



STATE OF THE WATERSHED

Review of Big Dry Creek 2002 Water Quality Data

During 2002, 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 4,188 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 also monitored on a monthly basis. The Cities also helped to fund operation of the USGS gauging station at Westminster behind Front Range Community College. Key findings related to the 2002 data follow.

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

stream standards, with the exception of unionized ammonia, the standards were attained based on comparison of the appropriate statistics to the chronic stream standards and determining whether any exceedances of acute standards occurred.

2. Water quality constituents with one or more exceedances of a stream standard included fecal coliform, *E. coli*, unionized ammonia, pH, total recoverable iron, and dissolved selenium.
3. Unionized ammonia data indicated nine samples out of 119 (8 percent) exceeded the chronic and acute stream standards for unionized ammonia. The 85th percentile value 0.086 mg/L was below the chronic standard of 0.1 mg/L.

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Rocky Flats Nutrient Data for 2002

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:

Date: September 2003

Time: To Be Announced

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

All Watershed Association meetings are open to the public.

Visit our new web site for updates on recent watershed activities:

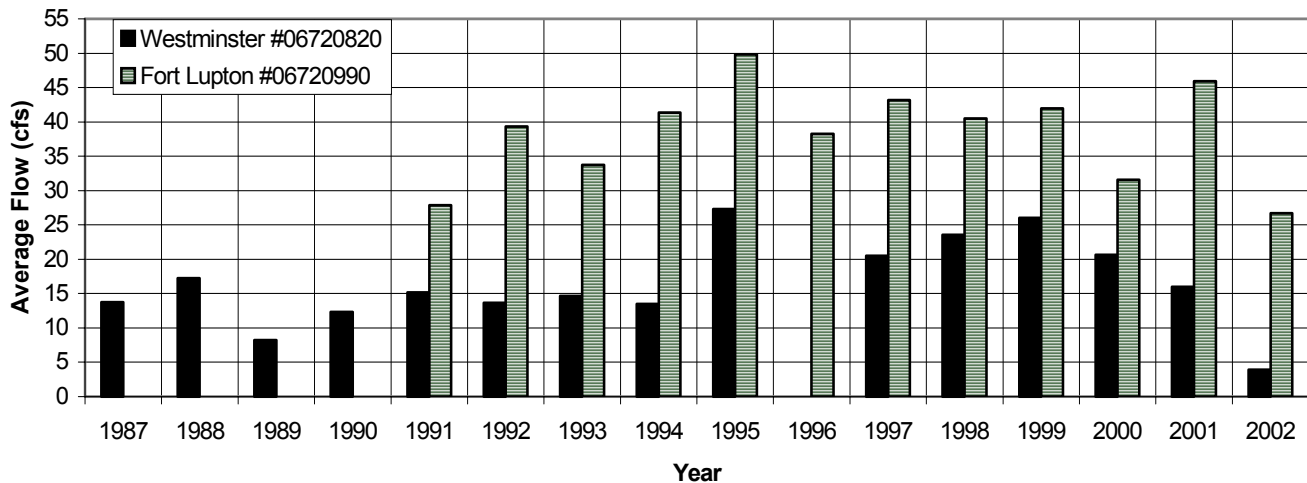
www.wrightwater.com/
Big Dry Creek

Big Dry Creek Water Quality (continued)

(Continued from page 1)

- About half of these elevated concentrations appear to be due to temporary operational changes associated with construction related to upgrades and expansion at the Broomfield Wastewater Treatment Plant (WWTP). Other elevated concentrations appear to be nonpoint source in nature, with about half of these located in the agricultural area. During the winter months, unionized ammonia concentrations in the stream increased below the Broomfield WWTP and then decreased for several miles downstream before increasing somewhat in the downstream agricultural area. During the summer months, concentrations were lower than during the winter.
4. Even though the geometric mean fecal coliform concentration of 445/100 mL did not exceed the Recreation Class 2 stream standard of 2000/100 mL, 19 out of 118 grab samples exceeded the stream standard. Fecal coliform concentrations met stream standards in 84 percent of the samples collected during 2002. This was also the case during 2001, which had represented a 10 percent decrease in the number of samples meeting standards during 1994 through 2000. About 63 percent of the elevated concentrations during 2002 are directly attributable to non-point sources, 5 percent are probably attributable to the Broomfield WWTP effluent during construction activities and 32 percent are probably attributable to a combination of nonpoint and point sources. As discussed in #3 above, elevated concentrations below the Broomfield WWTP were likely due to construction activities related to the plant upgrade and expansion.
 5. *E. coli* concentrations met stream standards in 61 percent (72 out of 118) of samples collected during 2002, which was comparable to exceedances in 2001. This represents a 12-13 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 498/100 mL, which did not exceed the 630/100 mL standard. About 57 percent of the elevated concentrations were due to non-point sources, 15 percent appear to be influenced by the Broomfield WWTP during operational changes related to construction, and 26 percent appear to be due to a combination of the Broomfield WWTP discharge and non-point sources. An upstream to downstream trend was not apparent for the 2002 data set, as was the case during 2001.
 6. For both the fecal coliform and *E. coli* data, it is important to note that EPA has disapproved the Recreation Class 2 standard currently in place for Big Dry Creek, which may result in lower numeric limits for pathogens for Big Dry Creek. It is unlikely that the creek would meet these standards at any location under current conditions.
 7. Total suspended solids (TSS) concentrations continued to exhibit the trend of increasing concentrations from upstream to downstream. The highest TSS concentrations occurred during July and September, which are expected to be due to increased flows and storm events. The July sampling event occurred directly following a storm event.
 8. Total recoverable iron concentrations during 2002 exceeded the stream standard in 28 percent of the samples collected (i.e., 33 out of 120 samples). As was the case in 2000 and 2001, the 50th percentile value attained the stream standard. Average iron concentrations continued to be well correlated with TSS concentrations and generally increase from upstream to downstream along with TSS.
 9. For selenium, two out of 119 samples slightly exceeded the chronic standard; however, the 85th percentile did not exceed the standard. The values of 4.61 and 4.69 µg/L were only slightly above the standard of 4.6 µg/L and were likely within the range of laboratory error. Both of

Mean Annual Flows at Westminster and Fort Lupton Gauges



these occurred upstream of the Broomfield WWTP. 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.

10. Three pH values exceeded the upper standard of 9.0 for pH during 2002. These elevated concentrations were not related to wastewater discharges to the stream. Historically, Big Dry Creek instream pH values have been within the stream standard limits of 6.5 to 9.0.
11. Measured flows at the Westminster USGS gauge ranged from 0.18 cfs to 141 cfs with an

average of 3.9 cfs. Roughly 80 percent of the flows were 5 cfs or less during the year, with remaining 20 percent (excluding the maximum value of 141 cfs) between 6 and 23 cfs. Measured flows for the Fort Lupton gauge data ranged from 2.1 cfs to 140 cfs with an average of 26.7 cfs. Roughly 80 percent of the flows were 35 cfs or less during the year, with remaining 20 percent between 63 and 86 cfs (excluding the 140 cfs value). Instantaneous flow measurements were also collected by the Big Dry Creek cities during monthly sampling. These data indicate that there would be very little water in the creek throughout much of the year in the absence of the Broomfield and Westminster WWTP discharges.

Funding in Place for 2003

Through the collaborative efforts of the cities of Broomfield, Westminster, Northglenn and Thornton, and the U.S. Department of Energy (DOE), the Watershed Association has funding in place for several activities during fiscal year 2003.

DOE has provided cooperative agreement funding for a fourth fiscal year to help continue a variety of monitoring and watershed coordination services.

The cities of Broomfield, Northglenn and Westminster continue to fund the monthly in-stream monitoring on Big Dry Creek and spring biological sampling. The city of Thornton provides *E. coli* analysis for samples and contributes to coordination costs.

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

Rocky Flats Nutrient Data for 2002 (continued)

(Continued from page 1)

Among the designated uses applied by the CWQCC was Aquatic Life Class 2, which includes 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 2003 and presented the summary of results for calendar year 2002.

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 samples was conducted in accordance with RFETS procedures. The sampling period represented by these data was calendar year 2002.

Statistic	Nitrate (mg/L)	Unionized Ammonia (mg/L)
Maximum	3.0	0.30
Minimum	0.1	ND
Average	1.1	0.10
85th Percentile	2.5	0.13

For all samples collected in the monitoring period, the average concentration of unionized ammonia was 0.10 mg/L and the 85th percentile value was 0.13 mg/L. For all samples collected in the monitoring period, the average concentration of nitrate was 1.1 mg/L and the 85th 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 85th percentile for the unionized ammonia for 2002 alone was slightly above the standard; however, the 85th percentile value of 0.08 for the three-year period of 2000-2002 was below the stream standard. Several comments regarding these data included: 1) RFETS experienced a 10 percent decrease in discharge quantity during 2002; 2) higher ammonia values may have been related to a WWTP breakdown that occurred during 2002; and 3) ammonia values decreased in May and remained low throughout the remainder of the year.

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

Big Dry Creek Integrated Water Quality & Biological Data Analysis

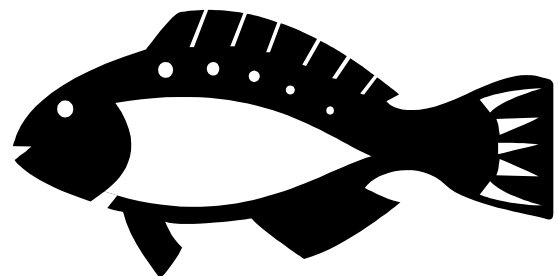
During late 2002, the Big Dry Creek Watershed Association Steering Committee determined that an update to the report “Integrated Analysis of Habitat, Macroinvertebrate, Fish, Flow and Selected Water Quality Parameters on the Main Stem of Big Dry Creek” (Wright Water Engineers 1999) would be appropriate, since five years of biological data were now available for the creek. As a result, a technical memorandum was prepared and presented to the Watershed Association. This memorandum compared the findings from the five-year data set to the WWE (1999) report and further explored possible trends with regard to the biological data. Key relationships explored in the memorandum included: 1) trends over time; 2) findings related to the artificial substrate sampling; 3) effects of flow on macroinvertebrate and fish indices; and 4) relationship between new selenium data and macroinvertebrate and fish communities.

The relationships between the dependent variables of macroinvertebrate Invertebrate Community Index (ICI) scores for Hess, “kick” and artificial substrate samples and Fish Index of Biotic Integrity (IBI) scores were explored relative to these independent variables: unionized ammonia, iron, total suspended solids (TSS), dissolved selenium, flow, stream habitat scores, location (general upstream to downstream trends) and season (for kick samples only).

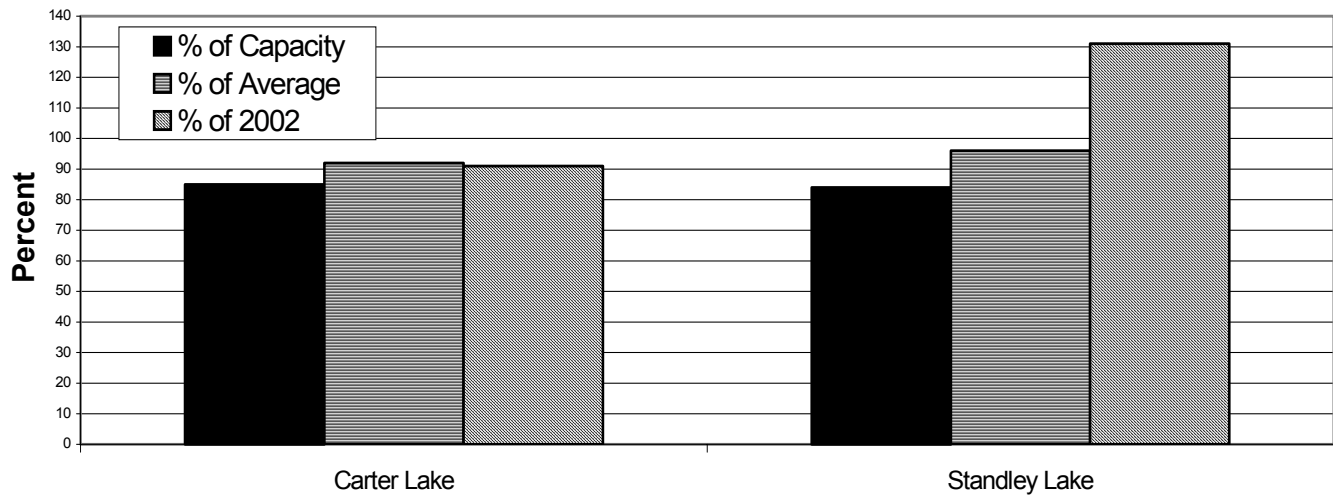
Conclusions and selected recommendations related to this analysis included:

1. No single variable explains trends in the benthic ICI and fish IBI scores on Big Dry Creek.
2. Upstream locations generally have higher quality fish and benthic communities than downstream locations. Upstream locations also generally have higher habitat scores, better water quality and lower flows.

3. Habitat appears to be the most consistent influence on benthic ICI scores.
4. Fish IBI scores are not strongly related to the variables explored.
5. Seasonal variation was evident for the “kick” ICI scores, with spring samples showing lower scores.
6. Unionized ammonia does not appear to be affecting the fish and benthic communities, based on concentrations present in the creek during the spring and fall of the last five years. Unionized ammonia concentrations on the creek are generally below the stream standard for the period of record explored.
7. Iron does not appear to be affecting the fish and benthic communities, even though iron periodically exceeds the stream standard.
8. Dissolved selenium does not appear to be adversely affecting the fish and benthic communities, based on the limited sample size reviewed.
9. Artificial substrate samples showed stronger relationships to flow, TSS and location than did the other benthic samples, indicating that factors other than habitat appear to be influencing the aquatic community. In other words, habitat alone does not fully explain benthic community health.
10. The Watershed Association should continue the current biological monitoring program.



2003 Reservoir Storage Levels



Reservoir Water Supply for Big Dry Creek Watershed Cities and Farmers

Drought Relief for the Big Dry Creek Watershed

The Colorado Climate Center defines drought in Colorado as: "A period of insufficient snowpack and reservoir storage to provide adequate water to urban and rural areas." The Colorado Climate Center reports that most people believe that Colorado is in the third consecutive year of a drought cycle and that the state is in the fifth year of below-average snow pack. Based on the available information at the Colorado Climate Center, Colorado is in the worst drought since 1977, with some river basins below 10 percent of their normal water capacity. The Colorado Climate Center reports that chances of full recovery this year for the state are minimal.

On the brighter side, precipitation recorded at Northglenn by the Western Regional Climate Center indicates precipitation levels are recovering in the Big Dry Creek watershed. Mean annual precipitation for the period of record at the Northglenn station is 14.25 inches. The station has already experienced 14.61 inches during the first five months of 2003, which represents 7.24 inches of above-normal precipitation for this time period. In contrast, just 10 miles away at former Stapleton airport, a deficit of over 6 inches of precipitation still exists.

Because the watershed relies heavily on water stored in reservoirs, it is important to also look at water levels in key reservoirs. Standley Lake supplies water for the cities of Westminster, Northglenn and Thornton and farmers in the lower watershed. As of May 2003, Standley Lake is at 96 percent of average storage, which is about 131 percent of last year's storage level. Carter Lake is located outside of the watershed, but supplies water for Broomfield. This reservoir is at 92 percent of average and 91 percent of last year's storage. As of the end of May 2003, the cities of Broomfield, Westminster and Thornton had removed mandatory watering restrictions, while still encouraging voluntary conservation measures. The city of Northglenn had downgraded its drought level status from Stage 3 to Stage 2, but mandatory watering restrictions were still in place.

Although conditions are improving, it is important for watershed residents to continue to use water wisely and adhere to local water restrictions and/or voluntary conservation guidelines. Contact your city to find out what is currently required in your area.

New Video and Web Site

Under a grant from the EPA and contributions from DOE and the cities of Broomfield, Northglenn and Westminster, a 20-minute video was 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. Over 50 videos have been distributed to date. The video can be broken into two 10-minute segments that 1) characterize the watershed and the watershed association and 2) identify actions to protect the watershed.

The Association also recently updated and relocated its web site. Historical and current reports and newsletters can now be accessed on this web site. Additionally, the watershed management plan, a preview of the video and the current sampling/monitoring plan can be viewed.

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.

Who Swims in Big Dry Creek?

In order to evaluate the types of recreational uses in place on Big Dry Creek, Wright Water Engineers staff contacted several middle schools in the watershed for the purposes of educating the students about the Big Dry Creek watershed and conducting a survey regarding their recreational use of the creek. Three schools within the watershed chose to participate, including Westlake Middle School in Broomfield, Shaw Heights Middle School in Westminster and Northeast Middle School in Northglenn.

The classroom presentations included a brief overview of the concept of a watershed including a map orientation of the relevant school and neighborhood in relation to Big Dry Creek followed by viewing a

Pick Up After Your Pet!

Pet waste can be a major source of bacteria and excess nutrients in local waters. Stream samples in Big Dry Creek show that elevated bacteria concentrations occur at many locations along the creek. You can help to reduce these concentrations.



When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into waterbodies.

Visit www.epa.gov/npdes/stormwater for more information on how you can help to reduce stormwater and nonpoint source pollution.

portion of the Big Dry Creek Watershed Association video. To conclude the lesson, the recreational use surveys and their relevance were explained, and surveys were distributed and completed by students.

Students completed a total of 178 surveys: 79 in Broomfield, 46 in Westminster and 53 in Northglenn. Overall, 63 percent of respondents indicated that they had not used any area water bodies in the last two years. Five students (3 percent) mentioned the following recreational uses on Big Dry Creek: wading, walking along the creek, catching crawdads and cooling off with water. No students identified swimming, kayaking, tubing, or rafting in association with Big Dry Creek.

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, and contributions from the U.S. Department of Energy/Rocky Flats Environmental Technology Site, and the cities of Broomfield, Northglenn, Westminster and Thornton.

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. The Big Dry Creek Watershed Association's web page can be accessed at www.wrightwater.com/BigDryCreek



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