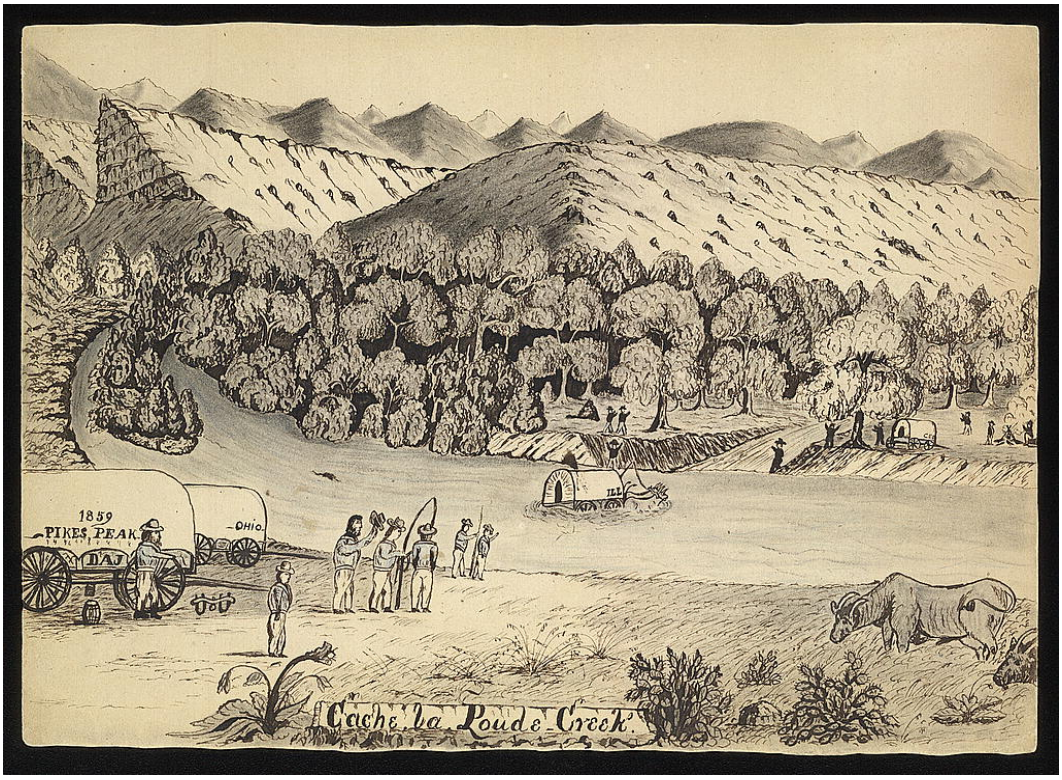
2009
City of Fort Collins

Lower Cache la Poudre River
&
Urban Creek

Water Quality Report



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2009 Lower Poudre River & Urban Creek Water Quality Report

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Introduction:

This 2009 Lower Poudre and Urban Creek Water Quality Report provides a water quality-focused summary of the scope, status and trends of the City's monitoring efforts on the Cache la Poudre River through Fort Collins and three urban creeks in our community. In addition, key stormwater quality enforcement and improvement efforts, regulatory requirements, activities and associated compliance and non-compliance issues are also highlighted. Details on river and creek monitoring site locations, test parameters, key results and trends are presented. It must be noted, however, that aspects of this report are limited in scope: flow and water quality are just two of many key factors that influence and reflect the health of a river or creek. Other factors include man-made changes and activities as well as stream geomorphology and the abundance and diversity of its biological community. The ability of the biological community in a stream to survive and thrive is dependent, in part, on the quantity, quality and physical characteristics of the water flow as well as stream habitat. Future monitoring reporting efforts and programs will strive to identify, assess and explain the interdependencies that tie together the many factors affecting the health of the Poudre and urban creeks in our community.

Purpose of the Report:

In order to fulfill City Council's goal of protecting and enhancing the Poudre River as outlined in Council Resolution 92-14 "Framework for Environmental Action" and Resolution 95-14 "Approving the Watershed Approach to Stormwater Quality Management", City staff has prepared the following status report on water quality conditions in key urban creeks and the Cache la Poudre River through Fort Collins. This report also includes summaries on the 2009 status of several stormwater quality programs in the City.

Executive Summary:

In 2009 several significant regulatory changes occurred that reveal both positive and negative trends in current water quality conditions in the Poudre through Fort Collins as well as our urban creeks.

1. The change to ***"Anti-Degradation Review Status "*** **for the Poudre**: Based on extensive datasets showing good water quality conditions in the river through the City, the Colorado Water Quality Control Division (WQCD) has reclassified the Poudre from Shields Street down to Boxelder Creek from "*Use-Protected*" to "*Anti-Degradation Review (ADR) Status. "* Eleven of twelve key water quality parameters were substantially better than existing State standards. The exception was natural selenium levels in the water as discussed below. The fundamental purpose of an ADR classification is to maintain and protect existing high water quality conditions from future degradation. This level of protection means that no existing or new State-permitted discharge to the river will be allowed to degrade existing high water quality conditions. Furthermore, and based on similar good overall water quality conditions,

the WQCD extended ADR protection to the Poudre from the Monroe Diversion above Gateway Park all the way downstream to the river's confluence with the Platte east of Greeley. The change to ADR status will have broad and long-term impacts on any project or activity that discharges water to the river, resulting higher costs. This holds true for upgrades and ongoing operation of the City's water reclamation facilities as well as possible upstream water storage projects. Details regarding the change as well as further discussion of the range of potential impacts begin on page 14 of this report.

2. **Selenium levels in the Poudre**: Water quality conditions in the Cache la Poudre River from Shields Street downstream to just above Boxelder Creek are currently better than all WQCD-defined stream standards except for the levels of selenium. Selenium is associated with shale and is naturally present in the soils, river- and creek-banks in our area. Over the years, higher selenium levels in the Poudre have not been observed. However, the WQCD-defined stream standard is now more restrictive and existing selenium levels exceed that new stricter standard. Despite these exceptions, the levels were not sufficient for the WQCD to list the Poudre through the City as 303(d)-impaired for any water quality standards. Further details regarding this issue are presented on page 18 and Table 7 on page 19.

3. **In contrast to the Poudre, both Fossil Creek and Boxelder Creek were listed early 2010 as "303(d)-impaired" for high selenium levels.** The exceedances of regulated selenium levels were the result of new, stricter selenium standards and not reduced water quality in the creeks. Data show that high selenium levels in our urban creeks are observed during and after major storm events. In addition, any activities that erode creek banks or otherwise contribute to soil erosion can contribute to higher selenium levels in the water. Further details on this issue are presented on pages 19 and 42.

4. **In early 2010, both Fossil Creek and Spring Creek were listed as impaired, *high priority,* for seasonal *E. coli* contamination**: *E. coli* is an indicator of fecal contamination. Although it can be a pathogen on its own, its presence means that other disease-causing bacteria may also be present. In our urban creeks, high *E. coli* levels show strong seasonal trends with the highest levels during the late spring and summer months and the lowest levels during the late fall and winter. The urban creeks are listed as a "high priority" because of the corresponding high probability of human and animal contact during recreational activities in nearby parks. The State is expecting a proactive approach and additional creek water quality monitoring and field survey efforts are underway to ensure that possible illicit discharges, leakage from sewer pipes or septic systems are not contributing to the problem. Additional details on this issue are presented starting on page 50.

5. **Stormwater Monitoring Programs Underway**: In cooperation with Colorado State University (CSU), the City is conducting a wet-weather monitoring program to assess the effectiveness of existing structural stormwater Best Management Practices (BMPs) and new Low Impact Development (LID) BMPs. Data collection activities started in the winter months of 2009 and will continue through 2010. Details on the stormwater quality programs begin on page 31.

6. **Nutrient Criteria**: There is one new water quality control program under development in Colorado that, like the Anti-Degradation Review for the river, will also have significant cost impacts on the design, capital improvements and long-term operation of the City's two water reclamation facilities. This program is called "Nutrient Criteria". The proposed changes focus on limiting key nutrients, nitrogen and phosphorus, that promote the growth of nuisance algae. Algal blooms can adversely affect water quality and disrupt the food web in lakes, reservoirs, rivers, and streams. In addition, algae blooms can adversely impact recreational activities and the corresponding revenue base. Currently, the State's "Nutrient Criteria" program is a moving target. It is limited by the science and treatment technologies for removing nitrogen from wastewater; the available techniques are very costly and are not effective. Though no decision has been reached, the State may begin the program by first imposing phosphorus limits over the next several years. Additional details on this issue and its potential impacts are presented starting on page 53.

All of these regulatory issues and operational changes point to the continued need for long-term, proactive monitoring and testing programs for the river and our urban creeks. Successful water quality monitoring programs will help to keep our community at the forefront of environmental protection and to promote careful stewardship of our limited resources.

• History of the City's River, Creek and Stormwater Quality Monitoring Programs:

In the mid-1970s, the Colorado Water Quality Control Commission held its first stream classification hearings for the Cache la Poudre River. At that time, both Federal and State Clean Water Act mandates were being implemented across the state and the nation. Unfortunately, little or no water quality data were available for the Poudre as it flowed past the City's two wastewater treatment plants. At the Commission's hearings it quickly became apparent that because of this lack of data, the City was at both a tactical and strategic disadvantage: proof was needed that treated discharges from its wastewater treatment plants were not harming the river. As a result, the City initiated several long-term monitoring efforts to gather flow and water quality data to protect both the Poudre and the City's interests.

Since the late 1970s and in cooperation with the US Geological Survey (USGS), the City has been monitoring both flow and water quality in the Cache la Poudre River above and through Fort Collins. Beginning in the early 1980s, and in cooperation with Colorado State University and Kodak Colorado Division (KCD), the USGS program was expanded to include assessments of the fish and benthic macro-invertebrate communities in the Poudre. At that same time, City staff from the Pollution Control Lab began weekly water quality monitoring both up- and down-stream of the City's two wastewater treatment plants. The City-CSU-KCD cooperative program expanded in 2007 to form the Poudre Monitoring Alliance.

The Poudre Monitoring Alliance is part of EPA's award winning *Performance Track* program. It brings together under one roof the monitoring efforts of the City, Boxelder and South Fort Collins Sanitation Districts, the Town of Windsor, KCD and the City of Greeley. The alliance monitors over 42 miles of the Poudre at ten separate sights from Lincoln Street to its confluence with the Platte. In May 2007, the Utility received a letter of appreciation from Dave Akers,

manager of the Clean Water Facilities program of the Colorado Water Quality Control Division (Exhibit A) commending the City's thirty year commitment to on-going water quality monitoring on the Cache la Poudre River. In the late fall of 2007, the City received a letter of recognition from then Senator Ken Salazar lauding the example of the Poudre Monitoring Alliance for on-going regional cooperation.

Since 1984, the City has monitored water quality in Parkwood Lake. Beginning in 2000, the City's water quality monitoring program was expanded to include routine testing at three urban creeks: Boxelder Creek, Spring Creek and Fossil Creek. In 2003, the stormwater quality monitoring program initiated a water quality assessment of the effectiveness of the Udall treatment site below Lincoln Street.

- **Agencies with Monitoring Activities on the Poudre & Urban Creeks:**

Natural water bodies in the Fort Collins area are actively monitored at numerous locations to evaluate the impacts of human and natural activities on water quality. Water quality datasets for some sites in the City begin in the mid-1970s. The Cache la Poudre River, as it flows through town from Shields Street to Boxelder Creek (Segment 11), is currently sampled and tested by several agencies, including: the City of Fort Collins, the Colorado Water Quality Control Division, Colorado Department of Health & Environment, Colorado State University, In-Situ, Inc., Boxelder Sanitation District, and RiverWatch.

- **Water Quality Monitoring Locations, Test Parameters and Test Frequencies:**

Location details for the City's water quality monitoring sample sites for Segment 11 of the Cache la Poudre River are presented in Table 1. The table includes the sites routinely checked by the staff from the Pollution Control Lab plus river locations that are part of the Poudre Monitoring Alliance. Tables 2 and 3 provide details on the 2009 monitoring locations and test frequencies for the Cache la Poudre River and urban creek sites, respectively.

To evaluate the potential impacts of the City's two wastewater treatment plants on the Cache la Poudre River, the Utilities sponsors a biosurvey program of the fish and bottom-dwelling invertebrates in the river both upstream and downstream of the City's water reclamation facilities. The City and Kodak Colorado have participated for 28 years, and Boxelder Sanitation District joined the program eight years ago. On the upper portion of the river below Martinez Park, the City and Kodak Colorado Division share the costs of contracting the biosurvey program with CSU. Beginning in 2007, the CSU fish and benthic macroinvertebrate biosurvey program became an integral part of the Poudre Monitoring Alliance. For the City of Fort Collins in cooperation with Colorado State University and as part of the regional Poudre Monitoring Alliance, this testing also includes: 1) Four sites eight times per year for bacteriological, physical, and chemical parameters, 2) Three sites four times each year for benthic macro-invertebrate population abundance and diversity, and 3) Two sites once each year for fish abundance and diversity. Overall the data show strong seasonal trends with generally the highest population numbers and diversity in early summer months. Similarly, the data show that the Poudre below Shields Street is flow and habitat-limited rather than water quality-limited.

Map of Poudre River Floodplain and Water Quality Sampling Sites:

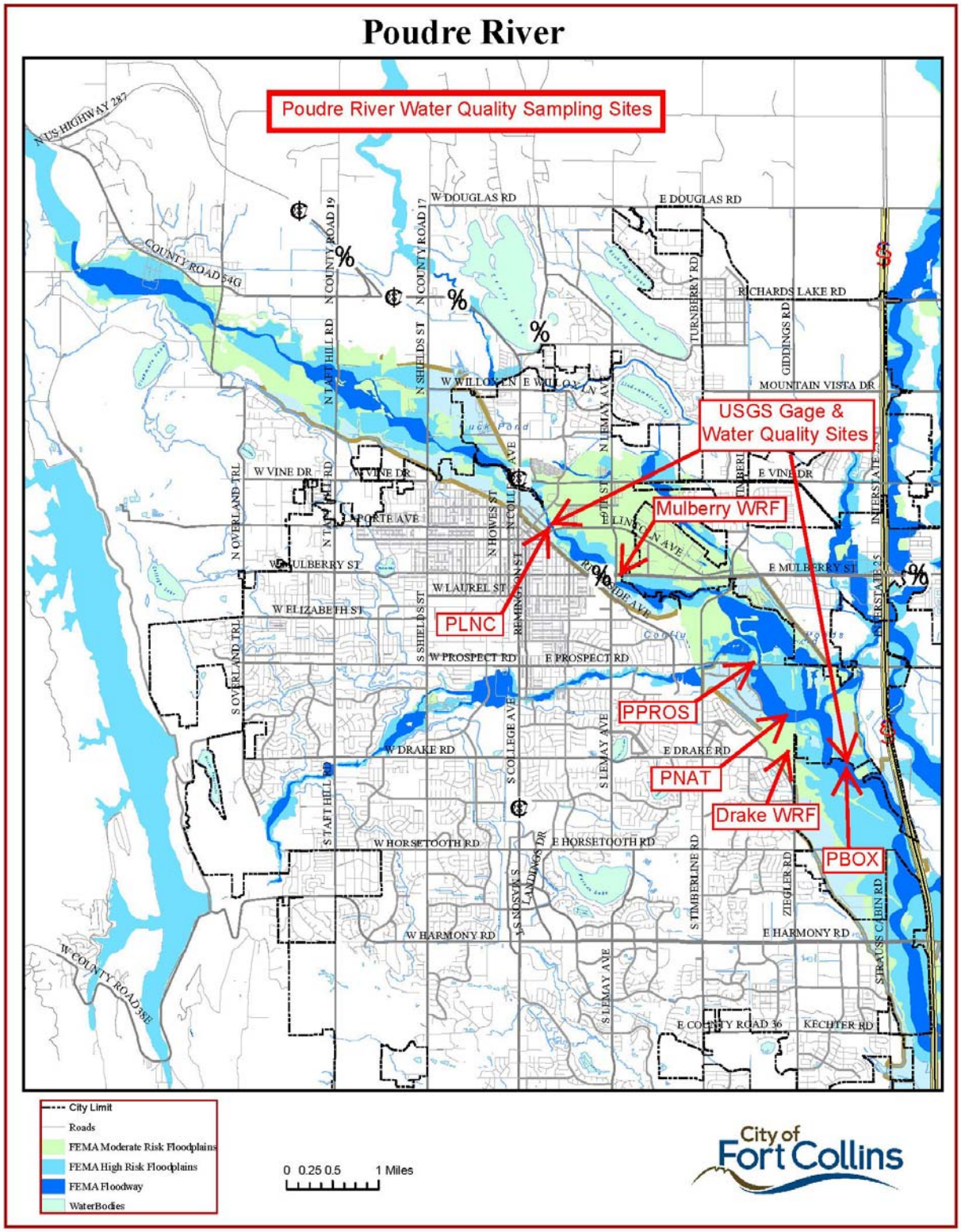


Table 1. 2009 City of Fort Collins Water Quality Monitoring Site Location Details:

Sample Site Name	Site Description	River Mile
City of Fort Collins Cache la Poudre River Monitoring Sites:		
Poudre @ Shields St	USGS Sample Site 06752258	45.00
PMRT	Poudre River at Martinez Park	44.50
Lincoln Street Gage	USGS Gage 06752260	43.44
432PLNC	Poudre River @ Lincoln Ave.	43.20
1EFF	001A - Mulberry effluent weir	-
1EFF	001A - Mulberry (MWRF) outfall to Poudre	42.49
PBRY	Poudre River @ Mulberry Street	41.60
390PPROS at Prospect St	USGS Sample Site 06752270	40.30
387PNAT	Poudre River @ Nature Center	38.70
2EFF	002B - Fossil Creek weir @ Drake	-
2EFF	002B - Fossil Creek outfall @ Drake	-
2EFF	002D - Poudre outfall @ Drake (DWRF)	38.39
2EFF	005B - PRPA @ Drake	-
370PBOX	Poudre River above Boxelder Creek	37.59
Boxelder Gage	USGS Gage 06752280 above Boxelder Cr	37.59
City of Fort Collins Urban Creek Monitoring Sites:		
FOSC287	Fossil Creek Ditch at Hwy 287	
FOSC34	Fossil Creek Ditch at CR34	
SPRC287	Spring Creek at Hwy 287	
SPRC-EP	Spring Creek at Edora Park	
BXC56	Boxelder Creek at CR56	
BXCG	Boxelder Creek Gage	
Lower Poudre Monitoring Alliance Sample Sites:		
432PLNC	Poudre at Lincoln St Gage above Mulberry WRF	43.2
390PPROS	Poudre at Prospect St Bridge below Mulberry WRF	39
370PBOX	Poudre at USGS Gage above Boxelder Cr	37
350LCR5	Poudre at Larimer County Rd 5	35
325PFOS	Poudre downstream of Fossil Cr Reservoir outlet	32.5
225SGAGE	Poudre at Staff Gage above Kodak Colorado Division	22.5
200STTH	Poudre at Shark's Tooth	20
145FSPUR	Poudre at Farmer's Spur below KCD	14.5
055WPCF	Poudre at Greeley WPCF gage	5.5
022FERN	Poudre at Fern Avenue below Greeley	2.2
City of Fort Collins Parkwood Lake Stormwater Impact Monitoring Sites:		
PKLa	Parkwood Lake Site A	Northeast Corner
PKLb	Parkwood Lake Site B	Southwest Corner
PKLc	Parkwood Lake Site C	Southeast Corner

Table 2. 2009 Monitoring Sites and Test Parameter Matrix for Cache la Poudre River Sites through Ft. Collins.

City of Fort Collins / Utilities Pollution Control Lab	Surface Water Quality Test Matrix			
	POUDRE RIVER MONITORING SITES			
Test Parameters	**432PLNC**	**390PPROS**	**380PNAT**	**370PBOX**
Alkalinity, mg/L as CaCO3	8/year	8/year	8/year	8/year
Ammonia-N, mg/L	1/week	1/week	1/week	1/week
Arsenic, µg/L	8/year	8/year	8/year	8/year
Biochemical Oxygen Demand, mg/L				
Cadmium, µg/L	8/year	8/year	8/year	8/year
Chromium, µg/L	8/year	8/year	8/year	8/yar
Conductivity, µmhos/cm	1/week	1/week	1/week	1/week
Copper, µg/L	8/year	8/year	8/year	8/year
Dissolved Organic Carbon, mg/L	8/year	8/year	8/year	8/year
Dissolved Oxygen, mg/L	1/week	1/week	1/week	1/week
E. coli / 100ml	1/week	1/week	1/week	1/week
Flow, cfs	1/week	8/year	8/year	1/week
Hardness, mg/L as CaCO3	1/week	1/week	1/week	1/week
Iron, µg/L	8/year	8/year	8/year	8/year
Lead µg/L	8/year	8/year	8/year	8/year
Manganese, µg/L	8/year	8/year	8/year	8/year
Mercury, µg/L	8/year	8/year	8/year	8/year
Nickel, µg/L	8/year	8/year	8/year	8/year
Nitrate-N, mg/L	1/week	1/week	1/week	1/week
Nitrite-N, mg/L	1/week	1/week	1/week	1/week
pH	1/week	1/week	1/week	1/week
Selenium, µg/L	8/year	8/year	8/year	8/year
Silver, µg/L	8/year	8/year	8/year	8/year
Sulfate	8/year	8/year	8/year	8/year
Temperature, °C	1/week	1/week	1/week	1/week
TKN-N, mg/L	8/year	8/year	8/year	8/year
Total Organic Carbon, mg/L	1/week	1/week	1/week	1/week
Total Phosphorus, mg/L	1/week	1/week	1/week	1/week
Zinc, µg/L	8/year	8/year	8/year	8/year

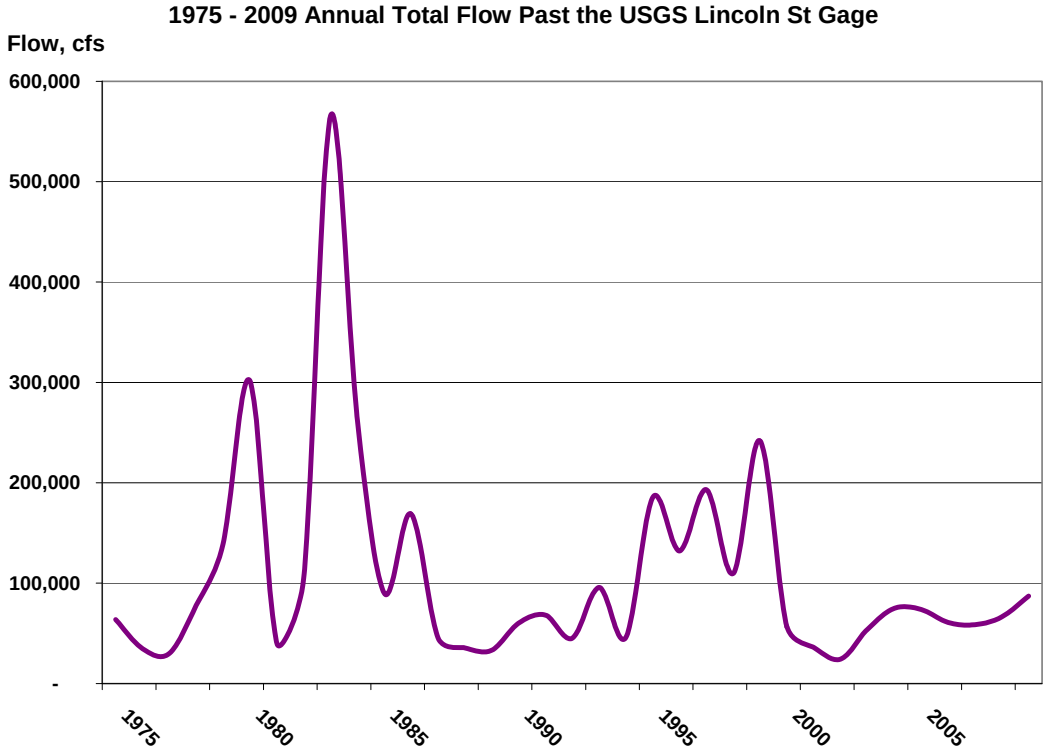
Legend:

Site Code	Description
432PLNC	Poudre River @ Lincoln Ave.
390PPROS	Poudre River at Prospect Street
380PNAT	Poudre River @ Nature Center
370PBOX	Poudre River above Boxelder Creek

- **Cooperative United States Geological Survey (USGS) Flow and Water Quality Monitoring on the Cache la Poudre in Segment 11 through Fort Collins:**

The City has participated in the USGS cooperative flow and water quality monitoring program on the Cache la Poudre River for over thirty years. This program plays mission critical roles in both managing the City's $700 million dollar water resources portfolio and providing independent documentation of ambient water quality conditions in the Poudre. Having accurate flow and water quality data is also essential for the Water Quality Control Division (WQCD) to develop accurate stream standards and discharge permit limits for the City's two water reclamation facilities.

The City pays the USGS a majority of the costs to record stream flow and water quality at several gage stations on the Poudre. At the USGS water quality sites, samples are collected and tested each month for a lengthy list of water quality parameters. Both the Lincoln Street and the river site above Boxelder Creek are equipped with continuous recording water flow gages. Real-time flow data for these two sites are posted at the USGS web site and available to the public. The entire historical record of flow and water quality data for the City-sponsored sites on the Cache la Poudre is available at the USGS web site.



The combined USGS-City cost total for the 2009 USGS flow and water quality monitoring on the Poudre was $116,580. The City's share of that amount was $81,680 with the remaining amount obtained from Federal matching funds. Details for the 2009 USGS flow and water quality sites on the Cache la Poudre River are presented in Table 4.

Table 4. City of Fort Collins & USGS Water Flow & Quality Cooperative Monitoring Sites, Period of Record and Cost-Sharing Importance to the USGS:

Site Number	Location	Period of Record	Flow and/or Water Quality	Importance to USGS †
6614800	Michigan River near Cameron Pass	1973 - Present	Flow	High
6746095	Joe Wright Crk above Reservoir	1978 – Present	Flow	Low
6746100	Joe Wright Crk blw Reservoir	1978 – Present	Flow	Low
06751150	North Fork Cache la Poudre blw Halligan Res.	1998 – Present	Flow	Low
06752258	Cache la Poudre at Shields St	1975 – 2005	Quality & Instantaneous Flow	Low
06752260	Cache la Poudre at Lincoln St	1975 – Present	Flow & Quality	High
06572270	Cache la Poudre at Prospect St	1975 – 2005	Quality & Instantaneous Flow	Low
06752280	Cache la Poudre above Boxelder Crk	1979 – Present	Flow & Quality	Medium
06737500	Horsetooth Res in conjunction with NCWCD & USBR	1969 - 2008	Quality	Low

† Ranking priorities influence the cost-sharing percentages. A higher USGS importance ranking increases proportion of available Federal matching funds for flow and water quality monitoring.

Table 5. 2009 Poudre River and Urban Creek Water Quality Program Cost Summary:

2009 Monitoring Program Description	Cost	Comment
USGS: U.S. Geologic Survey cooperative monitoring program for river six flow and two water quality sites on the Cache la Poudre from the Michigan River near Cameron Pass to the gage station upstream of Boxelder Cr.	$116,580	City's share: $81,680. Federal funds cover remainder.
Poudre River: City's Pollution Control and Water Quality Lab monitoring on Cache la Poudre River at both up- and down-stream sites from water reclamation facilities with both a weekly schedule and 8 special data collections for the Poudre Monitoring Alliance including the CSU fish and benthic macroinvertebrate surveys.	$92,152	Cost value of field sampling, field measurements and lab work; includes City's portion of Poudre Monitoring Alliance Program.
Urban Creeks: City's Pollution Control and Water Quality Lab quarterly monitoring at two sites on three urban creeks plus Parkwood Lake at three locations twice each year.	$6,939	Cost value of field sampling, field measurements and lab work.
Fossil Creek Ditch: 2008 & 2009 City's Pollution Control and Water Quality Lab bi-weekly monitoring of Fossil Creek Ditch at three sites from above the Drake WRF to Kechter Drive above the inlet to Fossil Cr Res. Monitoring began in late fall of 2008 and continued in 2009.	$46,484	Cost value of field sampling, field measurements and lab work. Study needed for development of future DWRF discharge permit limits.
2009 Fossil Cr Reservoir: Completed water quality *Mixing Zone Study* for the Drake Water Reclamation Facility (DWRF).	$8,500	Study needed for development of future DWRF discharge permit limits.
Fossil Cr Reservoir Water Quality: 2008 & 2009 Fossil Creek Reservoir water quality study for the Drake Water Reclamation Facility (DWRF). Study needed for development of DWRF discharge permit limits.	$56,273	Cooperative monitoring program and cost sharing between the City and South Fort Collins Sanitation District. Data analysis and reports from Western Environmental Analysts, Inc.
2009 **CSU** Fish and Macro-invertebrate Biosurveys on the Poudre through the City	$22,250	Part of the Regional Poudre Monitoring Alliance Program

In 2009, the City committed over $349,000 to collect both water quality and flow data on the lower Cache la Poudre River, key urban creeks and Fossil Creek Reservoir. This data is used to manage operations at the City's two water reclamation facilities and to manage its extensive water rights portfolio. The data is also used to assess stormwater impacts on the river and key urban creeks.

- **Is the Cache la Poudre River through Fort Collins Meeting Stream Standards?** *Yes, except for Selenium Levels*

Water quality conditions for the Cache la Poudre are reviewed approximately every five years by the Water Quality Control Division (WQCD) of the Colorado Department of Public Health and Environment. The review is then used to determine new classifications and standards, to identify exceedences in water quality standards and then to subsequently develop discharge permit limits for industries, communities and sanitation districts. Permitted discharge limits are designed to protect the receiving stream. The WQCD completed a review of the river through Fort Collins in 2008 and Table 6 presents the results of their findings:

Table 6. Poudre Water Quality: Standards vs. Actual Test Results. 2008 Report from the Colorado Water Quality Control Division for Segment 11 of the Cache la Poudre from Shields Street to Boxelder Creek just upstream of I-25.

Parameter	TVS†	Results‡	# of Tests	Meeting Std?
pH, std units	6.5 – 9.0	7.6 – 8.51	438	Yes
Dissolved Oxygen, mg/L	5	8.4	384	Yes
Hardness, mg/L as CaCO3	NA	284	448	Yes
E. coli # / 100ml	126	24	185	Yes
Arsenic, dissolved, µg/L	7.6	0	112	Yes
Cadmium, dissolved, µg/L	0.93	0	148	Yes
Copper, dissolved, µg/L	21.81	2.77	330	Yes
Iron, dissolved, µg/L	NA	69	286	Yes
Iron, total recoverable	1000	180	264	Yes
Lead, dissolved, µg/L	7.67	0	145	Yes
Manganese, dissolved, µg/L	2335	53.4	119	Yes
Selenium, dissolved, µg/L	**4.60**	**5.4**	**205**	**No**
Silver, dissolved, µg/L	1.93	0	208	Yes
Zinc, dissolved, µg/L	302.5	23.2	147	Yes
Uranium, dissolved, µg/L	4738	9.4	5	Yes
Ammonia-N, mg/L	TVS	0.3	381	Yes
Nitrate-N, mg/L	100	1.18	252	Yes
Sulfate, mg/L	NA	282.4	75	Yes

Derived from "Colorado Department of Public Health & Environment. Water Quality Control Commission, Regulation No. 38, WQCD Exhibit 38-11, June 2009..

† = TVS: Table Value Standard µg/L = part per billion mg/L = part per millions

‡ Results from the Water Quality Control Division, US Geological Survey, RiverWatch, Boxelder Sanitation District and the City of Fort Collins. Selenium exceedences on the Cache la Poudre were reported by RiverWatch. TVS stream standard for Selenium was reduced by the EPA to a lower level in 2001. Selenium exceedences were the result of stricter standards and not changes in water quality.

The chronic dissolved selenium standard was exceeded in the Cache La Poudre River at the USGS gage above Boxelder Creek (BSD #Station 4), at Lee Martinez Park (Riverwatch, RW #599), at Prospect Rd. (RW #602), and above Boxelder Creek (USGS #6752280). The acute dissolved copper standard was exceeded in the Cache La Poudre River at Lee Martinez Park (RW #599).

- **Potential Impacts of the 2009 Change to "Anti-Degradation Review Status" for the Cache la Poudre River through Fort Collins**:

For over thirty years, Segment 11 of the Poudre River from Shields Street to the confluence above Boxelder Creek, has been designated "*use-protected*". "Use protected" classification meant that regulated discharges, such as permitted wastewater effluents, could "use-up" the assimilative capacity of the river up to the water quality standard. Like other dischargers to "use-protected" streams, discharge limits for the City's Mulberry and Drake Water Reclamation Facilities (MWRF & DWRF) were calculated on that assumption. In their 2008 review of stream classifications and standards, the Colorado Water Quality Control Division (WQCD) reported:

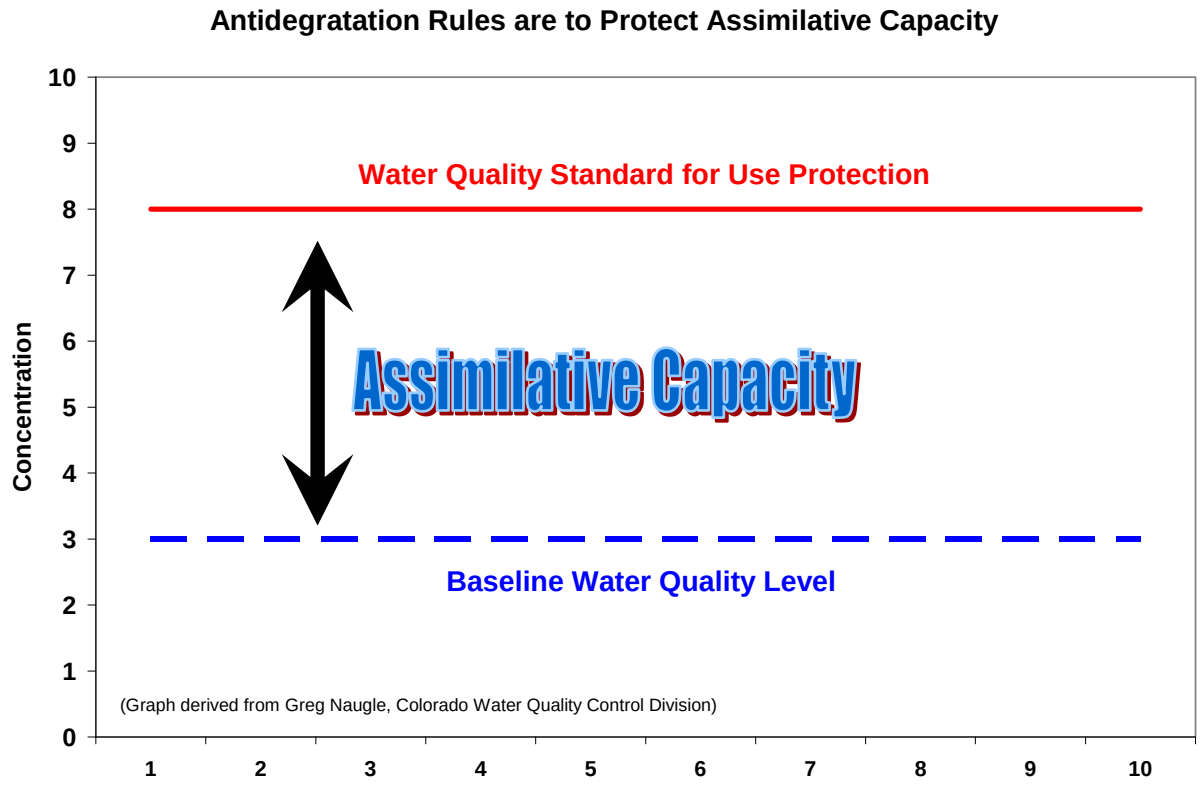
> ***"Evidence shows that the water quality in this* [i.e. the Poudre] *segment is better than TVS* [*sic*: table value standards] *for the key parameters, and supports the removal of the Use-Protected designation as defined in 31.8(2)(b). Of the 12 key parameters, only the dissolved selenium standard was exceeded."***

The WQCD reached this determination after careful review of the available water quality data in that segment of the Poudre. The Division made use of the extensive water quality datasets collected directly by the City's Pollution Control Laboratory and as well as the City-sponsored USGS flow and water quality monitoring program on the Poudre through Fort Collins.

Subsequently in June 2009, the Colorado Water Quality Control Commission (WQCC) approved the change to "anti-degradation review (ADR)" status for Segments 10, 11, and 12 of the Poudre. **The basic purpose of ADR status is to maintain and protect existing water quality.** These three classification segments extend from the Monroe Canal diversion upstream of Gateway Park to the confluence of the Poudre with the Platte east of Greeley.

2009 Colorado Water Quality Control Division Stream Classification Segments of the Lower Cache la Poudre River. Segments 10, 11, 12, 13b and 14 are all now classified with ADR status:

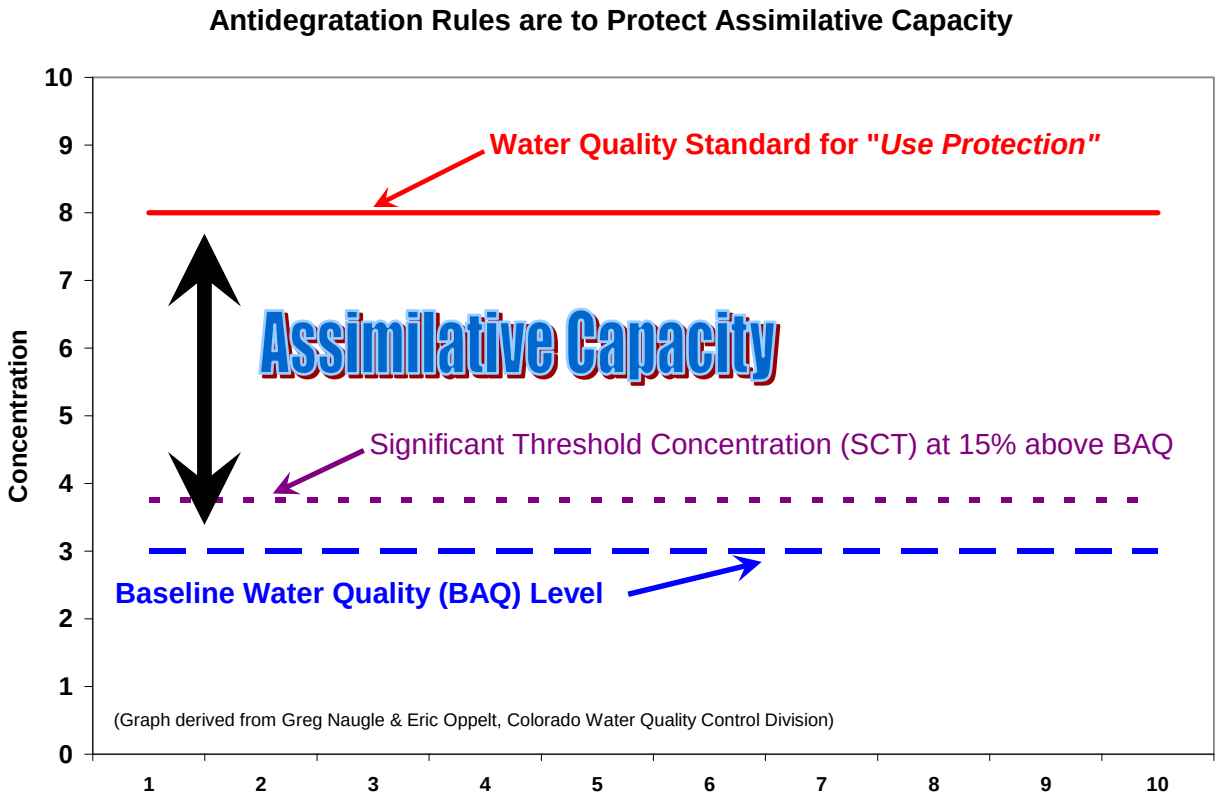
Poudre River Classificaton Segment ID#	Segment Description
10	Cache la Poudre River, Monroe Canal to Shields Street
11	Cache la Poudre River, Shields St to Boxelder Cr
12	Cache la Poudre River, Boxelder Creek to S. Platte River
13a	All tributaries to the Cache la Poudre River, including all lakes reservoirs and wetlands, from the North Fork of the Cache la Poudre River to the confluence with the South Platte River (Spring Creek, Fossil Creek, Parkwood Lake)
13b	Boxelder Creek from source to the Cache la Poudre River
14	Horsetooth Reservoir
In 2009, New Separate Segment 22 for Fossil Cr Reservoir	Fossil Creek Reservoir (Use-Protected Classification)



As depicted above, under the former "use-protected" status, a regulated discharge could "use-up" the assimilative capacity of the river to the level of the stream standard. Under ADR status, however, the assimilative capacity of the river is protected. The change to ADR status for Segments 10 through 13b means that no existing or new permitted discharge to the river will be allowed to degrade the existing high water quality conditions in the Poudre or its tributaries.

- **Comparison of Former "Use-Protected" Status Contaminant Levels with "Anti- Degradation Review" Limits**

Allowed pollutant limits calculated under "use protection" have the underlying goal of not exceeding established water quality standards. Theoretically, the "assimilative capacity" of the receiving water can be "used-up" as long as the stream standards were not exceeded. Under ADR, however, only a fraction of the assimilative capacity of the receiving water can be "used up" to a critical or significant threshold concentration (SCT). Still under development at the WQCD, the SCT pollutant level may be set at a maximum of 15% of the assimilative capacity:



The "Review" portion of the ADR process begins before any new or increased water quality impacts are allowed. Activities that are subject to antidegradation review are those that:

- require a discharge permit,
- require water quality certification under section 401 of the federal Act; or
- are subject to control regulations.

A first step in the antidegradation review process is a determination, in accordance with criteria specified in the regulation, whether "significant degradation" would result from the proposed new activity. If not, the review ceases. If significant degradation would result, a determination is made whether the degradation is necessary to accommodate important economic or social development in the area in which the waters are located. This determination is based on an assessment of whether there are alternatives available that would result in less degradation of state waters and which are economically, environmentally, and technologically reasonable. The proposed degradation is allowed only if no such alternatives are available.

- **Implications of ADR Status on the Poudre, Urban Creeks and Stormwater Quality Programs**:

  Potential impacts of ADR are multifold and include:

  - Changes in the criteria used to evaluate, regulate and permit water projects that will impact water quality in the Poudre and its tributaries. The change to ADR status will impact planning, development, construction and operations of the Northern Integrated Supply Project (NISP) and the Halligan-Seaman Water Supply Project (HSWSP). ADR evaluations will need to be completed as part of developing the final Environmental Impact Statements (EISs) for both NISP and HSWSP as well as during any permit application process for these proposed projects filed with the State's Water Quality Control Division.

  - Changes to the manner in which the City's Water Reclamation facilities are permitted and operated. The ADR review process is lengthy, involved and costly. To determine future treated wastewater discharge limits, very detailed and rigorous treatment characterization data collection activities must occur followed by equally rigorous analyses. Additional treatment systems and processes may need to be constructed, operated and maintained to meet the more stringent ADR-based limits. These changes have been anticipated in the design of the current Mulberry WRF upgrades. The Drake WRF does not discharge to the Poudre; it discharges to Fossil Creek Reservoir. The reservoir is classified as "use-protected" and is therefore not subject to ADR. Should Fossil Creek Reservoir be re-classified to ADR status in the future, treatment plant upgrades costing several tens of millions of dollars will need to be designed and constructed. Funds for significantly higher ongoing operating and maintenance (O&M) costs will need to be budgeted as well.

  - The development and application of more restrictive requirements in the City's Stormwater Quality (MS4) permit.

  - Changes to permit limits for other current or proposed regulated discharges from City projects or operations to the River.

With the change to ADR status for the Poudre from the Monroe Diversion upstream of Gateway Park to its confluence with the Platte east of Greeley, both regulated (permitted) water supply and wastewater treatment operations will, in the future, become part of an elaborate web of discharge limitation modeling with subsequent permit limits designed to protect both the river and its tributaries. The application of ADR will result in higher treatment plant capital project and O&M costs. ADR will also become a key driver for furthering both local and regional cooperation in minimizing environmental impacts on the Poudre.

- **303(d) Listing of *Impaired* Waters on the Cache la Poudre River**

In accordance with Section 303 of the Clean Water Act (PL 92-500), the Colorado Water Quality Control Division (WQCD) evaluates waters every two years to determine if they are impaired from meeting their water quality criteria. Waters that are determined to be impaired are added to the State's 303(d) list and become eligible for grant funds to determine the cause of impairment. Based on data collected in part by the City, the Cache la Poudre River, below the confluence with Boxelder Creek and then east to the South Platte River was put on the State's 303(d) list for high *E. coli* levels in 2004. The presence of *E. coli* is an indicator of fecal contamination in the water. This has been a long-term issue on the lower reaches of the Cache La Poudre and is attributed primarily non-point source and stormwater runoff and irrigation return waters from agricultural operations.

Table 7 presents a summary of the 303(d) listing status for the Cache la Poudre River from the Monroe diversion through the various classification segments to its confluence with the Platte River east of Greeley. **Note that Segment 11 through the City is not listed as 303(d)-impaired for any water quality parameter.**

However, both Fossil and Boxelder Creeks as well as Segment 12 of the Poudre below Boxelder Creek are listed as 303(d) impaired for selenium values that exceed the chronic table value stream standard of 4.6 µg/L. The following paragraph provides details on the toxicity, nature and fate of selenium in waters and the environment:

> *"Selenium is an essential nutrient for humans and animals. There is a narrow margin between too little and too much selenium. Selenium can be harmful to humans at 5 to 10 times recommended daily dose (55 micrograms per day for adults). Selenium is more toxic to vertebrates than to invertebrates and plants. Selenium is more toxic to fish and wildlife than to humans. Selenium "bioaccumulates" in the food chain, when selenium is ingested in amounts greater than the body needs, the excess selenium is not excreted, but instead is retained within the body. As organisms are preyed upon by other animals higher on the food chain, the predator takes on the entire body burden of selenium carried by the prey. High concentrations of selenium can result in adverse impacts to birds and fish, including selenium poisoning and reproductive toxicity. Extremely high concentrations of selenium can result in adverse impacts to livestock."* (Source: Fountain Creek Watershed Group, Pikes Peak and Pueblo Areas Council of Governments)

It should be noted that the selenium-impaired listings given in Table 7 are a result of a lower EPA and CDPHE stream standard and <u>not</u> changing water quality. For comparison, the safe drinking water standard for selenium is 50 µg/L (microgram per liter or part per billion, ppb) and Fort Collins drinking water contains less than 1 µg/L or less than 1 ppb.

Table 7. 2009 Colorado 303(d) Listing of Impaired Waters on the Cache la Poudre River:

River Segment COSPCP ID#	Segment Description	Designation	Use Classifications	Portion	Impairment	State's Priority	Easy Fix?
10	Cache la Poudre River, Monroe Canal to Shields Street	**Anti-Degradation Review (ADR) in 2009†**	Aquatic Life Cold 2 Recreation E Water Supply Agriculture	Below confluence with North Fork	**pH, Copper**	Medium	No
11	Cache la Poudre River, Shields St to Boxelder Cr	**ADR in 2009†**	Aquatic Life Warm 2 Recreation E Agriculture	All	**None**	-	-
12	Cache la Poudre River, Boxelder Cr to S. Platte River	**ADR in 2009†**	Aquatic Life Warm 2 Recreation E Agriculture	All	**Selenium**	Low	No
12	Cache la Poudre River, Boxelder Creek to S. Platte River	**ADR in 2009†**	Aquatic Life Warm 2 Recreation E Agriculture	Below Eaton Draw	***E. coli***	High	No
13a, **New Separate Segment 22 in 2009 for Fossil Cr Reservoir**	All tributaries to the Cache la Poudre River, including all lakes reservoirs and wetlands, from the North Fork of the Cache la Poudre River to the confluence with the South Platte River	**Use Protected Status Renewed in 2009**	Aquatic Life Warm 2 Recreation E Water Supply Agriculture	**Fossil Creek Reservoir**	**Selenium**	Low	No
13b	Boxelder Creek from source to the Cache la Poudre River	**ADR in 2009†**	Aquatic Life Warm 2 5/15-9/15 Recreation P 9/16-5/14 Recreation N Agriculture	All	**Selenium**	Low	No
14	Horsetooth Reservoir	Anti-Degradation Status – Reviewable	Aquatic Life Cold 2 Recreation E Water Supply Agriculture	All	**Dissolved Oxygen; Aquatic Life Use (Mercury fish consumption advisory)**	Low / High	No

Derived from: Colorado Department of Public Health and Environment; Water Quality Control Commission; 5 CCR 1002-93 April 2008; Regulation #93; Section 303(d) list water-quality-limited segments requiring TMDLs. † Moved to "Reviewable" Anti-Degradation Status by the Water Quality Control Commission on 09 June of 2009.

- **Parkwood Lake Water Quality:**

Since 1983, the City has shared in an agreement with the Parkwood Property Owner's Association (POA) for water quality monitoring on Parkwood Lake. The lake receives water from Arthur Ditch and stormwater from City streets. In giving permission for the City to use the lake as a receiving waterbody for stormwater, the City committed to an ongoing water quality monitoring program.

Twice each year, field measurements are taken and water samples are collected for testing at three defined locations near the shoreline of the lake. A summary of the data since 2006 is presented in the table below. Water quality is currently meeting applicable standards. However, should the Colorado Water Quality Control Division (WQCD) adopt strict "nutrient criteria" standards there may be issues with total phosphorus levels in the lake. Phosphorus is a common constituent of lawn and garden fertilizers as well as animal and bird feces.

2006 - 2009 Parkwood Lake Water Quality Summary

Parameter	Average	Maximum	Minimum	Standard	Good?
Ammonia-N (Nitrogen), mg/L	<0.1	0.1	<0.1	TVS †	**Yes**
Biochemical Oxygen Demand-5 Day, mg/L	4.4	8	<2	none	**Yes**
Conductivity, µmhos/cm	389	712	234	none	**Yes**
Dissolved Oxygen, mg/L	9	13	6	5	**Yes**
E. coli / 100 ml	15 (geomean)	143	<1	126 ‡	**Yes**
Hardness, mg/L as CaCO3	157	263	111	none	**Yes**
Lead, µg/L	<5.0	<5.0	<5.0	10.55	**Yes**
Nitrate-N, mg/L	<0.05	0.09	<0.05	10	**Yes**
Nitrite-N, mg/L	<0.05	<0.05	<0.05	0.5	**Yes**
pH	8.4	8.7	7.9	6.5 - 9.0	**Yes**
Silver, µg/L	<0.2	<0.2	<0.2	3.27	**Yes**
Temperature, °C	16	21	10	*I.D.*	**Yes**
Total Phosphate, mg/L	0.09	0.116	<0.1	0.082 [a]	**Yes[a]**
Zinc, µg/L	<5.0	<5.0	<5.0	393.2	**Yes**

Legend:

† TVS: Table Value Standard based on pH and temperature calculation

‡ Standard is based on geometric mean calculation of available stream or lake data

I.D. = Insufficient Data

a: Possible problem with very strict future "Nutrient Criteria" Standard for Lakes and Reservoirs. See page 51.

In 2009, the Parkwood POA contacted the Utility and asked for additional water quality testing to help evaluate options for control of algae and corrosion in their irrigation systems. Additional sampling and testing was completed in September 2009. The results and analysis indicated that at the time of sampling, the lake showed full mixed condition and oxygen levels near saturation.

Near Middle of Parkwood Lake Temperature and Dissolved Oxygen Levels on 08 September 2009:

Depth from Top, ft	Temperature °C	Dissolved Oxygen mg/L
0.5	24.1	9.42
1.5	22.7	9.92
2.5	22.2	9.81
3.5	21.8	9.49
4.5	21.7	8.81

Chlorophyll-a Analyses on samples collected 08 September 2009:

Parkwood Lake, middle depth of 4.5 ft: 25.8 µg Chlorophyll-a per Liter

Parkwood Lake Pump Intake: 18.7 µg chlorophyll-a per Liter

Parkwood Lake photo taken from sample site “A”

- **Center Lake at Fossil Creek Park:**

In 2009, efforts were started to rehabilitate Center Lake at Fossil Creek Park. Also known as the Portner Reservoir site, decades of organic matter had accumulated in the bottom of the lake. The Parks Planning and Development Division retained environmental engineering experts from CSU to develop a plan and implement a program to restore water quality in the lake. In mid-August, aerators were started to begin the restoration process. Unfortunately, dissolved oxygen levels in the lake dropped resulting in a fish kill:

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September 11, 2009

Department of Wildlife investigates fish kill at Fort Collins park

BY BOBBY MAGILL
BobbyMagill@coloradoan.com

The Colorado Division of Wildlife is investigating the fish kill at Center Lake at Fossil Creek Park, where hydrogen sulfide and a lack of oxygen killed thousands of fish and created a stench that angered many of the park's neighbors.

The city has been working with CSU to return the lake — part of the old Portner Reservoir — to ecological health using aerators.

Decaying organic matter at the bottom of the lake produced hydrogen sulfide, which smells like rotten eggs, and reduced the already-low oxygen level in the lake, which was especially oxygen-deprived near the bottom. The aerators, which stirred-up the lake making the smell worse, help provide adequate oxygen to all levels of the lake.

At the beginning of the aeration project, dead fish could be seen floating on the western shore of Center Lake.

DOW spokeswoman Jennifer Churchill said Friday the agency is investigating the fish kill and working with the city on "settlement parameters."

Even though the city is cooperating with the DOW, the agency could end up suing the city if a settlement is not reached, she said.

"We'll have to figure that out once we sit down with the city and have that conversation," she said, adding that she could not comment further on details of the investigation.

Fort Collins Parks and Recreation Planning Director Craig Foreman said the DOW prepared a report following its initial investigation, and he thinks the agency understands the fish kill was unanticipated as the city tries to rehabilitate the lake.

Foreman said he has not see the DOW report, but he thinks it will be fair in its assessment of the situation.

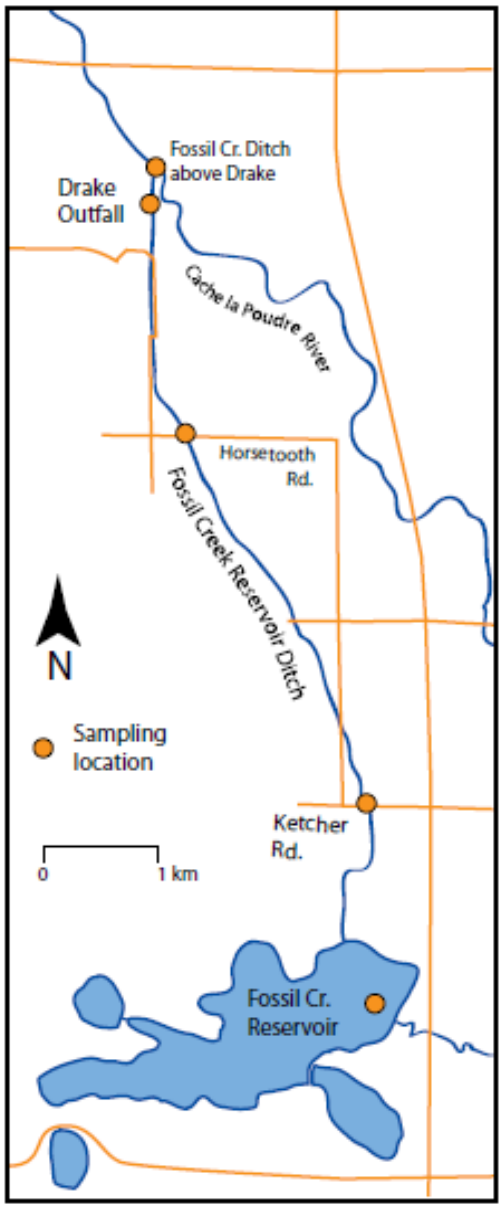
"We want to do the right thing," he said. "Whatever they tell us, we'll work on that."

In cooperation with DOW, Parks is conducting water suitability tests with live fish before initiating a re-stocking program. Efforts now focus on implementing the long-term goal of restoring the lake in a timely manner within current economic constraints.

- **Monitoring Fossil Creek Ditch and Fossil Creek Reservoir:**

The City's Pollution Control Laboratory staff monitor Fossil Creek Ditch both up and downstream of the DWRF discharge as well as above the inlet to Fossil Creek Reservoir over four miles away to the south. There are urban usage, stormwater, treated wastewater and former gravel mining pond impacts on both the Poudre river and Fossil Creek Ditch.

Map of Drake Water Reclamation Facility (DWRF) and discharge point to Fossil Creek Ditch leading to Fossil Creek Reservoir (from Lewis & McCutchan Report 292, 2009**):**

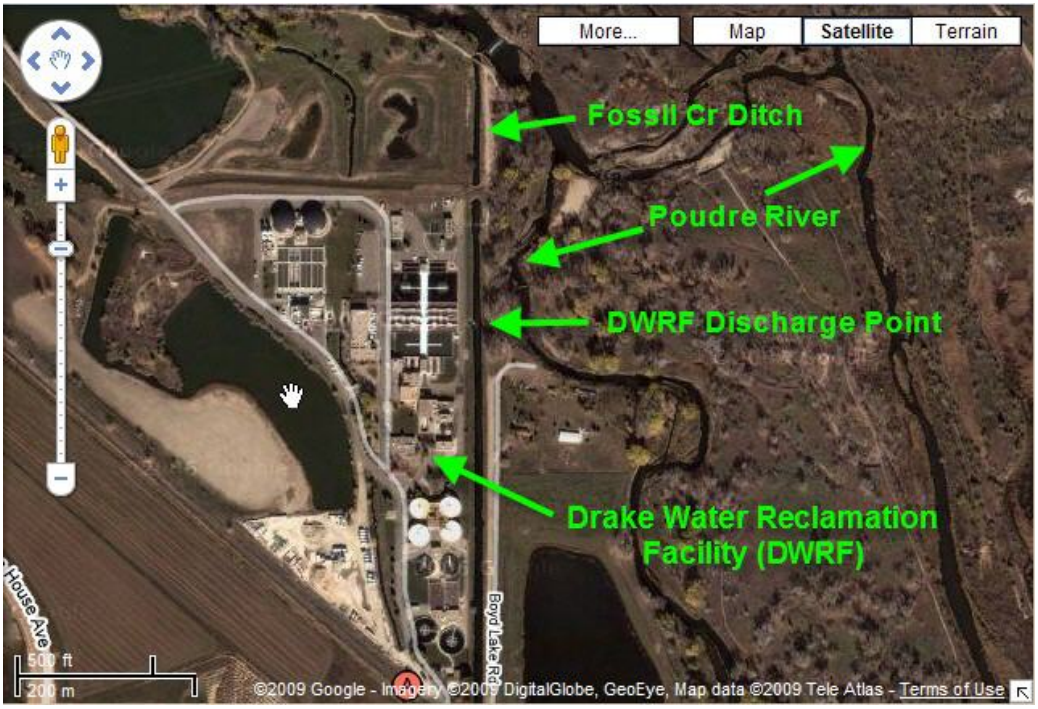


For over 20 years, the Drake Water Reclamation Facility (DWRF) has discharged to Fossil Creek Ditch just below its confluence with the Poudre. This blend of Poudre and treated wastewater then travels over four miles south and is discharged at the northeast corner of Fossil Creek Reservoir. In addition, the South Fort Collins Sanitation District water reclamation facility discharges directly into the west end of reservoir.

In 2009, the Colorado Water Quality Control Division gave Fossil Creek Reservoir a separate designation as Segment 22 of the Poudre with corresponding classifications and standards. A key designation assigned to the reservoir at that time was continuation of "use protected" status.

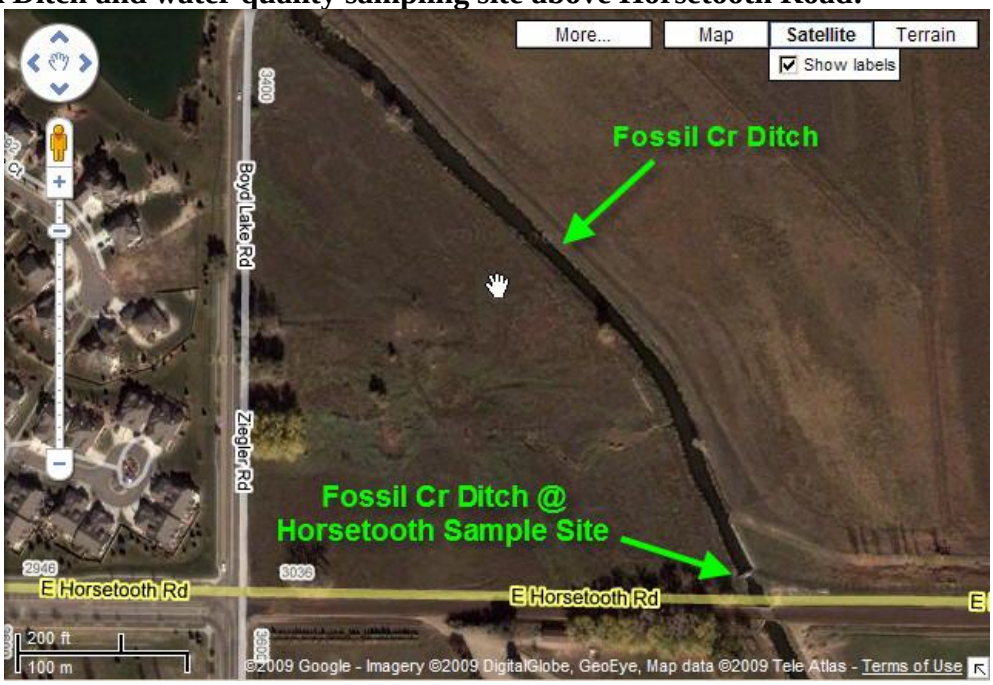
In 2009, several studies were completed relating to both present and future regulatory changes that will affect continued treated wastewater discharges to the ditch and reservoir. Three key studies related to DWRF operations included definition of the mixing zone from the ditch flowing into the reservoir, evaluation of "effluent dominance" for both MWRF and DWRF as well as determination of possible discharge limits under the new Anti-Degradation Review (ADR) criteria.

Aerial Map of Drake Water Reclamation Facility (DWRF) and discharge point, Cache la Poudre River, and Fossil Creek Ditch:



Treated Effluent Discharge Point for the DWRF into Fossil Creek Ditch:

Fossil Creek Ditch and water quality sampling site above Horsetooth Road:



Fossil Creek Ditch sample site just above Kechter Drive leading to Fossil Creek Reservoir:

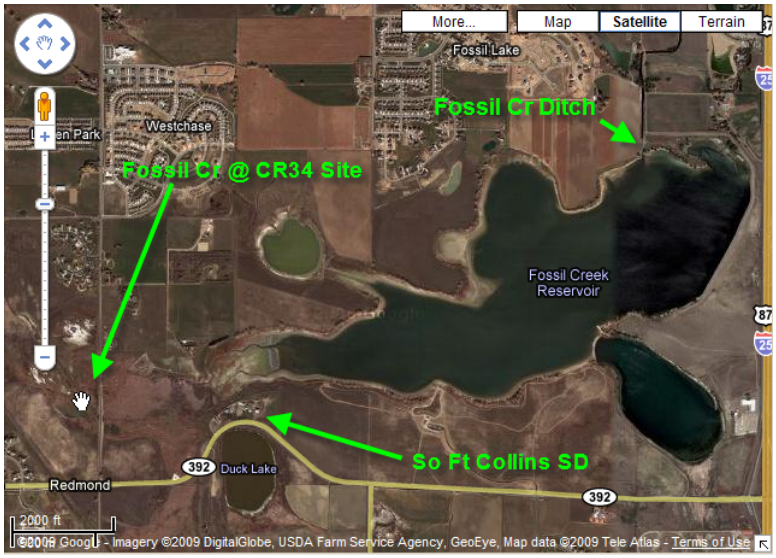
Table 8. 2008 Fossil Creek Ditch Study Parameter Matrix:

City of Fort Collins Fossil Cr Ditch Water Quality Acrual Study for DWRF NPDES Permit — 25-May-09
Pollution Control Laboratory / City of Fort Collins

Latitude	40°33'34.04748"N	40°29'53.43265"N	40°32'16.14181"N	40°29'53.43265"N
Longitude	105°01'12.48682"W	105°00'01.85699"W	105°00'59.10532"W	105°00'01.85699"W
Test Parameters	**Nature Center Site above Fossil Cr Ditch just upstream of DWRF discharge to Fossil Cr Ditch**	**DWRF Effluent Discharge to Fossil Cr Ditch - NPDES Testing Requirements**	**Fossil Creek Ditch Control Structure at Horsetooth Road**	**Fossil Creek Ditch above discharge point to Fossil Cr Reservoir @ Kechter Drive**
Phyicals, Nutrients, etc:				
Instantaneous Flow, cfs		Yes, continuous		
5-Day BOD, mg/L	-	Yes, 3 per week	-	-
Total Suspended Solids, mg/L	Yes, bi-weekly	Yes, 3 per week	Yes, bi-weekly	Yes, bi-weekly
Total Residual Chlorine, mg/L	-	Yes, 5 per day	-	-
Oil & Grease, mg/L	-	Yes, daily	-	-
pH	Yes, bi-weekly	Yes, daily	Yes, bi-weekly	Yes, bi-weekly
Temperature °C	Yes, bi-weekly	Yes, daily	Yes, bi-weekly	Yes, bi-weekly
Conductivity, µmhos/cm	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly
Cyanide, Total, µg/L	-	Yes, Quarterly	-	-
E. coli by QuantiTray / 100ml	Yes, bi-weekly	Yes, daily	Yes, bi-weekly	Yes, bi-weekly
Whole Effluent Toxicity, Chronic	-	Report Stat Dif & IC25, quarterly	-	-
Hardness, mg/L as CaCO3	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly
NH3-N, Total, mg/L	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly
Nitrite-N, mg/L	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly
Nitrate-N, mg/L	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly
TKN, mg/L	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly
DOC, mg/L	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly	Yes, bi-weekly
Metals:				
Arsenic, total, µg/L	-	Yes, Quarterly	-	-
Cadmium, pd, µg/L	-	Yes, Quarterly	-	-
Chromium, total, µg/L	-	Yes, Quarterly	-	-
Copper, total rec, µg/L, Dr Lewis	2X / month	2X / month	2X / month	2X / month
Copper, dissolved, µg/L, river	2X / month	2X / month	2X / month	2X / month
Copper, pd, µg/L NPDES		2X / month		
Iron, dis, µg/L	-	Yes, Quarterly	-	-
Iron, total rec, µg/L	-	Yes, Quarterly	-	-
Lead, pd, µg/L	-	Yes, Quarterly	-	-
Manganese, pd, µg/L	-	Yes, Quarterly	-	-
Mercury, total 1631E, ng/L	2X / month	2X / month	2X / month	2X / month
Nickel, pd, µg/L	-	Yes, Quarterly	-	-
Selenium, pd, µg/L	2X / month	2X / month	2X / month	2X / month
Silver, pd, µg/L	-	Yes, Quarterly	-	-
Zinc, pd, µg/L	-	Yes, Quarterly	-	-

Fossil Creek Ditch at the inlet point to Fossil Creek Reservoir:

Aerial Map of Fossil Creek Reservoir, Fossil Creek Ditch Inlet and the urban creek sample site on Fossil Creek:



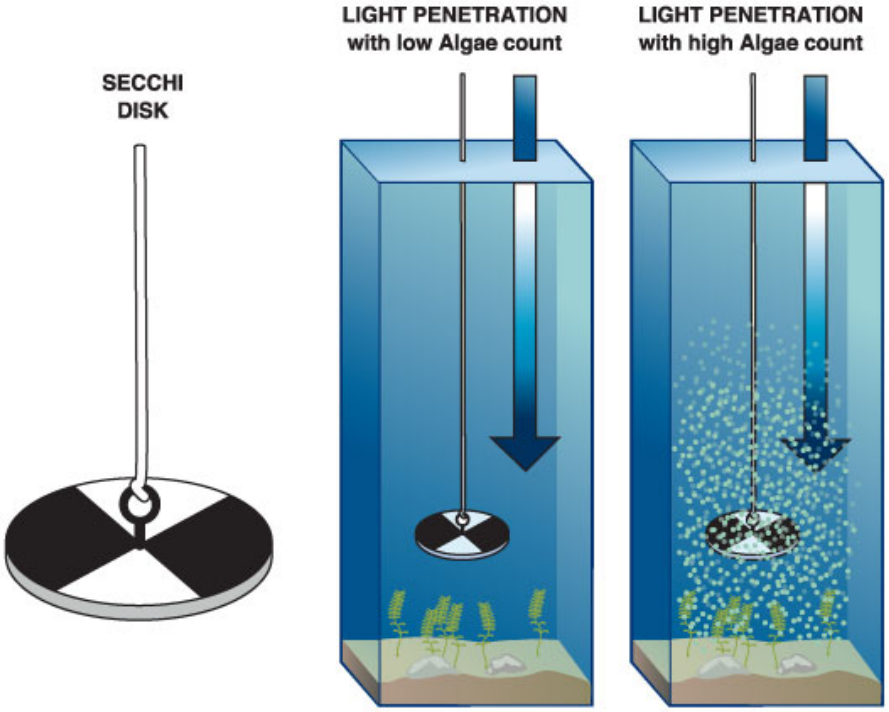
Fossil Creek Reservoir is located approximately 4.5 miles downstream from the Drake WRF discharge to Fossil Creek Ditch. The ditch is influenced by urban usage, Stormwater runoff, and treated wastewater impacts from both the DWRF and South Fort Collins Sanitation District. It is also the receiving reservoir for Fossil Creek. Fossil Creek is listed as 303(d) impaired for high Selenium levels.

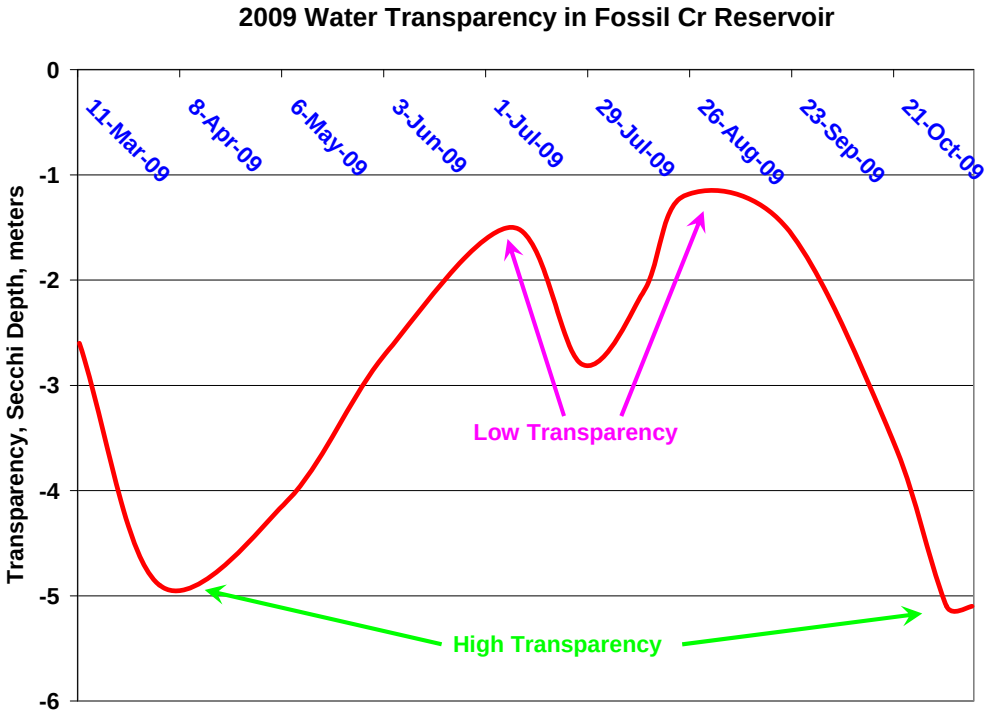
Table 9. 2008 – 2009 Fossil Creek Reservoir Study Parameter Matrix:

Fossil Creek Reservoir 2008 - 2009 Water Quality Study Parameters

Field Parameters: vertical depth profiles of:	Test Method	Tester
Temperature	SM-2550B	Field Crew
pH	EPA 150.1	Field Crew
Conductivity	EPA 120.1	Field Crew
Dissolved Oxygen	EPA 360.1	Field Crew
Three separate depth samples from reservoir water column: top, mid, & bottom		
Water Quality Test Parameters for each sample:		
E. coli	SM 9223B	PCLab
Soluble reactive phosphorus	SM-4500-P	WQLab
Total dissolved phosphorus	SM-4500-P	WQLab
Particulate phosphorus	SM-4500-P	WQLab
Ammonia-nitrogen	EPA 350.1	WQLab
Nitrate-nitrogen	EPA 300	WQLab
Nitrite-nitrogen	EPA 300	WQLab
TKN (Total Kjeldahl Nitrogen)	EPA 351.2	PCLab
Chlorophyll a	SM10200H WQL	WQLab
Phytoplankton composition (quantitative)	SM10200-F	PCLab
Major Cations (calcium, magnesium, sodium, potassium)	Flame AA	PCLab
Major Anions:		
Bicarbonate	SM 2320B	PCLab
Sulfate	EPA 300	WQLab
Chloride	EPA 300	WQLab
Chlorine (Ac/Ch)	SM-4500 CL	PCLab
Sulfur		
Boron	EPA 200.7	Analytica
Cyanide	SM-4500E	Analytica
Metals Test Parameters:		
Arsenic-T	200.9	PCLab
Cadmium-PD	200.7	PCLab
Chromium-T	200.7	PCLab
Copper-PD	200.9	PCLab
Iron-D&TR	200.7	PCLab
Lead-PD	200.7	PCLab
Manganese-PD	200.7	PCLab
Manganese-Dissolved	200.7	PCLab
Mercury-T (1631E)	1631E	PCLab
Nickel-PD	200.7	PCLab
Selenium-PD	200.9	PCLab
Silver-PD	200.9	PCLab
Zinc-PD	200.7	PCLab

Secchi Disk Measurement of Water Transparency in Fossil Creek Reservoir: Secchi depth is a quick and inexpensive way to assess the health of a lake or reservoir. In general, the greater the depth before the disk disappears, the healthier the water body.

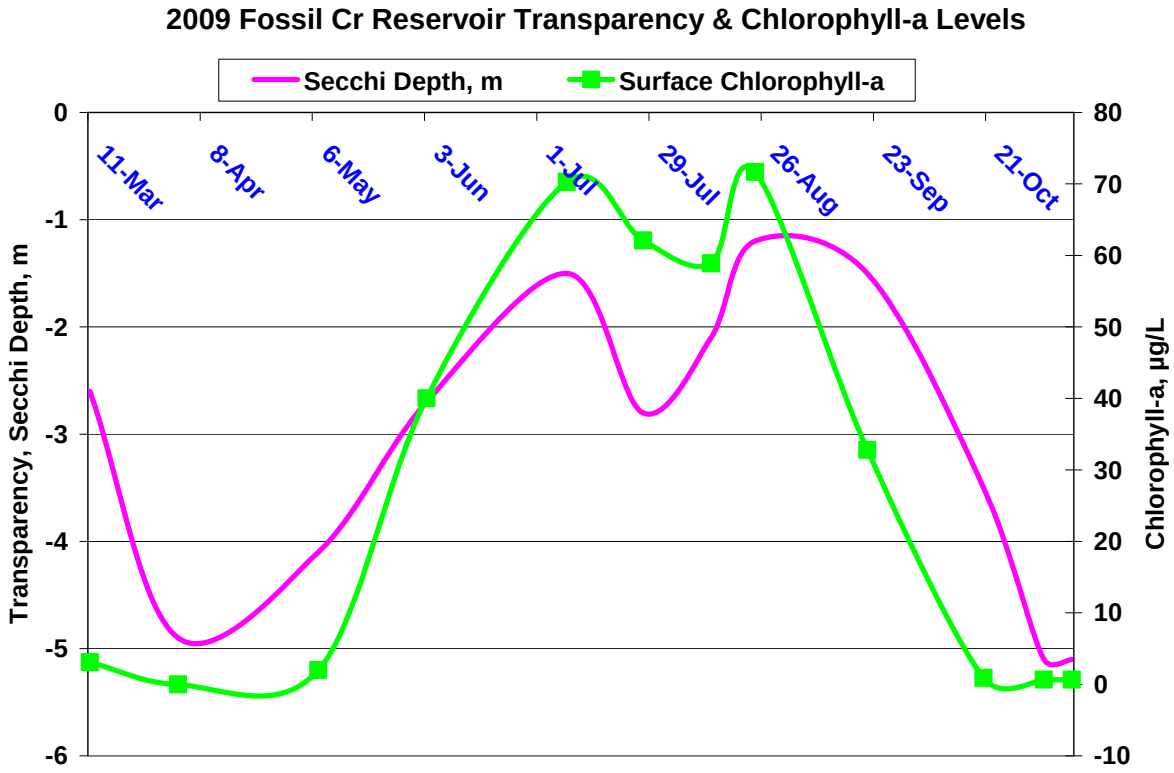




Note the strong seasonal trends in the loss of Fossil Creek Reservoir transparency. With algal growth in the summer months, the transparency is decreased. Suspended particles of silt and clay from watershed runoff can also contribute to a loss in water clarity. In the fall season at the reservoir, the algae die away and the water becomes more transparent again.

Correlation Water Transparency and Chlorophyll-a Levels in Fossil Creek Reservoir:

In 2009, there was a strong correlation of loss in transparency in Fossil Creek Reservoir water with green algae growth and their production of chlorophyll-a.



Nutrients (phosphorus and nitrogen) in the water from fertilizers, treated effluent from the DWRF and the South Fort Collins Sanitation District as well as stormwater discharges are likely contributing factors to algal growth in the reservoir.

Fossil Creek Reservoir is classified as a use-protected agricultural water supply reservoir and the surrounding open space is managed by the Larimer County Parks. Swimming, fishing, wading and boating (except for emergency or maintenance) are prohibited per the 2001 City of Fort Collins lease with North Poudre Irrigation Company. The reservoir operations are patrolled by parks rangers.

- **Stormwater Quality Study Programs Underway in 2009 and 2010**:

In cooperation with Colorado State University (CSU), the City is conducting a three year wet-weather monitoring program to assess the effectiveness of existing structural stormwater Best Management Practices (BMPs) and new Low Impact Development (LID) BMPs. The program will also help identify potential pollutants of concern within our urban area to better focus the resources of our urban watershed protection program.

Existing City-owned and operated BMPs currently being monitored include:

- the constructed wetlands located at the Howes Street Outfall near Martinez Park,

- the large regional water quality detention pond located at the Udall Natural Area, and

- the sand infiltration basin located at 215 N. Mason Street.

The City's LID pilot projects, which incorporate more innovative BMPs, include:

- the permeable pavers at the Mitchell Block (Bohemian Foundation Building) and

- the porous concrete pavement located at CTL Thompson (351 Linden St.)

BMP monitoring began in fall of 2009. As of May, 2010 water quality and/or water quantity data was collected from 10 wet-weather events (3 snow and 7 rain) at 9 different sites. A minimum of approximately 0.25 inches of precipitation is needed from each event for data collection to be possible. The water quality data will help us evaluate how well certain BMPs remove pollutants such as bacteria, total suspended solids, nutrients, and metals. The water quantity data will help us determine which BMPs are more effective at minimizing downstream flooding and/or stream degradation.

To date, the research team has focused primarily on data collection and has not yet analyzed enough of the collected data to make conclusions. However, preliminary results suggest that some BMPs are more effective than others at removing certain pollutants. For example, very few bacterial contaminants are being found in the stormwater being treated by the new LID permeable pavement installations.

It is hoped that this study will help the City determine the pollutants that are the most prevalent in our runoff, the most effective treatment methods for those pollutants, how to best operate existing BMPs and how best to judge the effectiveness of newer treatment methods.

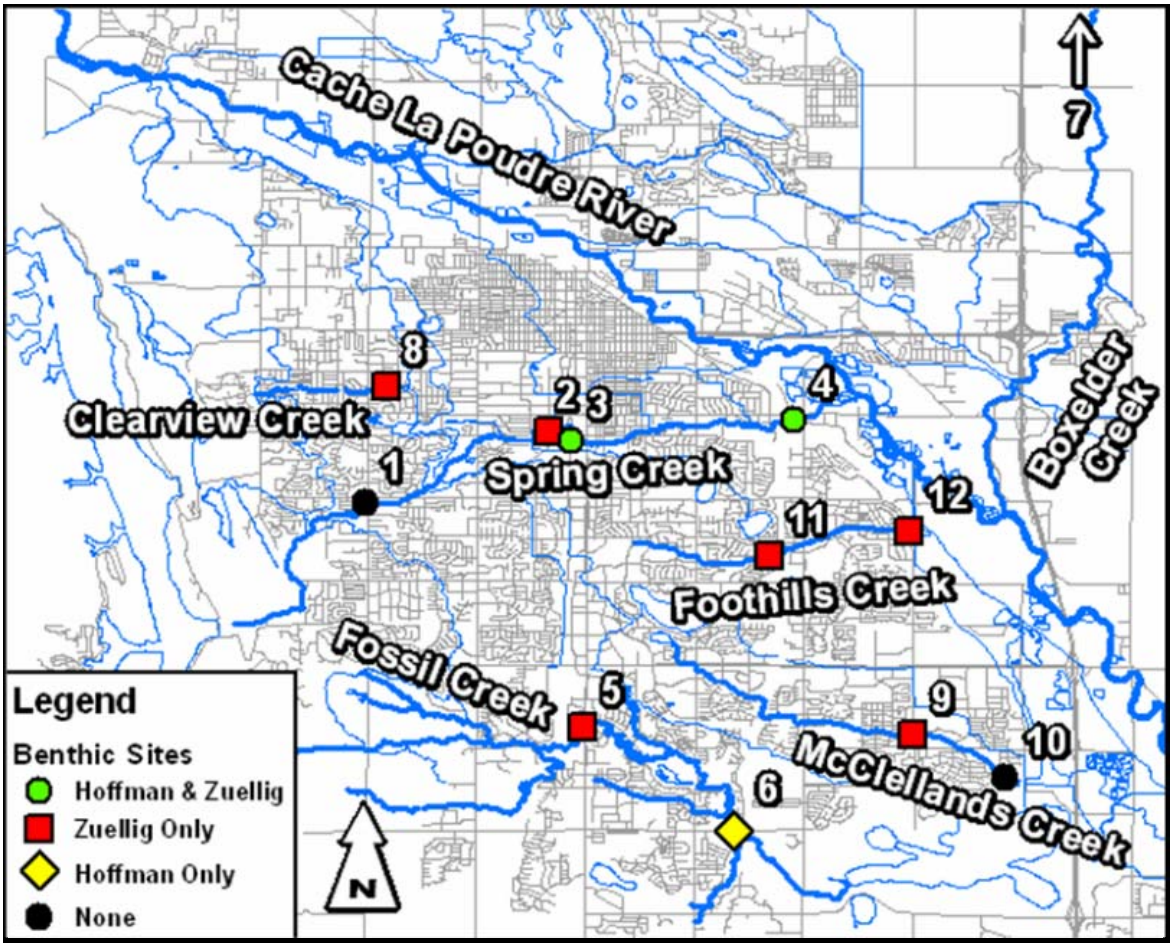
CSU Stream Health Assessment Study:

The City, in cooperation with CSU, is conducting a Stream Health Assessment study of local streams. The study is evaluating the relationships between a stream's physical, hydrological and biological characteristics and the level of development in the watershed. The overall health of these streams is being evaluated using EPA-accepted methods including the determination of biological indices. These indices measure different types of significant biological indicators in streams [e.g. the relative numbers and different types of benthic (bottom-dwelling) macroinvertebrates (bugs)]. In addition to benthic population numbers and diversity, other characteristics being measured include stream hydrology and types of stormwater control measures present (e.g. water quality ponds).

The goal of the study is to determine the specific stream characteristics that will have the greatest impacts on improving their overall health. In turn, this will help prioritize stormwater management

efforts toward maximizing stream health and focusing stream rehabilitation efforts to locations that would see the most benefit.

Biosurveys have been completed at twelve locations in Fort Collins located along Spring Creek, Fossil Creek, McClelland's Creek and Boxelder Creek:



These sites were chosen based on the availability of flow records, the presence of stormwater control measures and the availability of 1998 and 2001 biosurvey data that the City collected at these sites. Biological surveys have been completed at these sites using EPA's Rapid Assessment Test protocols.

The new data are being evaluated and compared to the previous results. This will help determine which stream segments are improving, holding steady or showing evidence of degradation in relation to their overall biological health. The data analysis and recommendations will be completed in 2010 and will be included in the update of the City's stormwater basin master plans as well as the 2010 edition of this report.

2009 Stormwater Quality Program Costs:

Monitoring Program Description	Cost	Comment
City-CSU event-based Best Management Practices (BMP) Stormwater Quality Monitoring Program	$19,755	$6,123 in direct water quality testing fees from the City's Pollution Control Lab with the balance for salaries and program expenses. Project funded through the City-CSU stormwater contract.
Stream Health Assessment and Benthic Survey. Benthic macro-invertebrate survey of streams at nine locations within the City. Study will be completed in 2010.	$8,520	2009 salary costs only. Project funded through the City-CSU stormwater contract

- **Stormwater Quality Study Programs Completed:**
  - Assessments of all flowing stream corridors were completed in 1999 by Dr. Bob Zuellig for development of the Master Plans.
  - Udall study completed in 2004.

- **MS4 Report Background & Highlights:**

The City of Fort Collins is required by the Colorado Water Quality Control Division (WQCD) to have a Municipal Separate Storm Sewer System (MS4) permit in order to discharge stormwater from its MS4 into State waters. The City must implement a Colorado Discharge Permit System (CDPS) Stormwater Management Program in accordance with the MS4 permit. The City's Stormwater Management Program is a comprehensive program comprised of six minimum control measures designed to reduce the discharge of pollutants from its MS4. Each measure requires several detailed elements that must be implemented annually or on an ongoing basis.

In addition to maintaining permit compliance, the elements facilitate protection of water quality and habitat of the Cache la Poudre River and our urban streams. City staff take pride in implementation of these pollution prevention measures and the resulting urban watershed quality. Many of the elements identified below were originally developed as a part of the "*Watershed Approach to Stormwater Quality*". Listed below are the minimum control measures, abbreviated requirements, and 2009 accomplishments.

- **Public Education and Outreach** - *The permittee must implement a public education program in an effort to promote behavior change by the public to reduce water quality impacts associated with pollutants in stormwater runoff and illicit discharges:*

  - In 2009, the City's WaterSHED (Stormwater Habitat Education Development) program educated 3968 students and 394 adults, for a total of 8,536 student and 1,027 adult contact hours.
  - Other events that included stormwater education and outreach were the Fort Collins *Children's Water Festival*, the *Master Naturalist Program*, *Sustainable Living Fair*, *Thursday Night Music & More*, and partnerships with P.R.E.P. (Poudre River Ecology Partners), CSUnity, CSU Ram Fest, Front Range Forum class, and a City employees training class.
  - The 2009 *Children's Water Festival* had 1700 student participants.
  - The *Storm Drain Stenciling Program* stenciled 206 storm drains in 2009.
  - Twenty-five people were trained though the Master Naturalists program.
  - Staff developed and tested an "*Adopt-a-Stream*" pilot program with Laurel elementary Kids Care Club.
  - The *Stormwater Business Outreach Program* targets a different business sector each year and makes at least 50 business contacts. In 2009, 62 carpet cleaning businesses were provided stormwater pollution prevention materials on proper disposal of carpet cleaning wastewater. The materials included removable bumper stickers, clipboards that list acceptable locations to dispose of carpet cleaning wastewater, and customer receipt stickers that say, "Ask us how we help keep the Poudre clean" to facilitate dialogue between the businesses and their customers.
  - Interpretive signage is displayed at select outdoor classrooms in Fort Collins, including the watershed display at the Spring Creek Bicycle Trail.
  - The WaterSHED program received the 2009 CAEE (Colorado Alliance for Environmental Education) Citizen / Community Award. The program was recognized by the Colorado Non-Point Source program for its focus on protecting the quality of the state's streams, lakes and rives and the approach used to educate a spectrum of the community through its many varied activities.

- **Public Participation and Involvement** - *The permittee must provide a mechanism and process to allow the public to review and provide input on the CDPS Stormwater Management Program.*

  - An annual update of the permit Stormwater Management Program is presented to the Natural Resources Advisory Board and the Water Board. The 2009 MS4 Permit update included a summary of the 2008 MS4 Permit annual report, minimum control measure internal assessment and tracking, program challenges and successes, and progress on 2009 goals.
  - To facilitate public access to the City's permit program documents and to facilitate public input on the programs, the City's MS4 Stormwater Management Program descriptions and related information are now posted on the City's website at: http://www.fcgov.com/stormwater/permit.php

- **Illicit Discharge Detection and Elimination** - *The permittee must develop, implement and enforce a program to detect and eliminate illicit discharges into the permittee's MS4.* During 2009, the staff:

  - Responded to 56 spill complaint calls in 2009. Responses included site visits, incident investigations, on-site and phone education, delivery of educational door hangers and follow-up letters. Staff reported 13 verbal and 24 written notices of violation, four criminal convictions, three charges for spill remediation and one monetary penalty.
  - Responded to a complaint referral by the Water Quality Control Division regarding discharge of sediment from the vicinity of the Mason Street North development and issued a warning letter to property Home Owner's Association (HOA.
  - Sampled ice from the addition of potable water for the ice skating rink on City Park Lake for chlorine.
  - Collaborated with City Database Analyst to develop incident tracking system for illicit discharges.
  - Worked with legal staff to draft amendments to Chapter 26 of the City Code Relating to Right of Entry and Nuisance Abatement and Article VII of Chapter 26 for to stormwater quality and enforcement. These code changes were passed in 2010.

- **Construction Site Runoff Control** – *The permittee must develop and implement a program to assure adequate design, implementation, and maintenance of BMPs at construction sites within the MS4 to reduce pollutant discharges and protect water quality.* To complete this requirement, staff

  - Performed 1, 240 inspections on 76 construction sites for sediment and erosion control in 2009. Enforcement measures for inadequate sediment and erosion control included: 115 verbal warnings, four written notices of violation, two stop-work orders, one certificate of occupancy held, 40 building permits held, and holds issued on 11 initial building permits until installation of erosion control measures was complete.
  - Organized "Environmental Management for City Projects" training for City project engineers and staff.
  - Developed and presented three erosion control training courses to private developers and their contractors.
  - Administered the City's erosion control and re-vegetation contract and assisted City engineering staff with the development of erosion control and wetlands plans for 10 City projects.
  - Provided City departments and contractors on Construction Stormwater Permit and Stormwater Management Plan requirements for fifteen City projects
  - Participated in twelve development construction permitting meetings to review plans for new building projects within the City.

- **Post-Construction Stormwater Management in New Development / Redevelopment** - *The permittee must develop, implement, and enforce a program to address stormwater runoff from new development and redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale, that discharge into the MS4. The program must ensure that controls are in place that would prevent or minimize water quality impacts.* To complete this MS4 requirement, staff:

- Inspected 94 sites with permanent water quality control features, or best management practices. Enforcement actions included 13 written notices of violation,
- Participated in the Stormwater Quality Team to review stormwater Best Management Practices (BMPs) in Fort Collins. Staff also coordinated meetings on topics including Stormwater Master Plan stream assessment work, urban stream health/stability and stormwater management effectiveness, GIS stormwater quality coverage, Upper Cache la Poudre Watershed Program, LID demo sites, Wildlands Restoration Volunteers, winter runoff monitoring, and Automatic Vehicle Locating System.
- Conducted two training events for HOAs regarding stormwater water quality pond maintenance.

o **Pollution Prevention/Good Housekeeping for Municipal Operations** - *The permittee must develop and implement an operation and maintenance program that includes an employee training component and has the ultimate goal of preventing or reducing pollutants in runoff from municipal operations.* To complete these requirements, staff:

- Conducted Spill/Abandoned Waste Tabletop Training exercises for 388 City employees specific to each work group and potential incidents that it might encounter during its daily activities.
- Met with ten facilities to discuss Standard Operating Procedures (SOPs) for activities that could potentially cause pollutants to discharge to the MS4.
- In partnership with the Water Quality Control Division, staff assisted the Colorado Stormwater Council Permit Compliance Committee in development of 21 SOPs for municipal operations and development of the One-time Inventory Report of written documentation for municipal operations, required for Phase II MS4 permittees.
- Collaborated with the City Attorney's Office and the Parks Department on stormwater compliance for the BMX track.
- Conducted site Runoff Control Plan inspections for nine facilities.
- Met with Capital Projects and Water Reclamation on the planning for the stormwater vacuum truck decant facility, and arranged for sampling and analysis of vacuum truck decant.

The elements required by the MS4 permit focus primarily on stormwater pollution prevention BMPs, as stormwater quality monitoring is not required by the permit. However, an annual assessment and report to the State are required. If monitoring is to be conducted to assess the effectiveness of the MS4 permit Stormwater Management Program, then these results must be included in the City's MS4 annual report to the State.

City of Fort Collins Stormwater Sampling Sites:

- **Urban Creek & Watershed Water Quality Monitoring Program:**

The Colorado Department of Health and Environment (CDPHE) has established public use classifications and water quality standards for Spring Creek and Fossil Creek designed to protect aquatic life and support public uses, recreation and agriculture. Available water quality data from November 2000 through August 2007 show that Fossil Creek and Spring Creek consistently meet water quality standards for pH, dissolved oxygen, and nitrite designed to support aquatic life.

The water quality standard for the indicator bacteria, *E. coli*, is designed to protect recreational use. Spring Creek and Fossil Creek are both designated as "Recreation Class 1a" waterbodies. This classification indicates waters where primary contact occurs including swimming and frequent water play by children. Water quality data for *E .coli* show strong seasonal trends with individual values above the water quality standard primarily during summer months. Sources of *E. coli* contamination include human and animal waste. Controlling or minimizing contamination from improper connections to the City's river and creeks is the focus of the Utility's Illicit Discharge Program, a component of the City's stormwater quality program.

In 2006, Fossil Creek was included on CDPHE's list of impaired waterbodies for non-attainment of the selenium water quality standard. Available monitoring data shows selenium values consistently above the water quality standard. High concentrations of selenium are found in local shale deposits.

The EPA has published more stringent Selenium standard of 4.6 ppb in a revision of water quality criteria. Consequently in 2006, Colorado adopted this as a water quality standard and is now placing numerous river and stream segments on the 303(d) list for Selenium. The following local stream segments were put on the 303(d) list in 2006 due to exceeding the new selenium standard:

- the Poudre River from Boxelder Creek to where it meets the South Platte River,
- all of Fossil Creek, and
- Boxelder Creek, from its origin in northern Colorado to where it meets the Poudre River.

Selenium is naturally occurring in the underlying shale. The listings given above were a result of a new lower standard and not changing water quality. Selenium can be mobilized by precipitation runoff and infiltration to surface water and groundwater, resulting in elevated stream concentrations.

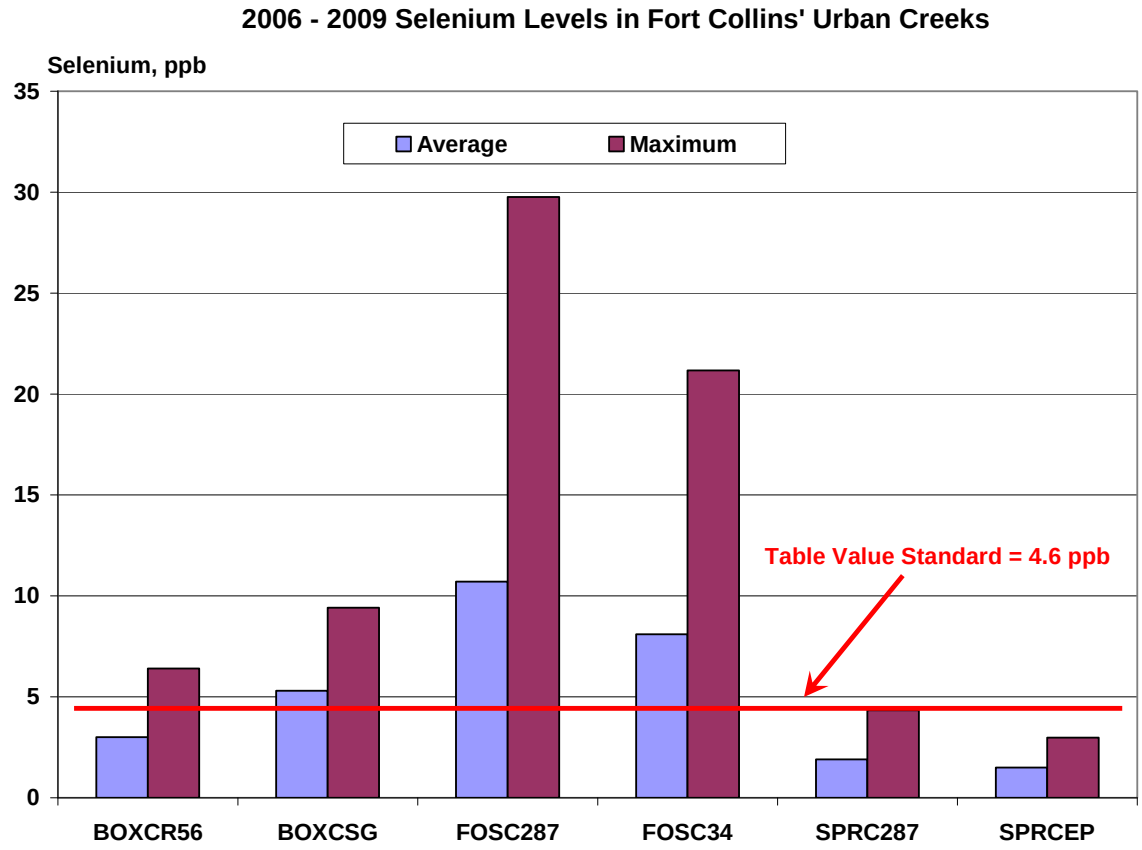
As directed in City Council Resolution 2000-128, "Recognizing the Need to Protect Water Quality", the City monitors Boxelder Creek, Spring Creek, and Fossil Creek at two sites every calendar quarter for inorganic chemicals, dissolved oxygen and bacteria. Parkwood Lake is sampled twice per year for bacteriological, physical, and chemical parameters. Details for the sampling sites for these key urban creeks are presented in Tables 3.

Table 3. 2009 Monitoring Sites and Test Parameter Matrix for Urban Creek Sites through Fort Collins.

City of Fort Collins / Utilities Pollution Control Lab	Surface Water Quality Test Matrix						
	CREEK MONITORING SITES						PARKWOOD LAKE
Test Parameters	**FOSC287**	**FOSC34**	**SPRC287**	**SPRCEP**	**BXC56**	**BSCXG**	**PKL**
Alkalinity, mg/L as CaCO3							
Ammonia-N, mg/L	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	2/year
Arsenic, µg/L							
Biochemical Oxygen Demand, mg/L							2/year
Cadmium, µg/L							
Chromium, µg/L							
Conductivity, µmhos/cm	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	
Copper, µg/L							2/year
Dissolved Organic Carbon, mg/L							
Dissolved Oxygen, mg/L	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	
E. coli / 100ml	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	
Flow, cfs							
Hardness, mg/L as CaCO3	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	2/year
Iron, µg/L							
Lead µg/L							2/year
Manganese, µg/L							
Mercury, µg/L							
Nickel, µg/L							
Nitrate-N, mg/L	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	2/year
Nitrite-N, mg/L	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	2/year
pH	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	2/year
Selenium, µg/L	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	
Silver, µg/L							2/year
Sulfate							
Temperature, °C	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	2/year
TKN-N, mg/L							
Total Organic Carbon, mg/L							
Total Phosphorus, mg/L	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	1/Qtr	2/year
Zinc, µg/L							2/year

Site Code	Description
FOSC34	Fossil Creek at County Rd 34
FOSC287	Fossil Creek at College Avenue
SPRC_EP	Spring Creek at Edora Park
SPRC287	Spring Creek at College Avenue
BXCG	Boxelder Creek Gage
BXC56	Boxelder Creek at County Road 56
PKL	Parkwood Lake

Figure 1. 2006 – 2009 Maximum, Average and Table Value Standard Selenium Levels in Fort Collins Urban Creeks.



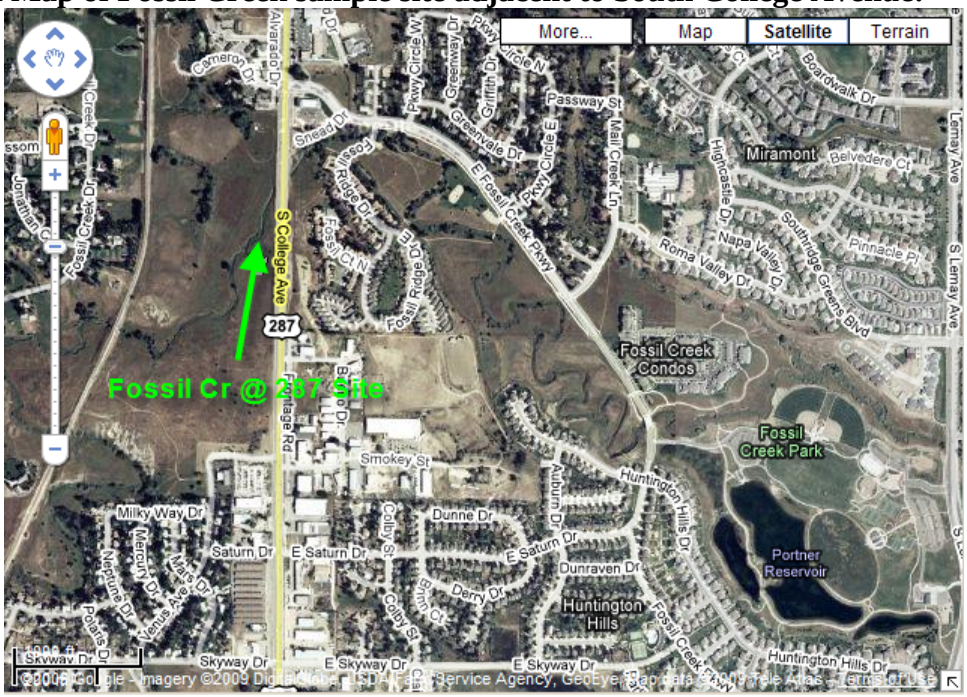
Legend:

BOXC56 = Boxelder Creek at County Road 56
BOCSG = Boxelder Creek at Staff Gage located south of Prospect St.
FOSC287 = Fossil Creek at Hwy 287
FOSC34 = Fossil Creek at County Road 34
SPRC287 = Spring Creek at Hwy 287
SPRCEP = Spring Creek at Edora Park

The Colorado Department of Health, Water Quality Control Division has listed both Boxelder Creek and Fossil Creek as 303(d)-impaired for the naturally elevated selenium levels in those waters. The Table Value Standard (TVS) for selenium levels in these creeks is 4.6 micrograms per liter (parts per billion). Selenium is associated with the shale common to soils in our geographic region. The City's Pollution Control Lab monitors the selenium levels in these urban creeks at two locations every calendar quarter.

- **Photographs and Aerial Maps of Fort Collins Urban Creek Monitoring Sites:**
  - **Fossil Creek looking downstream toward Hwy 287:**

  - **Aerial Map of Fossil Creek sample site adjacent to South College Avenue:**

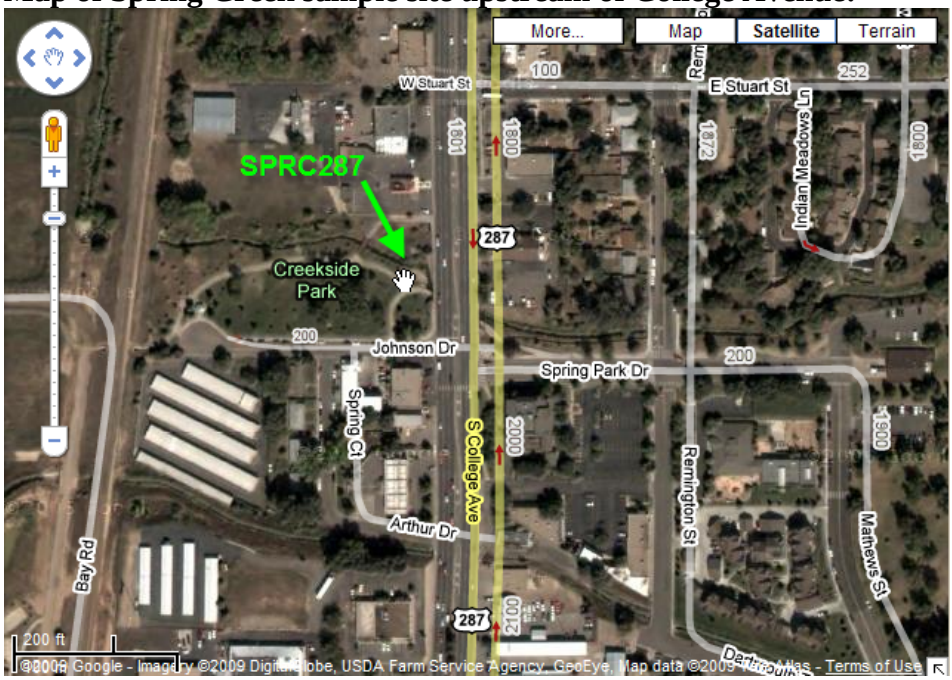


- **Aerial map of Fossil Creek @ County Road 34:**

- **Fossil Creek looking upstream from County Road 34:**

- **Spring Creek sample site near College Avenue:**

- **Aerial Map of Spring Creek sample site upstream of College Avenue:**

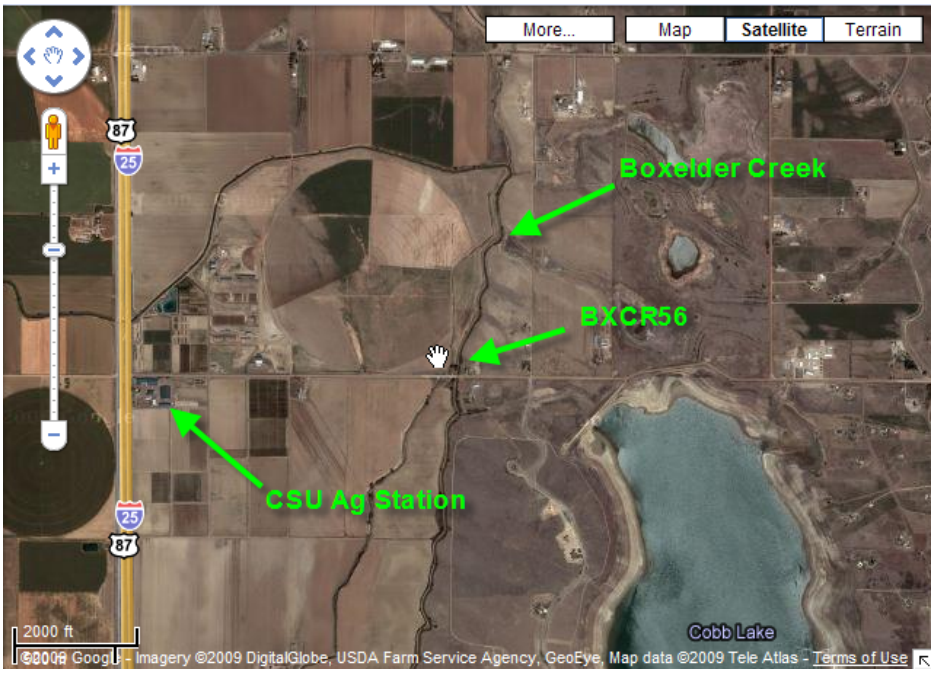


- **Spring Creek at Edora Park looking downstream:**

- **Aerial photograph of Spring Creek at Edora Park sample site:**

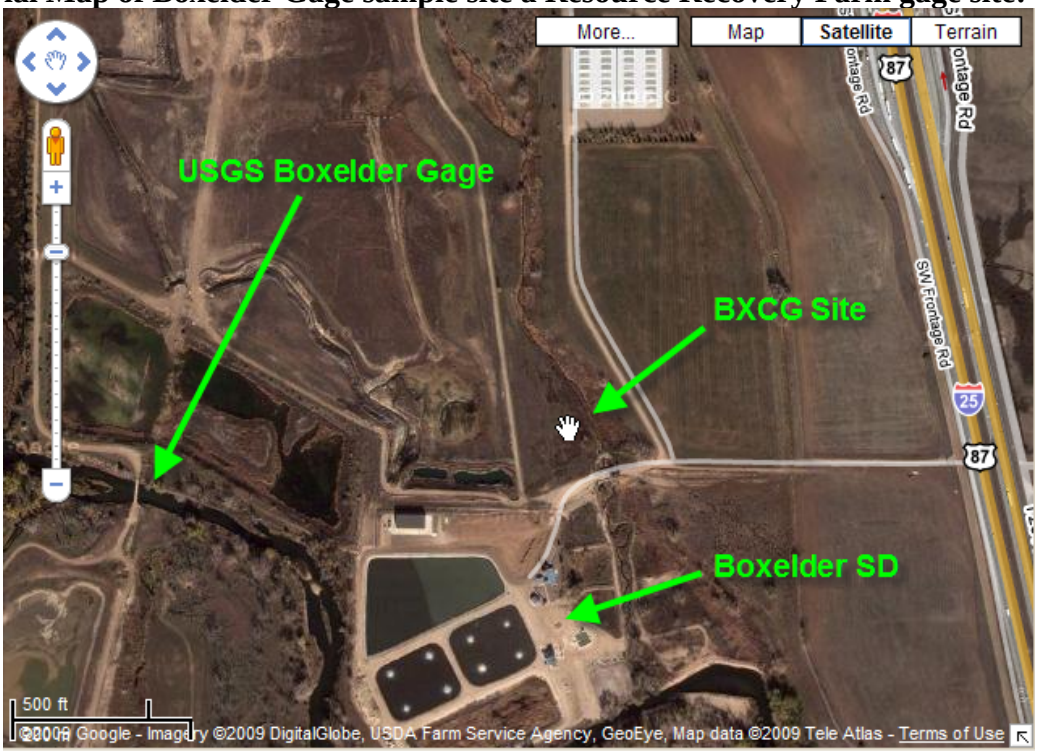
- **Boxelder Creek looking upstream from CR56**

- **Aerial photograph of the Boxelder Creek Sampling Site just upstream of CR56:**

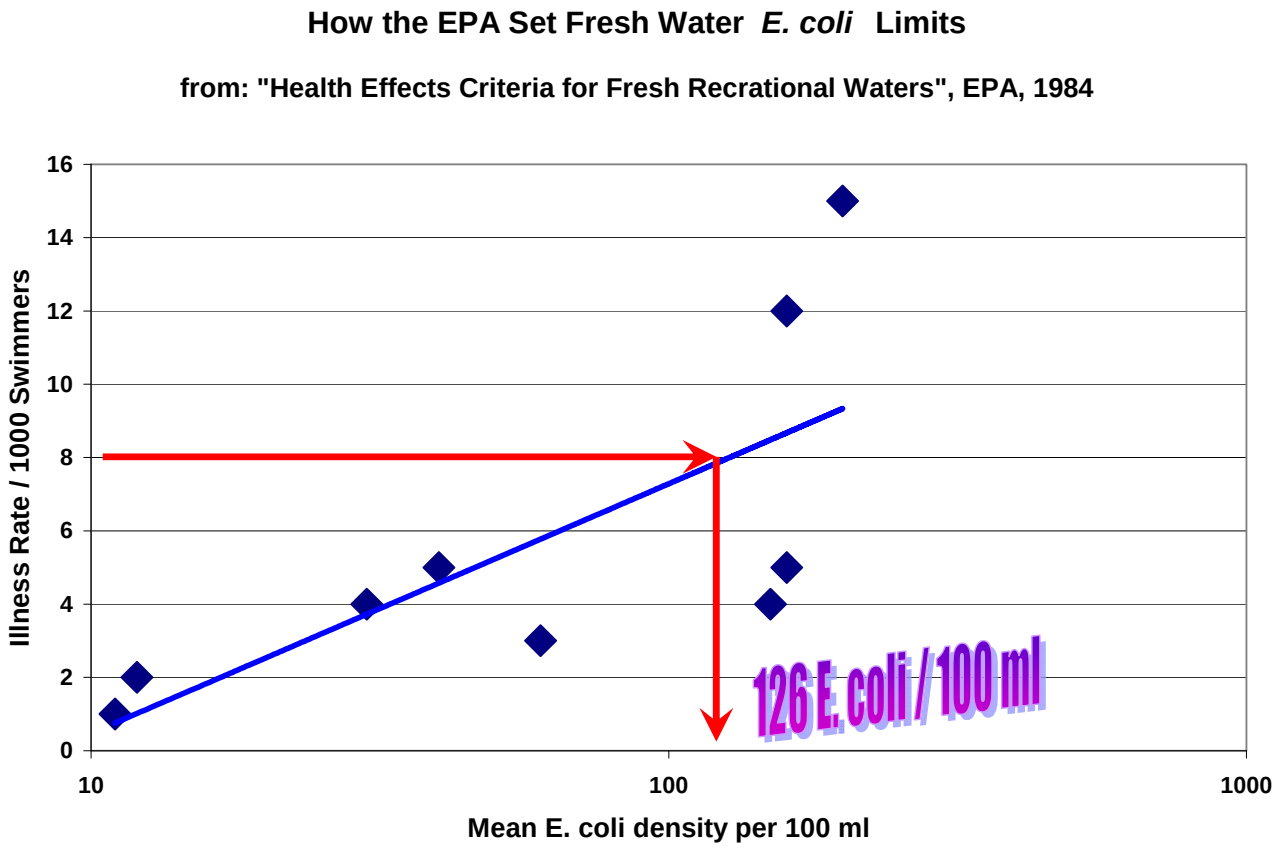


- **Boxelder Creek looking downstream toward the confluence with the Cache la Poudre:**

- **Aerial Map of Boxelder Gage sample site a Resource Recovery Farm gage site:**



- **How the EPA Developed the Fresh Water *E. coli* Contamination Standard:** *E. coli* levels in rivers and streams indicate the extent of human and animal fecal contamination in the water. *E. coli* is much easier to grow in the lab than pathogens like Salmonella, Typhoid, or Cholera bacteria, hence, its choice as an indicator. In 1984, the EPA completed an extensive literature review and epidemiological study of the rates of gastro-intestinal illness among fresh-water recreational swimmers. The study revealed that if *E. coli* levels were below 126 per 100 milliliters (~ 4 ounces) extrapolated to an illness rate was 8 individuals per 1000 swimmers. This level of contamination was established as the upper limit of an "acceptable" exposure-illness frequency. A higher incident rate was unacceptable and so the standard was set at 126 *E. coli* per 100ml.



- ***E. coli* contamination in Fossil Creek and Spring Creek:**

Using several years of City and USGS data and focusing on the months of April through October, the Colorado WQCD has determined that both Fossil Creek and Spring Creek are now 303(d)-listed as "impaired" for *E. coli* contamination. Both creeks were also given a "high priority" designation for developing corrective actions. Potential sources of *E. coli* contamination include failing septic systems, leaking sewer lines, domestic animals (pets, cattle, horses, etc.) and wildlife. Additional monitoring to identify potential point sources of contamination within the creeks will need to be completed.

Figure 2 below depicts the overall and seasonal geometric mean values of *E. coli* levels found in key Fort Collins urban creeks for the 2006 – 2009 timeframe compared to the stream standard of 126 *E. coli* per 100 ml. *E. coli* levels were monitored once each calendar quarter for this time period and the overall and seasonal (April through October) geometric means were calculated per Colorado Water Quality Control Division (WQCD) procedures. The overall geometric mean values (n=20) for each site were all below the 126 *E. coli* / 100 ml limit set by the WQCD. However, data for the April through October showed the creeks to be in violation of the water quality standard.

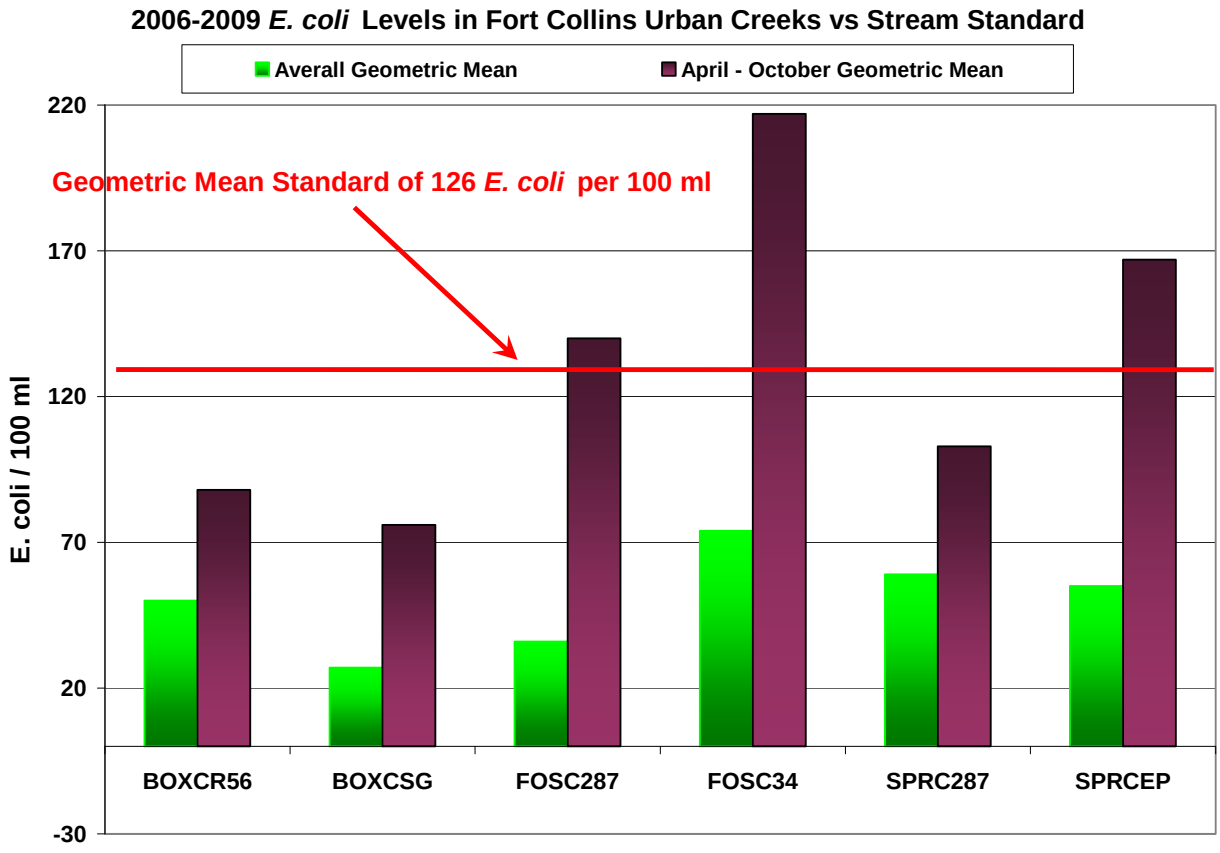


Figure 2. 2006 – 2009 Overall and April through October *E. coli* levels in Fort Collins key urban creeks versus the stream standard of 126 *E. coli* per 100 milliliters (ml).

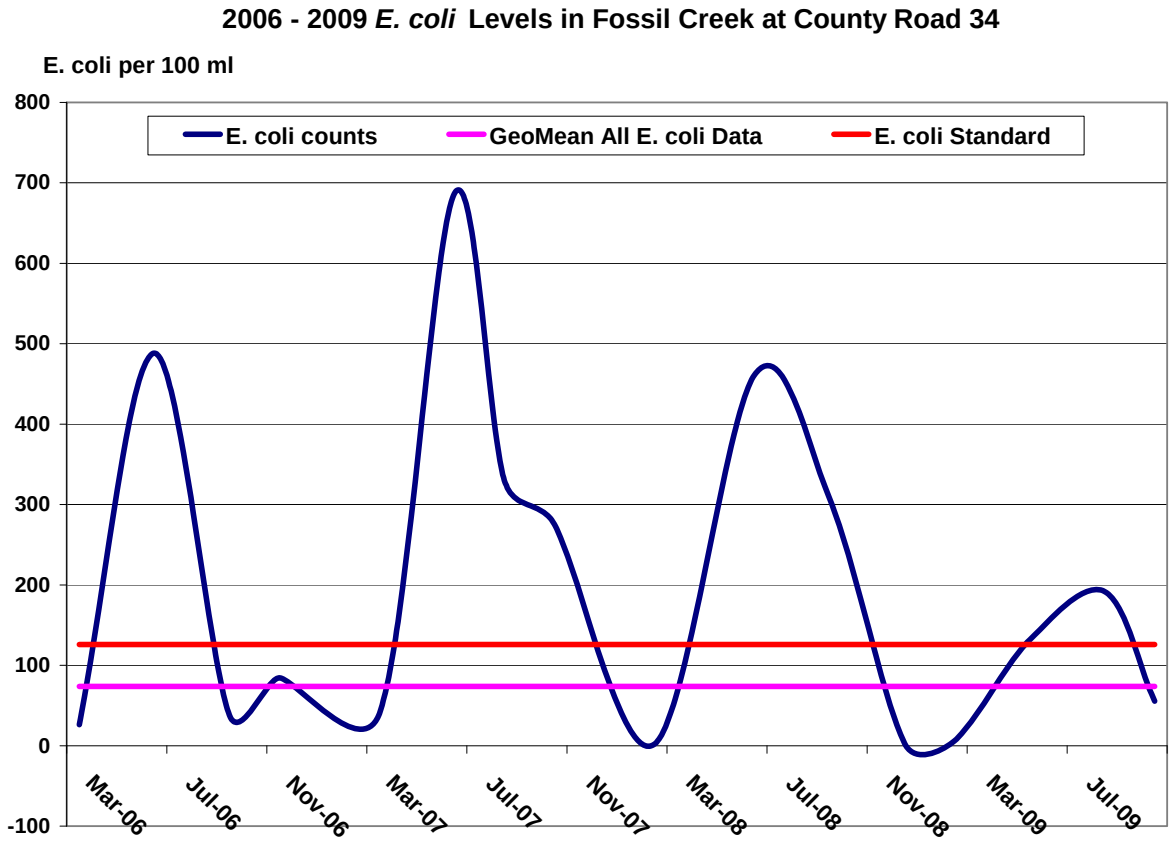


Figure 3. 2006 – 2009 Overall and seasonal *E. coli* levels in Fossil Creek at County Road 34 versus the stream standard of 126 *E. coli* per 100 milliliters (ml) and the overall geometric mean of the data. Note the strong seasonal trends with the highest *E. coli* levels observed in the spring and summer months.

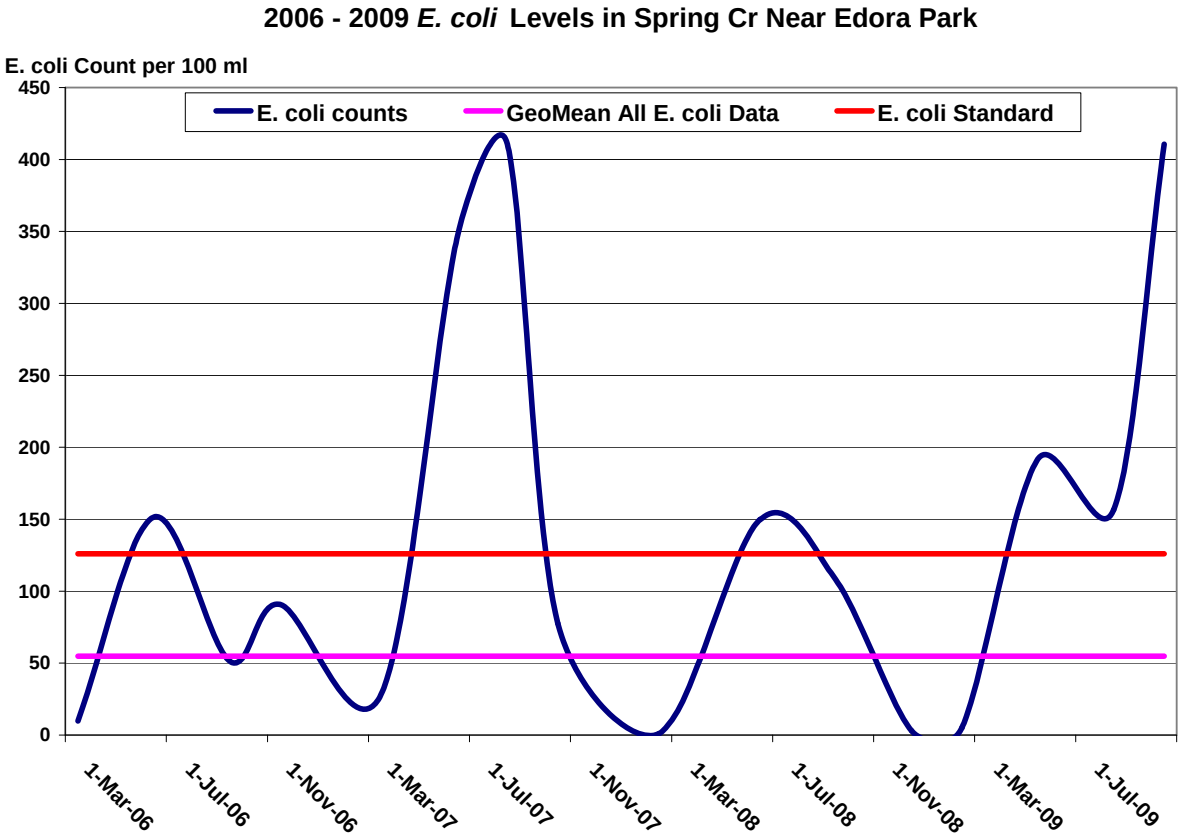


Figure 4. 2006 – 2009 Overall and seasonal *E. coli* levels in Spring Creek at Edora Park versus the stream standard of 126 *E. coli* per 100 milliliters (ml) and the overall geometric mean of the data. Note the strong seasonal trends with the highest *E. coli* levels observed in the spring and summer months.

- **Proposed Colorado Nutrient Criteria for Lakes, Reservoirs, Rivers & Streams**

Background

Nutrient criteria will be adopted in the 2011 Regulation 31 Basic Standards Hearing. In preparation for the hearing , the Colorado Department of Health and Environment (CDPHE) - Water Quality Control Division has developed preliminary criteria for total phosphorus and total nitrogen in preparation .

The WQCD has developed the following preliminary criteria for phosphorus and total nitrogen for rivers and streams:

Nutrient Criteria for Rivers and Streams		
	Total Phosphorus	**Total Nitrogen**
Cold Water	0.090 mg/L	0.824 mg/L
Warm Water	0.135 mg/L	1.316 mg/L

The WQCD has developed the following preliminary criteria for phosphorus and total nitrogen for lakes and reservoirs:

Nutrient Criteria for Lakes and Reservoirs	
Total Phosphorus	**Total Nitrogen**
0.082 mg/l	0.960 mg/l

Critical comparison of preliminary Colorado nutrient criteria to various wastewater treatment technologies:

Parameter	Typical Municipal Raw Wastewater, mg/L	Secondary Effluent (No Nutrient Removal), mg/L	Typical Advanced Treatment Nutrient Removal (BNR), mg/L	Enhanced Nutrient Removal (ENR), mg/L	Limits of Treatment Technology, mg/L	Draft Colorado In-Stream Nutrient Criteria, mg/L Cold Water (Warm Water)
Total Phosphorous	4 - 8	4 - 6	1	0.25 - 0.50	0.05 - 0.07	0.082 – 0.129 (0.125 – 0.184)
Total Nitrogen	25 - 35	20 - 30	10	4 - 6	3 -4	0.776 – 0.988 (1.251 – 1.539)

Source: **Municipal Wastewater Treatment Considerations: Dave Clark (HDR) – presentation to Nutrient Workgroup, April 13, 2010:**
http://projects.ch2m.com/cwqf/Workgroups/Content/nutrient_criteria/Meetings/04%202010%20April/Colorado%20Nutrient%20LOT%20and%20Permitting.pdf

Technology is getting close to achieving the proposed phosphorous level, but is no where near achieving that proposed for nitrogen. The associated costs increase dramatically as different technologies are applied from advanced treatment nutrient removal to enhanced nutrient removal and finally to the limit of technology. These new technologies become extremely expensive and use a lot of energy. Barbara Biggs reported that in order for [Denver] Metro to achieve 3 mg/L nitrogen and 0.1 mg/L phosphorous, it will cost $2.2 billion, with an annual incremental increase in $20 million for operational and maintenance costs. This represents a 12 to 13% increase per year for services. To achieve 1.3 mg/L nitrogen and 0.05 mg/L phosphorous would cost an additional $2.8 billion, with an annual incremental increase in $20 million for operational and maintenance costs (from Nutrient Criteria Meeting - April 13, 2010, Memo of Jerry Raisch and Aine L. Durkin, 21 April 2010).

- **Potential "Nutrient Criteria" Implementation Issues in both Drinking Water Treatment & Water Reclamation for Fort Collins**:

  - **Drinking Water Treatment**:

It is likely that a new sub-designation for drinking water reservoirs will be available for those reservoirs where water is taken out and then treated for drinking water. This is in contrast to reservoir waters that are not going into another reservoir or stream. The subset will be referred to as *direct use* reservoirs. It is likely that these reservoirs will have more stringent nutrient standards than reservoirs that are not directly used for drinking water supply. This proposed sub-designation would affect Horsetooth Reservoir and possibly the Halligan-Seaman Water Supply Project (HSWSP) as well as NISP.

  - **Water Reclamation**:

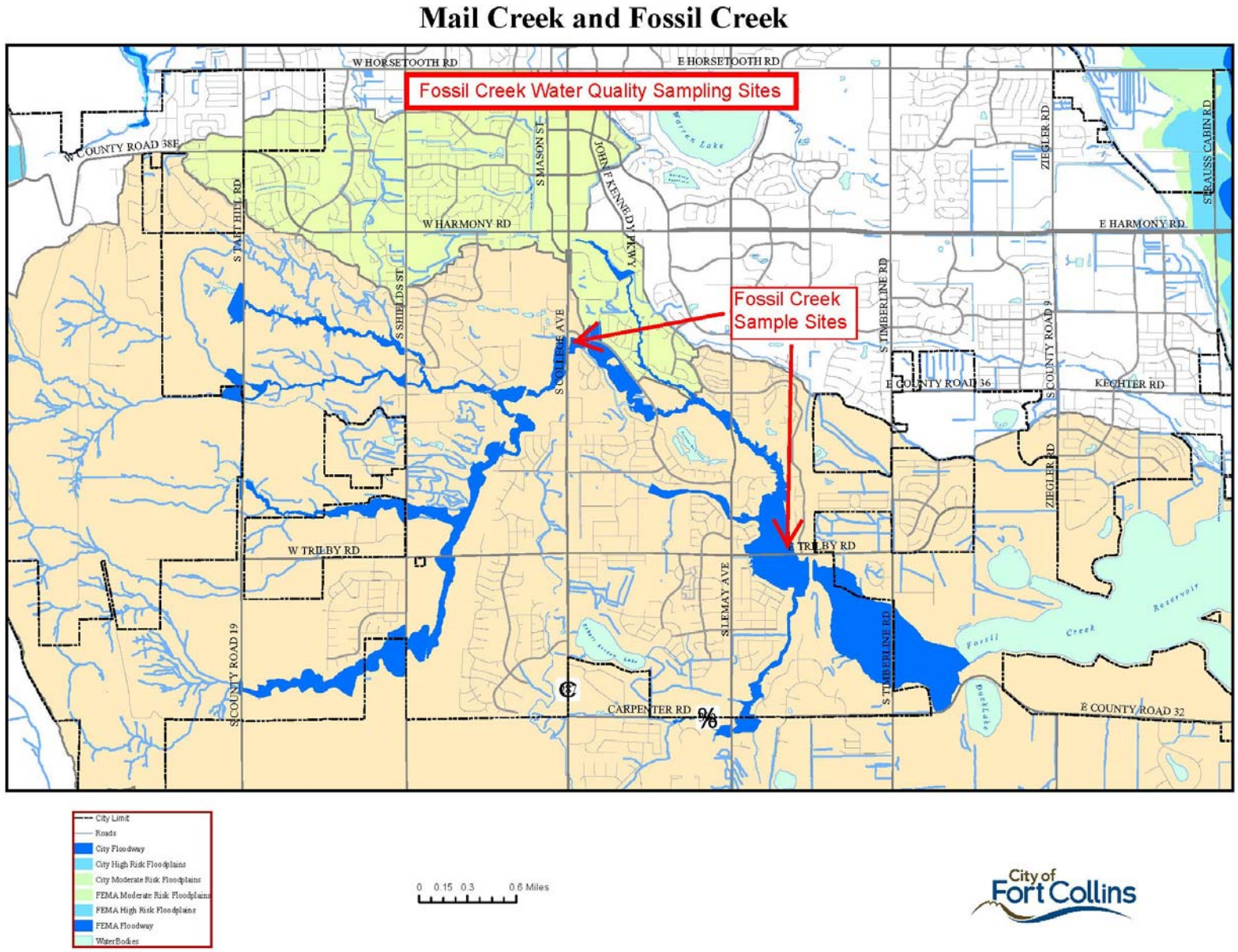
If the WQCD follows the proposed schedule for nutrient criteria implementation, these criteria will be incorporated into the Mulberry and Drake Facilities discharge permits in approximately 2017/2018. It is possible to receive a 5 year + compliance schedule to meet the nutrient standards.

  - Best Case Scenario – Temporary modifications are adopted in the 2015 Regulation 38 South Platte Basin Hearing, delaying implementation of nutrient criteria into discharge permits past 2018 and allowing for 5+ years compliance schedules.
  - Worst Case Scenario – The Division does not grant temporary modifications, adopts nutrient criteria simultaneously into the basin regulations, and does not allow lengthy compliance schedules. Compliance with nutrient criteria would be required as early as 2017.

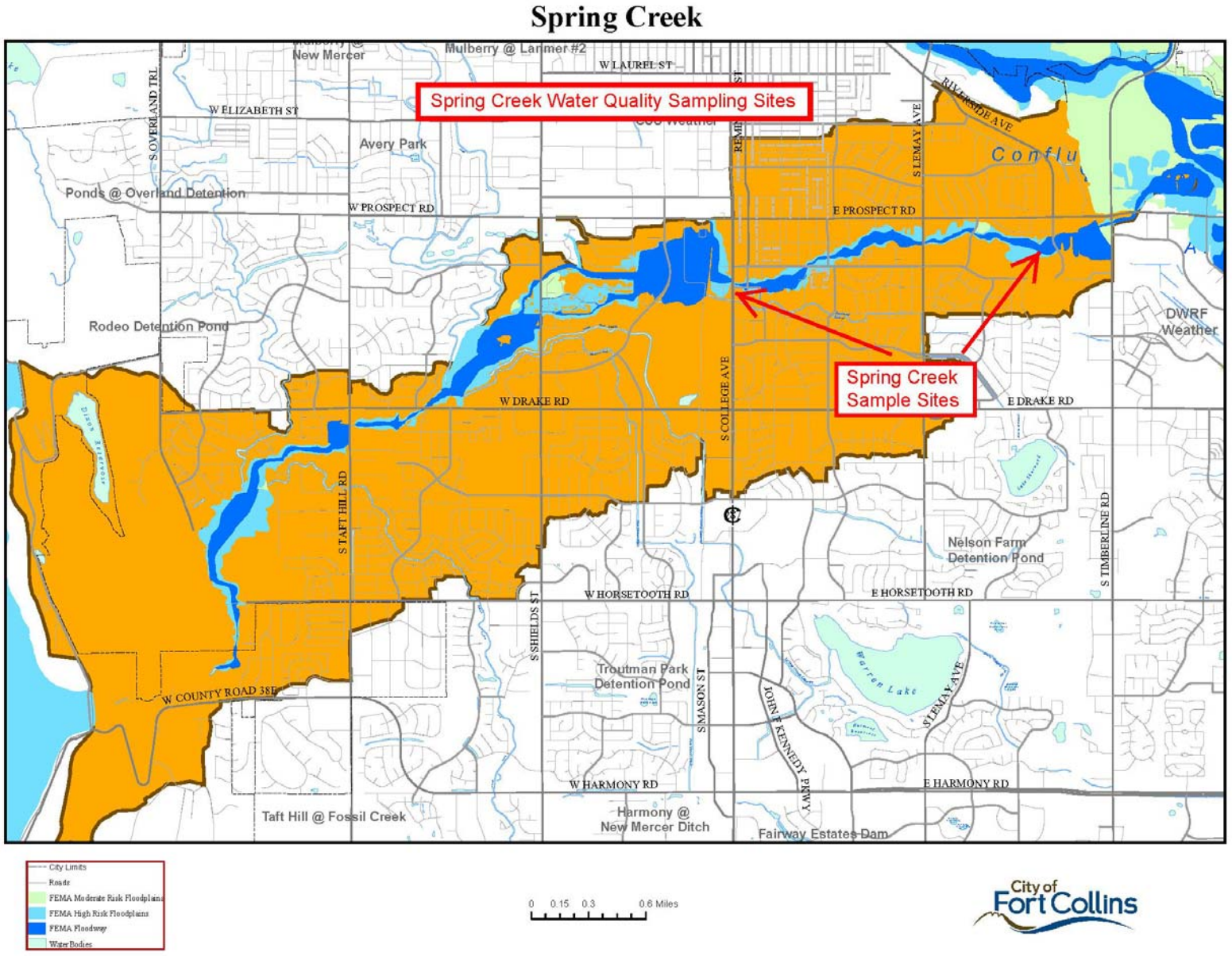
- **Related Nutrient Criteria Implementation Issues**:

  - How will the proposed nutrient criteria be translated into permit limits for community water reclamation facilities, especially where there is little natural in-stream dilution flow?
  - How to achieve a balance between the treatment technologies currently available for controlling nutrients and their associated high initial capital construction and long-term operating costs.
  - Without control of non-point sources (stormwater, agricultural runoff, etc.), overall concentration levels of nutrients will remain essentially the same and there will not be significant improvements in overall water quality.
  - Over-regulation of point sources by itself will not achieve water quality standards, especially in areas where non-point sources are the major nutrient load contributions.
  - Understanding the cost-effectiveness of both point and non-point source control measures is essential to choose the best investment options between advanced wastewater treatment and implementation of non-point Best Management Practices (BMPs).

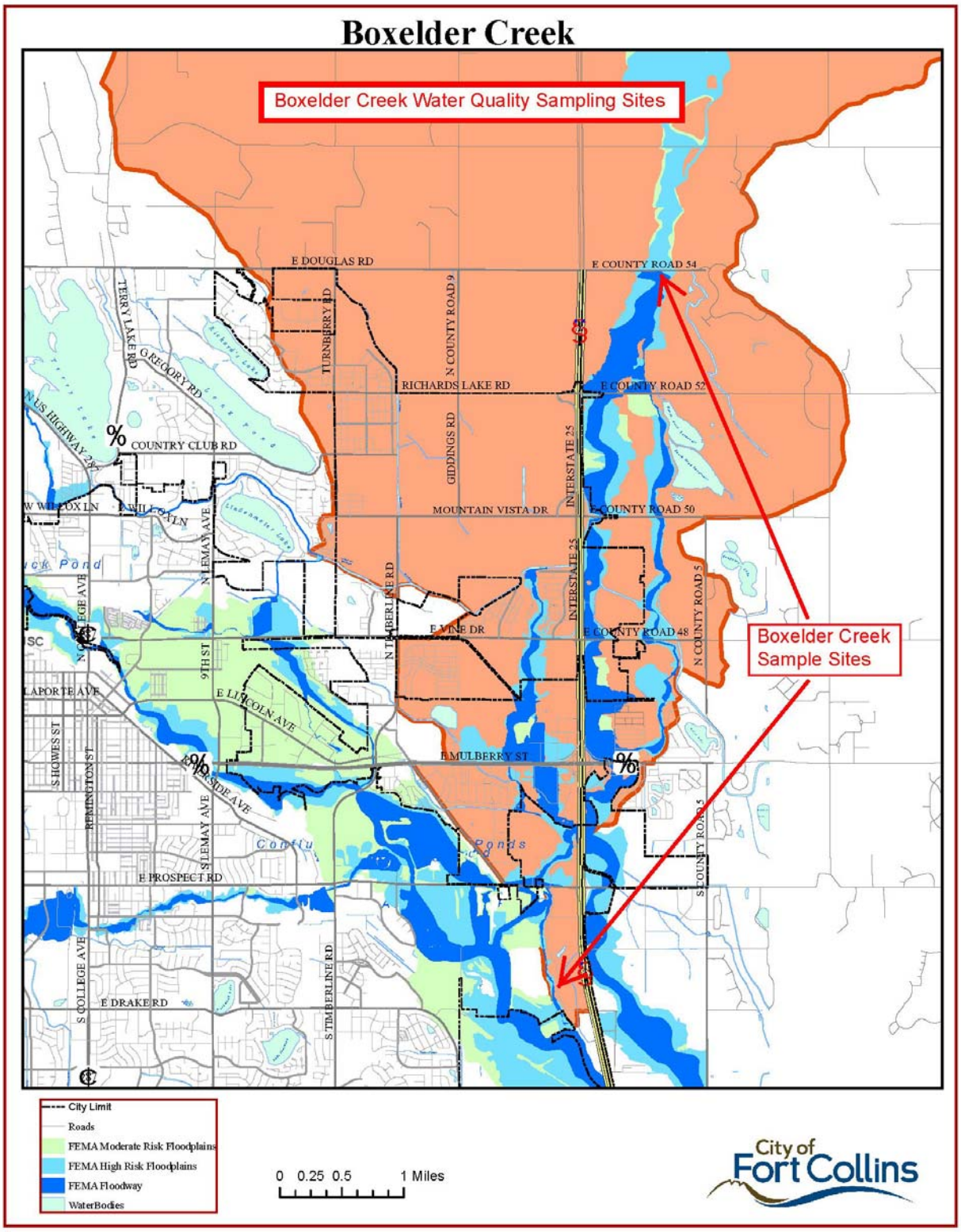
Map of Fossil Creek Floodplain and Water Quality Sampling Site Locations:



Map of Spring Creek Floodplain and Water Quality Sampling Sites:

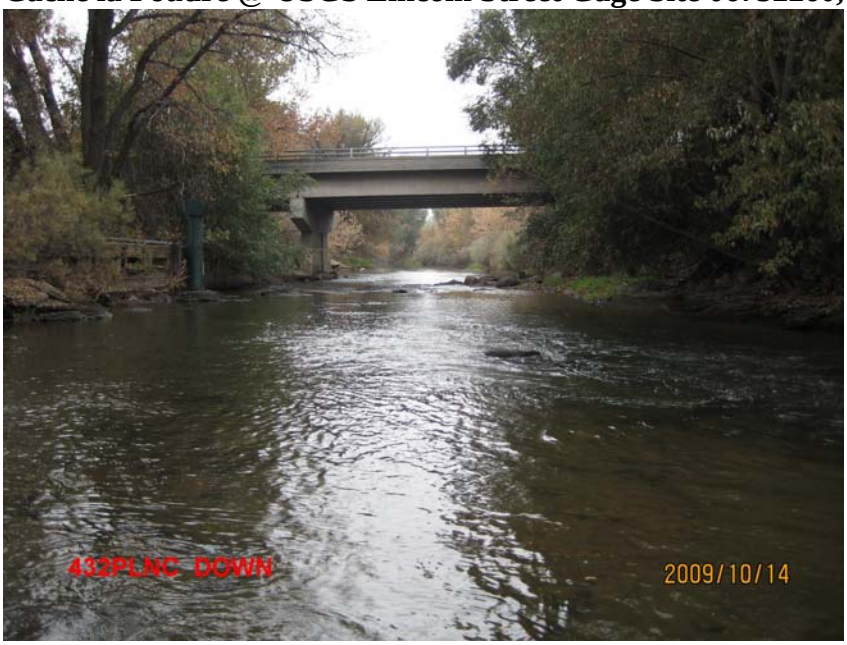


Map of Boxelder Creek Floodplain and Water Quality Sampling Sites:

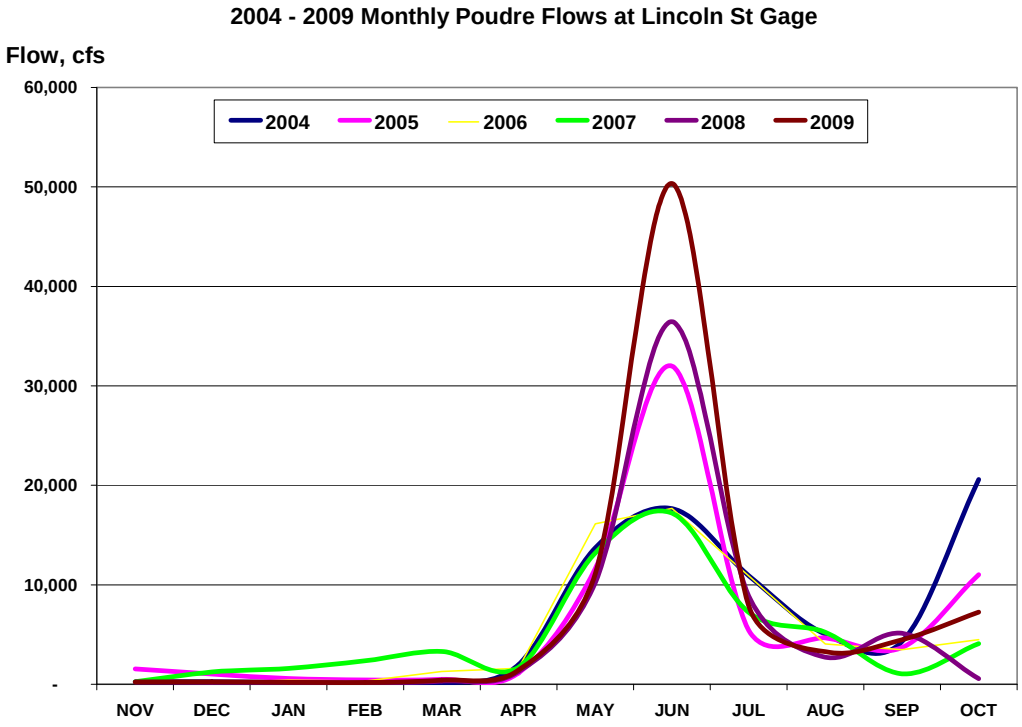


- **City of Fort Collins Cache la Poudre River Monitoring Sites and Descriptions:**

Cache la Poudre @ USGS Lincoln Street Gage Site 06752260, River Segment 11:



The Lincoln Street Gage site is a flow and water quality control station upstream of Mulberry Water Reclamation Facility (MWRF). It is influenced by urban, stormwater and recreational impacts. There are extensive long-term flow, chemical and physical water quality data available for this site from both the City and USGS for over 25 years.



Aerial map of Lincoln St gage and Mulberry Water Reclamation Facility (MWRF) sites:

Colorado Division of Wildlife records report the presence of the following species of fish: Johnny darter (WS-1), common shiner (WS-1), brown trout, rainbow trout, black bullhead, black crappie, bluegill, bigmouth shiner, brassy minnow, brook stickleback, common carp, creek chub, fathead minnow, gizzard shad, hornyhead chub, Iowa darter, longnose sucker, largemouth bass, longnose dace, plains killifish, pumpkinseed, plains topminnow, red shiner, sand shiner, smallmouth bass, green sunfish, central stoneroller, mountain whitefish, white sucker, and yellow perch. According to CDOW, Johnny darters have been commonly observed in both recent and historic surveys (from page 21, WQCD Exhibit 38-11, Cache la Poudre Basin Rationale, June 2009).

Cache la Poudre @ Prospect Street, River Segment 11:

Map of showing the location of the Prospect St sample site and other key locations downstream.

The Prospect St Site is downstream from the MWRF discharge point. It is influenced by urban usage, stormwater and MWRF treated wastewater discharges. Long-term biological, chemical and physical data is available from City and USGS. Instantaneous flow and water quality monitoring from the USGS ceased at this site in 2005 due to the cost. Pollution Control Lab staff continue to monitor at this site.

Cache la Poudre @ Nature Center, River Segment 11:

The Nature Center Site is located downstream from MWRF and Spring Creek. It is influenced by urban usage, stormwater and treated wastewater discharge impacts. There are long-term biological, chemical quality and physical data available for this site from City.

Cache la Poudre River at USGS Gage Site (06752280) above confluence with Boxelder Creek:

Aerial photograph of the Cache la Poudre River @ USGS Gage above Boxelder Creek, River Segment 11:

The site located at the USGS Gaging station (Site # 06752280) just above Boxelder Creek. It is downstream from the Nature Center site and serves as an upstream control site for treated wastewater from the Boxelder Sanitation District. It is influenced by urban usage, stormwater, treated wastewater and gravel mining impacts. There are extensive flow, biological, chemical and physical datasets available from both the City and USGS for this site.

Cache la Poudre River looking downstream from the USGS Gage 06752280 upstream of Boxelder Creek:

In the stretch of the Poudre below Boxelder Creek, Colorado Division of Wildlife records report the presence of the following species of fish: Johnny darter, common shiner, brown trout, rainbow trout, black bullhead, black crappie, bluegill, bigmouth shiner, brassy minnow, brook stickleback, channel catfish, common carp, creek chub, fathead minnow, gizzard shad, hornyhead chub, Iowa darter, longnose sucker, largemouth bass, longnose dace, western mosquitofish, Northern redbelly dace, orangespotted sunfish, plains killifish, pumpkinseed, plains topminnow, red shiner, sand shiner, smallmouth bass, green sunfish, central stoneroller, white crappie, mountain whitefish, white sucker, and yellow perch. Johnny darters have been commonly observed in both recent and historic surveys. Common shiners were documented in early surveys but they have been rarely observed in recent surveys (from page 23, WQCD Exhibit 38-11, Cache la Poudre Basin Rationale, June 2009).