BIG DRY CREEK

STATE OF THE WATERSHED

Newsletter of the Big Dry Creek Watershed Association

Summer 2005 Volume 7

Big Dry Creek 2004 Water Quality Review

During 2004, the cities of Broomfield, Northglenn Westminster and Thornton 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 4,752 data points being added into the Big Dry Creek Watershed Association database. Metals were monitored on a quarterly basis with the exceptions of 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 (USGS) gauging station at Westminster behind Front Range Community College. Selected findings related to the 2004 data follow.

1. The main stem of Big Dry Creek attained currently assigned stream standards for all constituents with the exception of one exceendance of the acute selenium standard. Additionally, it is noteworthy that several constituents, namely fecal coliform, *E. coli* and selenium, have temporary modifications to the stream standard as a result of the 2004 triennial review of these standards. The 2004 Big Dry Creek data met the underlying (unmodified) standard for fecal coliform, but would not have met the underlying standard for chronic selenium or *E. coli*.

2. Dissolved selenium concentrations during 2004 exceeded the underlying chronic stream standard of 0.0046 mg/L at all locations on the creek; however, the 85th percentile value met the temporary modification to this standard of 0.011 mg/L, which was assigned by the Colorado Water Quality Control Commission (CWQCC) in 2004. The 85th percentile value was calculated to be 0.009 mg/L, which was comparable to 2003. One sample at bdc1.5 on January 8 exceeded the acute standard of 0.018 mg/L with a concentration of 0.020 mg/L. There is

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Final Rocky Flats Nutrient Report

Bob Fiehweg provided the fifth and final Rocky Flats annual report on ammonia and nitrate monitoring at Indiana Street to the Big Dry Creek Watershed Association in March 2005. Approximately 287 samples were collected over the five year period to support this effort. The Rocky Flats wastewater treatment plant has been demolished and is no longer discharging to Big Dry Creek; therefore, this was Bob's final report.

The monitoring program included routine monitoring at station GS03 on Walnut Creek at the RFETS boundary along Indiana Street. The collection and analysis of samples was conducted in accordance with RFETS procedures. A summary of the data for 2004 and for the past five years is provided below. The findings show that chronic concentrations of both unionized ammonia and nitrate were at acceptable levels.

	Nitrate (mg/L)		Unionized Ammonia (mg/L)	
Summary Statistic	**2004**	**2001-2004**	**2004**	**2001-2004**
Maximum	3.8	7.40	0.32	0.47
Minimum	0.5	0.00	0.00	0.00
Average	1.4	1.26	0.03	0.04
85th Percentile:	**3.3**	2.64	**0.05**	0.07

Inside this issue:

Next Watershed Association Meeting:

Topic: *Selenium Issues in the Sand Creek and Big Dry Creek Watersheds*

Time: *September 20, 1:00 to 3:00 p.m.*

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

All Watershed Association meetings are open to the public.

Contact Jane Clary with questions. 303-480-1700

Big Dry Creek Water Quality (continued)

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not an apparent upstream to downstream trend for selenium. As was the case in 2003, the highest concentrations are present at bdc1.5, upstream of both the wastewater discharges and agricultural influences. It should be noted that many streams throughout Colorado do not meet selenium standards, due in part to naturally elevated selenium in soils.

3. The geometric mean fecal coliform concentration of 232/100 mL did not exceed the underlying standard of 325/100 mL for the new Recreation 1b stream classification or the temporary modification of 380/100 mL currently assigned to this standard. Fecal coliform concentrations for the last three years were somewhat lower than concentrations over time relative to 2002, which had an overall geometric mean of 445/100 mL. This reduction in fecal coliform concentrations is hypothesized to be due to increased dilution in the stream, as drought conditions have improved, rather than a reduction in the sources of fecal coliform.

4. Based on comparison of the instream and wastewater discharge samples, it appears that the majority of the elevated fecal coliform concentrations are non-point source related, with the municipal effluent showing significantly lower concentrations than the stream. An upstream to downstream trend was not apparent for the instream fecal coliform concentrations. One location, bdc2.0 below the Broomfield WWTP, which had particularly high concentrations of fecal coliform during 2002 and 2003, showed a reduction in fecal coliform concentrations. Historically elevated coliform concentrations at bdc2.0 have been attributed to non-point sources of bacteria, given that the Broomfield effluent (bdc10.0) is well below the standard. During 2004, fecal coliform concentrations were highest in the agricultural area at bdc6.0 and may be due to cattle that graze in this area.

5. The geometric mean *E.coli* concentration of 224/100 mL exceeded the underlying standard of 205/100 mL for the new Recreation 1b stream classification, but did not exceed the temporary modification of 401/100 mL currently assigned to this standard, as shown in Figure 5. Consistent with the fecal coliform discussion, bdc6.0 also shows the highest 2004 concentrations of *E. coli*, and upstream to downstream trends are not apparent. In general, *E. coli* concentrations are about half of what they were at the drought peak in 2002. Also noteworthy is the significant reduction in *E. coli* concentrations in the Broomfield WWTP effluent since modifications have been completed to the plant. Effluent concentrations for 2003/2004 were about 15 times lower than the 2001/2002 concentrations.

6. Unionized ammonia concentrations were well below stream standards in 2004. Like 2003, 2004 continued to show an improvement in unionized ammonia conditions in the creek relative to 2002. During 2002, several exceedances were attributed to operational challenges during the Broomfield WWTP plant expansion and upgrade, which is now complete. The 2003 and 2004 data are relatively consistent with Big Dry Creek data prior to 2002, which indicate very few unionized ammonia concentrations above the stream standard.

7. Although Big Dry Creek does not have a drinking water classification or a corresponding in-stream nitrate standard, the Middle South Platte River Segment 1 downstream of Big Dry Creek has a drinking water classification and a nitrate standard of 10 mg/L. This standard is applied based on a single day combined total of nitrite and nitrate at the point of intake to the domestic water supply. A scatter plot of nitrate grab samples collected at the farthest downstream sampling point (bdc6.0) in the Big Dry Creek monitoring program indicates that over the past five years, nitrate grab samples reached or exceeded 10 mg/L nine times at this location. At the confluence with the South Platte River, Big Dry Creek's average nitrate concentrations were below 10 mg/L during 2004. BDCWA anticipates the need to protect the downstream drinking water classification to be an issue in the future; therefore, nitrate concentrations along Big Dry Creek will continue to be examined and modeling will likely be required to determine Big Dry Creek's contribution to nitrate concentrations at the "point of compliance" on the South Platte River.

8. Annual average instantaneous flow measurements collected by the Big Dry Creek cities during monthly sampling over the last several show some recovery from the peak drought conditions during 2002. During 2004, average daily flows at the USGS Westminster gauge ranged from 0.47 cfs to 312 cfs with an average of 12.93 cfs. Average daily flows for the Fort Lupton gauge data ranged from 9.2 cfs to 268 cfs with an average of 44.84 cfs. High flows were associated with several key storm events during the summer. Both the upstream municipalities and downstream landowners documented significant flooding during the July storms.

Special Report: Lower Big Dry Creek Hydrologic Study

Executive Summary from Wright Water Engineers 2005 Report

Since the Big Dry Creek Watershed Association (BDCWA) began meeting in 1997, landowners in the lower portion of the watershed in Weld and Adams Counties have raised concerns about increased erosion, higher flows in the creek and more frequent flooding along Big Dry Creek. The storm events during the summer of 2004 heightened these concerns regarding current and future flow conditions. As a result, the BDCWA sponsored the Lower Big Dry Creek Hydrologic Study to answer questions regarding Big Dry Creek's current and expected future hydrology and to identify potential solutions to landowner problems. This study was funded by the Colorado Water Conservation Board, the cities of Broomfield, Westminster and Thornton and Weld County. A full version of the report can be downloaded from the Big Dry Creek website (www.bigdrycreek.org) or be requested on CD from the BDCWA. The findings and recommendations from the study are provided as a special pull-out section below because of the importance of this issue to stakeholders.

Erosion around private pasture-access bridge in Adams County following large July 2004 storm event.

Hydrologic Findings

1. Many factors influence the character of Big Dry Creek in Adams and Weld Counties. Key factors include: naturally occurring erosion-prone soils and stream characteristics; urbanization in the central portion of the watershed resulting in wastewater and stormwater discharges to the creek that did not occur historically or have increased; increased base flows related to urbanization; releases from Standley Lake; irrigation diversions and return flows; stream crossing structures; and land management practices in the lower watershed that decrease vegetative cover along the streambank. Although this report does not assign relative responsibility of these factors to conditions present in Big Dry Creek, it does describe each of these factors in more detail, particularly stormwater management strategies in the urbanized portion of the watershed.

2. The character of Big Dry Creek in Adams and Weld Counties is consistent with a plains stream type description that includes shifting channels, eroding banks and bar migration. This type of stream is described as being transient, with little structural stability. Big Dry Creek exhibits these characteristics, indicating a naturally occurring pre-disposition to erosion.

3. The "flashy," variable flows that occur in the watershed in response to storm events cause increased bank erosion by preventing the stream from reaching a state of equilibrium. Banks dry out at low flows, and at high flows, water moves into the pore spaces in the soil, reducing pore space tension, and the soil becomes less cohesive and erosion prone (Bledsoe 2001). In order to balance the sediment transport capacity of the high flow, sediment is removed from the banks of the stream. As sediment is removed from the bank, surface erosion, undercutting and sloughing can occur. As the flow recedes, the banks dry again, and the cycle repeats itself (Knighton 1998).

4. Significant urbanization has occurred and will continue to occur in the central portion of the Big Dry Creek watershed. The fact that urbanization significantly alters the frequency, duration and peak flows of natural runoff events is a well documented phenomenon that is true for Big Dry Creek. The use of regional and on-site detention can help to control peak flows; however, increased frequency and duration of runoff events will occur, even when detention facilities are used.

5. Limitations associated with the period of record for both stream gages in the watershed and accuracy limitations of the lower stream gage on Big Dry Creek make it difficult to conduct a rigorous statistical analysis that quantitatively defines hydrologic changes in the watershed. Nonetheless, photo documentation and anecdotal accounts clearly show that lower Big Dry Creek is experiencing erosion, high water and flooding. Based on photos provided immediately following the July and August storms and the field visit in 2005, much of the major erosion on the creek is attributable to the large storms during the summer of 2004.

6. The precipitation associated with the types of storms that occurred in July 2004 should not be considered typical or

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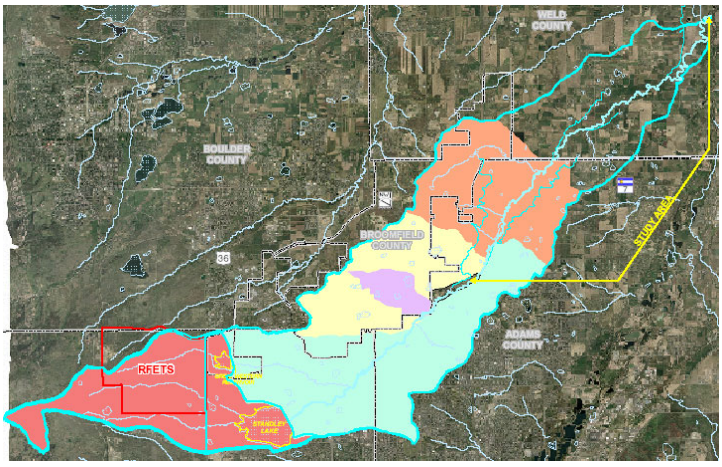
common. Even in the absence of urbanization, this type of storm would have likely produced flood conditions and erosion in the lower watershed. Many of the impacted areas are located within the 100-year floodplain, as mapped by FEMA in 1979 and 1982, prior to the development boom of the 1990's in the urbanized portion of the watershed.

7. The stormwater management strategies implemented in the urbanized portion of the watershed are consistent with the regional and national state of the practices. The vast majority of the watershed upstream of the Weld County line has drainage plans that have been conducted in accordance with regional standards and national norms. Regional stormwater detention is a key technique implemented in these plans, with over 2,600 acre-feet planned and roughly 1,800 acre-feet estimated to be currently existing. This represents an investment along the order of $3.5 to 4 million in regional facilities. Based on comparison of projected flows in these master plans and the estimated flows during July 2004, it appears that these facilities are significantly reducing peak flows experienced in the lower watershed. In the absence of these facilities, higher peak flows would have been expected in the lower watershed based on peak flows developed in drainage master plans.

8. Given that the watershed is only about 60 percent developed, downstream residents will likely experience increased volumes, frequency and duration of runoff as development continues to occur. Provided that detention practices are implemented as planned, peak flow rates should be controlled to a significant extent. These controls are expected to be more effective for a wider range of flow events relative to historical practices because the more frequently occurring flows associated with the water quality capture volume are also now controlled in addition to the 2- to 5-year storm and the 100-year storm, whereas more recent development may not have provided treatment of the water quality capture volume.



Shaded areas identify boundaries of stormwater master plans completed in the watershed in the past. Yellow lines show the area of focus for Lower Big Dry Creek Hydrologic Study. Northeast shaded area (in peach) will be the study area for the update to the Big Dry Creek North Area Tributaries Outfall Systems Plan.

9. Big Dry Creek has not had a natural flow regime in about 100 years due to the construction of Standley Lake in the upper watershed. On average, releases from Standley Lake are believed to constitute roughly 30 percent of the flows present in the creek, while wastewater flows are believed to constitute about 40 percent (annual volume) of the flows in the creek. Base flows in the watershed are characterized by relatively low depths, non-flashy nature and relatively low velocities. Based on a cursory review of these characteristics, base flows would not appear to be the driving force in stream channel erosion. However, a more detailed analysis of stream geomorphology would be required to draw this conclusion with certainty, particularly given some recent studies (e.g., Rohrer and Roesner 2004) indicating that low, constant flows can move large quantities of sediment and can undercut and destabilize banks. It can be said, however, that wastewater-related baseflow conditions are not expected to significantly increase due to the planned implementation of wastewater reuse programs in the watershed. Actual conditions will depend on how augmentation plans are administered and the degree to which the wastewater reuse programs are implemented. Irrigation return flows in both the upper and lower watershed also contribute to baseflows. The extent to which non-wastewater related baseflows associated with urbanization will be offset by potential reductions in wastewater discharges was not quantified in this study.

10. Although land management practices in the lower watershed do not typically cause erosive storm flows and flooding, they do increase the susceptibility of banks to erosion in some locations where the ground is denuded or trampled. Similarly, any type of constriction to the creek's flow path such as bridges or culverts have the potential to contribute to flooding and erosion.

Recommendations to Improve and Address Drainage Problems in the Lower Watershed

1. The Big Dry Creek Northern Area Tributaries Outfall Systems Plan Update planned to begin in 2005 under the direction of the Urban Drainage and Flood Control District and sponsored by Adams County, Broomfield, Thornton and Westminster is an important component in laying a framework for managing stormwater flows in one of the key developing areas in the watershed. Given that the entities sponsoring

the update are also participating in the Big Dry Creek Watershed Association, there are significant opportunities to recognize the existing downstream flooding and erosion concerns and recommend stormwater management strategies to help minimize impacts of future development in this area. The Big Dry Creek Watershed Association must ensure that the findings of this hydrologic study are considered in the alternatives evaluated in the outfall systems plan update.

2. Downstream landowners within or in the vicinity of the 100-year floodplain along Big Dry Creek should take appropriate steps to plan for and protect themselves from flooding. For properties in the floodplain (i.e., all of the properties visited in this study), flooding risk exists, regardless of the type of development and stormwater management implemented upstream.

3. Stream stabilization options for properties in the lower watershed consist of three primary steps: 1) reducing the slope of (i.e., laying back) steep cut banks, 2) providing armoring or other stabilization for these banks, particularly for the toe of the bank, and 3) revegetating the banks to help them resist future erosion. Specific techniques have previously been provided in BDCWA-sponsored reports and remain valid, as do the many techniques described by the NRCS. Given the relatively flat slopes in the study area, preliminary analysis suggests that, in general, grade control structures do not appear to be needed to stabilize the stream channel in this area; however, more detailed channel analysis would be needed to confirm this.

4. While concrete chunks placed along the bank to stabilize the stream may provide short-term benefits as a "stop-gap" measure under certain conditions, typically, placement does not adequately protect the toe (lower part) of the bank, so undercutting is likely to continue to occur, with the concrete eventually falling into the creek. Additionally, placement of concrete on one portion of the bank may cause impacts on another part of the bank, which should be taken into consideration. To comply with federal law, landowners should be sure to obtain a permit from the U.S. Army Corps of Engineers to place concrete or other material along the streambank. From an engineering perspective, WWE strongly recommends against use of broken concrete to stabilize banks.

5. Planned detention in the urbanizing portion of the watershed should be aggressively pursued as a high priority. This is particularly critical in areas that currently provide inadvertent detention that has not been formalized by a legal agreement. Areas at particular risk include inadvertent detention sites on tributaries to Big Dry Creek along the I-25 corridor where land prices are at a premium and rapid development is occurring. Additionally, the inadvertent detention at the railroad embankment on Colorado Blvd. is providing significant benefits to the downstream Weld County landowners. Opportunities to formalize and improve this detention area in a manner that help reduce flooding impacts to upstream Adams County landowners should be pursued.

Undersized culvert at the Union Pacific Railroad embankment near Colorado Blvd. provides inadvertent detention of flows in Big Dry Creek.

6. Given the downstream complaints about high water and flooding, local governments in the urbanizing areas should consider use of existing provisions in their drainage criteria to require stricter stormwater management in areas with known drainage problems. In many cases, this would mean more rigorous implementation of principles already in the UDFCD's *Urban Storm Drainage Criteria Manual* and adopted by the cities. Examples of the types of existing provisions that could be emphasized include:

   a. Require that developers minimize directly connected impervious area to the maximum extent practicable and implement other "low impact development" techniques such as porous landscape detention, grass lined swales, porous pavement and other techniques that promote infiltration of runoff, particularly for frequently occurring storms. Because of maintenance issues and limited benefits of underground detention relative to other stormwater management strategies, underground detention should be discouraged and used only as a last resort.

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b. Require that developers evaluate and consider the downstream impact of their development and implement appropriate stream stabilization techniques.

c. Strongly consider requiring outlet structures in new detention facilities that more closely approximate the pre-development flow-frequency curve based on the concepts developed by Nehrke and Roesner (2004) and Wulliman and Urbonas (2005).

7. From an engineering and regional perspective, the BDCWA should aggressively support regional open space planning along Big Dry Creek in the near-term because of the current rapid pace of development. The *City of Thornton Open Space Master Plan* has targeted the Big Dry Creek floodplain in Adams County for high-priority land acquisition. Open space taxes in Adams County and Thornton provide a realistic funding mechanism for open space acquisition. Many options exist for landowners to remain on their property and dedicate easements through a variety of tools described in the *City of Thornton Open Space Master Plan*. Aside from engineering issues, however, it should be noted that complex social, economic and cultural issues must be taken into account when considering private property acquisition. In the event that conservation easements or property acquisition is completed, preservation of a meander corridor that enables to the stream to adjust geomorphically should be strongly considered.

8. The BDCWA should contact and work with the USGS to identify improvements that could be made to the Fort Lupton gage so that more accurate flow data can be obtained in the lower watershed.

9. The BDCWA should consider sponsoring a suitably qualified graduate student to model hydrologic conditions Big Dry Creek and identify the key design storms (e.g., "breakpoint" storm suggested by Nehrke/Roesner) that could be controlled to most benefit the creek. As a companion study, additional geomorphic characterization of the stream would be very beneficial in determining the stormwater management practices of most benefit to the stream channel. Such characterization could build upon the habitat characterization work previously completed by Aquatics Associates.

10. The BDCWA should consider sponsoring a stream restoration demonstration project with a university or the NRCS that equips landowners with information on affordable and effective techniques for stream restoration on private property.

11. The BDCWA should explore the feasibility of developing a drainage impact fee, fee in-lieu-of program, or other financial strategy for developments in the Big Dry Creek watershed to help fund downstream improvements. An intergovernmental agreement would like be needed for this type of activity.

Special Thanks to John Stover U.S. Department of Energy

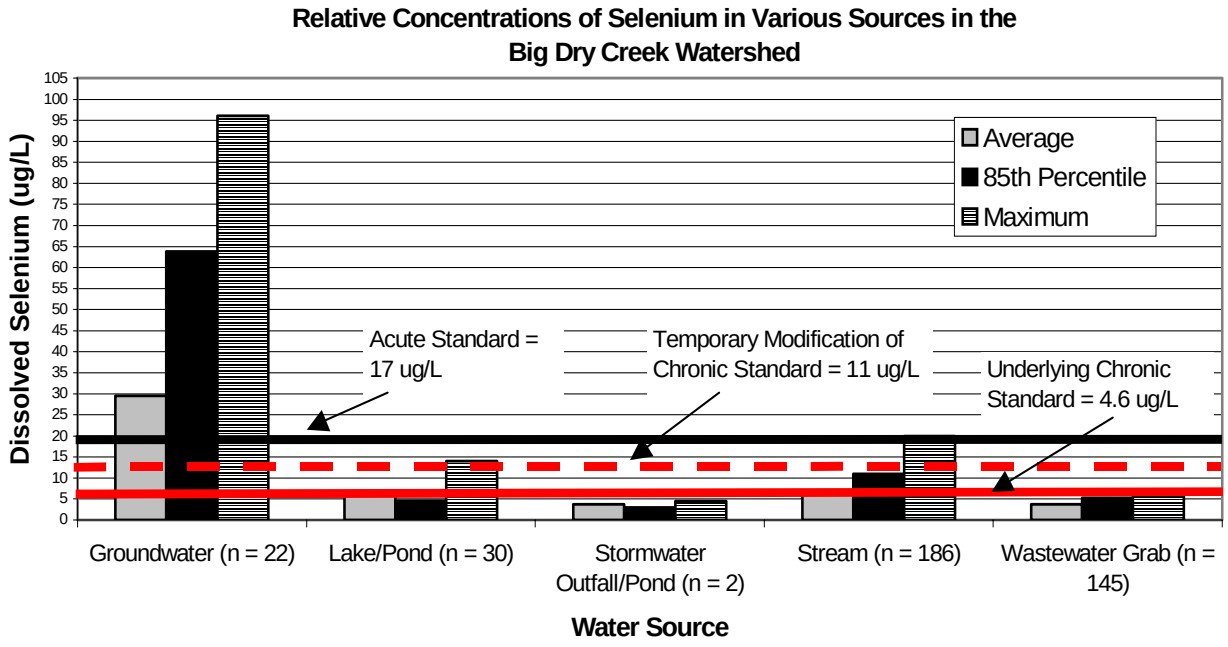
The Big Dry Creek Watershed Association would like to thank John Stover, U.S. Department of Energy (DOE), for his support of the BDCWA activities over the last nine years. Through his role with DOE's Rocky Flats Field Office, John recognized the importance of biological monitoring in the watershed and worked through the DOE to help support these efforts in a manner that enabled continuity of data collection that would have otherwise been difficult to accomplish. We wish John the best of luck in his new role with DOE and will miss his involvement with the BDCWA.

Big Dry Creek Northern Area Tributaries Update Underway

In July 2005, the Urban Drainage and Flood Control District (UDFCD) in Denver issued a request for proposals to complete an update to the Big Dry Creek Northern Area Tributaries Outfall Systems Plan. The original plan was completed by Wright Water Engineers in 1989 and was in need of updating due to the significant development occurring in the planning area, particularly along the I-25/E-470 corridor.

The vicinity of the project study area is roughly Baseline Road on the north, 136th Avenue on the South, Holly St. to the east and Zuni St. to the west. The plan focuses on the following tributaries to Big Dry Creek: Wadley Creek South, Wadley Creek North, Sack Creek, Sack Creek South, Preble Creek, South Fork Preble Creek, Mustang Run, North Mustang Run, Shay Ditch, Short Run, Morris Creek, Morris Creek South, Elms Run, Tank Run and Oil Run.

Working with UDFCD, the project sponsors include the cities of Broomfield, Thornton and Westminster and Adams County. Through a competitive selection process, Wright Water Engineers, Inc. was selected to completed this update. If you would like to be included in the planning process, please contact Jane Clary 303-480-1700 at Wright Water Engineers to be placed on the project mailing list. A project website will also be developed in the near future.



Characterizing Selenium Sources in the Big Dry Creek Watershed

The BDCWA is working to characterize sources of elevated selenium in the Big Dry Creek Watershed. These activities include in-stream, wastewater, groundwater and pond sample analysis, as well as biological analysis. Initial data analysis suggests shows the highest selenium concentrations in groundwater samples, with much lower concentrations in wastewater. Instream samples, though lower than many groundwater samples, do not attain the underlying chronic or acute stream standards. The stream attains the temporary modification to the chronic standard of 11 µg/L.

The U.S. Environmental Protection Agency (EPA) issued *Draft Aquatic Life Water Quality Criteria for Selenium-2004* in November 2004. Because EPA's proposed chronic selenium criterion is based on a selenium concentration of 7.91 µg/g dry weight in whole-body fish tissue, BDCWA contracted Aquatics Associates to conduct preliminary fish tissue sampling as part of the fall fish sampling in Big Dry Creek in October 2004. Key findings from the Aquatic Associates (2004) report follow.

Whole body fish tissue selenium concentrations, after conversion to dry weight, ranged from 7.5 µg/g in fathead minnows collected at site bdc3.0 to17.0 µg/g in longnose dace from site bdc1.0. The overall mean selenium concentration in fathead minnows for all sites was 11.7 µg/g (range 7.5-15.5 µg/g), while the mean for longnose dace was 13.3 µg/g (range 8.5-17.0 µg/g). Comparison of selenium concentrations in fish between the upstream sites (bdc0.5-bdc1.5) and the downstream sites (bdc2.0-bdc6.0) showed very little difference.

Both Lemly (2002) and Swift (2002) recommend a total selenium criterion of 0.002 mg/L for water bodies because of its very high bioaccumulation potential. In whole body fish tissue, Lemly (2002) further notes that concentrations of selenium >4.0 µg/g (dry weight) would likely be indicative of impairment of fish health and reproductive success. Based on this reported threshold value, some degree of biological impairment in the fish populations in Big Dry Creek and the Republican River might have been expected. However, in Big Dry Creek no obvious impairment has been observed to date (Aquatics Associates, Inc. 2004), nor was any impairment reported in the Republican River study (May et al. 2001). Lemly et al. (1987) however, stressed that his guidelines should be applied with caution because of the general complexity of selenium toxicity especially in terms of: 1) other contaminants in the system, 2) selenium's interaction with other metals, 3) differences in species sensitivities, 4) the relative toxicity of the different forms of selenium, and 5) other environmental influences.

The Aquatics Associates (2004) results indicate that the proposed draft selenium criterion would be difficult for Big Dry Creek to meet, just as the water column based standard is. The Big Dry Creek biological data collected over the last five years may be useful in support of a site-specific standard for Big Dry Creek based on the lack of impairment of the fish species studied. Because Big Dry Creek has a temporary modification in place, the BDCWA must work towards developing a better scientific understanding of sources and impacts of selenium on the creek. The monthly water quality monitoring data and fish tissue sampling help to support this effort.

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 Cities of Broomfield, 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 consisting of representatives of the cities of Broomfield, Westminster, Thornton, Northglenn and Weld County. Activities of the BDCWA during the last nine 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 Regional Geographic Initiative grant program.

For more information on the Big Dry Creek Watershed Association, please visit The BDCWA's web page 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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