, visit <http://www.bigdrycreek.org/>.

Westminster Interceptor Project

The Big Dry Creek Sewer Improvements Project is a large project involving sewer pipe lining, sewer pipe construction, and restoration from West 100th Ave. to West 128th Ave. along Big Dry Creek. Continued maintenance and improvement to the sanitary sewer system could play a role in reducing *E. coli* levels in Big Dry Creek. Although the interceptor has not been identified as a specific source of *E. coli* to Big Dry Creek, aging infrastructure has been identified as a source of *E. coli* in other communities nationally. BDCWA will be comparing instream water quality following the infrastructure improvements to historic water quality to assess the potential water quality benefits of this important public works project.

Work continues at various project locations at a sequence that minimizes impacts to the public and wastewater operations. Here are some updates:

- Crews are wrapping up work at the structure near West 110th Ave west of Sheridan Blvd
- Crews are installing pipe in the open space near W 109th Circle.

- Construction of a concrete trail leading to the new pedestrian bridge near City Park is ongoing and will be completed according to planned construction sequencing.
- A new project area in the open space near the Butterfly Pavilion has been established.

Learn more about the project and sign up for email updates at:
<https://www.cityofwestminster.us/BigDrySewer>





Choose Phosphorus-Free Fertilizer to Keep Lawns Green and Waters Blue!

Fertilizers that contain phosphorus can harm our environment. When it rains or snows, the phosphorus runs off your lawn and pollutes nearby rivers, lakes and streams. Phosphorus is like junk food for algae and weeds. It feeds them until they grow out of control, turning ponds green and possibly killing fish.

If your lawn is not phosphorus-deficient (test your soil to confirm), choose phosphorus-free lawn fertilizers to help keep Colorado's waters blue.

✓ DO:

- ☑ Carefully follow all manufacturer's instructions.
- ☀ Check the weather forecast before applying fertilizer.
- 🧽 Clean up all spills – no matter how small.

✗ DON'T:

- ☔ Over-apply fertilizer – more is not better.
- ⚡ Apply fertilizer right before or after a storm.
- 🧊 Apply fertilizer when it's too hot or on frozen ground.

Visit lovecoloradowater.org for more water quality tips and to learn the 4 R's (*right product, rate, place, and time*) of applying lawn fertilizers.

¡Escoja Fertilizante Sin Fósforo Para Mantener El Césped Verde Y El Agua Azul!

Fertilizantes que contienen fósforo pueden ser perjudiciales para el medio ambiente. Cuando llueve o nieva el fósforo se riega de su jardín y contamina ríos, lagos y arroyos. El fósforo es como comida rápida para las algas y malezas. Esto da un color verde poco saludable a los estanques, e inclusive mata a peces.

Si su jardín no tiene deficiencia de fósforo (haga la prueba de su terreno y confirme), escoja fertilizantes sin fósforo.

✓ HACER:

- ☑ Siga con atención las instrucciones del manual.
- ☀ Revise el reporte del clima antes de aplicar el fertilizante.
- 🧽 Limpie cualquier derrame por más pequeño que sea.

✗ NO HACER:

- ☔ Aplicar demasiado fertilizante- más no es mejor.
- ⚡ Aplicar el fertilizante justo antes o después de una tormenta.
- 🧊 Aplicar el fertilizante cuando haya mucho calor o en el suelo congelado.

Visite lovecoloradowater.org para más consejos sobre calidad del agua y aprender las reglas (*producto correcto, precio, lugar, y tiempo*) de aplicación de fertilizantes.



Meeting Total Inorganic Nitrogen Limits Using Carbon Addition

The City and County of Broomfield (Broomfield) Wastewater Reclamation Facility (WRF) is one of three major municipal wastewater facilities discharging to Big Dry Creek that is subject to Colorado Discharge Permit System (CDPS) limits for total phosphorus (TP) and total inorganic nitrogen (TIN) under Regulation 85. The facility's current process performance is on track for meeting anticipated effluent TP limits, while further reductions in effluent TIN are required to comply with daily TIN limits that go into effect July 1, 2024.

Nitrogen removal from domestic wastewater involves the initial transformation of ammonia and organic nitrogen to nitrates via nitrification, and the subsequent elimination of nitrates through denitrification. In a biological nutrient removal wastewater treatment facility, nitrification typically only occurs following carbonaceous biological oxygen demand (cBOD) removal. The limiting factor for effective denitrification is often the absence of a readily biodegradable carbon source that can be used as an effective energy source by denitrifying bacteria during the denitrification process. Without the availability of a ready energy source of biodegradable carbon, denitrification will not occur, or will occur too slowly for sufficient nitrogen removal to occur.

Based on historical operating performance (2016 to August 2020), the Broomfield WRF effluent TIN concentration has typically exceeded the future regulatory limit of 14 mg/L TIN. The figure below shows historical effluent TIN, as well as the effluent TIN 95th percentile, running average median, and the future daily maximum permit limit.

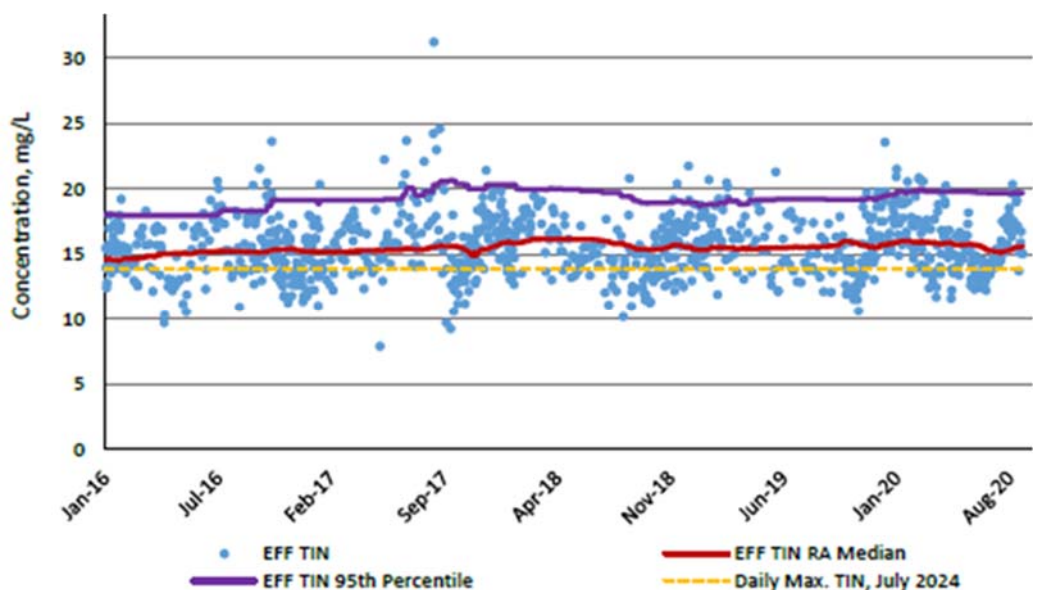
Broomfield's WRF already has significant capital infrastructure and process flexibility in place to achieve nutrient removal. However, operations staff has appropriately identified carbon limitation as a key driver in limiting denitrification performance. This hypothesis was confirmed during a full-scale

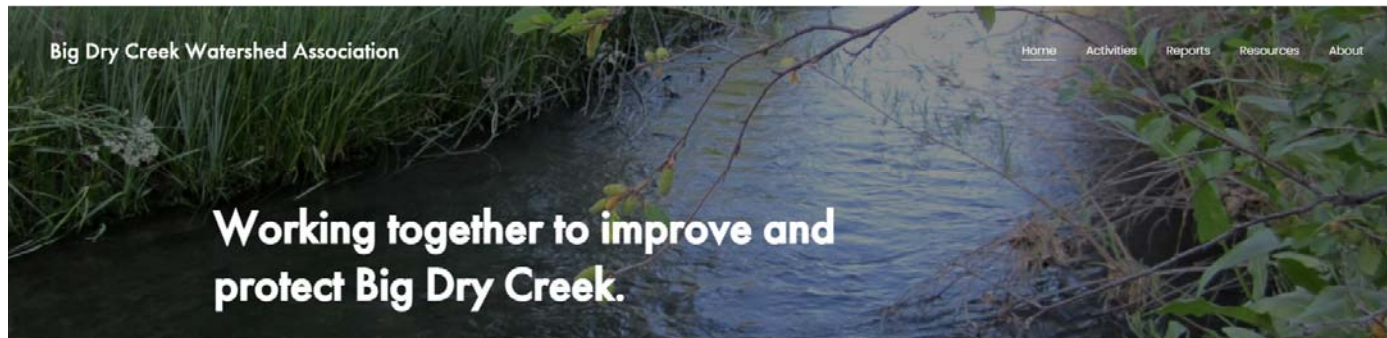
pilot study in 2018/2019, which helped develop a holistic understanding of how denitrification performance can be improved through chemical carbon addition into the existing unaerated zones. Staff knowledge and a calibrated BioWin process model were also used in conjunction with historical process data to highlight process optimization opportunities, which may further enhance facility operation with modest capital investment.

As a result of the pilot project and BioWin modeling work, Broomfield has embarked on a carbon addition project that consists of an external carbon feed system that will intermittently dose MicroC® 2000 (MicroC) to the unaerated zones of the facility's North Treatment Train, Middle Treatment Train, and South Treatment Train. MicroC is a glycerin-based, commercially-available product derived from biodiesel waste. This chemical is a non-hazardous carbon alternative to acetic acid and methanol. The project will include construction of an external carbon feed system and modifications to existing buildings at the WRF.

Construction started in October 2021 and is scheduled to be completed by the end of 2023. The completion goal allows Broomfield staff six months to fine-tune the carbon addition process to ensure uninterrupted permit compliance with the new daily TIN limit effective July 1, 2024.

Article provided by Ken Rutt, City and County of Broomfield, Wastewater Division Superintendent.





Visit Our Website at www.bigdrycreek.org

Interested in learning more about the Big Dry Creek Watershed? Visit our website for up-to-date information on water quality in Big Dry Creek, as well as other resources related to water quality. The website provides notice of meetings and the most current reports related to watershed efforts. Additionally, use the Contact Us link if you would like to be added to our email list or have questions about the watershed.

A key feature of the website is our Resources page, which summarizes a wide range of technical information pertinent to the watershed and provides 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.



E. coli / Pet Waste



Nutrients



Stream Standards



Stormwater and Drainage



Wastewater



Stream Flow



Flood Alert



Agriculture



Open Space & Wildlife



Regional Water Quality Efforts

Learn More
about Water Quality

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.

Results are highlighted below from the 2020 monitoring program along with findings from four previous sampling events from 2012 to 2018. Aquatics Associates' forthcoming report will also include information on the fish community.

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.



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

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