



EXECUTIVE SUMMARY

WATER QUALITY ASSESSMENT FOR THE UPPER SOUTH PLATTE RIVER

SEPTEMBER | 2013

PREPARED BY:



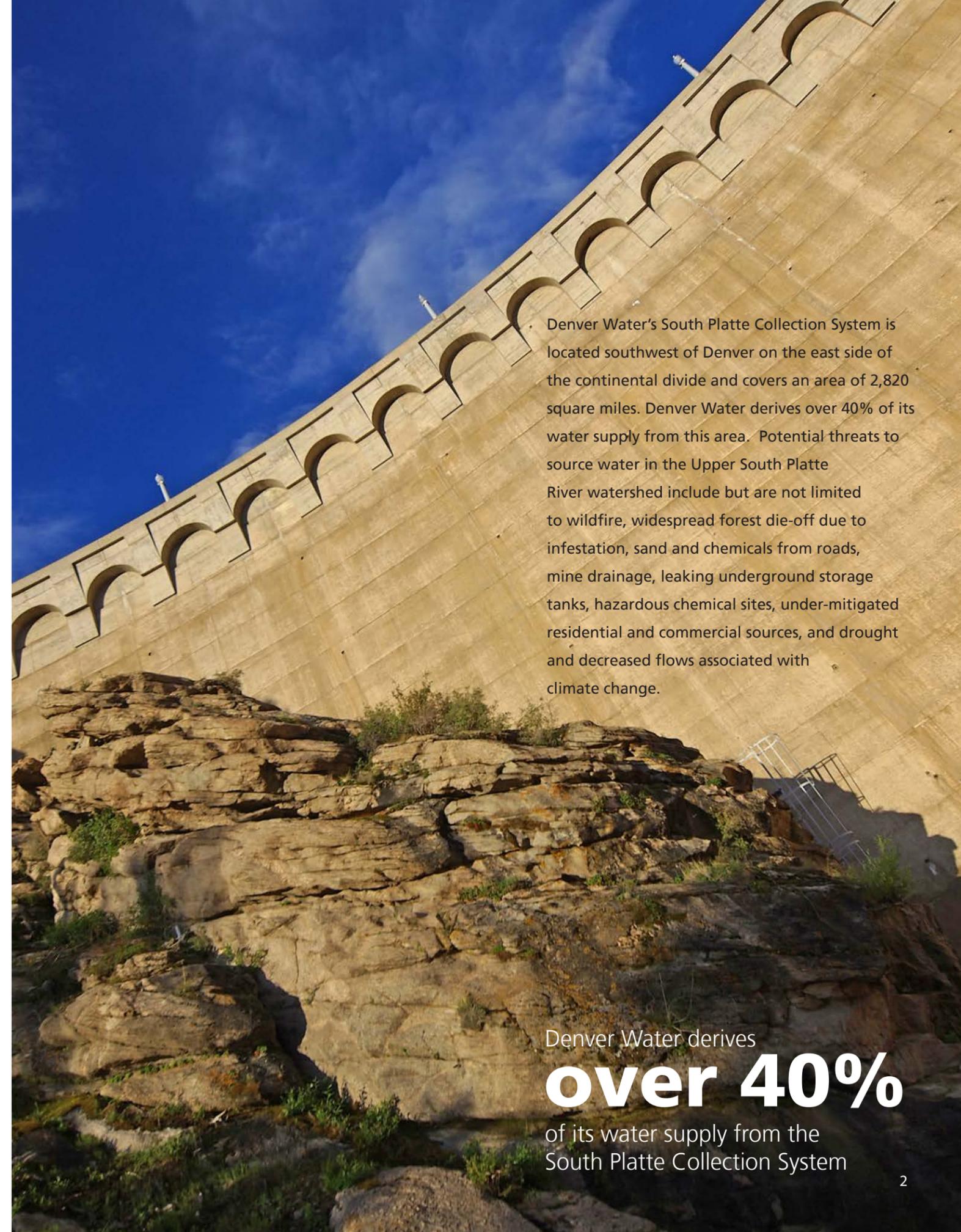
PROJECT BACKGROUND

Denver Water's mission is to be a responsible steward of the resources, assets and natural environments entrusted to it in order to provide a high-quality water supply, a resilient and reliable system, and excellent customer service.

One of the programs that Denver Water employs to fulfill its mission is a watershed management program. The purpose of the watershed management program is to evaluate each watershed, coordinate Denver Water's watershed activities, prioritize watershed improvement projects, and to engage stakeholders in the management of the watersheds.

Some of Denver Water's goals for the watershed program are to:

- Continue to protect public health,
- Maintain customer confidence,
- Prepare for more stringent drinking water regulations,
- Increase awareness of water quality, and
- Treat contamination at the source.



Denver Water's South Platte Collection System is located southwest of Denver on the east side of the continental divide and covers an area of 2,820 square miles. Denver Water derives over 40% of its water supply from this area. Potential threats to source water in the Upper South Platte River watershed include but are not limited to wildfire, widespread forest die-off due to infestation, sand and chemicals from roads, mine drainage, leaking underground storage tanks, hazardous chemical sites, under-mitigated residential and commercial sources, and drought and decreased flows associated with climate change.

Denver Water derives
over 40%
of its water supply from the
South Platte Collection System

PROJECT BACKGROUND

In 2013, Denver Water retained ARCADIS to help characterize and evaluate water quality in the Upper South Platte River watershed. This executive summary focuses on the water quality assessment for the Upper South Platte watershed.

Water Quality Categories and Parameters

| Categories | Parameters |
|--------------------|---|
| General Parameters | Conductivity, pH, Alkalinity, Flow |
| Pathogens | E.coli, Total Coliforms |
| Nutrients | Total Phosphorus, Nitrate/Nitrite, Ammonia-Nitrogen |
| Sediments | Turbidity, Total Suspended Solids |
| Organics | Total Organic Carbon |
| Radionuclides | Uranium |
| Metals | Arsenic, Cadmium, Copper, Lead, Manganese, Molybdenum, Selenium, Zinc |

PROJECT GOALS AND APPROACH

Goals

The goals of the water quality assessment for the Upper South Platte River watershed were to:

- Identify contaminant risks associated with the Upper South Platte River watershed,
- Identify potential impacts to water quality and treatability of source water, and
- Develop a template/road map for future watershed analyses.

These goals were evaluated through the completion of the tasks shown in the table to the right.

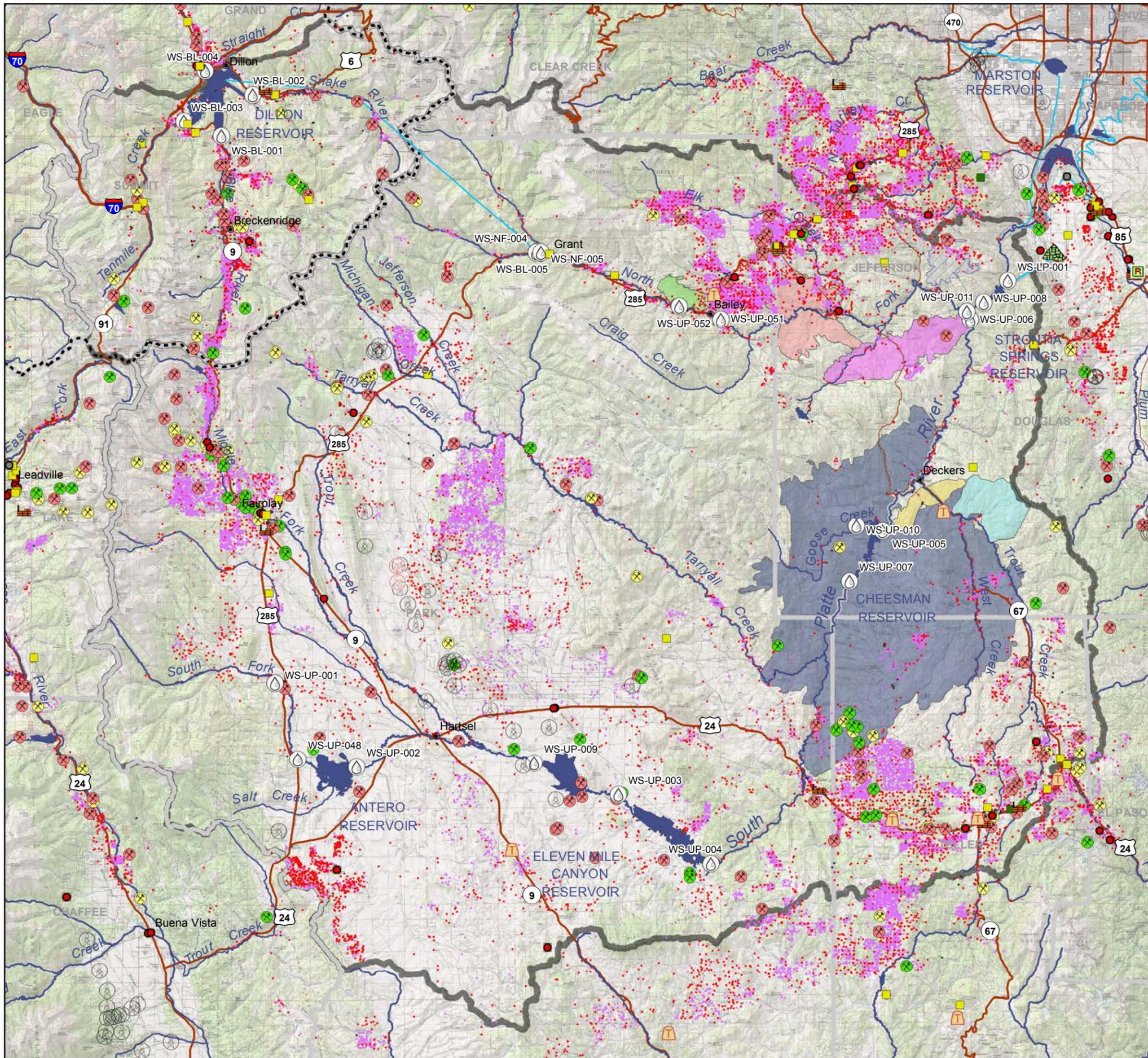
| Task | Description | Activities Performed |
|---|--|--|
| Assess Water Quality | Characterization of the Upper South Platte River watershed through data analysis using statistical methods | <ul style="list-style-type: none"> • Compiled water quality data gathered by Denver Water over 10 years 1999-2012 in the watershed that included over 120,000 individual data points • Prepared over 800 plots • Evaluated over 80 water quality parameters |
| Assess Water Quality Monitoring Program | Evaluation of the current watershed monitoring program based on Denver Water goals | <ul style="list-style-type: none"> • Assessed Denver Water's water quality monitoring program and developed strategies to update it |
| Assess Watershed Condition | Identification and evaluation of potential issues and threats in the Upper South Platte River watershed | <ul style="list-style-type: none"> • Prepared a watershed geographical information system (GIS) database • Evaluated watershed condition based on water quality conditions and potential threats to water quality • Characterized threats in watershed based on their potential impact on Denver Water's Foothills and Marston Water Treatment Plants • Reviewed local watershed planning activities |

WATER QUALITY FOR THE UPPER SOUTH PLATTE RIVER

As part of the project, Denver Water collected and compiled many different data sets to establish a watershed GIS database and also developed a series of maps in support of evaluating the Upper South Platte River watershed condition. One of the primary figures used to assess potential contaminant sources

throughout the watershed (in relation to major reservoirs, streams, and sampling locations) is provided on the following page. It presents the locations of oil wells, well permits (which indicate potential septic locations), landfills, storage tanks, permitted mines, and wildfire boundaries.

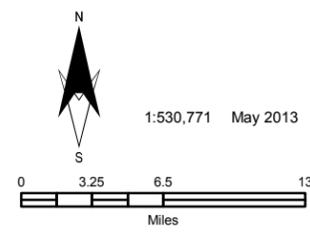
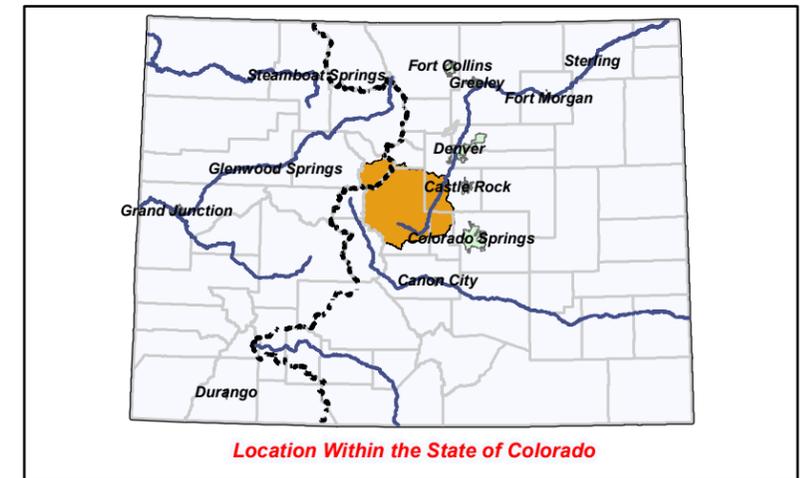




City and County of Denver
Board of Water Commissioners
**Upper South Platte River
Watershed Assessment**
Potential Contaminant Sources

LEGEND

| | |
|--|--------------------------------|
| Water Quality Sampling Sites | DRMS - Permits Mines Active |
| COGCC Directional Oil Wells | Other |
| COGCC Oil Wells | Inactive |
| DWR - Well Permits (potential septic locations) | GeoMAC - Wildfires |
| COMMERCIAL | Buffalo Creek (1996) |
| DOMESTIC | Hayman (2002) |
| HOUSEHOLD USE ONLY | High Meadows (2000) |
| CDPHE - Landfills | Polhemus Burn (2001) |
| LANDFILL | Schoonover (2002) |
| RECYCLER | Snaking (2002) |
| OTHER | Lower North Fork (2012) |
| TRANSFER STATION | Project AOI |
| CDLE - Storage Tanks | County Boundary |
| Currently In Use, Gas/Kerosene | Road |
| Currently In Use, Diesel/Gasoline | Major Stream or River |
| Currently In Use, Oil | Major Canal or Tunnel |
| Not Regulated | Major Lake or Reservoir |
| Permanently Closed | Town |
| Temporarily Out Of Use | Continental Divide |



Planning & Water Resources Division
This Geographic Information Systems (GIS) map is provided 'as is' with no claim by the Denver Water Board as to the completeness, usefulness or accuracy of its content.
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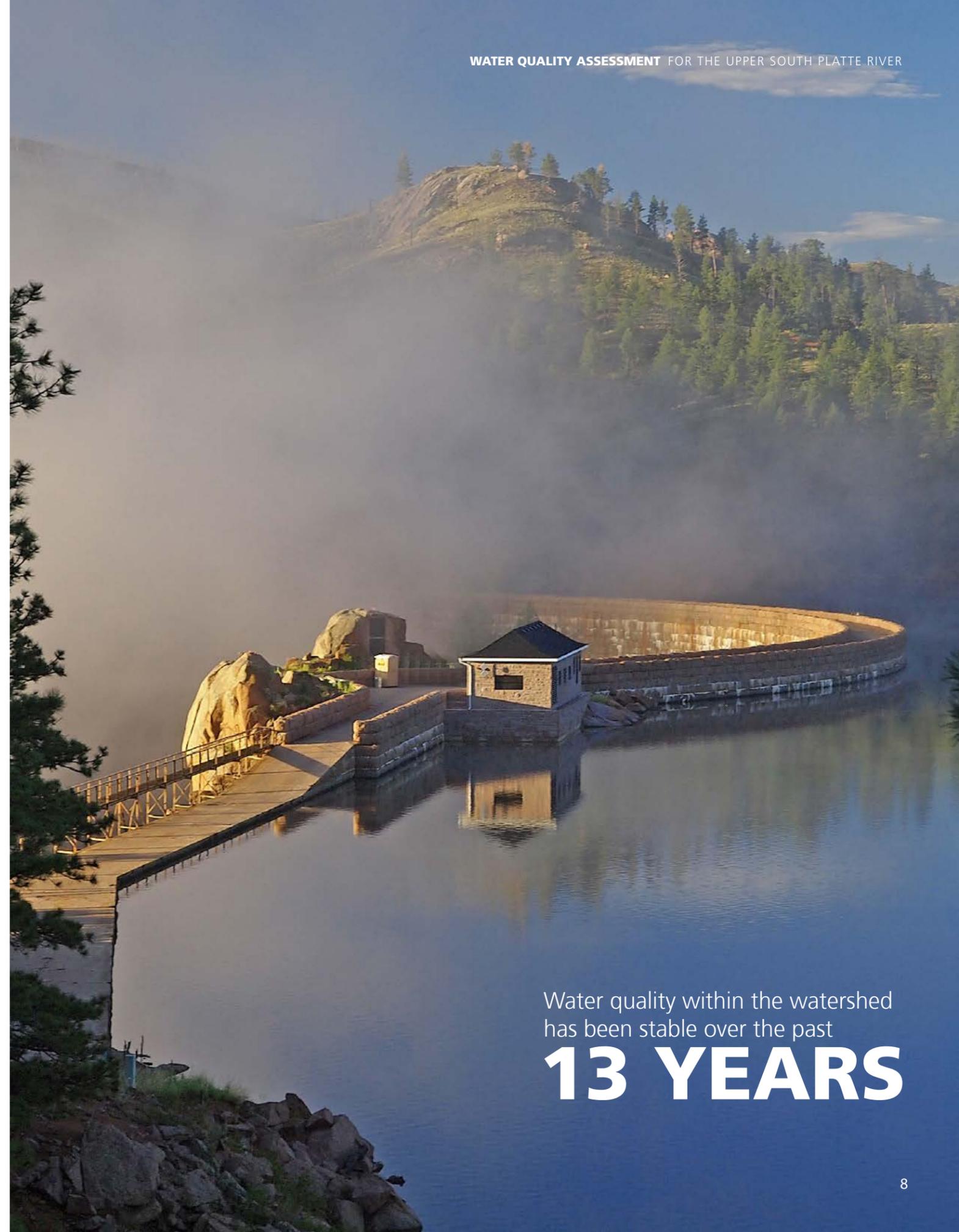
PROJECT FINDINGS and CONCLUSIONS

The project team evaluated the Upper South Platte River watershed based on water quality conditions and potential threats to water quality, focusing on potential impacts to Denver Water's treatment plants. Overall, the evaluation indicated that the water quality within the watershed has been stable over the past 13 years, with the exception of localized mine discharges, forest fires, and recreational impacts as presented in the table below. Additionally, Denver Water's watershed water quality monitoring program is collecting a significant number of water samples and generating high quality data that provide statistical information sufficient to evaluate water quality in the watershed.

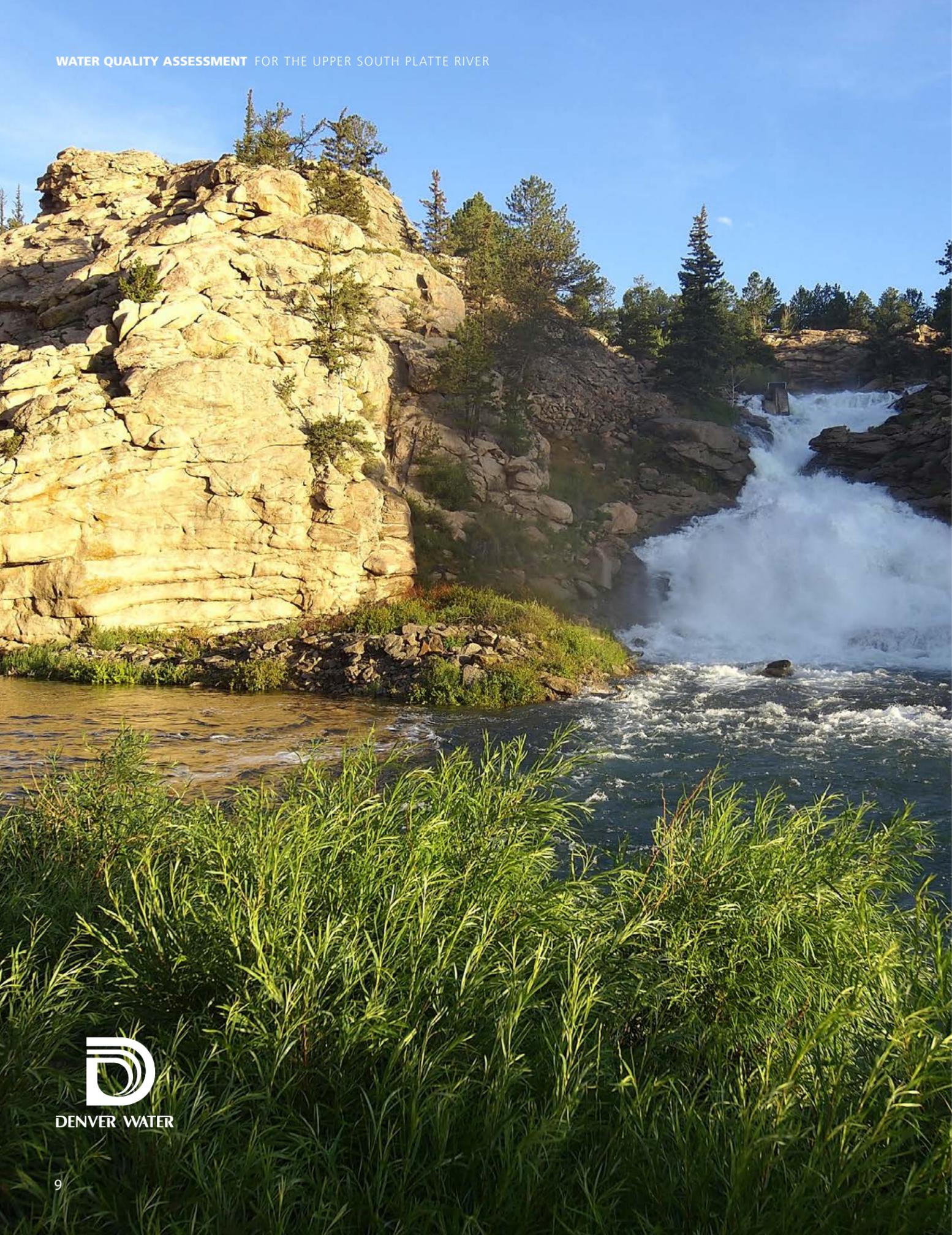
Water Quality Threat Assessment Results

| Potential Contaminant Source | WATER QUALITY ASSESSMENT FOR THE UPPER SOUTH PLATTE RIVER | | | Potential Hazards by Contaminant Class | | | | | | | | | |
|------------------------------------|--|--|-------------------------------|--|-----------|-----------|----------|---------------|--------|-----------------------|--------------|--------------------|---|
| | Potential for Source in Upper South Platte River Watershed | Observed Impact in Upper South Platte Watershed through Data Analysis* | Close Proximity to Water Body | Water Quality Available | | | | | | No Data | | | |
| | | | | Pathogen Indicators | Nutrients | Sediments | Organics | Radionuclides | Metals | Herbicides/Pesticides | Hydrocarbons | Micro-Constituents | |
| Agriculture or Ranching | Yes | No | Yes | • | • | • | • | | | | • | • | |
| Erosion | Yes | No | Yes | • | • | • | • | | | • | • | • | |
| Mine Discharges | Yes | Yes | Yes | • | • | • | • | • | • | | | • | |
| Wastewater or Septic Systems | Yes | No | Yes | • | • | | • | • | • | • | • | • | • |
| Fires | Yes | Yes | Yes | • | • | • | • | • | • | | | | |
| Natural | Yes | No | Yes | • | • | • | • | • | • | | | | |
| Recreation | Yes | Yes | Yes | • | • | • | • | | | | | • | |
| Solids or Hazardous Waste Disposal | Yes | No | Yes | • | • | | • | • | • | • | • | • | |
| Storm water | Yes | No | Yes | • | | • | | | | | | • | |
| Beetle Kill | Yes | No | Yes | | | • | • | | | | | | |
| Oil and Gas | Yes | Need Data | No | | | • | • | • | • | | | • | |

*Note: items in orange highlight that an observed impact in watershed was observed during this assessment of water quality data.



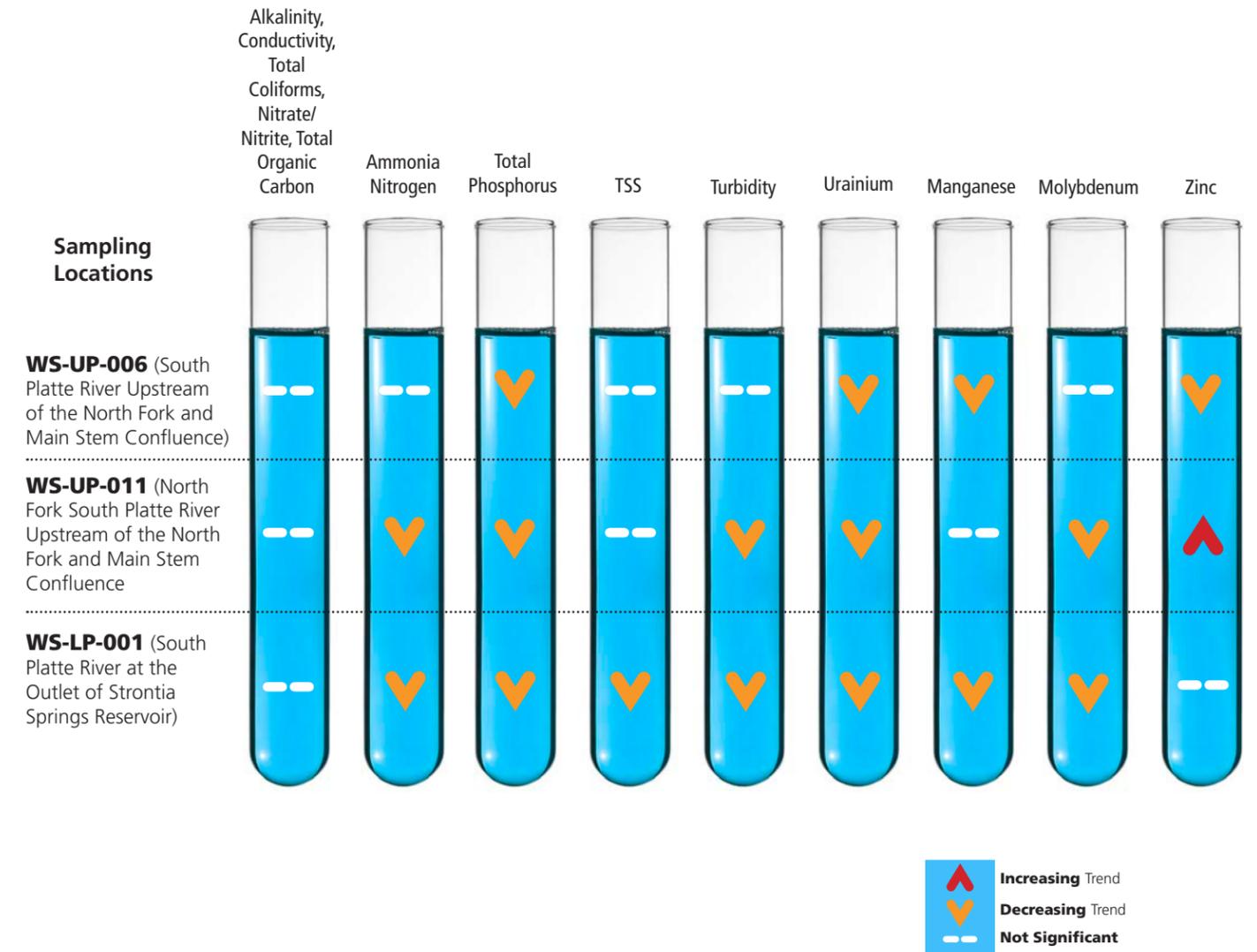
Water quality within the watershed has been stable over the past
13 YEARS



NEXT STEPS

Denver Water is in the process of applying for a Source Water Assessment and Protection Pilot Project Grant from the Colorado Department of Public Health and Environment's Water Quality Control Division. During the assessment phase, the grant would be used to build on this analysis to evaluate the vulnerability of the Upper South Platte River and its tributaries to contaminants from both point sources and Nonpoint sources. During the protection phase, the grant would be used to collaborate with local governments, communities, stakeholders, and other utilities to develop and implement protection strategies aimed at reducing water quality degradation. The anticipated commencement of this project is Fall 2013.

Trend Analysis for Key Locations and Analytes





DENVER WATER

WATER QUALITY ASSESSMENT FOR THE UPPER SOUTH PLATTE RIVER

This project is dedicated to Chips Barry, Denver Water's Manager from 1991 to 2010. Chips was always quick to point out that the large fires in Denver Water's Upper South Platte watershed were a wakeup call for Denver Water. He often said that we needed to start treating our watersheds as an extension of our infrastructure and he championed investing in watersheds to protect water quality.

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