DENVER ENVIRONMENTAL HEALTH

2015 Water Quality Update
An overview of water quality in Denver's streams

a river is more than an amenity, it is a treasure
- Supreme Court Justice Oliver Wendell Holmes
An Overview of the City’s Streams During 2015

This report covers:

- Denver’s priorities related to water quality
- Efforts to improve water quality in Denver’s streams and lakes
- Information on actions you can take to prevent pollution from reaching Denver’s streams and lakes.

For up-to-date information on water quality, follow us on Facebook at [facebook.com/denverswaterqualityprogram](http://facebook.com/denverswaterqualityprogram) or Twitter at [twitter.com/DenverWQ](http://twitter.com/DenverWQ).

For detailed information on water quality in Denver’s streams visit [denvergov.org/waterquality](http://denvergov.org/waterquality), or contact us by email at [waterquality@denvergov.org](mailto:waterquality@denvergov.org).

For up-to-date information on the Department of Environmental Health’s other programs, follow us on Twitter at [twitter.com/DenEnviroHealth](http://twitter.com/DenEnviroHealth) or visit [denvergov.org/EnvironmentalHealth](http://denvergov.org/EnvironmentalHealth).
Pollutants from many sources impact urban streams, including those in Denver. To determine the extent of those impacts, the Department of Environmental Health (DEH) samples most of Denver’s streams at least once a quarter. Samples are analyzed for a broad suite of pollutants, including nitrogen and phosphorous, Escherichia coli (E. coli), and metals.

Results of sampling are used to determine:

- Whether water in the City’s streams meets the State of Colorado’s water quality standards;
- Whether it is safe for people to wade, boat, or fish in the City’s streams;
- Whether the City’s efforts to reduce the amount of pollution entering our streams are effective;
- Trends in water quality;
- Progress towards achieving the Mayor’s 2020 sustainability goal of ensuring all streams and lakes in Denver are safe for fishing and swimming.
DOES WATER IN DENVER’S STREAMS MEET COLORADO WATER QUALITY STANDARDS?

The State of Colorado determines the appropriate uses for all of the streams in Colorado and develops water quality standards that are protective of those uses. Every other year, water quality data from throughout the State is evaluated by the Colorado Department of Public Health and Environment to determine which streams and lakes meet standards. The streams which don’t meet standards are compiled into a list called the 303(d) list. If a stream is placed on the 303(d) list, it means that additional protection or action is needed for the stream to achieve or maintain water quality standards. It does not change the stream’s designated uses.

Table 1 is a list of streams in Denver, their intended use, and the pollutants for which they exceed water quality standards. The pollutants which most commonly exceeded standards were E. coli and selenium.

<table>
<thead>
<tr>
<th>Stream</th>
<th>Use Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aquatic Life</td>
</tr>
<tr>
<td>South Platte River</td>
<td>Yes</td>
</tr>
<tr>
<td>South Platte Tributaries</td>
<td></td>
</tr>
<tr>
<td>Bear Creek</td>
<td>No (Habitat)</td>
</tr>
<tr>
<td>Lakewood Gulch</td>
<td>Yes</td>
</tr>
<tr>
<td>Weir, Sanders, Harvard West, and Harvard Gulches and Westerly Creek</td>
<td>No (Selenium)</td>
</tr>
<tr>
<td>Cherry Creek</td>
<td>No (Selenium and Iron)</td>
</tr>
<tr>
<td>Cherry Creek Tributaries</td>
<td></td>
</tr>
<tr>
<td>Goldsmith Gulch</td>
<td>No (Selenium)</td>
</tr>
<tr>
<td>Sand Creek</td>
<td>No (Selenium)</td>
</tr>
</tbody>
</table>

Table 1. Streams in Denver with intended use as designated by the State of Colorado and whether or not water quality in the stream supports that use. Pollutants in parentheses are present at levels that exceed instream water quality standards. Source: Colorado Department of Public Health and Environment, Water Quality Control Commission, 5 CCR 1002-93, Regulation #93, Colorado’s Section 303(d) List of Impaired Waters and Monitoring and Evaluation List, Adopted January 11, 2016.

RESULTS FROM DEH’S WATER QUALITY MONITORING EFFORTS

DEH routinely monitors ten streams in Denver.

According to the monitoring results from 2015:

• E. coli levels exceeded standards in all 10 streams;
• Selenium levels exceeded standards in three streams (Goldsmith Gulch, Weir Gulch, and Harvard Gulch West), and;
• Eight streams contained iron at levels that exceeded standards.
ARE DENVER’S STREAMS SAFE FOR RECREATION?

ASSESSING RISK

DEH uses the State of Colorado’s swim beach standard as an indicator of whether or not Denver’s streams are safe for recreation. The swim beach standard is 235 colonies of E. coli. When the standard is exceeded, there is an elevated risk of becoming ill when recreating in a water body. When E. coli levels are less than the standard, the water body is considered safe for recreation.

The State of Colorado has determined that all of the streams in Denver are suitable for recreation and has assigned water quality standards to protect recreational uses. As a result, at the time of year when recreational use is highest (between May and October) DEH monitors water at a number of locations heavily used for wading, boating, and fishing. Results are compared to the State of Colorado’s swim beach standard to determine if there is any risk related to coming into contact with waters in the City’s streams. The results are then provided to the public with an assessment of potential risks to their health.

SAMPLING RESULTS

DEH monitors the following four locations, which are the most heavily used recreation areas in Denver:

- Confluence Park
- Bear Creek near the picnic shelter in Bear Valley Park
- Cherry Creek near Holly, and
- Westerly Creek near the playground at Great Lawn Park.

Monitoring results indicate that these locations are not always safe for wading or boating. In particular, those who recreate in Denver’s streams during the summer and fall are at an increased risk of illness due to exposure to elevated E. coli levels (Figure 1).

Currently, DEH does not assess whether fish from the South Platte River or other streams in Denver are safe for consumption. As a result, the City recommends against eating fish from Denver streams.

Figure 1. Percent of samples collected from Confluence Park in which E. coli levels exceeded the State of Colorado swim beach standard, May through of October of 2015.
COMMUNICATING WITH THE PUBLIC

DEH provides information about water quality conditions to the City’s Park Ranger and posts the most recent sampling results on a map (Figure 2) on the Water Quality Program’s web page and Facebook page. The map provides up to date information on E. coli levels and temperature and indicates if water quality conditions are good or bad. The map is updated weekly during the recreation season and at least twice a month during the winter.

Figure 2. Map of sites monitored for E. coli during warm weather. Clicking on any of the icons will yield the most recent results for each site. Green icons indicate that the sample result met the instream water quality standard for E. coli, yellow icons signify that the result was between the instream water quality standard and the swim beach standard, and red icons indicate that the result exceeded the swim beach standard. Note that E. coli results are highly variable and that conditions on the map may not be representative of actual conditions. The map can be found on the Water Quality Program’s web and Facebook pages.
IMPROVING WATER QUALITY IN OUR STREAMS

Denver’s Departments of Environmental Health, Public Works, and Parks and Recreation are committed to understanding and improving water quality in all of the City’s streams and lakes. Here are a few examples of the things Denver is doing to achieve that:

**Strategic Planning for Water Quality**

- In 2015, the Department of Public Works and the Department of Parks and Recreation developed guidance and policy related to implementing green infrastructure for water quality in ultra-urban settings and for water quality treatment facilities in City parks. The documents provide design criteria for City agencies and developers constructing water quality treatment facilities in City right-of-way or on City property. Both documents will be published in 2016.

- In 2015, the Department of Public Works also completed a study to identify which parts of the City have the greatest need for water quality treatment. The study identified specific locations where water quality treatment facilities could be built to improve the quality of runoff discharging from the City’s storm sewers. Public Works used the results of the study to develop a multi-year plan to install water quality treatment facilities. Several projects moved into the planning and design phase and one project, Hampden Heights (Figure 3), was completed. DEH has been working with Public Works to design monitoring programs that will measure the effectiveness of the new water quality treatment facilities to ensure future facilities perform as intended. Figure 4 is a map showing completed, planned, and potential water quality projects in Denver.

Figure 3. The Hampden Heights water quality pond near Havana and Dartmouth in southeast Denver shown during a storm. The pond functions by capturing storm runoff, holding the water long enough for particulates and sediment to settle out, and allowing water to infiltrate into the underlying aquifer. In this photo, overflow from the pond is shown cascading down a series of steps and into Cherry Creek. Cherry Creek is in the foreground (bottom) of the photograph.
COMMUNITY PARTNERSHIPS

In 2015, DEH continued its work with a number of community groups, non-profits, and local universities on projects to improve water quality in the City’s streams and lakes. Here are some of our partners and the projects we have been working on:

- DEH funded and worked with the Urban Waters Partnership and The Water Connection on the development of the first phase of a web-enabled map showing water quality sampling results throughout the Denver metro area. The map is meant to be a user friendly, interactive portal that allows for easy exploration of the data. The map also provides context for the data. The first phase of the project looked at E. coli data. Future phases will optimize the map for mobile devices and will incorporate other pollutants. To explore the map, visit The Water Connection’s website.
DEH continues to work with Groundwork Denver and Denver’s Department of Public Works on efforts to understand and address E. coli in Bear Creek downstream of Bear Creek Reservoir. The project is using innovative approaches to identify sources of E. coli, such as microbial source tracking, and a direct to implementation approach to addressing those sources. Under the direct to implementation approach, mitigation efforts are undertaken before the State of Colorado imposes mitigation requirements. The approach gives Denver the flexibility to implement technologies that will be the most effective at eliminating each source.

DEH is also working with The Greenway Foundation on efforts to prevent trash from entering City streams and lakes. The primary focus in 2015 was the Clean River Design Challenge at Metro State University, funded by the Rose Community Foundation. Teams participating in the Challenge designed innovative techniques to remove trash from Cherry Creek (Figure 6). The designs were judged by a panel and the top five were awarded $1,000 to participate in the second phase of the challenge in which prototypes will be tested on Cherry Creek in April 2016.
Figure 6. Two of the five Clean River Challenge Design finalists. Both designs show innovative approaches to removing trash from Cherry Creek. The final phase of the challenge will be held in April, 2016.

- In 2015 DEH funded a study at the Metro State University of Denver to used advanced microbial source tracking techniques to better understand sources of E. coli in discharges from storm sewers along the South Platte River. The study will help the Department of Public Works to more effectively target efforts to eliminate those sources.
- DEH initiated discussions with the University of Colorado at Denver about a study to develop a better understanding of the human health risks associated with exposure to water in City streams by evaluating what human pathogens are present.
WATER QUALITY TRENDS

DEH evaluates data from a number of pollutants to determine whether any changes in pollutant levels are apparent through time or as streams pass through Denver. Data are analyzed using both graphical and statistical techniques. The 2015 evaluation examined E. coli, nitrogen, phosphorous, and selenium in Cherry Creek and the South Platte River. Highlights of the analysis include:

CHERRY CREEK

- Nitrate, phosphorous, and E. coli levels in Cherry Creek have decreased since 2006, when Glendale’s wastewater treatment plant closed. The changes are most noticeable downstream of Colorado Boulevard.
- Selenium levels increase immediately downstream of Goldsmith Gulch and then begin to decrease further downstream. Selenium is a naturally occurring pollutant which has been detected at high levels in water in Goldsmith Gulch.
- Levels of E. coli and nitrate (Figure 7), two common urban pollutants increase as Cherry Creek passes through Denver.

SOUTH PLATTE RIVER

- Instream levels of nitrate and phosphorous in the South Platte River have been decreasing through time at the site upstream of the Littleton / Englewood Wastewater Treatment Plant and at the sites downstream of 6th Ave.
- As with Cherry Creek, E. coli levels increase as the South Platte River passes through Denver. Selenium levels also increase as the river passes through Denver.

Figure 7. Change in nitrate levels in Cherry Creek as the creek flows through Denver. Sampling locations are arranged from east (upstream, on the left side of the chart) to west (downstream, on the right side of the chart) and show a gradual increase in nitrate levels as the creek passes through Denver. The green dotted line is Colorado’s proposed new water quality standard for nitrate.
PROGRESS TOWARDS MAYOR’S FISHABLE / SWIMMABLE GOALS

The Mayor’s Office of Sustainability has established a goal of making all of the City’s streams swimmable and fishable by 2020. DEH uses the data it collects to measure progress towards reaching this goal.

FISHABLE WATERS

The most important measures of whether or not a water body is suitable for fishing are water quantity, water quality, fish habitat, and fishing access.

In 2015, most of the progress towards the Mayor’s fishable waters goals was in the design and construction of improvements at Pasquinel’s Landing and Grant-Frontier Park. Specifically, construction at Pasquinel’s Landing and on the stretch of the river just downstream of Florida to Evans was completed and work started on Grant-Frontier Park and the first phase of Confluence Park. The projects will improve water quality, add habitat for fish and wildlife, provide recreational access points and restore approximately 2100 linear feet of riparian zone and habitat.

The City also continued collaborating with the US Army Corps of Engineers to identify areas within Denver that could benefit from ecosystem restoration work. In 2015 the public was introduced to the Corps of Engineers’ Urban Waterways Feasibility Study, a three year study to identify improvements that address flood risk reduction, ecosystem and habitat restoration, and improved recreational access. The three areas included in the study are the South Platte River between 6th Avenue and 58th Avenue, on Weir Gulch, or on Harvard Gulch. In 2016, a plan will be tentatively selected and sent out for public review.

DEH also used its water quality sampling results to determine whether or not water quality will support aquatic life. Table 1 indicates that when compared to State of Colorado’s water quality standards, water quality in many of the streams in Denver is not sufficient to support a healthy and diverse population of aquatic life. The primary pollutant of concern is selenium, which occurs naturally in bedrock underlying most of the Denver metro area.
SWIMMABLE WATERS

In 2015, DEH continued its work with a number of community groups, non-profits, and local universities on projects to improve water. The primary measure for determining if a water body is suitable for swimming is whether or not E. coli levels meet health-based standards for recreation. Table 1 indicates that most of the streams in Denver do not meet those standards and Figure 1 shows that during the 2015 recreation season, both Cherry Creek and the South Platte River were more frequently not safe for recreation than safe. E. coli levels in Cherry Creek have been gradually improving through time, however; there is too much variation in the data to draw any conclusions about progress being made towards the Mayor’s goal of making all waters in Denver swimmable. Over the next few years, Denver will begin installing some of the water quality treatment facilities identified in the City’s water quality master plan. As those projects are completed, we anticipate being able to demonstrate progress towards the Mayor’s goal of making Denver’s rivers and streams safe for swimming.
Looking for more information about water quality in Denver?

Email us at waterquality@denvergov.org or visit us at denvergov.org/waterquality.

You can also get up to date information on water quality by following us on Facebook or Twitter: facebook.com/denverswaterqualityprogram or twitter.com/DenverWQ.

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