



# STATE OF THE WATERSHED

Newsletter of the Big Dry Creek Watershed Association

**BIG DRY CREEK** Summer 2002

Volume 5

## Big Dry Creek Water Quality Good in 2001

During 2001, the cities of Broomfield, Northglenn and Westminster (Cities) worked together to collect water quality and flow data along the main stem of Big Dry Creek. Water quality samples were analyzed for a variety of constituents, resulting in 4,035 water quality data points being added into the Big Dry Creek Watershed Association database. Metals were monitored on a quarterly basis with the exceptions of arsenic, iron, and selenium, which were monitored monthly. All other constituents were monitored on a monthly basis. The Cities also helped to fund operation of the U.S. Geological Survey gauging station at Westminster behind Front Range Community College. Key findings related to the 2001 data follow.

1. For all of the water quality constituents with Colorado Water Quality Control Commission

(CWQCC) stream standards, the stream attained numeric water quality standards based on comparison of the appropriate statistics to the chronic stream standards and determining whether any exceedances of acute standards occurred.

2. Even though the stream attained water quality standards based on the CWQCC's assessment protocols, there were several water quality constituents with one or more exceedances of a stream standard, including fecal coliform, *E. coli*, unionized ammonia, nitrite, total iron, and total mercury.
3. Fecal coliform concentrations met stream standards in 84 percent of the samples collected during 2001, which represents a 10 percent de-

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## Rocky Flats Nutrient Data for 2001

Within the Big Dry Creek basin, the Colorado Water Quality Control Commission (CWQCC) has established stream segments and designated uses for Big Dry Creek and applied water quality standards based on these uses. Segment 1 is the entire main stem of Big Dry Creek and that portion of Walnut Creek downstream of Great Western Reservoir. Segments 2 and 3 are for Standley Lake

and Great Western Reservoir, respectively. Segment 4 includes Walnut Creek and Woman Creek downstream of the terminal ponds on Rocky Flats Environmental Technology Site (RFETS), and Segment 5 includes the ponds on RFETS and those portions of the creek upstream of the ponds.

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### Next Watershed Association Meeting:

#### Topics:

1. Progress Report on Big Dry Creek Watershed Management Plan and Video
2. Results of 2001 Biological Monitoring

**Time:** To Be Announced

**Place:** Broomfield Water Treatment Facility, 4395 W. 144th Ave.

All Watershed Association meetings are open to the public.

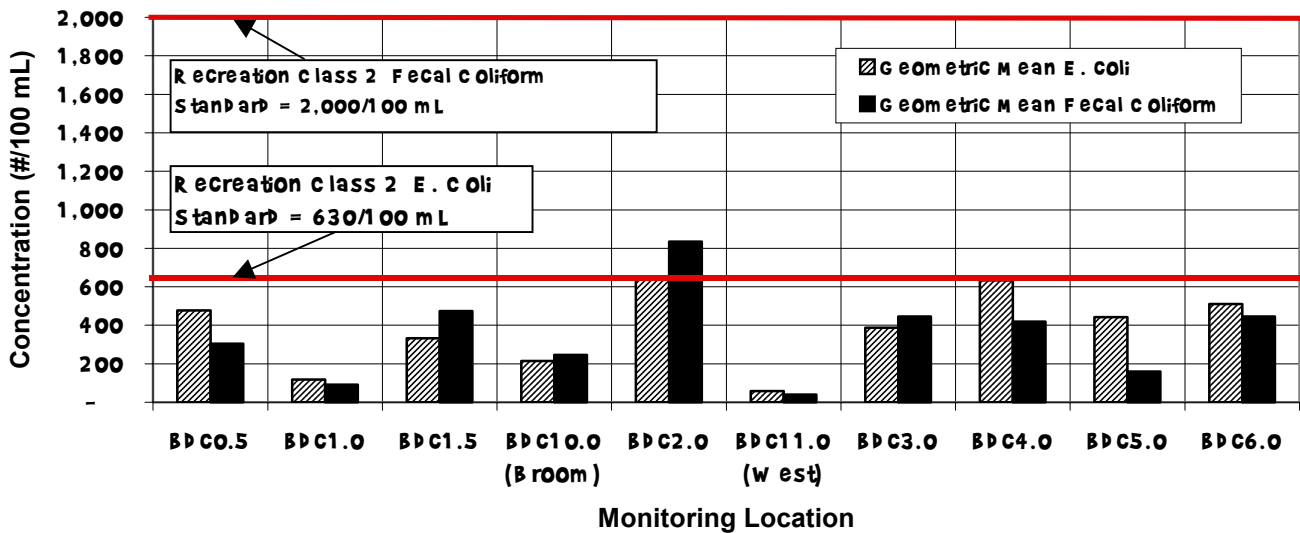
## Big Dry Creek Water Quality (continued)

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crease in the number of samples meeting standards during 1994 through 2000. Based on review of this data set, the following observations are relevant:

- The stream standard was exceeded most frequently during the summer months of June, July and August, followed by October and November. During cooler months, the concentrations were lower.
  - Elevated fecal coliform concentrations do not appear to be related to point source (wastewater) discharges from Broomfield and Westminster. On days where the stream exceeded the standard, the fecal coliform concentrations were lower in the effluent than in the stream.
  - An upstream to downstream or other geographic trend was not apparent for any particular sampling event. Elevated concentrations occurred at both the upstream-most location below Standley Lake dam, in the developed portion of the watershed and in the agricultural area. The standard was exceeded most frequently between 120<sup>th</sup> Avenue and I-25. Much of Big Dry Creek in this area is located in Westminster Open Space.
  - Neither an increasing nor decreasing trend over time for the watershed as a whole is apparent. For example, at bdc1.5 in the upper watershed, concentrations have increased while in the agricultural area (bdc4.0 through bdc6.0), the fecal coliform concentrations during the last three years were generally lower than during 1993 to 1995.
4. *E. coli* concentrations met stream standards in 60 percent of the samples collected during 2001. This represents a 13 percent decrease in *E. coli* samples meeting the 630/100 mL standard compared to the data collected between April and December of 2000, where 73 percent of the samples attained the standard. Nonetheless, the geometric mean for Segment 1 as a whole was 429/100 mL, which did not exceed the 630/100 mL standard. Based on review of this data set, the following observations are relevant:
- The stream standard was exceeded most frequently during the summer months of June and July, and during November. However, elevated concentrations were also spread throughout the year.
  - Elevated *E. coli* concentrations do not appear to be related to point source (wastewater) discharges from Broomfield and Westminster. On the two days that grab samples from effluent discharges exceeded the standard, samples from upstream of the discharges were already well above the standard.
  - An upstream to downstream or other geographic trend was not apparent for any particular sampling event. Elevated concentrations occurred throughout the watershed at both the upstream-most location below Standley Lake dam, in the developed area and in the agricultural area.
  - For both the *E. coli* and the fecal coliform data, the lowest concentrations were at bdc1.0, but even at this location, the standard was exceeded by both parameters on at least one day.
5. Nitrite concentrations exceeded the stream standard on January 18, 2001 at bdc2.0. The 85<sup>th</sup> percentile value for the data set did not exceed the stream standard. The January 18 exceedance appears to be related to elevated nitrite (10.91 mg/L) in the Broomfield WWTP discharge on that day. During 2000, one similar exceedance occurred for the same reason.

**Big Dry Creek 2001 E. coli and Fecal Coliform Geometric Mean Values**



6. One unionized ammonia sample exceeded the chronic stream standard, but not the acute standard. This elevated value occurred on August 9, 2001 at bdc5.0 at a concentration of 0.125 mg/L. The 85<sup>th</sup> percentile value for the unionized ammonia data set was well below the stream standard. For purposes of comparison, only one exceedance of the chronic standard occurred during 2000 and no exceedances for acute or chronic unionized ammonia standards occurred during 1999. During 1994-1998, the chronic standard had been exceeded in 3 percent of the samples collected.

7. Iron concentrations during 2001 exceeded the stream standard in 38 percent of the samples collected. As was the case in 2000, the 50<sup>th</sup> percentile value attained the stream standard. During 2000, the stream standard was exceeded in 27 percent of the samples. During 1999, iron had exceeded stream standards in 56 percent of the samples, comparable to findings during 1994-1998 when the iron standard was exceeded in 62 percent of the samples. A few relevant observations with regard to iron include:

- Iron concentrations generally increased from upstream to downstream, just as total suspended solids (TSS) did.

- Iron concentrations are highest during the summer months of May through August. These are the months with the highest in-stream flows and storm events.
- Elevated iron concentrations are not attributable to point sources. Iron concentrations in the Broomfield and Westminster effluent discharges are typically one-third or less than the instream concentrations downstream of their discharges.

The Watershed Association attributes the elevated iron concentrations to natural sources that vary based on soil erosion associated with storm events. During 2002, CSU engineering student Miranda Larsen will be conducting a study to verify this hypothesis. The study will include collection of soil samples adjacent to the creek, among other tasks.

8. The TSS concentrations during 2001 were significantly higher than what had been measured during 1994 through 2000. Mean concentrations were strongly influenced by the high TSS values measured on July 12, 2001. After removing the influence of the July 12, 2001 samples, concentrations were more comparable to

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## Rocky Flats Nutrient Data for 2001 (continued)

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Among the designated uses applied by the CWQCC was Aquatic Life Class 2, with which is associated a chronic standard for unionized ammonia at a level of 0.10 mg/L. In 1995, the CWQCC re-segmented Segment 4 into Segments 4a and 4b, and removed the ammonia standard from Segment 4b. Segment 4b is that portion of Walnut Creek downstream of Ponds A-4 and B-5 extending to the RFETS boundary at Indiana Street. The CWQCC took this action to allow the Department of Energy (DOE) time to complete an evaluation of the future mission for RFETS and to consider reconfiguration options for the wastewater treatment plant (WWTP). Concurrently, the Environmental Protection Agency (EPA) was working on the renewal of the RFETS National Pollutant Discharge Elimination System (NPDES) permit and determining effluent limitations for the WWTP. In lieu of imposing a limitation for ammonia, the permit writer included a provision requiring the study of ammonia in Walnut Creek to determine if there was reason to reapply the standard removed from Segment 4b. Because ammonia levels and nitrate levels are often related in wastewater discharges, the nitrate levels were monitored at the same time as ammonia.

EPA issued the NPDES permit for RFETS with an effective date of October 27, 2000. As part of permit requirements, the permittees were required to submit an annual letter report to EPA describing the results of the ammonia study. Once the permit became effective, arrangements were made to meet with the Big Dry Creek Watershed Association and present the results of the ammonia monitoring at RFETS and seek input on the future scope of this effort. RFETS staff met with the Watershed Association in April 2002 and presented the summary of results for calendar year 2001.

The monitoring program included routine monitoring at station GS03 on Walnut Creek at the RFETS boundary along Indiana Street. An additional grab sample of flow in Walnut Creek during pond discharges and measuring pH and water temperature in the field were added to the routine monitoring. The samples were analyzed for nitrate and total ammonia. Using the pH and temperature data, the portion of the total ammonia that was unionized was calculated. The collection and analysis of sam-

Statistic	Nitrate (mg/L)	Unionized Ammonia (mg/L)
Maximum	3.6	0.17
Minimum	0.5	ND
Average	1.8	0.09
85th Percentile	2.5	0.10

ples was conducted in accordance with RFETS procedures. The sampling period represented by these data was calendar year 2001.

For all samples collected in the monitoring period, the average concentration of unionized ammonia was 0.09 mg/L and the 85<sup>th</sup> percentile value was 0.10 mg/L. For all samples collected in the monitoring period, the average concentration of nitrate was 1.8 mg/L and the 85<sup>th</sup> percentile value was 2.5 mg/L. No values were above the underlying stream standard of 10 mg/L. Given these findings, the nitrate concentrations were well below the stream standard. The 85<sup>th</sup> percentile for the unionized ammonia was right at the standard.

For more information on these findings, contact Bob Fiehweg, Summit Technical Resources, (303) 966-7403.

## Funding in Place for 2002

Through the collaborative efforts of the cities of Broomfield, Westminster and Northglenn, the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA), the Watershed Association has funding in place for several activities during fiscal year 2002.

DOE has provided grant funding for a third fiscal year to help continue a variety of monitoring efforts: fall macroinvertebrate sampling on Big Dry Creek and Walnut Creek; fall fish sampling on Big Dry Creek and Walnut Creek; habitat assessments at biological monitoring locations on Big Dry Creek and Walnut Creek; and continued baseline watershed coordination services such as meetings,

data analysis and general administration.

In addition to activities funded by DOE, the cities of Broomfield, Northglenn and Westminster continue to fund the monthly in-stream monitoring on Big Dry Creek and spring biological sampling. The cities, DOE and EPA are also contributing additional funding to development of an educational video of the watershed that will be released in the summer of 2002.

We are grateful for the contributions of these organizations who have generously supported the efforts of the Big Dry Creek Watershed Association!

## Big Dry Creek Watershed Management Plan Released for Review

Under a grant from the U.S. Environmental Protection Agency (EPA), the Big Dry Creek Watershed Management Plan (Plan) has recently been released for review and comment and is expected to be finalized during June 2002. The purpose of the Plan is to provide a comprehensive framework for the activities of the Big Dry Creek Watershed Association. This Plan condenses the findings of over five years worth of work by the Watershed Association and has been developed to conform to the requirements of the EPA's Watershed Restoration Action Strategy (WRAS) guidelines. A broad range of topics is covered including targeting (characterizing) current watershed conditions, identifying measures to protect and restore the watershed, and identifying the methods used to evaluate the watershed and activities of the Watershed Association. Key findings and recommendations of this Plan include:

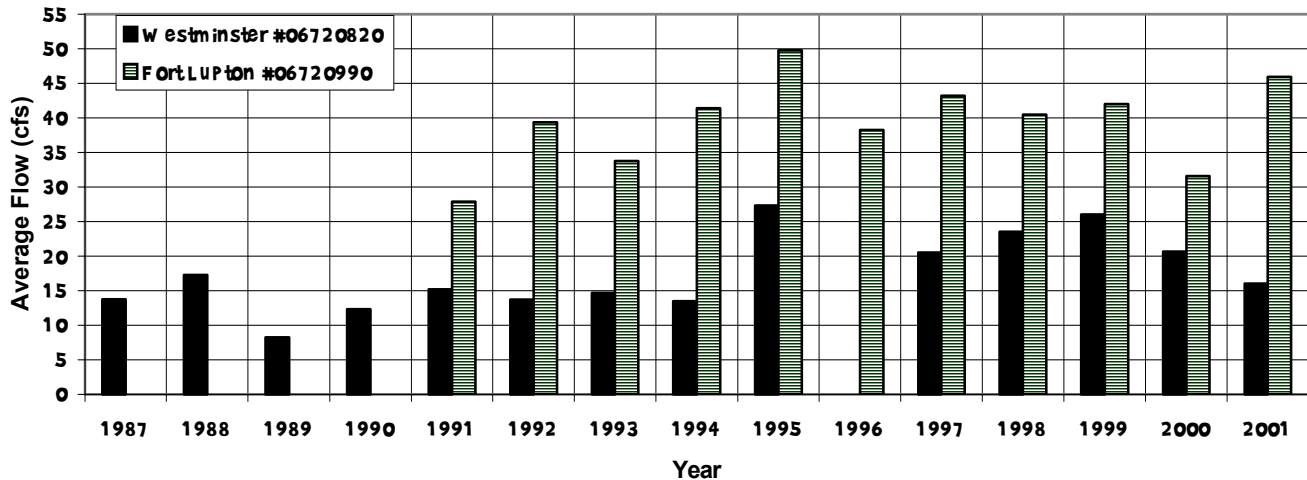
1. As a result of the diligent efforts of the Watershed Association, many aspects of Big Dry Creek are relatively well characterized. The ongoing water quality, flow and biological moni-

toring program continues to provide up-to-date information on watershed conditions that can be used to target and prioritize future actions in the watershed.

2. Based on water quality data collected to date, wastewater discharges to the creek appear to be adequately controlled by the Colorado Discharge Permit System.
3. Hydrologic modification of the creek from increased stormwater flows associated with urbanization in the central portion of the watershed is an area that will require continued attention by local governments and the Watershed Association. In both the urban and agricultural portions of the watershed, specific areas have been identified that would benefit from stream restoration activities to control erosion.
4. Local government enforcement of existing stormwater ordinances relating to detention of stormwater flows and erosion and sediment

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Mean Annual Flows at Westminster and Fort Lupton Gauges



## Big Dry Creek Water Quality (continued)

(Continued from page 3)

- the 1994 through 1999 values. During 2001, TSS concentrations continued to exhibit the trend of increasing concentration from upstream to downstream. The highest TSS concentrations occurred during June and July, which are expected to be due to increased flows and storm events.
9. Of the 39 samples analyzed for mercury, no samples were detected above the 0.0002 mg/L detection limits with the exception of one sample on September 13, 2001 at bdc6.0 reported at 0.00025 mg/L. Follow-up with the laboratory for this sample is appropriate to assess whether this is a true detection or whether it is within the range of laboratory error around the detection limit.
  10. Several other constituents are watched closely by the Watershed Association, including:
    - Cyanide: Cyanide is being closely watched based on findings during 1999 and 2000 that indicated multiple exceedances of the cyanide standard. These exceedances were believed to be due to laboratory error based on follow-up with the commercial laboratory that confirmed procedural issues re-

lated to the cyanide analysis method. Since no cyanide exceedances occurred during 2001 after changing laboratories and improving the QA, the laboratory error hypothesis appears to be appropriate.

- Selenium: During 1999 and 2000, several exceedances of the dissolved selenium standard were identified. No exceedances of the dissolved selenium standard occurred during 2001, even with the sampling frequency increased from quarterly to monthly.
  - Lead and Zinc: No exceedances occurred for lead and zinc during 2001, 2000 or 1999. Lead exceedances were limited to 1994 and have not occurred since that time.
11. The USGS flow data at the Fort Lupton and Westminster gauges for 2001 were reviewed. Mean annual flows (16 cfs) during 2001 at Westminster were lower than the average of the previous four years (22.7 cfs), but comparable to the average for the last 10 years (17.4 cfs). At Fort Lupton, the mean annual flow (45.9 cfs) was somewhat higher than the mean annual flows experienced in the previous 10 years (38.8 cfs).

## Watershed Management Plan (continued)

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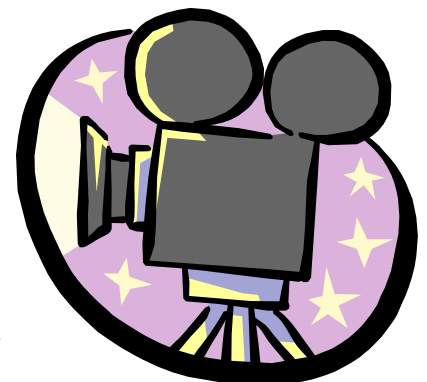
- controls at construction sites is critical to protecting Big Dry Creek water quality and habitat. In general, the local governments are believed to have appropriate ordinances in place for new development and redevelopment of existing areas.
5. Stormwater flows and pollutant contributions have not been well characterized, relative to the strong base of information associated with ambient stream conditions. This is an area of additional study that the Watershed Association may want to consider.
  6. Based on analysis of the last five years of data, Big Dry Creek meets existing stream standards for all constituents. Although the stream meets Recreation Class 2 fecal coliform and *E. coli* standards, it would have considerable difficulty meeting Recreation Class 1 standards in the event that the stream is reclassified.
  7. Considerable data have been collected on erosion and sedimentation issues in the agricultural portion of the watershed. Sufficient information is believed to have been developed to support local landowners in obtaining grants to help stabilize portions of the streambank. Based on information provided by the Natural Resources Conservation Service, it is critical that the landowner initiates the grant application process. The Watershed Association can provide the landowners with a good base of information to help facilitate this process.
  8. The Phase II stormwater regulation emphasizes the watershed approach and collaborative efforts to reduce pollution associated with stormwater discharges. The Watershed Association should meet with local government staff and managers responsible for implementation of the Phase II permits in the near future to determine what role the Watershed Association will play in helping the cities to meet the requirements of the regulation.
  9. The Watershed Association should continue its public education efforts such as development of a watershed educational video, newsletters and other products. It is important that the Watershed Association work with local governments to take advantage of existing communication pathways to broaden its audience.
  10. The current monitoring and evaluation process used to evaluate the mission and goals, monitoring program, water quality and biological data should be continued.

## Educational Video Under Development

Under a grant from the EPA and contributions from DOE and the cities of Broomfield, Northglenn and Westminster, a 15-minute video is being developed to educate watershed stakeholders on the Big Dry Creek watershed, the activities of the Big Dry Creek Watershed Association and activities that citizens can take to improve and protect Big Dry Creek. The target audience includes local governments, civic organizations and high school students. The video includes a three-part format: 1) characterization of the watershed; 2) activities of

the watershed association; and 3) actions to protect the watershed.

If you would like more information on the video, please contact Jane Clary, Wright Water Engineers, Inc., at 303-480-1700 or [clary@wrightwater.com](mailto:clary@wrightwater.com).



## What is the Big Dry Creek Watershed Association?

The Big Dry Creek Watershed Association is a voluntary association 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 includes the Cities of Broomfield, Northglenn and Westminster and Rocky Flats Environmental Technology Site (RFETS), founded the Watershed Association in 1997. These four entities discharge wastewater into Big Dry Creek and 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 Association is open to those interested in cooperatively working towards understanding and prioritizing efforts to improve basin conditions.

Activities of the Association during the last five years have been funded through the U.S. Environmental Protection Agency's 319 program (as administered by the Colorado Department of Public Health and Environment) and Regional Geographic Initiative grant program, grants from the U.S. Department of Energy and contributions from the cities of Broomfield, Northglenn and Westminster and RFETS.

For more information on the Big Dry Creek Watershed Association, please contact Jane Clary, Watershed Coordinator, at Wright Water Engineers, Inc., 303-480-1700 or [clary@wrightwater.com](mailto:clary@wrightwater.com). The Big Dry Creek Watershed Association's web page, which is hosted by the City of Broomfield, can be accessed at [www.ci.broomfield.co.us/wastewater/bigdrycreek.shtml](http://www.ci.broomfield.co.us/wastewater/bigdrycreek.shtml).



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